

LECTURENOTES
On
ENVIRONMENATAL STUDIES



ORISSA SCHOOL OF MINING ENGINEERING

Government of Odisha

ଓଡ଼ିଶା ଶାସନ ଯାନ୍ତ୍ରୀକ ବିଦ୍ୟାଳୟ, କେଉଁଜହର

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Metallurgical Engineering Department

Orissa School of Mining Engineering Keonjhar

Course code: Th-5 Semester: 3rd

Vision and Mission of the Department

VISION: To offer quality technical education In the field of Metallurgical Engineering with orientation towards industry, entrepreneurship, environmental studies , higher education and to strive for developing professionally competent technicians meeting the needs of the global economy .

MISSION:

M1: To develop students in the field of Metallurgical Engineering as highly motivated , skill ful and qualified man powering employment and higher learning.

M2 : To promote a conducive environment all round developments of students.

M3 : To promotes linkages with external agencies to meet changing needs of industry and society.

Programme Education Objectives (PEOs)

PEO 01 : Diploma professionals will be able to make successful career in metallurgical industries or higher studies to meet the needs for future requirements.

PEO 2 : Diploma metallurgists have a technical and behavioral competencies through adequate exposure to industry .

PEO 03: To impart technological knowledge and skill for solving real time engineering problems.

PEO 04: To develop human resources with capabilities of effective communication , moral values , ethics and social responsibilities.

LECTURE-01

ENVIRONMENTAL STUDIES

Introduction:

Environment is derived from the French word —Environ” which mean —encircle or surround|| Environmental Studies deals with every issue that affects an organism.

So, Environment refers to surroundings which vary from place to place and continent depending upon Physiography, Topography, Climate and the available Natural resources. Since the beginning of the culture, the natural resources such as Soil, Land, Water etc are being over-exploited causing the environment gets polluted or degraded. This has resulted in multi – dimensional environmental crisis like soil erosion, landslides and in turn have created soil pollution, air pollution, water pollution, noise pollution etc.

Definition:

The sum total of all surroundings of a living organism, including natural forces and other living things, which provide conditions for development and growth .

Importance of Environment:

1. Environment is concerned with day – to – day interaction with the surroundings with which human being is closely associated.
2. Environmental Science is related to many branches of Sciences
3. Environment is concerned with the importance of wild life and its protection.
4. Environmental Science explains the significant role of biodiversity in establishing ecological balance.
5. Environmental Science gives information relating to Population growth, Population explosion and impact on Population growth. Environmental Science also gives information about water conservation, watershed management and the importance of water.

Scope of Environment: The environment consists of four segments as under:

1. Atmosphere: The atmosphere implies the protective blanket of gases, surrounding the earth:

- (a) It sustains life on the earth.
 - (b) It saves it from the hostile environment of outer space.
 - (c) It absorbs most of the cosmic rays from outer space and a major portion of the electromagnetic radiation from the sun.
 - (d) It transmits only here ultraviolet, visible, near infrared radiation (300 to 2500 nm) and radio waves. (0.14 to 40 m) while filtering out tissue-damaging ultra violate waves below about 300 nm.
- The atmosphere is composed of nitrogen and oxygen. Besides, argon, carbon dioxide, and trace gases

2. Hydrosphere: The Hydrosphere comprises all types of water resources oceans, seas, lakes, rivers, streams, reservoir, polar icecaps, glaciers, and ground water.

- (i) Nature 97% of the earth's water supply is in the oceans,
- (ii) About 2% of the water resources is locked in the polar icecaps and glaciers.
- (iii) Only about 1% is available as fresh surface water-rivers, lakes streams, and ground water fit to be used for human consumption and other uses

3. Lithosphere: Lithosphere is the outer mantle of the solid earth. It consists of minerals occurring in the earth's crusts and the soil e.g. minerals, organic matter, air and water.

4. Biosphere: Biosphere indicates the realm of living organisms and their interactions with environment, viz atmosphere, hydrosphere and lithosphere .

NEED FOR PUBLIC AWARENESS

1. Growing Population

A population of over thousands of millions is growing at 2.11 per cent every year. Over 17 million people are added each year. It puts considerable pressure on its natural resources and reduces the gains of development. Hence, the greatest challenge before us is to limit the population growth. Although population control does automatically lead to development, yet the development leads to a decrease in population growth rates. For this development of the women is essential.

2. Poverty

India has often been described a rich land with poor people. The poverty and environmental degradation have a nexus between them. The vast majority of our people are directly dependent on the nature resources of the country for their basic needs of food, fuel shelter and fodder. About 40% of our people are still below the poverty line. Environment degradation has adversely affected the poor who depend upon the resources of their immediate surroundings.

3. Agricultural Growth

The people must be acquainted with the methods to sustain and increase agricultural growth with damaging the environment. High yielding varieties have caused soil salinity and damage to physical structure of soil.

4. Air and water Pollution

Majority of our industrial plants are using outdated and pollution technologies and makeshift facilities devoid of any provision of treating their wastes. A great number of cities and industrial areas that have been identified as the worst in terms of air and water pollution.

Acts are enforced in the country, but their implementation is not so easy. The reason is their implementation needs great resources, technical expertise, political and social will. Again the people are to be made aware of these rules. Their support is indispensable to implement these rules .

LECTURE-02

NATURAL RESOURCES

The word resource means a source of supply. The natural resources include water, air, soil, minerals, coal, forests, crops and wildlife are examples. All the resources are classified based on quantity, quality, re-usability, man's activity and availability.

Classification of Resource

Exhaustible Resources: These resources have limited supply on the earth and liable to be exhausted if used indiscriminately. These resources are of two types

(1) Renewable resources:

These resources have the capacity to reappear themselves by quick recycling with a reasonable span of time. Eg: forests, wildlife.

(2) Non-renewable resources:

Resources that exist in a fixed quantity in earth's crust are called non-renewable resources.

These resources lack the ability of recycling and replacement. Eg: minerals, fossil fuels etc..

A few mineral resources which occur in the earth's crust namely copper, aluminum, mercury, gold etc., minerals of asbestos, clay and mica are considered as non-renewable resources. Fossil

fuels are derived from organic matter that accumulated during hundreds of millions of years of early bio-geological history. There is no way of recycling the energy in fossil fuels.

Inexhaustible Resources:

These resources are present in unlimited quantity in the nature and they are not likely to be exhausted by human activities. Eg: solar energy, wind power, tidal power, rain fall, atomic energy etc...

It is very important to protect and conserve, the natural resources. Natural resources are to be used in a judicious manner so that they cannot be exhausted. It doesn't mean that we should stop using them. Natural resources are to be used in such a way that we can make use for future generations. Among the natural resources, Water resources; Mineral resources; Energy resources; Land resources are the major ones to discuss.

FOREST RESOURCE

FOREST FUNCTIONS

Watershed protection:

- Reduce the rate of surface run-off of water.
- Prevent flash floods and soil erosion.
- Produces prolonged gradual run-off and thus prevent effects of drought. Atmospheric regulation:
 - Absorption of solar heat during evapo-transpiration.
 - Maintaining carbon dioxide levels for plant growth.
 - Maintaining the local climatic conditions. Erosion control:
 - Holding soil (by preventing rain from directly washing soil away). Land bank:
 - Maintenance of soil nutrients and structure.

Local use –

Consumption of forest produce by local people who collect it for subsistence – (Consumptive use)

- Food - gathering plants, fishing, hunting from the forest. (In the past when wildlife was plentiful, people could hunt and kill animals for food. Now that populations of most wildlife species have diminished, continued hunting would lead to extinction.)
- Fodder - for cattle.
- Fuel wood and charcoal for cooking, heating.
- Poles - building homes especially in rural and wilderness areas.
- Timber – household articles and construction.
- Fiber - weaving of baskets, ropes, nets, string, etc.
- Sericulture – for silk.
- Apiculture - bees for honey, forest bees also pollinate crops.
- Medicinal plants - traditionally used medicines, investigating them as potential source for new modern drugs. Market use - (Productive use)
 - Most of the above products used for consumptive purposes are also sold as a source of income for supporting the livelihoods of forest dwelling people.
 - Minor forest produce - (non-wood products): Fuelwood, fruit, gum, fiber, etc. which are collected and sold in local markets as a source of income for forest dwellers.
 - Major timber extraction - construction, industrial uses, paper pulp, etc.

Timber extraction is done in India by the Forest Department, but illegal logging continues in many of the forests of India and the world.

1. OVER EXPLOITATION OF FOREST:

Due to overpopulation, the forest materials like food, medicine, shelter, wood & fuel are not sufficient to meet the people's demand. Hence exploitation of forest increases day by day

Reason for over exploitation in India:

In India forest area required to maintain good ecological balance is 33% but at present is only 22% there. Hence over exploitation of forest occur

Causes of over exploitation:

- Increasing agricultural production
- Increasing industrial activities
- Increase in demand of wood resources
- Effects of Over exploitation: Led to migration of the farmers
- Environment damage is heavy
- Tropical forests are destroyed very fastly
- Countless plants and animal species are endangered
- Marine population will go into extinction
- Dumping of wastes into land, water,& air is a severe problem

DEFORESTATION

Deforestation means destruction or removal of forests due to natural or man-made activities.

Deforestation in India:

Deforestation is a continuous process in India. About 1.3 hectares of forest land has been lost. The presence of waste land is a sign of deforestation in India.

Causes of Deforestation

1. Developmental projects (Ex) Bigdams, hydroelectric projects, road construction etc
2. Mining operations (ex) Mica, coal, manganese, limestone etc.
3. Raw materials for industries (ex) for making boxes, furnitures, plywood, match boxes, pulp etc.
4. Fuel requirements (ex) Both rural & tribal population depend on forests for fuel
5. Shifting cultivation - Replacement of natural forest ecosystem lead to loss of plants & animal species
6. Forest Fires - Due to human interruption & increase in temperature forest fire happens

Effects or Consequences of deforestation:

1. Global Warming ► Cutting & burning of forest trees increase CO₂ content in atmosphere This causes global warming and depletion of ozone layer.
2. Soil erosion ► Forest trees act as natural barrier to reduce the wind velocity & reduce soil erosion. Deforestation causes soil erosion, floods, landslides, and drought.
3. Loss of genetic diversity ► Destroy the genetic diversity on earth which provides food & medicines for entire world.

4. Loss of Biodiversity ► When plants does not exist, animals that depend on them for food & habitat become extinct.

5. Loss of Food grains ► Due to soil erosion, the countries loose the food grains.

6. Flood & land slides ► frequent floods, landslides in hilly areas and wind speed are heavy.

7. Unemployment Problems ► people living around forest areas losses their livelihood.

Preventive measures of conservation of forests

- Planting trees to replace the cut down trees
- Use of wood for fuel should be discouraged
- Controlling forest pest by spraying pesticides using aeroplanes
- Controlling forest fire by modern techniques
- Controlling over grazing by cattle
- Discouraging migration of tribal people by the government.
- Conducting education & awareness programmes
- Strict implementation of law of forest conservation act.

LECTURE -03

DAMS & THEIR EFFECTS ON FORESTS & TRIBAL PEOPLE:

Definition: Dams are artificial structures built across the river to create reservoir to store water. Indian Scenario: Maharashtra = more than 600 dams, Gujarat = more than 250 dams Madhya Pradesh = more than 130 dams

Benefits of Constructing Dams:

Control flood & store water Divert water from river into a channel

Used for drinking & agricultural purposes Built for generating electricity

Used for recreational purposes

Navigation & fishery can be developed in dam areas Help for the socio economic development of the society

Used for irrigation during dry seasons

Prevent drought

Effects of dam on forest:

- Thousands of hectares of forest are cleared for river valley projects
 - Forest is also cleared for residential, office, buildings, storing materials, laying roads etc
 - Hydro electric projects have led to loss of forest.
 - Dam construction kills wild animals & aquatic life
 - Hydro electric projects spread water borne diseases.
 - Water logging leads to salinity & reduces the fertility of land
- (Examples) Narmada Sagar Project = submerged 3.5 lakhs hectares of forest Tehri dam = submerged 1000 hectares of forest

Effects of dam on tribal people:

- Displacement of tribal people
- Cultural change affects the tribal people mentally & physically
- They do not accommodate the modern food habits & life styles.
- Tribal's are ill treated by modern society
- They are recognized and compensated
- Their body condition will not suit the new area & are affected by many diseases

Problems of Constructing Dams:*Upstream Problem:*

- Displacement of tribal people
- Loss of forests, flora & fauna Soil erosion, sedimentation, siltation occurs
- Water logging retards plant growth
- Spread of vector-borne & water borne diseases Reservoir Induced Seismicity (RIS) causes earthquake

Down stream problems:

- Water logging causes salinity
- Silt deposition in rivers
- Salt water intrusion in river
- As nutrients deposits in reservoir, land
- losses its fertility Structural defects of dam destroy many living organisms

Water resources

The water cycle, through evaporation and precipitation, maintains hydrological systems which form rivers and lakes and support in a variety of aquatic ecosystems. Wetlands are intermediate forms between terrestrial and aquatic ecosystems and contain species of plants and animals that are highly moisture dependent. All aquatic ecosystems are used by a large number of people for their daily needs such as drinking water, washing, cooking, watering animals, and irrigating fields.

OVER UTILIZATION OF WATER:**1. Decrease of Ground water:****Reason:**

Increased usage of ground water Inadequate rainfall Construction activities reduces the area for percolation of rainwater

2. Ground subsidence: When the groundwater withdrawal is more than recharge rate ground subsidence occur.**Problems:**

Structural damage in buildings

- Fracture in pipes
- Reversing flow of canals & tidal flooding

3. Lowering of Water table: Water pressure is lower than the atmospheric pressure, hence disturb the hydrological cycle.**Problems:**

Lowering of water table Decreased pressure of water changes the speed & direction of water flow.

4. Intrusion of salt water:
 - Over-exploitation of ground water lead to rapid intrusion of salt water from the sea
 - Water cannot be used for drinking & agricultures.
5. Earthquake & landslides: Over utilization of ground water leads to earthquake, landslides & famine.
6. Drying up of wells:
 - the groundwater withdrawal is more than recharge rate
 - this leads to drying up of dug wells & bore wells
7. Pollution of water: Water containing nitrogen as nitrate fertilizer, percolates rapidly into ground & get polluted.
 - Water becomes unsuitable for potable when nitrate concentration exceeds 45 mgs/lit.

