GOVT. POLYTECHNIC MAYURBHANJ

DEPARTMENT OF METALLURGICAL ENGINEERING

LECTURE NOTES

ON

ENVIRONMENTAL STUDIES

3RD SEMESTER

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PTGF

Environmental studies

Concept & defination of environment

imp **Defination**

(i) The sum total of biotic and abiotic components surrounding and influencing the responces of organism in a region is termed as environment.

(ii) The word environment is derived from the french word 'Environ' which means to encircle or surround

(iii) Environment is a sum of all social, economical, biological, physical or chemical factors which constitudes the surroundings of living organisms, who is both creater and makker of this environment.

Objectives

(i) After complition of study of environmental studies we will be able to -

(i) Gather adequate knowledge of different polutants, their sources and shall be aware of solid waste management system and hazardous waste and their effects.

(ii) Develope awareness towards preservation of environment.

imp **Components of environment**

Environment consist of all living and non-living things which surround us. The basic components of environment are -

1. Atmosphere or the air

2. Hydrosphere or the water
3. Lithosphere or the rocks & soil
4. Biosphere

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ECOLOGY

(i) Ecology is derived from two greek words
1. oikos – Home or dwelling place
2. Logos – to study

(ii) Ecology is a science which deals with the organism and home i.e. in their natural habitat.

(iii) It is the relationship between the organism and its environment or surroundings.

OBJECTIVE OF ECOLOGY

The following are the adjectives of ecology –

(i) Temporary changes in the seasonal, annual person and succeSsional patterns.

(ii) The behaviour of organism in natural condition.

(iii) Interaction between organisms and their surrounding.

HABITAT

(i) The natural place where an organism lives with the interaction with its surrounding is known as habitat of the organism.

(ii) The habitat of an organism is related to its environmental conditions suitable for survival.

(iii) Habitat is a set of physical and chemical factor effecting combiningly on an organism.

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NICHE

(i) The micro habitat of a place is otherwise known as niche. It is termed as ecological niche.

(ii) Grinnel (1971) was the first to use the word niche. According to him it is the distributional unit within which each species is confined (সীমাবদ্ধ) and no more species can occupied the same ecological niche for long time.

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IMPORTANCE OF ENVIRONMENTAL STUDY

The study of enviromental and ecology shall be given in sight into the world we live in and the limitation encountered there. Further the importance and need for the study are given under following catagories—

(i) To understand the environment in totality.
(ii) To understand the whole life process of man.
(iii) To understand the inter disciplinary approach of this branch.
(iv) To activate the participation of people in prevention

and control of various kind of pollution.
(v) To focus on potential environmental situatio
(vi) To understand environmental issues from local; regional, national and international point of view.
(vii) They give various approach in solving the problems.
(viii) To enable co-operation at regional, national and international level on environmental issues.

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Scopes (Major improvement)

Following are the major environment or scopes of environmental studies.

(i) The production of more and better quality food.

(ii) The creation of housing for protection from extremes of climate and providing living spaces.

(iii) The building of first and reliable means of transport.

(iv) The invention of various systems of communications.

(v) The supply of safe water and disposal of waste.

(vi) The elimination of most of waterborne deises in the develope world through improve water

technology.

(viii) The protection from the worst effects of natural disaster. such as - floods, droughts, earthquake and volcanic eruption.

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Need for public Awareness

(i) We can't create public awareness by only celebrating world environment day. we need to aware ourself which can lead towards public awareness.

(ii) Back to the past memories, if few more voices began to speak out about the new problems. Among the most effective campings the highlight problems were published by "G. Hardin" who published "tragedy of the Commons" and 'paul Ehrlich' wrote "population bomb" in 1968.

(iii) Meadow's et. in his work "limit's to growth" (1972) and Barry Commonersin his books "closing circle" (1971) highlighted environmental problems

(iv) The UN focus on the problems by organizing a conference on the human environment in (1972) Later UN Conference dealing with population, food desertification human settlement. Science and technology was organize.