Floods:

Floods have been a serious environmental hazard for centuries. However, the havoc raised by rivers overflowing their banks has become progressively more damaging, as people have deforested catchments and intensified use of river flood plains that once acted as safety valves. Wetlands in flood plains are nature's flood control systems into which overfilled rivers could spill and act like a temporary sponge holding the water, and preventing fast flowing water from damaging surrounding land.

As the forests are degraded, rainwater no longer percolates slowly into the subsoil but runs off down the mountainside bearing large amounts of topsoil. This blocks rivers temporarily but gives way as the pressure mounts allowing enormous quantities of water to wash suddenly down into the plains below. There, rivers swell, burst their banks and flood waters spread to engulf peoples' farms and homes.

Drought:

In most arid regions of the world the rains are unpredictable. This leads to periods when there is a serious scarcity of water to drink, use in farms, or provide for urban and industrial use. Drought prone areas are thus faced with irregular periods of famine. Agriculturists have no income in these bad years, and as they have no steady income, they have a constant fear of droughts .

One of the factors that worsens the effect of drought is deforestation .

CONFLICTS OVER WATER:

1. Conflicts through use: Unequal distribution of water led to inter-state or international disputes.

A. International conflicts:

- India & Pakistan fight to water from the Indus
- Iran & Iraq fight for water from Shatt-al-Arab water
- India & Bangladesh fight for Bhramaputra river
- Mexico & USA fight over Colorado river

b. National Conflicts:

- Cavery problem between Karnataka & Tamilnadu
- Krishna problem between Karnataka & Andhra Pradesh

- Siruveni water problem between Tamilnadu & kerala

2. Construction of Dams/Power stations:

For hydroelectric power generation, dams built across the rivers, initiates conflict between the states.

3. Conflict through pollution:

- Rivers & Lakes are used for electricity, shipping & for industrial purpose.
- Disposal of waste water & industrial waste decrease the quality of water & causes pollution.

EXAMPLES OF WATER CONFLICTS:

Conflicts on Indian river:

- Damodar river → It is the most polluted river, carrying 43 industries discharges/
- Yamuna river → 19,000 cubic meters of Water containing DDT derivatives are dumped in the river.
- Ganga river → 1000 cubic meters of polluted water from 68 industries are discharged in the river.
- Periyar river → The River is dying due to mining of 4,37,000 tonnes of sand everyday & become salty due to intrusion of sea water
- Suriyapalayam river → 34 tanneries located around this river contaminate drinking water, & make soil unfit for agriculture.
- Thamraparani river → Continuous brick making on its bank has converted the river into mud pools.

Cavery water dispute:

The Cauvery water dispute Tribunal set up on 2nd June 1990, directed Karnataka to ensure 205 TMCF of water to Mettur dam every Year.

Water conflicts in the middle east:

In Ethipia, Sudan & Egypt:

Problems in sharing Jordan, Tigris-Euphrates & Nile river water resources by middle east countries

In Jordan, Syria & Israel:

Problems in sharing of Jordan river water between Jordan, Syria & Israel.

LECTURE-04

MINERAL RESOURCES

A mineral is a naturally occurring substance of definite chemical composition and identifiable physical properties.

An ore is a mineral or combination of minerals from which a useful substance, such as a metal, can be extracted and used to manufacture a useful product.

Minerals and their ores need to be extracted from the earth's interior so that they can be used. This process is known as mining.

Types: 1. Surface mining: It is process of extraction of raw materials form surface.

2. **Underground mining:** It is the process of extraction of raw materials below the earth's surface

Open-Pit mining: machines dig holes & remove the ores. (ex) Iron, copper, limestone, marble etc

Dredging: Scraping the minerals from under-water mineral deposit by chained buckets & draglines.

Strip mining: The ore is stripped off by using bulldozers, stripping wheels.

Effects of over exploitation of mineral resources

- Rapid depletion of mineral deposits
- Wastage & dissemination of mineral deposits
- Causes environmental pollution
- Needs heavy energy requirements.
- Vibration developed during mining causes earthquake
- Causes Noise pollution
- Reduces size & shape of forest areas
- Continuous mining causes landslides, Causes migration of tribal people.

1. De-vegetation & defacing of landscape

- Topsoil & vegetation are removed from mining areas.
- De-vegetation leads to severe ecological losses.

2. Groundwater contamination

- Mining pollutes the ground water.
- Sulphur present in many ores, is converted into sulphuric acid by microbial action. • Hence water becomes acidic.
- Some heavy metals also leach into ground water.

3. Surface water pollution

- The drainage of acid mine contaminates streams & lakes.
- Radioactive substances like Uranium contaminate the surface water &
- Kill the aquatic animals.

4. Air pollution

- Smelting & roasting done to purify the metal causes air pollution & affects the nearby vegetation.
- *The SPM (suspended particulate matter) like Arsenic, cadmium, lead etc. contaminate the atmosphere & affects public health.

5. Subsidence of Lands Mining results in cracks in houses, tilting of buildings, bending of rail tracks etc

Food resources

Today our food comes almost entirely from agriculture, animal husbandry and fishing. Although India is self-sufficient in food production, it is only because of modern patterns of agriculture that are unsustainable and which pollute our environment with excessive use of fertilizers and pesticides. On the other hand, if the farmer uses traditional varieties and grows several different crops, the chance of complete failure is lowered considerably.

World food problems:

In many developing countries where populations are expanding rapidly, the production of food is unable to keep pace with the growing demand.

Food production in 64 of the 105 developing countries is lagging behind their population growth levels. These countries are unable to produce more food, or do not have the financial means to import it. India is one of the countries that have been able to produce enough food by cultivating a large proportion of its arable land through irrigation. The Green Revolution of the 60's reduced starvation in the country.

EFFECTS / IMPACTS OF MODERN AGRICULTURE:

1. Problems in using Fertilizers:

Micronutrient imbalance:

- a. Chemical fertilizers used in fields contain nitrogen, phosphorus & potassium (NPK)
- b. Excess of fertilizers used in fields causes micronutrient imbalance.

Blue Baby syndrome:

- a. Nitrogenous fertilizers used in fields, contaminate the ground water.
- b. When the nitrate concentration exceeds 25 mg/lit, they cause serious health problem called "Blue Baby syndrome"
- c. This disease affects infants & leads to death.

Eutrophication:

- a. A large proportion of N & P fertilizers used in fields is washed off & causes over nourishment of the lakes. This process is known as Eutrophication.
- b. Eutrophication leads lakes to get attacked by algal blooms.
- c. Life time of algal blooms are less & they die quickly & pollute water & affect the aquatic life.

2. Problems in using pesticides:

1st generation Pesticides: Sulphur, arsenic, lead or mercury are used to kill the pests.)

2nd generation pesticides: DDT Dichlorodiphenyltrichloromethane is used to kill the pests.)

These chemicals produce number of side effects. They are as follows

Death of non-target organisms = Insecticides not only kill the target species, they also kill the non-target species.

Producing new pests: Some pest species survive even after the pesticide spray; they are immune & are called super pests.

Bio-magnification:

Many pesticides are non-biodegradable & keep on concentrating in food chain. The process is called bio-magnification & is harmful to the human beings.

Risk of cancer: It directly acts as carcinogens, It indirectly suppress the immune system.

Quality of an ideal pest:

Must kill only the target species Must be biodegradable Should not produce new pests

Should not produce any toxic pesticide vapour Excessive pesticides should not be used

Chlorinated & organophosphate pesticides are hazardous & they should not be used.

3. Water logging:

Water logging is the land where water stand for most of the year

Problems in water logging:

- Pore-voids in the soil get filled with water & the soil-air gets depleted.
- So, the roots of the plants don't get adequate air for respiration.
- So, mechanical strength of the soil & crop yield decreases.

Causes of Water logging:

Excessive water supply to the croplands.

Remedy:

- Preventing excessive irrigation
- Preventing water-logging by
- Sub-surface drainage technology
- Bio-drainage by eucalyptus tree etc

4. Salinity:

Definition:

- Water evaporation leaves behind a thin layer of salts in the topsoil. & this process of accumulation of salts is called salinity of soil.
- Saline soils are due to Sodium chloride, calcium chloride, magnesium chloride, sodium sulphate, sodium bicarbonates & sodium carbonates.
- The Ph of the water exceeds 8.0 Problems in salinity Due to salinity the soil becomes alkaline & crop yield decreases Remedy:
- The salt deposit is removed by flushing them by good quality water Salt water is flushed out by using sub-surface drainage system

LECTURE-05

RENEWABLE ENERGY RESOURCES & NON-RENEWABLE ENERGY RESOURCES:

Renewable Energy Resources:

Definition: They are natural resources which can be regenerated continuously

Examples: **Solar energy** = Solar cells, Solar heat collectors, Solar water heater

Wind energy = Wind mills, Wind farms

Ocean energy = Tidal energy, Ocean Thermal energy, Geothermal energy

Biomass energy = Biogas, Bio fuel, Hydrogen fuel

A) SOLAR ENERGY:

The Energy that we get directly from the sun is called solar energy

Methods of Harvesting Solar Energy

1. Solar cells (or) photovoltaic cells (or) PV cells

- Solar cells consist of a p-type semiconductor and n-type semi-conductor
- They are in close contact with each other.
- When the solar rays fall on the top layer of p-type semi-conductor, the electrons from the valence band get promoted to the conduction band and cross the p-n junction into n-type semi-conductor.
- Thus potential difference produced between two layers causes flow of electrons (ie.,an electric current)

Uses

Used in calculators, electronic watches. Street lights, water pumps to run radios and TVs.

Solar Battery

- Large number of solar cells is connected in series to form a solar battery.
- Solar battery produce more electricity which is enough to run water pump, to run street-light, etc.,

2. Solar heat collectors

- Solar heat collectors consist of natural materials like stones, bricks, (or) materials like glass.
- They can absorb heat during the day time and release it slowly at night.

Uses

Used in cold places, where houses are kept in hot condition using solar heat collectors.

3. Solar water heater

It consists of An insulated box inside of which is painted with black paint.⌘ Provided with a glass lid to receive and store solar heat.⌘ Inside the box it has black painted copper coil, which heats the cold water.⌘ Then flows out into a storage tank.⌘ From the storage tank water is then supplied through pipes.

Significance of Solar energy: They are noise & pollution free Solar water heaters, cookers require no fuels Solar cells can be used in remote & isolated forest & hilly regions.

b) WIND ENERGY

Definition

Moving air is called wind.

Energy recovered from the force of the wind is called wind energy.]

The energy possessed by wind is because of its high speed.]

The wind energy is harnessed by making use of wind mills.]

Methods of Harvesting wind energy

1. Wind Mills

- The strike of wind on the blades of the wind mill rotates it continuously.
- The rotational motion of the blade drives machines like water pump, flour mills, electric generators etc.

2. Wind farms

- Wind farm consists of large number of wind mills .
- The wind farms produce a large amount of electricity.

Conditions

The minimum speed required for satisfactory working of a wind generator is 15 km/hr.

Advantages

It does not cause any air pollution It is very cheap.

c) OCEAN ENERGY

It can be generated by following ways.

1. Tidal energy (or) Tidal power

Ocean tides, produced by gravitational forces of sun and moon, contain enormous amount of energy.

- The “high tide” and “low tide” refer to the rise and fall of water in the oceans.
- The tidal energy can be harnessed by constructing a tidal barrage.
- During high tide, the sea-water which flow into the reservoir of the barrage, rotates the turbine, which in turn produces electricity by rotating the generators

Significance of tidal energy:

Do not require large areas

Pollution free energy source

No fuel is used & does not produce any wastes.

2. Ocean thermal energy (OTE)

- The temperature difference between the surface level & deeper level of the oceans are used to generate electricity.
- The energy available due to the difference in temperature of water is called ocean thermal energy.

Condition

The temperature difference should be of 20°C or more between surface water and deeper water.

Process

- The warm surface water of ocean is used to boil a low boiling liquid like ammonia.
- The high vapour pressure thus produced turns the turbine of the generator and generates electricity.

Significance:

OTE is Continuous, renewable, pollution free, used to produce H₂,

3. Geo-thermal Energy

The energy harnessed from high temperature & pressure present inside the earth is called geothermal energy.

1. Natural geysers In some places, the hot water (or) steam comes from the ground through cracks naturally

2. Artificial geysers

In some places, we can drill a hole up to the hot region & make the hot water to rush out through the pipe with very high pressure.

Thus, the hot water (or) steam coming out from the natural (or) artificial geysers is allowed to rotate the turbine of a generator to produce electricity.

Significance:

Power generation is higher than solar & wind energies,

Can be brought online quickly,

Used for direct uses such as hot water bath, resorts, aquaculture, greenhouses

d) BIOMASS ENERGY

Biomass is the organic matter, produced by plants or animals,

Eg: Wood, crop residues, seeds, cattle dung, sewage, agricultural wastes.

1. Biogas

- Mixture of methane, carbondioxide, hydrogen sulphide, etc.
- It contains about 65% of methane gas as a major constituent
- Biogas is obtained by the anaerobic fermentation of animal dung or plant wastes in the presence of water.

2. Bio fuels Biofuels

are the fuels, obtained by the fermentation of biomass.

Examples: (a)Ethanol = Easily produced from the sugarcane. Its calorific value is less than petrol,

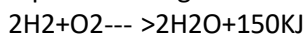
(b)Methanol = obtained from ethanol or sugar-containing plants. calorific value is also too low than gasoline and diesel.

(c)Gasohol = Gasohol is a mixture of ethanol+gasoline.

3. Hydrogen Fuel

Hydrogen can be produced by thermal dissociation or photolysis or electrolysis of water.

It possesses high calorific value. It is non polluting, because the combustion product is water.



Disadvantages of hydrogen fuel

1. Hydrogen is highly inflammable and explosive in nature
2. Safe handling is required
3. It is difficult to store and transport.

Lecture-06

NON-RENEABLE ENERGY

1. Coal

Coal is a solid fossil fuel formed in several stages & were subjected to intense heat and pressure over millions of years.

Various stages of coal

Wood → Peat (60% carbon) → Lignite(70% carbon) → Bituminous coal (80% Carbon) → Anthracite (90% carbon)

Disadvantages

1. When coal is burnt it produces CO₂ causes global warming
2. coal contains impurities like S and N, it produces toxic gases during burning.

2. Petroleum

Petroleum or crude oil = hydrocarbons +small amount S, O, N.

Occurrence Petroleum was formed by the decomposition of dead animals and plants, buried under high temperature and pressure for million years

Fractional distillation

Hydrocarbons are separated by fractioning the crude oil.

3. LPG (Liquefied Petroleum Gas)

1. The petroleum gas, converted into liquid under high pressure is LPG
2. LPG is colorless and odorless gas.
3. During bottling some mercaptans is added, to detect leakage of LPG from the cylinder.

4. Natural Gas

1. Mixture of 50-90% methane and small amount of other hydrocarbons.
2. Its calorific value ranges from 12,000-14,000 k-cal/m³.

(i) Dry gas = the natural gas + lower hydrocarbons like methane and ethane, is called dry gas.

(ii) Wet gas = natural gas + higher hydrocarbons like propane, butane along with methane is called wet gas.

4. Nuclear Energy

Dr. H. Bhabha –father. India has 10 nuclear reactors, which produce 2% of India's electricity.

a) Nuclear Fission

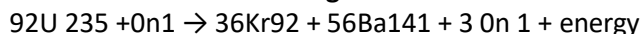
Heavier nucleus is split into lighter nuclei, on bombardment by fast moving neutrons, and a large amount of energy is released.

Eg: Fission of U²³⁵

When U²³⁵ nucleus is hit by a thermal neutron, it undergoes the following reaction with the release of 3 neutrons.

- Each of the above 3 neutrons strikes another U²³⁵ nucleus causing (3x3) 9 subsequent reactions.
- These 9 reactions further give rise to (3x9) 27 reactions.
- This process of propagation of the reaction by multiplication in threes at each fission is called chain reaction.

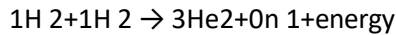
Fission reaction of U²³⁵ is given below.



b) Nuclear fusion:

Lighter nucleuses are combined together at extremely high temperatures to form heavier nucleus and a large amount of energy is released.

Eg: Fusion of H₂ 1 .Two hydrogen-2 (Deuterium) atoms may fuse to form helium at 1 billion°C with the release of large amount of energy



Nuclear power of India

- ✓ Tarapur (Maharashtra),
- ✓ Ranapratap Sagar (Rajasthan)
- ✓ Kalpakkam (Tamilnadu)
- ✓ Narora (U.P)

ROLE OF INDIVIDUAL IN CONSERVATION OF NATURAL RESOURCES:

1. Conservation of energy

- Turn off lights, fans and other appliances when not in use.
- Dry the clothes in sun instead of drier
- Use solar cooker for cooking food on sunny days and will cut down LPG expenses.
- Grow trees and climbers near the houses and get a cool breeze and shade. This will cut off electricity charges on coolers and A/C
- Ride bicycle or just walk instead of using your car or scooter.
- Always use pressure cooker.

2. Conservation of water:

- Use minimum water for all domestic purpose
- Check for water leaks in pipes & toilets & repair them properly
- Reuse the soapy water after washing clothes for washing courtyards, drive ways etc.
- Use drip irrigation to improve irrigation efficiency & reduce evaporation
- The waste water from kitchen, bath tub can be used for watering the plants
- Build rainwater harvesting system in your home

3. Conservation of soil:

- Grow plants, trees & grass which bind the soil & prevent its erosion
- Don't irrigate the plants using strong flow of water, as it will wash off the top soil
- Soil erosion can be prevented by the use of sprinkling irrigation
- Use green manure in the garden, which will protect the soil
- Use mixed cropping, so that specific soil nutrients will not get depleted
- While constructing the house don't uproot the trees

4. Conservation of food resources:

- Eat minimum amount of food, avoid over eating.
- Don't waste the food, instead give it to someone before getting spoiled.
- Cook only required amount of food
- Don't cook food unnecessarily
- Don't store large amounts of food grains & protect them from insects.

5. Conservation of forest:

- Use non-timber products
- Plant more trees & protect them
- Grassing, fishing must be controlled
- Minimize the use of papers & fuel wood
- Avoid developmental work like dam, road, construction in forest areas.

LECTURE -07

SUSTAINABLE DEVELOPMENT

Meeting the needs of the present, without compromising the ability of future generations, to meet their own needs.

Dimensions of sustainable development

Derived from interactions between society, economy and environment.

Aspects of sustainable development

- Inter-generational equity = states to hand over safe, healthy & resourceful environment to future generation.
- Intra-generational equity = Technological development of rich countries should support the economic growth of poor countries. Approaches for sustainable development
- Developing appropriate technology - locally adaptable, eco-friendly, resource efficient and culturally suitable.
- Reduce, reuse, recycle [3R] approach – reduces waste generation and pollution
- Providing environmental education and awareness – changing attitude of the people
- Consumption of renewable resources – attain sustainability
- Conservation of non renewable resources – conserved by recycling and reusing
- Population control

LECTURE-08

ECOSYSTEMS

Ecosystem—A group of organisms interacting among themselves and with environment is known as ecosystem.

Types of Ecosystem

A. Natural –

1. Terrestrial

Related to land & types Of vegetation (Ex) grassland ecosystem Forest, desert ecosystem

2. Aquatic –

(Related to water, based on salt content classified into 2 types)

Marine -(Seas & sea shores)

Fresh water- Lotic(running water) – river, stream or spring.

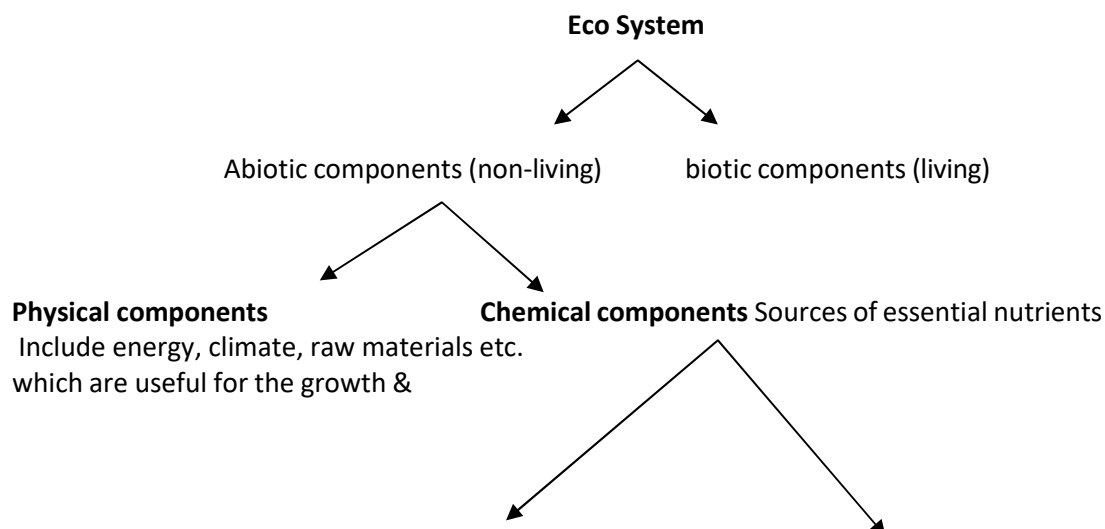
Lentic (standing water) – lake, pond or swamp.

B. Artificial/Man-made –

(Ex) croplands, dams etc

Ecology - Study of interactions among organisms, with their environment. the flows of energy and materials between abiotic and biotic components of ecosystems.

Structure/ Components of an Ecosystem



maintenance of its member
Ex. Air, water, soil, sunlight

Organic substances Proteins, lipids, carbohydrates etc

Inorganic substances All micro & macro elements Ex. C, H, O, P, N, Al, Co, Zn

BIOTIC COMPONENT

- 1. Autotrophic components** Members are producers, get energy from sunlight

Ex. All green plants, trees Photosynthesis:



- ## 2. Heterotrophic Components:

Members are consumers, can't prepare their own food & depend on producers

Types:

Primary consumers Called herbivores/plant eaters- depend on plants for food. Ex. Insects, rat, goat, deer, cow, horse etc

Secondary consumers: Called primary carnivores/meat eaters Depend on herbivores for food
Ex. Frog, cat, snakes, foxes etc.

Tertiary Consumers: Called Secondary carnivores, feed on secondary consumers. Ex. Tigers, lions etc.

Decomposers: Organisms which feed on dead organisms, plants & animals & decompose into simpler compounds Ex. Microorganism like bacteria & fungi.

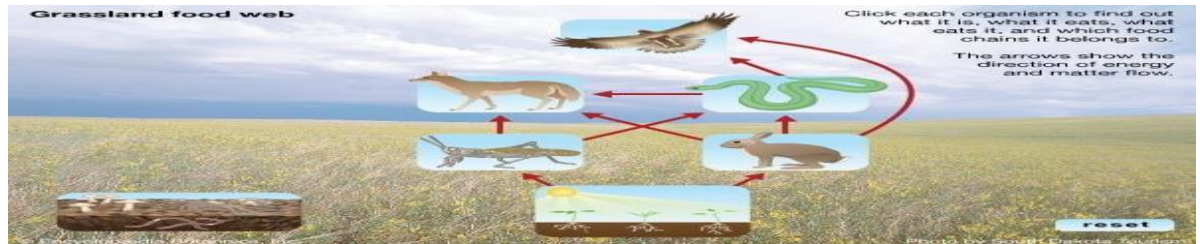
Classes of Consumers

Herbivore – primary consumer – eats plants Carnivores – secondary – meat eaters; eat herbivores Tertiary – feed on carnivores Omnivores – eat plants/animals.

FOOD CHAIN

Definition : The sequence of eating & being eaten in an ecosystem is food chain (or) Transfer of food energy from the plants through a series of organisms is food chain.

- ### 1. Food Chain in a Grass land



2. Food Chain in a Pond: Phytoplankton → Zooplankton → Small fish → large fish → Man
3. Food Chain in a forest: Plants → Deer → Tigers/Lions

Types of Food Chain: Grazing Food Chain → starts with green plants & goes to decomposer food chain/

Detritus food chain → starts with dead organic matter & goes to decomposer food chain.

Tropic Levels:

The various steps through which food energy passes in an ecosystem is called as trophic level.

$$T1 \rightarrow T2 \rightarrow T3 \rightarrow T4 \rightarrow T5$$

T1= Producers, T2= Primary consumers, T3= Secondary consumers, T4= Tertiary consumers,

T5= decomposers

FOOD WEB

Definition:

The interlocking pattern of various food chains in an ecosystem is food web. Many food chains are interconnected.

Energy Flow in Food web:

- Grass → insects → fishes → birds → tigers
- Grass → insects → birds → tigers
- Grass → deer → tigers — Grass → insects → birds → tigers
- Grass → cattles → tigers — Grass → rats → snakes → eagles → tigers
- Grass → rats → eagles → tigers

Difference between food chain & food web:

In food chain, if one species gets affected, then species in all trophic levels are also affected. But in food web if one species gets affected, it does not affect other trophic levels.

LECTURE-09**4. Energy flow through atmosphere to an ecosystem:**

Sun the ultimate source of energy is absorbed by producers (plants) to produce organic matter through photosynthesis. The conversion of solar energy is governed by law of thermodynamics.

1st Law of Thermodynamics:

Energy can neither be created, nor be destroyed, but it can be converted from one form to another

(Ex) photosynthesis- solar energy converted to chemical energy.

Photosynthesis Equation: $\text{CO}_2 + 2\text{H}_2\text{O} \xrightarrow{\text{hv, sunlight}} \text{CH}_2\text{O} + \text{O}_2 + \text{H}_2\text{O}$

Plants are used by herbivores, herbivores are used by carnivores as their food.

Thus energy is transferred & conversion of solar energy is governed by law of thermodynamics

2nd law of thermodynamics:

Whenever energy is transformed, there is a loss of energy through the release of energy in the form of heat. (Ex). Respiration process: $\text{CH}_2\text{O} + \text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

Relationship between structure & function: Hence biotic components and abiotic components are linked through energy flow and nutrient cycle.

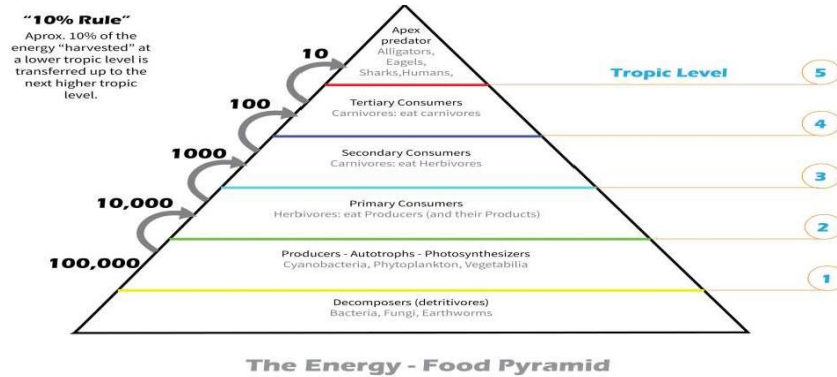
Sun → Plants → Animals → Bacteria

ECOLOGICAL PYRAMIDS

Graphical representation of structure and function of trophic levels of an ecosystem is ecological pyramid.

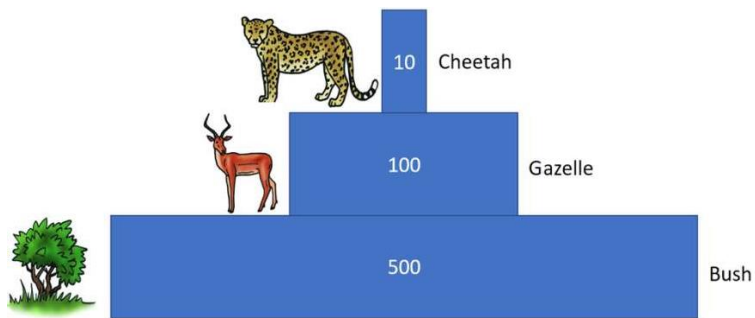
Types:

Pyramid of Energy: Represents the amount of energy present in each trophic level.



- * At each trophic level there is a heavy loss of energy
- * Hence there is a sharp decrease in energy at all level

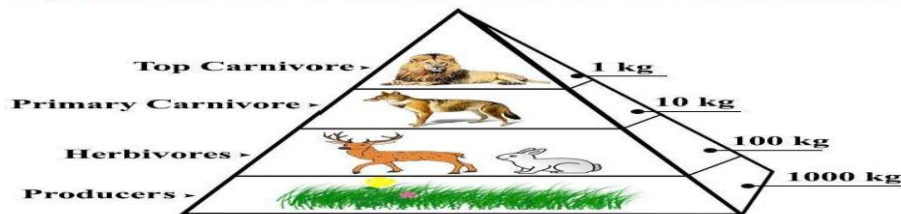
Pyramid of Numbers → Represents the number of individual organisms present in each trophic levels.