(v) In 1992 UN 'earth Summit Conference on environment, the largest ecological meeting held at "Rio de Jeneriro" was attended by 18

Countries and 102 heads of states.

(vi) The crusaders for environmental protection in India are Menka Gandhi, Baba Amte, Mr. Chandi prashad Bhatt, Mr. Sundarial Bagban and Miss Medha Phatker.

(vii) Ms. Sunita Narayan chair person of center of science and Environmental New delhi through her activity and magazine "Down to earth" is doing praise worthy survey in the protection of environment.

Unit-1

Page No. 07
Date :
CLASS NOTE

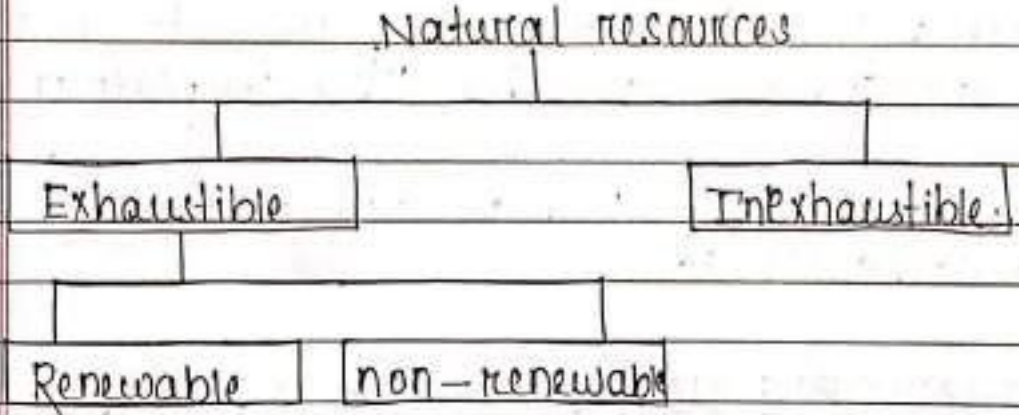
NATURAL RESOURCES

Definition :-

(i) Natural resources are naturally occuring substances that are concerned valuable in their relatively are modified and unmodified or natural form.

(ii) A commodity as generally considered natural resources when the primary activities associated with it are extraction, purification as opposed to creation.

(iii) Thus mining, petroleum, extraction, fishing and forestry as generally consider a naturally resources while agriculture is not



EXHAUSTIBLE NATURAL RESOURCES

(i) Exhaustible natural resources are forest, water, Coal, petroleum, Natural gas, minerals etc.

(ii) These are Consumed or a exhausted through continuous use or misuse.

(iii) Exhaustible natural resources can be further divided into a type — (1) Renewable natural resources
(2) Non-renewable " "

Renewable Natural Resources

(i) The natural resources which are consumed or exhibit or depleted so continuous use can be recovered by very hard efforts taken have up for long period are called as renewable natural resources.

(ii) Example – Forest

Renewable resources are generally 2 types –

(1) living resources

(2) Non-living resources

Non-Renewable Resources

(i) Non-renewable resources are the resources we can not get back in our lifetime, if one's they are consumed or exhaustible completely.

(ii) Example :– Coal, petroleum reserve, oil deposite, minerals, salts etc.

INEXHAUSTIBLE NATURAL RESOURCES

(i) Inexhaustible natural resources are those resources which can not be exhausted or consumed through continuous use or misuse.

(ii) Example – air, sunlight etc.

Forest resources

(i) Forest and wild life are essential for the ecological balance of an area.
(ii) They are important components of our environment and economy.
(iii) Forest reduce air pollution, soil erosion and prevent landslide and provide it calm and cool ambience (atmosphere).
(iv) The total annual consumption of wood is estimated as 3·7 billion tonnes or 3·7 billion m^3, 80% of which is used by developed countries. 50% of which the people of the world depends on wood for their fuel needs.

Functions of forests

The following are the function of the forest.