Producer – occupy 1st trophic level Primary consumer occupy 2nd trophic level Bcoz no of rats are lower than no of grasses. Secondary consumer occupy 3rd trophic level Bcoz no of snakes are lower than no of rats Tertiary consumer occupy 4th trophic level No & size is very low.

2 Pyramid of Biomass → The amount of living or organic matter present in a particular environment is called biomass. – There is a decrease in the biomass from the lower trophic level to the higher trophic level.

Upright Pyramid of Biomass in a Terrestrial Ecosystem



ECOLOGICAL SUCCESSION

The progressive replacement of one community by another till the development of stable community in a particular area is ecological succession.

Stages of ecological succession:

Pioneer community → first group of organism in an area

Seral stage → various developmental stages of community

Types of ecological succession:

Primary succession → involves gradual establishment of biotic communities on a lifeless ground

Hydrarch / Hydrosere → establishment starts in watery area like pond and lake

Xerarch / Xerosere → establishment starts in a dry area like desert and rock

Secondary succession → Involves establishment of biotic communities in an area, where biotic community already present there

Process of Ecological Succession

- Nudation
- Invasion Migration
- Establishment
- Competition
- Reaction
- Stabilization

LECTURE-10**FOREST ECOSYSTEM****Introduction:**

A forest ecosystem is the one in which a tall & dense trees grow which support many animals & birds. In India 19% occupies forest of total land area.

Types of Forest ecosystem:

Tropical rain forests → found near the equator, high temperature, have broad leaf trees like sandal, lion, tiger

Tropical deciduous forest → Found away from equator, warm climate, deciduous trees like maple, oak, deer, fox, rabbit etc.

Temperate rain forests → adequate rainfall areas, coniferous trees like pines, firs, squirrels, fox, cats, bear etc.

Temperate deciduous forest → found in moderate temp., trees like oak, hickory, animals – deer, fox, bear etc.

Tropical scrub forests → dry climate for longer time, small deciduous trees & shrubs, animals – deer, fox etc.

Characteristics of forest ecosystem:

Characterized by warm temperature, adequate rainfall

Maintain climate & rainfall

Support many wild animals & protect biodiversity

Soil is rich in minerals, so support growth of trees

Penetration of light is poor so conversion of organic matter is very fast

Structure and Function of Forest Ecosystem

- I. Abiotic Components → abiotic components are physical components present in soil & atmosphere (Ex) temperature, light, rainfall, minerals

- II. Biotic Components

1. Producers → plants absorb sunlight & produce food by photosynthesis. Ex-trees, shrubs, plants

2. Consumers

Primary consumers → Called herbivores/plant eaters- depend on plants for food. Ex. Insects, rat, goat, deer, cow, horse etc

Secondary consumers → Called primary carnivores/meat eaters. depend on herbivores for food Ex. Frog, birds, cat, snakes, foxes etc.

Tertiary consumers → Called Secondary carnivores, feed on secondary consumers. Ex. Tigers, lions etc.

3. Decomposers

→ Organisms which feed on dead organisms, plants & animals & decompose into simpler compounds Ex. bacteria & fungi

AQUATIC ECOSYSTEMS

Introduction:

Aquatic ecosystem deals with water bodies.

Types: 1. Fresh water life zones → (ex) Ponds, streams, lakes, rivers

2. Salt water life zones → (ex) oceans, estuaries

LECTURE-11

BIODIVERSITY

Definition:

The variety and variability among all groups of living organisms and the ecosystem in which they occur.

Levels/Classification of Biodiversity:

1) Genetic diversity → Diversity within the species is genetic diversity. (ex) teak wood varieties, Indian, Burma, malasian

2) Species diversity → diversity between different species. (ex) plant species = apple, mango, grapes, animal species = lion, tiger, elephant etc.

3) Community/Ecosystem diversity → Diversity at the ecological or habitat level is ecosystem diversity. Ex. River ecosystem

Biogeographic regions of India:

According to wild life Institute of India, the country has 10 distinct biogeographic zones or regions.

They are:

1. Trans – Himalayan Zone
2. Himalayan Zone
3. Desert Zone
4. Semi – arid Zone
5. Western Ghats
6. Deccan Zone
7. Gangetic plain Zone
8. NE Indian Zone
9. Coastal Zone
10. Islands around the country

Value of biodiversity:

The value of biodiversity (in terms of its commercial utility, ecological services, social and aesthetic values) is enormous. There are several ways that biodiversity and its various forms are valuable to humans. We get benefits from organisms in an innumerable ways. Sometimes, one realizes the value of the organism only after it is lost from this Earth. Every year numerous species are lost before we have a chance to know anything about them.

The biodiversity value may be classified as follows:

1. **Consumptive Value:** Biodiversity is an essential requirement for the maintenance of global food supply. The main sources of human food include animals, fish and plant produces. A large number of plants are consumed by human beings as food. A few animal species are consumed by people who come from cattle, pigs, sheep, goats, buffaloes, chickens, ducks, geese and turkey species.
Fish: Many fresh water fish can be grown in ponds. Israel and China already get about half of their fish from aqua culture.
Drugs & medicines: About 75% of the world's population depends upon plants or plant extracts for medicines. The drug Penicillin used as an antibiotic is derived from a fungus called Penicillium. Likewise, Tetracycline from bacteria which is used to cure malaria is obtained from the bark of cinchona tree.
Fuel: The fossil fuels like coal, petroleum products and natural gas are the products of biodiversity.
2. **Productive Value:** Some of the organisms are commercially usable where the product is marketed and sold. The animal products like tusks of elephants; musk from deer, silk from silkworm, wool from sheep or goats; fur of many animals etc all of which are traded in the market.
 → **Calabar bean** was traditionally used as a poison in West Africa.
 → **Daisy plants** were first used as a lice remedy in the Middle East and this led to the discovery of Pyrethrum. Mosquito coils made from Pyrethrum are sold in the market.
 → The bacterium **Bacillus thuringiensis** produces toxic proteins that kill certain insects.
 → The **neem** tree has been used in birth control such as parts of neem tree that cause abortion.
3. **Social Value:** These are the values associated with the social life, religion and spiritual aspects of the people. Many of the plants are considered to be sacred in our country like Tulasi, Mango leaves, Banana leaves. The leaves, fruits, flowers of some of the plants are used in worship. Many animals like cow, snake, bull, peacock also have significant place in spiritual and thus hold special importance. Thus, biodiversity has distinct social value, attached with different societies.
4. **Ethical Value:** The ethical value means that human beings may or may not use a certain species but knowing the very fact that this species exists in nature gives pleasure.
 Ex: a peculiar species of Pigeon, grey / white bird with short legs is no more on this earth. Similarly, Dodo species is also no more. Human beings are not deriving anything direct from Kangaroo, giraffe but strongly feel that these species should exist in nature.
5. **Aesthetic value:** The beautiful nature of plants and animals insists us to protect the biodiversity.
 Ex) eco-tourism, colour of butterfly, flowers etc.

LECTURE-12

BIODIVERSITY AT GLOBAL, NATIONAL AND LOCAL LEVELS

There are at present 1.8 million species known and documented by scientists in the world. However, scientists have estimated that the number of species of plants and animals on earth could vary from 1.5 to 20 billion! Thus the majority of species are yet to be discovered.

Most of the world's bio-rich nations are in the South, which are the developing nations. In contrast, the majority of the countries capable of exploiting biodiversity are Northern nations, in the economically developed world.

These nations however have low levels of biodiversity. Thus the developed world has come to support the concept that biodiversity must be considered to be a 'global resource'.

However, if biodiversity should form a 'common property resource' to be shared by all nations, there is no reason to exclude oil, or uranium, or even intellectual and technological expertise as global assets. India's sovereignty over its biological diversity cannot be compromised without a revolutionary change in world thinking about sharing of all types of natural resources.

India as a mega diversity nation:

India is the 7th largest country in the world and Asia's second largest nation with an area of 32,87,263 sq km. It has a land frontier of 15,200 kms and a coast line of 7516 km. India's northern frontier's are Tibet; China; Nepal and Bhutan. In the North West, India borders on Pakistan; in the Northeast China and in the East, Burma. The southern peninsula extends into Indian Ocean; Bay of Bengal lying to the Southeast and the Arabian Sea to the Southwest. For administrative purposes India is divided into 28 states and 7 union territories.

Physically the country is divided into four relatively well defined regions:

- a) Himalayan region
- b) The Gangetic river plains or Indo-Gangetic plains.
- c) The southern (Deccan) Plateau and
- d) The islands of Lakshadweep, Andaman and Nicobar.

The Himalayas in the North include the highest peaks in the world.

The highest mountains are:

- a) Khanchen Junga (8586 mts) which is located in Sikkim;
- b) Pir Panjal (3,600 – 4,600 mts) in Kashmir;
- c) Dhaula dhar in Himachal Pradesh and
- d) Siwaliks (900 – 1500 mts) in the Indo – Gangetic plains.

The northern plains of India stretch from Assam in the East to the Punjab in the West covering a distance of 2400 kms. Some of the largest rivers in India including the Ganges, Ghaghara, Brahmaputra and Yamuna flows across this region. Thar desert which is located at the western extremity of Indian part of the plains in the states of Rajasthan. Observations show that the biodiversity is far richer in NE Himalayan range compared to Northwest range. The following factors play a major role in the classification of biogeographical / biodiversity:

Climate:

The climate of India is dominated by the Asiatic monsoon, mostly by southwest rains between June and October and drier winds from the North between December and February. From March to May the climate is dry and hot. .

Wet Lands:

India has a rich variety of wetland habitats. The total area of wetlands excluding rivers in India is 5,82,86,000 hectares . Chilka lake (orissa) and Keoladeo National Park (Bhartpur in Rajasthan) have been designated under the convention of wetlands of International importance. The country's wet lands are generally differentiated by region into 8 categories:

1. The reservoirs of the Deccan Plateau in south
2. the vast saline expanses of Rajasthan and Gujarat
3. Fresh water lakes and reservoirs from Gujarat eastwards.
4. The delta wet lands and lagoons of India's east coast.
5. The fresh water marshes of Gangetic plain
6. The Flood plain of Brahmaputra
7. The marshes and swamps in the hills of NE India and Himalayan foot hills and the lakes and rivers of the mountain region of Kashmir and Ladakh and
8. Wet lands of the island areas of Andaman & Nicobars.

Forests:

The panorama of Indian forests ranges from evergreen tropical rain forests in the Andaman and Nicobar Islands; the Western Ghats to alpine forests in the Himalayas to the North. The country has also several types of forests viz.,

- a) Semi – ever green rain forests
- b) Deciduous forests
- c) Thorn forests
- d) Pine forests
- e) Tropical forests (Andaman & Nicobar Islands; the Western Ghats)
- f) Rain forests (Orissa) g) Western Ghats monsoon forests contain rosewood, Malabar, teak.
- h) Tropical evergreen rain forests and tropical monsoon forests (Andaman & Nicobar)

LECTURE-13**THREATS TO BIODIVERSITY**

Any disturbance in a natural ecosystem tends to reduce its biodiversity. Various threats to biodiversity are:

1. HABITAT LOSS:

Loss of population of interbreeding organism.

Factors influencing Habitat Loss:**Deforestation:**

- Forest & grasslands are cleared for agricultural lands or developmental projects.
- Many species disintegrate due to loss of natural habitat.

Destruction of wetlands:

- Wetlands are destroyed due to pollution, draining etc.

Developmental activities:

- Construction of dams in forest, industrial effluents kill birds & aquatic organisms.

Habitat fragmentation:

- Habitat is divided into small & scattered
- So, many animal & birds are vanishing.

Raw materials:

- For the production of hybrid seeds, wild plants are used as raw materials.

Production of Drugs:

- Pharmaceutical companies collect wild plants for drugs production.
- So, no of medicinal plants are on the verge of extinction.

Illegal Trade:

- Trade on wild life reduces bio-diversity

2. POACHING:

Killing / Hunting of animals is poaching.

Types:

Subsistence Poaching- killing animals for surviving. Commercial Poaching- hunting animals for selling

Factors influencing Poaching:**Human Population:**

increase in population increases pressure on forest resources.

Commercial activities: Smuggling of wild life products for high profit.

Wildlife products=Furs, horns, tusk, live specimen, herbal products.

Importers of wild life = Europe, North America, Japan, Taiwan, Hong Kong

Examples:

- Male gorilla for its body parts
- Blue morpho butterfly – making attractive trays
- Snowy large egret – used for white feather in ladies hat.US
- Elephant feet – for making Ash trays
- Elephant – for ivory
- Bengal tiger – soled for \$1,00,000 in foreign market
- Dynamite fishing – high tech fishing, exhaust marine life. Sea horses, Sea turtles

MAN-WILDLIFE CONFLICTS:

Examples: **Sambalpur – orissa:**

195 humans were killed by elephants,

In retaliation- 98 elephants were killed, 30 injured by villagers.

Kote – Chamrajanagar –Mysore:

Sugarcane & cotton crop, explosives

Royal Chitwan National Park – Kathmandu

Man-eating tiger killed 16 nepalese, 4 yrs child

Sanjay Gandhi National Park

– Mumbai Leopards killed– 14 persons

Factors Influencing man-animal conflicts:

1. Shrinking of forest compels wildlife to move outside the forest
2. Electric wiring around crops
3. Animals suffer pain and attack humans
4. Female wildlife attack human more to safe its cubs.
5. Forest dept. don't cultivate foods for wild
6. Cash compenstn by Govt – 400/- per quintal But market price 2400/
7. Garbage near human settlement attract wild

Remedial Measures for conservation of biodiversity:

Make Available of Adequate food & water for wildlife

Construction works in forest must be stopped.

Solar powered fencing must be used to prevent animals

ENDANGERED & ENDEMIC SPECIES OF INDIA:

Species are classified into various types:

Extinct species → No longer found in the world

Endangered species → A species is said to be endangered when its no has been reduced to a critical level. Unless it is protected it is in danger of extinction.

Vulnerable species → when its population is facing continuous decline due to habitat loss.

Rare species → when it is localized within restricted area.

ENDANGERED SPECIES OF INDIA: A species is said to be endangered when its no has been reduced to a critical level. Unless it is protected it is in danger of extinction.

Important Endangered Species:

Reptiles → Tortoise, green sea turtle, gharial, python

Birds → Peacock, Siberian white crane, pelican, Indian Bustard

Mammals → Indian wolf, red fox, tiger, Indian lion, golden cat, desert cat.

Primates → lion tailed monkey, capped monkey, golden monkey

Plants → medicinal plants, sandal wood tree

RED-data Book = Data book which contains the list of endangered species of plants and animals.

Factors affecting Endangered Species:

- Pollution: Human disposal in nature. Travel through food chain and leads to death
- Over-exploitation: over usage of natural resources— & poaching leads to extinct of wild life
- Climate change : ozone depletion, flood etc, threatens organisms and ecosystem

Remedial Measures:

- CITES – Convention on International Trade in Endangered Species is signed
- 2900 and other 900 endangered species are restricted for trade.

ENDEMIC SPECIES:

- The species, which are found only in a particular region are known as endemic species.
- 62% of endemic species are found in Himalayas and Western Ghats

Fauna:

- Animals present in a particular region or period is Fauna.
- 62% amphibians & 50% lizards are endemic to Western Ghats.
- (ex) Monitor lizards, reticulated python, Indian salamander, viviparous toad.

Flora:

- Plants present in a particular region or period is Flora
- (ex) Sapria himalayana, ovariya lurida, pteridophyta, angiosperms etc.

Factors affecting endemic species:

Habitat loss, fragmentation, pollution

LECTURE-14

CONSERVATION OF BIODIVERSITY

Definition :

The management of biosphere for the sustainable benefit to meet the needs of future generation.

Factors affecting biodiversity:

- ✓ Human activities like construction of dams in forest, industrial wastes, using pesticides etc
- ✓ Poaching of wild animals, over exploitation of natural resources.
- ✓ Discharge of effluents disturbs the marine ecosystem
- ✓ The climatic factors-global warming, ozone depletion, acid rain affect the biodiversity

Advantages or Need of Biodiversity:

Recreation, tourism, Drugs, herbs, food, important raw materials, preserves plants— & animals, hence leads to life supporting systems.

Types of Biodiversity:

- In-situ conservation (within habitat)
- Ex-situ conservation (outside habitat)

In-situ Conservation:

In-situ conservation is on site conservation or the conservation of genetic resources in natural populations of plant or animal species, such as forest genetic resources in natural populations of tree species.

It is the process of protecting an endangered plant or animal species in its natural habitat, either by protecting or cleaning up the habitat itself, or by defending the species from predators. In India following types of natural habitats are being maintained:

1. National parks
2. Wildlife sanctuaries
3. Biosphere reserves

INDIA has over 600 protected areas, which includes over 90 national parks, over 500 animal sanctuaries and 15 biosphere reserves.

Advantages of in-situ conservation:

1. The flora and fauna live in natural habitats without human interference.
2. The life cycles of the organisms and their evolution progresses in a natural way.
3. In-situ conservation provides the required green cover and its associated benefits to our environment.
4. It is less expensive and easy to manage.
5. The interests of the indigenous people are also protected.

Ex-Situ Conservation:

Ex-situ conservation is the preservation of components of biological diversity outside their natural habitats. This involves conservation of genetic resources, as well as wild and cultivated or species, and draws on a diverse body of techniques and facilities. Such strategies include establishment of botanical gardens, zoos, conservation strands and gene, pollen seed, seedling, tissue culture and DNA banks.

Gene bank:

Genetic variability also is preserved by gene bank under normal growing conditions. These are cold storages where germ plasm are kept under controlled temperature and humidity for storage; this is an important way of preserving the genetic resources.

Cryopreservation:

This is the newest application of technology for preservation of biotic parts. This type of conservation is done at very low temperature (196°C) in liquid nitrogen. The metabolic activities of the organisms are suspended under low temperature, which are later used for research purposes.

Botanical gardens:

A botanical garden is a place where flowers, fruits and vegetables are grown. The botanical gardens provide beauty and calm environment. Most of them have started keeping exotic plants for educational and research purposes

Advantages of ex-situ preservation:

1. It is useful for declining population of species.
2. Endangered animals on the verge of extinction are successfully bred.
3. Threatened species are bred in captivity and then released in the natural habitats.
4. Ex-situ centres offer the possibilities of observing wild animals, which is otherwise not possible.
5. It is extremely useful for conducting research and scientific work on different species.

LECTURE-15
ENVIRONMENTAL POLLUTION

Introduction:

According to ODUM (1971), Pollution is —an undesirable change in the characteristics of air, water and land that harmfully affect the life and also create health hazards for all living organisms on the globe||.

According to SOUTHWICK (1976), Pollution can be defined as —the unfavorable (or) alteration of environment caused by human activities and causing harm to human beings.

Basically the Pollution is of two types.

(1) Natural Pollution

: This type of pollution is limited in its occurrence generally from natural hazards like volcanic eruptions, emissions of natural gas, soil erosion, ultraviolet rays, cosmic rays etc and (2)

(2) Manmade Pollution:

Most of the pollution is man made only. However, Pollution is usually categorized as Air Pollution; Water Pollution, Thermal Pollution; Noise Pollution; Land & soil Pollution; Radio Active Pollution and Marine Pollution

AIR POLLUTION

Air pollution may be described as the imbalance in quality of air so as to cause adverse effects on the living organisms existing on earth||. Pollution is due to the presence of undesirable substance of sufficient quantity which exists in environment. The substance or energy which causes pollution is called pollutant. Pollutants may be classified according to origin and state of matter.

Primary Pollutants:

Carbon Monoxide: It is a colorless, odorless, poisonous gas that is produced by the incomplete burning of carbon based fuels (coal, petrol, diesel and wood) which comes from the automobile industries, exhaust devices, about 70% of CO emissions are from the transport sector. When the air is polluted with CO, human blood is likely to be deprived of oxygen and leads to coma and death. In mild dosages, it leads to headache.

Oxides of Sulphur: SO₂ is a gas produced from burning of coal, mainly in thermal power plants. Some industries such as paper mills produce SO₂. It is injurious not only to men and plants, but it also attacks rapidly a few rocks such as limestones, marbles, electric contacts etc. It can even dissolve nylon. Paper absorbs SO₂ causing the paper to become brittle and fragile. SO₂ polluted air leads to corrosion of metals such as Fe, Zn, Cu, steel etc... SO₂ is a major contributor to Smog and acid rain.

Sulphur trioxide is more irritant than SO₂ because it combines immediately with water to form sulphuric acid.

Oxides of Nitrogen : Combustion of coal, oil, natural gas and gasoline which produces upto 50 ppm of Nitrogen. NO_x are also produced when fossil fuels are burned especially in power plants and motor vehicles

. NO₂ poisoning results SILOFILTER disease. High levels of NO₂ exposure causes cough and make the human beings feel short of breath. People who are exposed to NO₂ for a long time have a higher chance of getting respiratory infections.

NO_x compounds contribute for the formation of Ozone. Similarly, when nitrogen oxide when combine with SO_x to form acid rain.

Chloro Fluoro Carbons: CFC's (also known as Freon) are non- toxic. They contain Carbon, Fluorine and Chlorine atoms. The five main CFCs are the following:

→ CFC – 11 (Trichloro Fluoro Methane CFC13)

- CFC – 12 (Dichloro Fluoro Methane CF_2Cl_2)
- CFC – 113 (Trichloro Trifluoro Ethane $\text{C}_2\text{F}_3\text{Cl}_3$)
- CFC – 114 (Dichloro Tetrafluoro Ethane $\text{C}_2\text{F}_4\text{Cl}_2$)
- CFC – 115 (Chloropenta Fluoro Ethane $\text{C}_2\text{F}_5\text{Cl}$)

The major uses of CFCs are as coolants in refrigerators and in air conditioners; as solvents in cleaners particularly for electronic circuit boards etc. CFCs are the main cause of ozone depletion.

Effects of Air pollution:

The effects of pollution may be direct and affect certain organisms. The effects of pollution may possess a hazard or nuisance. Long continued pollution even affects the evolution of a species and eliminates organisms that cannot tolerate certain pollutants and favour others who can eat. Air pollution causes deaths, Impair health, reduce visibility and brings vast economic losses. It can also cause intangible losses to historic monuments such as Taj Mahal. Finally, Air pollution can affect the environment on a global scale.

Prevention and control of Air Pollution:

- Inputs that do not contain the pollutants.
- Operating process to minimize generation of the pollutants.
- Replacing the process with one does not generate the pollutant.
- Removing the pollutants from the process.
- Substitution of raw materials.

Ex: The substitution of high sulphur coal with low sulphur coal in power plants. Ex: Changing a fossil fuel with nuclear energy can eliminate sulphur emission.

→ By involving the Process Modification:

Ex: Chemical and petroleum industries have changed by implementing automated operations, computerized process control by reducing the oxidation of SO_2 to SO_3 by reducing excess air.

LECTURE-16

WATER POLLUTION

Hydrosphere in the universe contains water in the form of oceans, rivers, lakes, tanks and many other water sources. Water sources in the world are of two types.

- They are (1) Marine water bodies and
(2) Fresh Water bodies.

Water is a good solvent for many substances. Because of this property water cannot exist in its pure form at many parts of the world. Water pollution is mainly because of sewage, industrial disposals effluents.

It may be defined as “the alteration in physical, chemical and biological characteristics of water which may cause harmful effects on human and aquatic life.

Types, effects and sources of water pollution

1. Infectious agents :

Example: Bacteria, viruses, protozoa and parasitic worms.

Sources: Human and animal wastes.

Effects: Variety of diseases.

2. Oxygen demanding wastes: Example: Animal manure and plant debris that can be decomposed by aerobic bacteria.

Sources: Sewage, paper mills, and food processing facilities.

Effects: Wastes can degrade quality by depleting water of dissolved oxygen, make aquatic life to die

3. In organic Chemicals:

Example: Water soluble inorganic chemicals. Compounds of toxic metals such as lead, arsenic and selenium. Salts such as NaCl in water.

Sources: Surface runoff, industrial effluents, household cleansers

Effects: skin cancers & neck damage Damage nervous system, liver & kidneys Lower crop yields, Harm fish & other aquatic life Accelerate corrosion of metals

4. Organic Chemicals:

Examples: Oil, gasoline, plastics, pesticides, cleaning solvents, detergents

Sources: Industrial effluents, household cleansers, runoff from farms

Effects: Causes nervous system damage, cancer, harm fish & wild life.

5. Radio active materials:

Example: radioactive isotopes of iodine, radon, uranium, cesium, and thorium

Sources: Nuclear power plants, mining, nuclear weapons production.

Effects; genetic mutation, birth defects, and certain cancers.

6. Point and non-point sources of water pollution

Point sources: These are discharged pollutants at specific locations through pipes, ditches or sewers eg: factories, sewage treatment plants

Non-point sources: They are usually large areas or air shed that pollute water by runoff Eg: runoff of chemical from cropland to surface water.

Control measures of water pollution

- The administration of water pollution should be in the hand of state or central government.
- Scientific techniques are needed to control pollution in river, ponds or streams.
- Industrial plants should be based on recycling operations.
- The national goal should be “conservation of forests” and campaign should be “plant more trees”.
- Highly qualified and effective persons should be consulted for effective control or water pollution. • Awareness to public through radio, tv etc>
- Suitable laws, standards and practices should be framed to regulate pollution.
- Basic and applied research in public health engineering be encouraged.
- The possible of reuse or recycling of waste material should be encouraged.
- Companies should not discharge any type of waste either treated or untreated into rivers, lakes, ponds etc .

SOIL POLLUTION

It may be defined as “the contamination of soil by human and natural activities which may cause harmful effects on living beings”.

Types

1. Industrial wastes Sources:

Pulp and paper mills, chemical industries, oil refineries, sugar factories, tanneries, textile, steel, fertilizers etc.

Effects: Affect and alter the chemical and biological properties of soil.

Hazardous chemicals enter into human food chain from the soil and finally lead to serious effects.

2 .Urban wastes

Sources and effects: Plastics, Glasses, metallic cans, fibers, papers, rubbers, street sweepings, and other discarded manufactured products. These are also dangerous.

3 Agricultural practices

Sources and effects: Huge quantities of fertilizers, pesticides, herbicides, and weedicides are added to increase the crop yield. Apart from these farm wastes, manure, slurry, are reported to cause soil pollution.

4 Radioactive pollutants

Sources and effects: These are resulting from explosions of nuclear dust and radio active wastes penetrate the soil and accumulate there by creating land pollution.

5 Biological agents

Sources and effects: Soil gets large quantities of human, animal and birds excreta which constitute the major source of land pollution by biological agents.

Control measures of soil pollution

- ✓ Population growth
- ✓ Decrease of the available farm land due to urbanization
- ✓ Forestry and farm practices
- ✓ Proper dumping of unwanted materials
- ✓ Production of natural fertilizers
- ✓ Proper Hygienic condition
- ✓ Public awareness
- ✓ Recycling and Reuse of wastes
- ✓ Ban on Toxic chemicals.

LECTURE-17

MARINE POLLUTION

It may be defined as “the discharge of waste substances into the sea resulting in harm to living resources hazards to human health, hindrance to fishery and impairment of quality for use of sea water”.

Source of marine pollution

Dumping the wastes:

Huge amounts of sewage, garbage, agricultural discharge, pesticides, heavy metals, plastics are dumped in sea.

Effects: So many marine birds are affected by gastro-intestinal disorders.

Oil pollution of Marine water:

Caused by petroleum and its products.

Effects: Oil films inhibit photosynthesis & formation of oxygen.

This inhibit the growth of marine plants

Effects of marine pollutants

- ✓ Cause more damage in birds as thinning of eggshell and tissue damage of egg.
- ✓ Oil spilling causes low body temperature in birds resulting in hypothermia.
- ✓ Oil films decreases the rate of oxygen uptake by water.
- ✓ Cause damage to marine fauna & flora including algae, fish, birds, invertebrates
- ✓ Oil films inhibit photosynthesis & inhibit the growth of the plants
- ✓ Hydrocarbon— & benzpyrene accumulate in fish & consumption of fish by man cause cancer.