(i) Forests are habitats flora and fauna.
(ii) They balance gaseous cycle.
(iii) They accelerate due to rain fall.
(iv) They increase water holding capacity of soil.
(v) They maintain soil fertility.
(vi) They prevent runoff and increase percolation.
(vii) They reduce soil erosion and landslide.
(viii) They maintain streams in perennial stat.
(ix) They provide cool atmosphere.
(x) They function as gene bank.

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Deforestation

(i) Deforestation is the loss or continual degradation of forest habitat due to natural or human related causes.

(ii) Deforestation includes not only conversion to non-forest but also degradation that reduce forest quality, density and structure of trees, the ecological service supplied., the biomass of plants and animal, the species diversity and the genetic diversity.

(iii) The short definition of the deforestation is the removal of forest covered to an extend that allows for alternative land use.

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Causes of deforestation

Deforestation takes place due to various causes, they are listed below :-

- **population Increase**

Due to population increase the demand for timber, first wood, pulp wood and synthetic fibre increase & forest have been exploited for meeting these demands. Large tracts of forests have been cleared for cultivation, housing, highways & railways.

- **Demand of forest produces**

Timber and wood are required for making furniture, doors, windows, railway sleepers, packing cases & match boxes.

• Hydroelectric projects

several hydroelectric projects have been commissioned within dense forests & several thousands of km^2 of forests have been cleared for reservoirs in India. The area of forests cleared all over the world will be of the order of several lakhs of km^2.

• Mining operation

In open cast mining & deep tunnelling the over burden is removed & this involves forest clearances. Mining is done to extract iron ore, lime stone, manganese, coal, mica & copper.

• Shifting cultivation

This is called Jhum cultivation & is widely practiced in orrissa, Madhya pradesh & North eastern states. For cultivation trees are felled & burnt.

• Overgrazing

over grazing by cattle degrades forests.

• Weather conditions

Lightening triggers forest fires, floods and landslides also devastate forests.

• Fires

Human induced or nature induced fires are among the causes of depletion of forest.

• Pests

pests also destroy forests and their vitality.

Effects of Deforestation

The following are the adverse impacts of deforestation occurring due to mining, dam construction, road building agriculture & housing projects

→ Loss of cultural diversity

Forests are home of over 10 million members of forest dwellers. As a result of timber extraction their peaceful life is distributed. Animal and plant diversity are lost.

→ Loss of biodiversity

Diversity contributes to resilience and dynamic equilibrium to ecosystem. once the forest is ~~distribu~~ disturbed the biodiversity is reduced & the system becomes sick & unstable.

→ Loss of carbon storage capacity

Increase in carbon dioxide is moderated by forests. Now world is experiencing a rapid increase in atmospheric CO_2 due to release of CO_2 from fossil fuels. The CO_2 from the atmosphere must be removed through the growth of woody plant material or the growth of coral reefs.

→ Loss of hydrologic balance

(i) Forests are moderators of rain that falls in forests. substantial amount is evaporated & the balance is permitted to percolate into the ground or forest floor. If forests is lost these functions are hampered.

(ii) Forest removal is heavy rainfall areas especially mountainous regions causes soil erosion, nutrient loss & fertility loss. In dry regions deforestation may trigger into desertification.

(iii) Deforestation affects climate change. The climate becomes warmer due to the loss of greenary which absorbs CO_2.

(iv) Rainfall pattern may undergo change. forests provide condensation nuclei & moisture for triggering rainfall.

(v) Asthetic beauty is lost and man is deprived of deriving pleasure from such remote areas like forests.

Forest Conservation

Some of the measures of conservation are given below :—

→ As far as possible don't destroy the forests for any purpose.

→ If a tree is removed from an area two seedling of the same tree must be planted.

→ Intensive afforestation is wasteland, along highways & vacant plots.

→ Avoid using firewoods.

→ Reuse & recycle paper.

→ use e-mail & store information in digital form.

→ Don't use wood for building. use MDF & laminates.

→ Don't purchase products made from tropical hard woods like teak, rosewood & mahogany.

→ use minor forest produces that are collected by tribals.

→ Camping & hiking must be minimal.