Control measures of marine pollution

- ❖ Plants for conserving marine biodiversity must be taken into account of human needs.
- ❖ People should be educated about marine ecosystems and the benefits offered by them.
- ❖ Local communities must be involved in protecting and managing their coastal resources.
- ❖ Social and economic incentives must be offered for conserving and sustainable use of marine resources.
- ❖ Governments must manage their own water while extending cooperation to the neighboring states.

NOISE POLLUTION

It may be defined as “the unwanted, unpleasant or disagreeable sound that causes discomfort for all living beings”. Sound intensity is measured in decibel (dB).

Types of noise

Industrial noise (drilling sound, mechanical saws)

Transport noise (bus, trucks, motors, scooters, rail traffic noise)

Neighborhood noise (Musical instruments, TV, VCR, Radios, telephones, loudspeakers etc)

Effects of Noise pollution

- This affects human health, comfort and efficiency.
- It causes muscles to contract leading to nervous breakdown, tension.
- It affects health efficiency and behavior.
- loss of hearing due to excessive noise,
- impulsive noise also causes psychological and pathological disorders.
- Brain is also adversely affected by loud and sudden noise as that of jet and aero plane noise.
- Ultrasound can affect the digestive, respiratory, cardio vascular system.
- Rate of heart beat decrease or increase depending on the type of noise
- Blood is also thickened by excessive noises
- Optical system is also affected by noise pollution & lead to colour perception & loss of night vision.

Control and preventing measures

- **Source control** – acoustic treatment to machine surface, design changes, limiting the operational timings.
- **Transmission path intervention**- the source inside a sound insulating enclosure, construction of a noise barrier or provision of sound absorbing materials.
- **Oiling** – Proper oiling will reduce the noise from the machines.
- **Receptor control**: Protection of the receiver by altering the work schedule, by using ear plugs etc
- Planting trees also act as effective noise barriers

Different absorptive materials can be used to control interior noise .

LECTURE-18

THERMAL POLLUTION

It may be defined as the “addition of excess of undesirable heat to water that makes it harmful to man, animal or aquatic life or otherwise causes significant departures from the normal activities of aquatic communities in water”

Sources of thermal pollution

1. Nuclear power plants (drainage from hospitals, research institutes, nuclear experiments & explosions, emission from nuclear reactors)

2. Coal fired power plants (some thermal power plants use coal as fuel, condenser coil are cooled & discharge the hot water back to the nearby lake, & kills the fish & marine organisms)

3. Industrial effluents (Textile, paper, pulp, sugar industries discharge wastes)

4. Domestic sewage (Municipal sewage has higher temperature which decrease the dissolved oxygen content & result in foul & offensive smell in water)

5. Hydro – electric power

Effects of thermal pollution

- Reduction in dissolved oxygen
- Increase in Toxicity
- Interference with biological activities
- Interference with reproduction
- Direct mortality
- Food storage for fish

Control measures of thermal pollution

- ✓ Cooling towers - This is used as a coolant wet→ cooling tower, dry cooling tower.
- ✓ Cooling ponds and spray ponds.→
- ✓ Artificial lakes – The heated effluents can be→ discharged into the lake at one end and the water for cooling purposes from the other end.

NUCLEAR HAZARD: The radiation hazard in the environment comes from ultraviolet, visible, cosmic rays & microwave radiation which produce genetic mutations in man

Sources of Nuclear Hazards:

Natural sources: Space which emits cosmic rays, soil, rocks, air, water, food, radioactive radon-222 etc.

Man-made sources: Nuclear power plants, X-rays, nuclear accidents, nuclear bombs, diagnostic kits etc.

Effects of Nuclear Hazards:

- ✓ Causes delirium, convulsions & death within hours or days with brain exposure
- ✓ Eye cell die, forming cataracts with eye exposure
- ✓ Vomiting, bleeding of the gums, mouth ulcers etc.
- ✓ Blood vessel damage is indicated by red spots on the skin
- ✓ Nausea, vomiting→ & Infection of the intestinal wall can kill weeks afterwards
- ✓ Unborn children are affected by mental retardation or brain damage

Control measures from Nuclear Hazards:

- ✓ Nuclear devices should never be exploded in air.
- ✓ In nuclear reactor coolants may be used to prevent extraneous activation products
- ✓ Tightly sealed boxes & closed cycle system can be used to decrease the radioactive emissions
Production of radioisotopes should be minimized
- ✓ Minimum no of nuclear installations should be commissioned
- ✓ Fission reactions should be minimized
- ✓ The use of radio isotopes may be carried under jet of soil or water instead of gaseous forms→
- ✓ Wet drilling may be employed along with underground drainage
- ✓ Extreme care should be exercised in disposal of industrial wastes
- ✓ Use of high chimneys→ & ventilations at the working place for dispersing radio-pollutants
- ✓ Disposal methods are the possible ways to distribute the radio-pollutants

Disposal of Radioactive wastes:

High level wastes(HLW) = They are dangerous & so converted them into inert solids & then buried deep into earth or stored in deep salt mines. Ex. Spent nuclear fuel

Medium level wastes (MLW) = MLW are solidified & are mixed with concrete in steel drums before buried in deep mines

Low level wastes (LLW)= LLW are disposed off in steel drums in concrete lined trenches

SOLID WASTE MANAGEMENT

Solid Waste is defined as —any garbage, refused materials, sludge from a waste treatment plant and other discarded material including solids, semisolids etc resulting from industrial, commercial, mining, agricultural operations etc.

Solid Waste Management has become very important role in order to minimize the adverse effects of solid wastes. Solid waste (other than liquid or gaseous) can be classified as Municipal Solid Waste (MSW); Industrial Solid Waste; Hazardous Solid Waste; Agriculture Solid Waste; Mining Waste, Sewage Sludge Waste etc..

Sources of Solid Wastes:

1. Municipal Solid Waste is commonly known as garbage consists of packing materials, furniture, clothing, bottles, food scraps, newspapers, home appliances; paints, batteries etc. Municipal solid wastes are arise from residential quarters, commercial (markets, hotels, garages); institutions; public places, open areas/streets, parks, play grounds etc. MSW also include the following wastes:

Food Wastes usually generate from domestic houses, hotels, markets and consist of fruits, vegetable residues resulting from the handling, preparation, cooking and eating of foods. Rubbish waste consists of combustible wastes (papers; cardboards, torn clothes, plastics, wood etc) and non – combustible waste (glass, crockery, aluminum tins, ferrous metals; construction wastes).

Demolition & Construction wastes result from the construction, remodeling and repairing of residential, commercial buildings and industrial factories. These wastes include dust, stones, concrete, bricks, steel pieces etc.

Special Wastes include street sweepings, road side litter, drainage debris; dead animals and abandoned vehicle parts.

2. Industrial Waste arise from industrial activities such as chemical industries; metal and mineral processing industries. Radio Active wastes are generated by Nuclear Power Plants. Thermal Power Plants produce fly ash in large quantities. Fly ash is a fine solid particles result from the burning of wood, coal and other combustible wastes.

3. Hazardous Solid Waste is any solid waste or combination of wastes that posses a substantial danger, now or in future to human beings and plant / animal life and cannot be handled or disposed. The following is a list of types of hazardous wastes: → wastes from specific and non-specific sources. Ex: Disposable syringes from hospitals is a specific source identified as hazardous solid waste .

Effects of Solid Waste: The improper handling and transfer of the solid wastes results in various health and environmental problems.

The main impacts of waste accumulation are:

→ Garbage dumping places are breeding places for diseases.

→ Rats and pigs roam and feed on garbage and transmit diseases like brain fever from pigs to human beings and plague from Rats.

- Solid wastes may choke the drains and gully pits resulting in water logging which in turn results in breeding of mosquitoes and then cause for Malaria & dengue in human beings.
- Noxious fumes (harmful gas) may pollute air due to the burning of waste products especially plastic containers.
- Obnoxious (very unpleasant) odours pollute the air due to decomposition of organic solid wastes.
- Municipal solid wastes heap up on roads due to improper disposal system. Every year several tones of solid waste is dumped along the high-ways thereby spoiling the landscape (appearance of an area of land).
- Urban and industrial solid wastes often contain a variety of toxic chemicals which may enter into the food chain and affect both terrestrial and aquatic organisms.

STEPS INVOLVED IN SOLID WASTE MANAGEMENT

I .Reduce, Reuse, Recycling (3R)

- a) Reduce the usage of raw materials: Usage of raw materials is reduced.
- b) Reuse: refillable container which is discarded after using can be reused. Throwing rubber ring from cycle tubes can be used again in the manufacture of rubber bands.
- c) Recycling: recycling of discarded materials into new products. Eg:
 - i) Preparation of new cans and bottles from old aluminum cans and glass bottles.
 - ii) Preparation of fuel pellets from kitchen waste.

II Discarding wastes: Methods: a) Land fill b) Incineration c) Composting

a) Land fill:

- ✓ Solid wastes are placed in sanitary landfill system in alternate layers of 80 cm thickness of refuse
- ✓ Covered with selected earth fill of 20 cm thickness
- ✓ After 2 or 3 days solid wastes volume shrinks by 25-30%
- ✓ Then the land is used for parks, roads, small buildings etc

Advantages

- ✓ Simple and economical
- ✓ Segregation is not required
- ✓ Landfill areas can be used for other purposes
- ✓ Natural resources are retained to the soil

Disadvantages:

- ✓ Large area is required
- ✓ Transportations cost is heavy.
- ✓ Bad odors, if landfill is not properly managed
- ✓ Insecticides, pesticides should be applied at regular intervals
- ✓ Causes of fire hazards due to formation of methane

b) Incineration (or) Thermal process

- In this method combustible substances (rubbish, garbage, dead organisms) & non-combustible substances (glass, porcelain, metals) are separated first.
- The combustible waste substances are first dried in a preheater

- Then it is taken in a large incinerating furnace which incinerate about 100 to 150 tonnes per hour
- The temperature is maintained between 700°C to 1000°C
- The left out ashes & clinkers from the furnace is further disposed by landfill method
- The heat produced in the incinerator is used for generating electricity through turbines
- The non combustible substances are left out for recycling

ADVANTAGES

- ✓ Require little space
- ✓ Cost of transportation is not high
- ✓ Safest and hygienic
- ✓ Capacity 300 tonnes per day and can generate 3MW of power.

DISADVANTAGES

- ✓ Capital and operating cost is high
- ✓ Need skilled persons
- ✓ Formation of smokes, dusts, and ashes

c) Composting:

- ✓ In this method the bulk organic waste is converted into fertilizer by biological action
- ✓ The separated compostable waste is dumped in underground trenches(1.5m)
- ✓ Covered with earth of 20 cm and left over for decomposition
- ✓ Micro organism (actinomycetes) is introduced to start decomposition.
- ✓ After 2 or 3 days the organic waste are destroyed by micro organism and produce heat→ Composting will happen at 75°C
- ✓ Finally the refuse can be converted to powdery brown colored odorless mass called Humus(fertilizer).
- ✓ It contains lots of nitrogen, plants growth phosphates and other minerals.

Advantages:

- ✓ Increase of water retention and ion exchange character of soil
- ✓ Number of industrial waste can also be treated by this method
- ✓ Manure can be produced
- ✓ Recycling occurs.

Disadvantages:

- ✓ Non combustible have to be disposed separately
- ✓ No assured market

LECTURE-19

ROLE OF AN INDIVIDUAL IN PREVENTION OF POLLUTION

- Try to plant trees wherever you can and more importantly take care of them. They reduce air pollution.
- Reduce the use of wood and paper products wherever possible. Manufacturing paper leads to pollution and loss of forests which releases oxygen and takes up carbon dioxide. Try to recycle paper products and use recycled paper wherever possible.
- From the mail you receive reuse as many envelopes that you can.

- Do not buy furniture, doors, window frames made from tropical hardwoods such as teak and mahogany. These are forest based.
- Help in restoring a degraded area near your home or join in an afforestation program.
- Use pesticides in your home only when absolutely necessary and use them in as small amounts as necessary. Some insect species help to keep a check on the populations of pest species.
- Advocate organic farming by asking your grocery store to stock vegetables and fruits grown by an organic method. This will automatically help to reduce the use of pesticides.
- Reduce the use of fossil fuels by either walking up a short distance using a car pool, sharing a bike or using public transport. This reduces air pollution.
- Shut off the lights and fans when not needed.
- Don't use aerosol spray products and commercial room air fresheners. They damage the ozone layer.

DISASTER MANAGEMENT

Hazard

It is a perceived natural event which threatens both life and property.

Disaster

- ✓ A disaster is the realization of this hazard
- ✓ It is defined as the geological process and it is an event concentrated in time and space in which a society or subdivision of a society undergoes severe danger and causes loss of its members and physical property.

Types

Natural disasters – refers to those disasters that are generated by natural phenomena.

Man made disasters – refers to the disasters resulting from man made hazards.

FLOODS

Whenever the magnitude of water flow exceeds the carrying capacity of the channel within its banks the excess of water overflows on the surroundings causes floods.

Causes of floods

- ✓ Heavy rain, rainfall during cyclone causes floods
- ✓ Sudden snow melt also raises the quantity of water in streams and causes flood
- ✓ Sudden and excess release of impounded water behind dams
- ✓ Clearing of forests for agriculture has also increased severity of floods

Flood Management

- Encroachment of flood ways should be banned.
- Building walls prevent spilling out the flood water over flood plains.
- Diverting excess water through channels or canals to areas like lake, rivers where water is not sufficient.
- Optical and microwave data from IRS is also used for flood management.
- Flood forecasts and flood warning are also given by the central water commission.

CYCLONES

It is a meteorological process, intense depressions forming over the open oceans and moving towards the land. Cyclone is measured by Saffir-Simpson scale.

Effect

- ✓ The damage depends on the intensity of cyclone the damage to human life, crops, roads, transport, could be heavy.

- ✓ Cyclone occurrence slows down the developmental activities of the area.

Cyclone management

- ✓ Satellite images are used by meteorological departments for forecasting the weather conditions which reveal the strength and intensity of the storm.
- ✓ Radar system is used to detect the cyclone and is being used for cyclone warning.

LAND SLIDES

The movement of earthy materials like coherent rock, mud, soil and debris from higher to lower region to gravitational pull is called land slides.

Causes

- ✓ Movement of heavy vehicles on the unstable sloppy regions.
- ✓ Earthquake, shocks, vibrations and cyclone.

Effects of landslides

1. Block roads and diverts the passage.
2. Soil erosion increases.
3. Causes damages to houses, crops and live stock.

EARTH QUAKES

An earthquake is a sudden vibration caused on earth surface with the sudden release of tremendous energy stored in rocks under the earth's crust.

Causes

1. Disequilibrium in any part of the earth crust
2. Underground nuclear testing
3. Decrease of underground water level.

Severity of an earthquake: Generally it is measured by its magnitude on Richter scale

Effect

- Damage the settlements and transport systems
- Collapses houses and their structures
- Deformation of ground surface
- Tsunami

Earthquake Management

- ✓ Constructing earthquake resistant building
- ✓ Wooden houses are preferred
- ✓ Seismic hazard map should give the information about the magnitude of intensity of anticipated earthquakes.

LECTURE-20

TSUNAMI

A tsunami is a large wave that is generated in a water body when the seafloor is deformed by seismic activity. This activity displaces the overlying water in the ocean.

Causes of tsunami

Seismic activities like earthquakes, landslides, volcanic eruptions, explosions, can generate tsunami. ∞

Deformation of the sea floor due to the movement of plates.

Concept of Tsunami

A tsunami is not a single wave but a series of waves like the ordinary waves which we see on seas.

Effects on Tsunami

- ✓ Tsunami attacks mostly the coastlines, causing devastating property, damage and loss of life.
- ✓ Tsunami can kill lot of human beings, livestock's.
- ✓ Tsunami may also spread lot of water borne diseases.

Tsunami Management

- ✓ Earthquakes under the water are monitored by sensors on the floor of the sea.
- ✓ The sensors send the information of floating buoys on the surface, whenever they detect any changes in pressure of the sea.
- ✓ The information is then relayed to satellites, which passes it on to the earth stations.
- ✓ Finally the country make the people alert through the media to take all necessary precautions.

LECTURE-21

SOCIAL ISSUES AND THE ENVIRONMENT

WATER CONSERVATION

The process of saving water for future utilization is known as water conservation.

Need for water conservation

- ✓ Changes in environmental factors
- ✓ Better lifestyles need more water
- ✓ Increase in population
- ✓ Deforestation decreases annual rainfall
- ✓ Over exploitation of ground water leads to drought
- ✓ Agricultural and industrial activities require more water.

Strategies of water conservation

- Reducing evaporation losses → can place asphalt below the soil surface
- Reducing irrigation losses → sprinkling, drip irrigation, irrigation in early Morning / later evening reduces evaporation
- Re use of water → treated waste water from washings, bathrooms can be used for gardening
- Preventing of wastage of water → closing taps when not is use, repairing leakage, using small capacity taps etc
- Decreasing run-off losses → Can be done by using contour cultivation or terrace farming
- Avoid discharge of sewage. → discharge of sewage into water resources should be prevented

Methods of water conservation = **1. Rain water harvesting 2. Watershed management**

RAINWATER HARVESTING:

It is technique of capturing & storing of rainwater for further utilization.

Objectives of rain water harvesting (1)

- To meet the increasing demands
- Raise the water table by recharging the ground water
- Reduce ground water contamination
- Reduce the surface run off loss & soil erosion
- Increase in hydro static pressure.

- Minimise water crisis & water conflicts

Roof top Rainwater Harvesting Method:(2)

Method of collecting rainwater from roof of the building & storing it in the ground for future use.

Rain water is collected by PVC / aluminium pipe to the pit

The pit base is filled with stones & sand, which serve as sand filters

Advantages of Rain water Harvesting (3):

- Reduces the use of current
- Prevent drought
- Increase the water level in well
- Rise in ground water level
- Minimise soil erosion & flood hazards
- Upgrading the social & environmental status
- Future generation is assured of water.

WATER SHED MANAGEMENT –

Watershed is defined as the land area from which water drains due to gravity into stream, lake etc.

The management of rainfall and resultant run-off is called watershed management.

Objectives (1)

- To minimize of risk of floods
- For improving the economy
- For developmental activities
- To generate huge employment opportunities
- To promote forestry
- To protect soil from erosion.

Factors affecting watershed (2)

- Unplanned, uncontrolled, unscientific land use activities
- Deforestation, overgrazing, mining, construction activities
- Droughty climates affects the watershed.

Watershed management Techniques (3):

- Trenches (Pits)
- Earthen dam
- Farm pond
- Underground barriers (Dykes)

Maintenance of Watershed (4):

- Water harvesting
- Afforestation
- Reducing soil erosion
- Scientific mining & Quarrying
- Public participation
- Minimizing livestock population

RESETTLEMENT AND REHABILITATION

Causes

Due to Developmental activities = dams, mining, roads, airports, etc

Due to Disaster (Natural disaster = earthquake, floods, droughts, landslides, avalanches, volcanic eruptions etc.)

(Manmade disasters = Industrial accidents, nuclear accidents, dam bursts etc)

Due to conservation initiatives = national park, sanctuary, forest reserves, biosphere reserve etc.

Resettlement:

It is simple relocation / displacement of human population. Rehabilitation: Involves making the system to work again by replacing the lost economic assets, employment, land for building, repair damaged building etc.

Rehabilitation:

Involves making the system to work again by replacing the lost economic assets, employment, land for building, repair damaged building etc.

Rehabilitation issues

- Displacement of tribal's increases poverty by losing home, land, jobs, food security etc
- Breakup of families
- Communal ownership of property
- Vanishing social and cultural activities like folk songs & dances
- Loss of identity between the people.

Examples: Sardar Sarovar Dam, the Theri dam Project, Pong Dam.

LECTURE-22

ENVIRONMENTAL ETHICS

Environmental ethics refers to the issues, principles and guidelines relating to human interactions with their environment.

Function of Environment (1):

- A life supporting medium for all organisms
- It provides food, air, water, & other natural resources
- Moderates the climatic conditions
- Disintegrates the waste discharged by the society
- Healthy economy depends on healthy environment.

Environmental problems (2)

- Deforestation
- Population growth & urbanisation
- Pollution due to effluent and smoke
- Water scarcity
- Land degradation.

Solutions to environmental problems (3)

- Reducing the energy sources & waste production
- Recycle and reuse of waste products

- Soil degradation must be minimized
- Sustainable development by conservation on resources
- Over-exploitation of natural resources must be reduced
- Protection of Bio – diversity
- Reducing the population & increase the economic growth.

Ethical Guidelines (4)

- Love & honour the earth
- Should be grateful to plants & animals
- Should not waste your resources
- Should not steal from future generation
- Should not pollute & hold other living things
- Should not consume more materials
- Should share the precious earth resources

GREEN HOUSE EFFECT

The progressive warming of earth surface due to blanketing effect of man made CO₂ in the atmosphere is green house effect.

Green house gases- causing global warming are CO₂, CH₄, N₂O, CFCs.

CO₂ is the most important green house gas.

Human activities increase the green house effect & raise the atmospheric temperature & this is called global warming.

Effect on global warming

- 1. Sea level** → glacial melting & thermal expansion of ocean raise the sea level
- 2. Agriculture and forestry** → Climatic pattern shifts, rainfall is reduced, soils are dried, result in drought, less crop production
- 3. Water resources** → Rainfall pattern change, Drought & Floods will become common, Rise in temperature will increases water demand
- 4. Terrestrial ecosystems** → Animals & plants will have problems in adapting, They will be in Risk of extinction
- 5. Human health** → As earth become warmer, floods & droughts become frequent, This increase waterborne diseases, infectious diseases caused by mosquitoes.

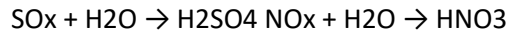
Preventive Measures of Global Warming:

- Reducing CO₂ emission by reducing use of fossil fuels
- Utilizing renewable resources like wind, solar, hydro power etc.
- Plant more trees
- Adopt sustainable agriculture.
- Use natural gas instead of coal
- Stabilize population growth
- Remove CO₂ by photosynthetic algae.

ACID RAIN

- Normal rain is slightly acidic due to CO₂ gas.→
- The pH of the rain water is further acidic due to SO₂→ & NO₂ gases
- This type of precipitation of water is called acid rain.

- Formation of Acid rain: Thermal power plants, industries, & vehicles release nitrous oxide & sulphur dioxide into atmosphere
- When these gases react with water vapour they form acids



Effects of acid rain

1. On Human beings Destroy life – nervous, respiratory and digestive system—
2. Causes premature death from heart and lung disorders like asthma— & bronchitis.

2. On Buildings Taj Mahal in Agra suffer due to H_2SO_4 acid fumes released from Mathura refinery.—

British Parliament building suffered due to H_2SO_4 rain—

Acid rain reduce the value of building, bridges, cultural objects etc.—

This increases the maintenance cost.—

3. On terrestrial and Lake Ecosystem

- Reduces rate of photosynthesis, growth of crops, Fish population.—
- Flies, mosquitoes— & worm occur on the dead fishes
- Nitrogen,— & phosphorous stay up in dead wastages.
- Biomass production is reduced— & fish population decreases.

Control measures

- By Clean combustion technologies
- Using pollution control equipments
- Replacement of coal by natural gas
- Liming of lakes and soils.
- Coal with lower sulphur content can be used
- Emission of SO_2 & NO_2 from industries can be reduced

OZONE LAYER DEPLETION

- Ozone gas O_3 found throughout the atmosphere is formed in the stratosphere by photo - chemical reaction.
- It protects us from the Ultraviolet radiation of the sun.
- Recent evidence shown that ozone layer is becoming thinner & holes have developed.

Ozone depleting chemicals

- Chloro Fluro carbon (CFC) [Used in refrigerators, propellant, spray cans, blowing agent, foam agent],
- Hydro chloro fluoro carbon (HCFC), [Used in refrigerants, blowing agents]
- Bromo fluoroCarbon (BFC) [Used in fire extinguisher].

Effects

- On human health – Skin cancer, Non melanine skin cancer, slow blindness called keratitis,cataracts, Allergies, reduces human resistivity, infectious diseases etc.
- On aquatic systems- Affects phyto plankton which absorb more CO_2 , affects fish, larval crabs
- On materials- Degradation of paints, plastics, & other polymeric material result in economic loss.
- On climate – increasing the average temperature of the earth surface & cause global warming.

The amount of ozone is measured by Dobson spectrometer & expressed in Dobson units (DU). 1 DU is equivalent to a 0.01 mm thickness of pure ozone at 1 atm pressure.

Control Measures

Replacing CFCs by less damaging materials
Use of methyl bromide crop fumigant should be controlled
Manufacturing & using of ozone depleting chemicals should be stopped.

NUCLEAR ACCIDENTS & HOLOCAUST

The release of large amounts of nuclear energy and radioactive products into the atmosphere.

Examples

1. Bhopal gas tragedy:

On night of 3rd December 1984 in Bhopal city of Madhya Pradesh
At Union carbide India Ltd, which manufacture carbonate pesticides using methyl isocyanate (MIC)
Due to failure of coolant, the reactor got exploded & 40 tons of MIC leaked over 40 sq.km area.
Nature of MIC: It is a toxic gas, affects lungs, eyes & causes irritation in skin. Remove oxygen from lungs & cause death.

Effects in Bhopal: About 5000 persons died, 1000 became blind, 65,000 people suffered from eye, respiratory, neuromuscular problems.

2. Chernobyl Nuclear Disaster:

(Nuclear Pollution) In April 26 1986, melt down of the Chernobyl nuclear reactor in Ukraine, Russia, has leaked out the radioactive rays & radioactive materials. This was happened due to poor reactor design & human error.

Effects: about 2000 persons died, more suffered due to degeneration of cells, severe bleeding, anaemia, skin cancer, animals plants was also affected more.

3. Nuclear holocaust in Japan:

* In 1945 two nuclear atom bombs were dropped on Hiroshima & Nagasaki cities in Japan.

* This explosion emitted neutrons, gamma radiations, strontium (Sr*90)

*This Sr90 has the property of replacing calcium in the bones & so many people were affected by bone deformities

*1,00,000 people were killed,

Effects of nuclear holocaust:

- Nuclear winter [Black soot formed will absorb all UV-radiations & prevent UV radiation to reach the earth.

This result in cooling effect & water evaporation will also reduce.

This process opposite to global warming is called nuclear winter.

- Ignition of all combustible material, destroy all living beings, material crushing, destruction of homes

Control Measures

- Suitable precautions to avoid accident
- Constant monitoring of the radiation level
- Checks and control measures done by Atomic Energy Regulatory Board.

LECTURE-23

WASTE LAND RECLAMATION

Waste land: - The land which is not in use – unproductive, unfit for cultivation another economic uses.

Types of waste land

1. Uncultivable waste land – Barren rocky areas, hilly slopes, sandy deserts.

2. Cultivable waste land- degraded forest lands, gullied lands. Marsh lands, saline land etc.

Causes for waste land formation

- Soil Erosion, Deforestation, Water logging, Salinity.
- Excessive use of pesticides.
- Developmental activities, [Construction of dams, power projects, causes water logging].
- Over-exploitation of natural resources.
- Sewage and industrial wastes.
- Mining destroy forests & cultivable land.
 - Growing demands for fuel, fodder, wood and food causes degradation and loss of soil productivity.

Objectives of waste land reclamation

- To improve the physical structure and quality of the soil
 - To prevent soil erosion
- To avoid over – exploitation of natural resources
 - To conserve the biological resources.
- To improve the availability of good quality of water
 - To supply fuel, fodder, timber for local use
- To provide source of income to the rural poor

Methods of waste land reclamation

- Drainage
- Leaching
- Irrigation practices
- Green manures and bio fertilizers
- Application of Gypsum
- Afforestation programmes
- Social forestry programmes

CONSUMERISATION OF WASTE PRODUCTS

- Consumerisation – Consumption of resources.
- Traditionally favorable rights of sellers
- Right to introduce product, price, Incentives
- Traditionally buyer rights
- Right to buy, right to expect the product to perform as claimed Important information to be known by buyers
 - About ingredients,
 - Manufacturing dates,
 - Expiry date, etc.
 - Health and happiness

Objectives of Consumerisation

- Improves rights and power of the buyers
- Making the manufacturer liable
- Reuse and recycle the product
- Reclaiming useful parts
- Reusable packing materials
- Health and happiness.

SOURCES OF WASTES = Glass, papers, garbage's, food waste, automobile waste, dead animals etc.

E – Waste = Computers, printers, mobile phones, Xerox machines, calculators etc.

Effects of wastes

Dangerous to human life

Degrade soil

Non biodegradable plastics reduce toxic gases.

Cadmium in chips, Cathode ray tube, PVC causes cancer and other respiratory problems.

Factors affecting consumerisation and generation of wastes

People over – Population

Consumption over – Population

LECTURE-24

ENVIRONMENTAL LEGISLATION AND LAWS – IMPORTANT PROTECTION ACTS

WATER ACT 1974:

This act provides for maintaining & restoring the source of water Provides for preventing & controlling water pollution.

Objectives:

- To protect water from all kinds of pollution
- To preserve the quality of water
- Establishment of Central & State Boards for preventing water pollution
- Restrain any person for discharging sewage/effluent into any water body
- Any contravention of the standards leads to prison for 3 to 6 months
- Requires permission to set up an industry which discharges effluent.

State pollution Control Board:

- Take step to establish any industry, disposal system, extension/addition in industry, discharge of effluent into river
- Use any new / altered outlet for discharge of sewage
- Begin to make any new discharge of sewage.

Punishment:

Stoppage of supply of electricity, water / any other services

Imprisonment for 1½ years to 6 years & Rs. 5000/- fine.

AIR ACT 1981:

Enacted in the Conference held at Stockholm in 1972.

Deals with problems related to air pollution, quality of air etc.

Objectives of air act:

To prevent, control & abatement of air pollution

To maintain the quality of air

Important features of air pollution:

- The Central Board settle disputes between state boards, provide technical assistance & guidance to State board.
- The State Board verify the emissions of air pollutants from industrial / automobile units
- The State Board Collect information about air pollution

- SB examine the standards of manufacturing process & control equipment
- SB can advise State Government to declare the heavily polluted areas & advice to avoid burning of waste products.
- Operation of industrial unit is prohibited in a heavily polluted areas
- Violation of law is punishable with imprisonment & Fine

FOREST ACT 1980:

Provides conservation of forests & related aspects.

Arrest deforestation

Objectives:

To protect & conserve the forest

To ensure judicious use of forest products

Important Features of Forest Act:

Forests are not diverted without the prior permission of the Central Government

Land registered for forest may not be used for non-forest purposes

Any illegal activity in a forest area can be stopped immediately

Clearance of forest land for re-afforestation is forbidden

One who violates the forest law is punishable.

Wildlife Act 1972:

Aimed protect & preserve wildlife.

Wildlife refers to all animals & plants It is declining due to human actions for wildlife's skins, furs, feathers, ivory etc.

Objectives:

To maintain ecological process & life supporting system

To preserve biodiversity To ensure a continuous use of species.

Important Features:

Covers the right & non-rights of forest dwellers

Provides restricted grazing in sanctuaries & prohibits in national parks

Prohibits the collection of non-timber forest

Environment Act 1986:

It is a general legislation law to rectify the gaps & laps in above acts.

This act empowers the Central Govt. to fix the standard of quality of air, water, soil & noise.

Objectives:

To protect & improvement of the environment

To prevent hazards to all living creatures & property

To maintain peaceful relationship between humans & their environment

Important Features of Environment Act:

- Empowers safeguard measures to Prevent accidents which cause pollution.
- Gives remedial measures if accident occurs.
- The Govt. has authority to close or prohibit or regulate any industry & its operation
- One who violates the act will be punishable with fine upto one lakh
- If the violation continues, an additional fine of Rs. 5000/- per day is imposed
- The act empowers the officers of Central Government to inspect the site / plant / machinery for preventing pollution.

- Collects samples of air, water, soil or other material from any factory / its premises for testing.

PUBLIC AWARENESS

Our environment is presently degrading due to many activities like pollution, deforestation, overgrazing, rapid industrialization and urbanization.

Objectives of public awareness

- Create awareness among people of rural and city about ecological imbalances, local environment, technological development and various development plants.
 - To organize meetings, group discussion on development, tree plantation programmes exhibitions.
- To learn to live simple and eco-friendly manner.

Methods to create environmental awareness

- In schools and colleges
- Through mass – media
- Cinema
- Newspapers
- Audio - Visual media
- Voluntary organizations
- Traditional techniques
- Arranging competitions
- Leaders appeal
- Non – government organizations.

LECTURE-25

HUMAN POPULATION AND ENVIRONMENT

Population Growth

The rapid growth of the global population for the past 100 years from the difference between the rate of birth and death.

Causes of rapid population growth

- ❖ The rapid population growth is due to decrease in death rate and increase in birth rate.
- ❖ Availability of antibiotics, immunization, increased food production, clean water and air decreases the famine-related deaths.
- ❖ In agricultural based countries, children are required to help parents in the field that is why population increases in the developing countries.

Characteristics of population growth

- ❖ Exponential growth
- ❖ Doubling time
- ❖ Infant mortality rate
- ❖ Total fertility rate
- ❖ Replacement level
- ❖ Male/female ratio
- ❖ Demographic transition

Variation of population based on age structure

- ❖ Pre-productive population (0-14 years)
- ❖ Reproductive population (15 – 44 years)

❖ Post reproductive population (above 45 years)

1. Pyramid shaped – India, Bangladesh, and Ethiopia. [Large no of young people enter into reproductive age group, hence Population growth increases].

2. Bell shaped – France, USA, and UK. [pre-productive age group population & reproductive age group population are almost equal, hence population growth is stable].

3. Urn shaped - Germany, Italy, and Japan [pre-productive population is less than reproductive age group, hence population growth decreases].

Population Explosion → The enormous increase in population due to low death rate and high birth rate

Doubling Time → The number of years needed for a population to double in size.

Causes of population explosion:

- * Modern medical facilities reduce death rate & increase birth rate,
- * Increase of life expectancy,
- * illiteracy

Effects of population explosion [PE]:

- ❖ Poverty → infant mortality is the tragic indicator of poverty
- ❖ PE leads to Environmental degradation,
- ❖ PE causes over-exploitation of natural resources,
- ❖ Renewable resources like forests are under threat,
- ❖ ↑ in population ↑ disease, communal war
- ❖ Over crowding leads to development of slums
- ❖ Lack of basic amenities like water, education, health etc
- ❖ Unemployment and low living standard of people

Remedy

Reducing fertility rate through birth control programmes

FAMILY WELFARE PROGRAMME

Objectives

- ❖ Slowing down the population explosion
- ❖ Reducing Over exploitation of natural resources

Population Stabilization Ratio:

Developed Countries: → Stability ratio = 1, indicate zero population growth

Developing countries → stability ratio = nearing 3,
expected to slow down by 2025

FAMILY PLANNING PROGRAMME

Objectives

- ❖ Reduce infant mortality rate.
- ❖ Achieve 100% of birth, death, marriage, pregnancy registration
- ❖ Encourage late marriages, late child-bearing.
- ❖ Improve women's health, education, employment.
- ❖ Prevent & Control of communal diseases.
- ❖ Promote small family norms

- ❖ Making free & compulsory education upto 14 yrs
- ❖ Constraint spread of AIDS

LECTURE-26

ENVIRONMENT AND HUMAN HEALTH

1. Physical Hazards – Radioactive and UV radiations, = affects the body cell, causes skin cancer
Global warming = cause famine & mortality, Chlorofluro carbons = damage ozone layer,
2. Chemical Hazards – Combustion of Fossil fuels = Asthma & lung diseases, industrial effluence
= cause cancer & death, pesticides = affect food chain, heavy metals = contaminate water.
3. Biological Hazards- Bacteria, Viruses, Parasites = Diarrhoea, malaria, parasitic worms, cholera\.

HUMAN RIGHTS

Human rights are the fundamental rights, which are possessed by all human beings irrespective of their caste, nationality, sex and language.

IN 1948 Universal Declaration of Human Rights UNKHR was established by UN .

- **Human right to freedom** [express views, forming union, building houses, choose any profession]
- **Human right to property** [right to earn property]
- **Human right to freedom of religion** [freedom to choose religion to his wishes]
- **Human right to culture and education** [right to conserve culture, language, establishing educational institution]
- **Human right to constitutional remedies** [can go to court, if fundamental rights are denied]
- **Human right to equality** [all citizens are equal before law without discrimination of religion, sex, caste, place]
- **Human right against exploitation** [children should not be employed as labours]
- **Human right to food and environment** [right to get sufficient food, safe, water, healthy environment]
- **Human right to good health** [right to have very good physical and mental health]

INDIAN CONSTITUTION

- Article 14→provides equality
- A15→prohibits discrimination on caste,sex, religion
- A 16→equal opportunity for all citizens
- A 19→freedom of speech, expression,forming union
- A 20 → protection from convection
- A 22 → rights of person in custody
- A 23 → prohibits traffic in human being
- A 24 → prohibits explosion of labour children
- A25 → freedom of profession, religion & practice
- A2→right to establish charitable & religious institution
- A 27 → prohibits paying tax for any religion
- A 28 → guarantees secular character in educational institution
- A29 → guarantees to conserve language of minorities

- A 30 → right of linguistic minority
- A 32 → right to constitutional remedies

LECTURE-27

VALUE EDUCATION

It is nothing but learning about the particular thing through knowledge. We can identify our values and ourselves with the help of knowledge and experience.

Types

1. Formal education- Self related learning process, all will read, write, get jobs, tackle any problem with formal education .
2. Value education – Analyze our behavior, provide proper direction to youth, know right & wrong.
3. Value-based environment education- knowledge about principles of ecology, biodiversity, care for natural resources, know to safe and clean environment.

Objectives

- To improve the integral growth of human begins.
- To create attitudes and improvement towards sustainable lifestyle.
- To increase awareness about our national history our cultural heritage, constitutional rights, national integration, community development and environment.
- To create and develop awareness about the values and their significance and role.
- To know about various living and non- living organisms and their interaction with environment.

Concept of value Education:

- Why & how can we use less resources & energy?
- Why do we need to keep our surrounding clean?
- Why should we use less fertilizers & pesticides?
- Why it is important to save water & keep our water sources clean?

Methods of Imparting value Education:

- Telling Modeling = presenting ideas to learner's as model
- Role Playing = Acting the role of another person
- Problem Solving = Asking the learners about their decision during dilemma
- Studying biographies of great man = use of great man good deeds & worthy thoughts

Types of values

Universal values-

[Importance of the human conditions, reflect in life, joy, love, compassion, tolerance, truth etc].

Cultural values

-[Right, wrong, good and bad, behavior of human being].

Individual values-

[Individual personality and experiences, parents & teachers are main key to shape individual values].

Global values –

[Human civilization, if harmony is disturbed anywhere there will be an ecological imbalance].

Spiritual values- [Self-restraint, discipline, reduction of wants]

LECTURE-28

WOMANS WELFARE

Need of Women Welfare

- Women suffer gender discrimination
- Devaluation at home, matrimony, workplace, public & power
- Dowry death, rape, domestic violence, mental torture to women,
- Human rights are violated , decision making are neglected

Objectives

- To provide education
- To impart vocational training
- To generate awareness
- To improve employment opportunities
- To restore dignity, equality and respect.
- To aware problems of population

Objectives of A National Commission For Women

To examine constitutional & legal rights for women

To review existing legislations

To sensitize the enforcement & administrative machinery to women's causes .

Various Organisation Towards Women Welfare:

The National Network for Women & Mining (NNWM) → fighting for gender audit of India's mining companies .

United Nations Decade for Women → inclusion of women welfare related issues on international agenda.

International Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) → Protection & Promotion of women's upliftment

Non-Government Organizations (NGO's) → Empower, educate village women & making self-dependent

Ministry for Women and Child Development → work for upliftment of women by family planning, health, education & awareness

LECTURE-29

CHILD WELFARE:

Reason for child Labours:

Poverty → work in unhealthy conditions

Want of Money → parents need money for their family

Various Organisation towards Child Welfare

1. UN Conventions on Rights of Child or International Law → promote & protect children in our society Rights of the Child:
 - The right to survival → emphasizes on good health, nutrition, standard of living
 - The right to participation → freedom of thought to the child

The right to development → ensures education, care, support, social security & recreation
The right to protection → freedom from exploitation, inhuman treatment & neglect

2. World summit on children → well being of the children is targeted

3. Ministry of Human Resource Development (MHRD) → concentrate on child's health, education, nutrition

Environmental degradation & child welfare → children are most affected due to pollution, even child in mother's womb is affected by environmental toxins

Center for Science & Environment (CSE) → keeping environment clean for healthy life of children

ROLE OF INFORMATION TECHNOLOGY IN ENVIRONMENT

Information technology means collection, processing storage & dissemination of information.

1. REMOTE SENSING [RS]

Gathering information about an object without coming in contact with it is called remote sensing.

Any force like acoustic, gravity, magnetic, electromagnetic etc. could be used for remote sensing

Applications

In agriculture → RS provide information about land, water management, use of seeds, fertilizer input etc

Forestry → Information on type, density & extent of forest cover, wood volume, forest fire, pest etc.

Land cover → Gives spatial information on land, RS data is converted to map

Water resources → surface water body mapping, ground water targeting, flood monitoring, water quality monitoring, run-off modeling, irrigation water management

2. DATA BASE-

Collection of inter related data on various subjects.

Applications

*Ministry of environment and forest → compile data on biotic communities, diseases like HIV, malaria, fluorosis

*National Management Information System (NMIS) → DB on R&D projects, research scientists etc.

*Environmental Information System (ENVIS) → DB on pollution control area, clean technology, biodiversity, remote sensing, environmental management, desertification etc

3. GEOGRAPHICAL INFORMATION SYSTEM (GIS) It is a technique of superimposing various thematic maps using digital data on a large number of inter-related aspects.

Application

- ✓ Thematic maps are super imposed using soft wares.
- ✓ Interpretation of polluted zones, degraded lands
- ✓ To check unplanned growth and related environmental problems.

4. SATELLITE DATA Helps in providing reliable information and data about forest cover. Provide information about forecasting weather, smog, ozone depletion. Reserves of oil, minerals can be discovered.

5. WORLD WIDE WEB → It provides Current data.

Applications

- Online learning
- Digital files or photos, animations on environmental studies

LECTURE-30

ROLE OF INFORMATION TECHNOLOGY IN HUMAN HEALTH

The health service technology involves three systems

- ✓ Finance and accounting
- ✓ Pathology
- ✓ Patient Administration
- ✓ clinical system.

Applications

- ✓ Data regarding birth and death rates, immunization, sanitation programme are maintained
- ✓ Helps doctor to monitor the health of the people effectively
- ✓ The information regarding the outbreak of epidemic diseases.
- ✓ Online Consultation with expert doctors for better treatment.
- ✓ Drugs and its replacement