→ Protect the forests from fire & insects.

→ Prevent cattle entering the forests.

Afforestation programme

planting of trees continuously may clothe our barren lands with greenery. such afforestation can be either a conservation forestry or a commercial forestry or any type mentioned below:-

Conservation forestry -

In this method the degraded forest tracts must be kept as such for re-growth, till they reach a stable state. No disturbance must be allowed.

→ However, the minor produces can be collected by local people or tribals.

→ such areas are designated as natinal parks, sanctuaries, and are kept away from human intervention.

production or Commercial forestry :-

→ In this method local varities of plants & trees are planted in all places & the tumber is extracted after sometime. production forestry can be (i) social forestry (ii) urban forestry (iii) agro forestry

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Mining

→ Mining is the extraction of valuable minerals or other geological materials from earth, usually from an ore body.

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

→ Any material that cannot be grown from agricultural processes must be mined.

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

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steps in mining process

1. Prospecting to locate ore.
2. Exploration to defining the extent & value of ore where it was located.
3. Conduct resource estimate to mathematically estimate the extent & grade of the deposit.
4. Conduct mine planning to evaluate the economically recoverable portion of the deposit.
5. Conduct a feasibility study to evaluate the total project & make decision whether to develop or walk away from mining project.
6. Developement to create access to an ore body.
7. Exploitation to extract ore on a large scale.
8. Reclamation to make land where a mine had been

suitable for future use.

Dams & their effects on forests & tribal people

→ About 40,000 large dams with a height more than 15 m have already been built. several thousands are under construction. All the reservoirs together have a water spread of more than 4,00,000 km².

→ All major dams are constructed in mountainous regions, where there is plenty of rainfall. These places are clothed with rich vegetation & forests.

→ Large tracts of forests have been utilized for other purposes. The trees, plants & other vegetation are removed & fauna are driven away. As more & more people occupy the dam sites, forests are destroyed for getting fuel & timber to the developers.

→ The tribal and local people who have been occupying the watersheds are displaced to remote areas. Many of them are not properly rehabilitated by Govt. authorities.

→ Tribals not only lose their habitat & social set up but lose their occupation & livelihood.

→ fertile soils are lost in the inundated reservoirs. Weed problems, euthophication & anaerobic conditions crop up.

→ The displaced tribals are not looked after. Such

human rights violations create unrest among the tribals & courts alone can come forward for their help.

→ The massive resistance are visible in case of "Narmada valley project" in India. Even in the case of "Three Gorges Dam" project in China. 1/3rd members of the parliament opposed the move for construction. However, the chinese Government is going ahead with the project. The story of "chipko movement" is up & "Appiko movement" in Karnataka are examples of popular movements against massive dam projects.

production or commercial forestry

→ In this method local varities of plants & trees are planted in all places & the tumber is extracted after sometime. production forestry can be

(i) social forestry
(ii) urban forestry
(iii) agro forestry

(i) social forestry

under this programme public lands, sides of roads, rails & canals are afforested with trees that can be used as fire wood, fodder sources of fruits or any other useful items.

Ex - Acacia & eucalypatus are used this scheme.

(ii) Agro forestry

→ under this programme woody species are grown in combination with herbaceous crops either simultaneously or in rotation. The two methods under this system

are taungya cultivation or jhum cultivation.

→ Taungya system is one where agricultural crops like tapioca, plantain & pineapple are grown between sal, teak & rubber trees.

→ Jhum cultivation is shifting cultivation prevalent in North India. Existing trees are cut & the terrain burnt and agricultural crops are grown cultivated after 5 years or so.

(iii) Urban forestry

→ This is suitable for urban areas. Fruit trees like mango, tamarind trees & such other trees are grown along road sides, vacant lands, the margins of parks and ponds. The fruit are collected by the local bodies & sold.

Natural Resources

* Water Resources

→ The water cycle, through evaporation and precipitation maintains hydrological systems which form rivers and lakes and supports in a variety of aquatic ecosystem.

→ All aquatic ecosystems are used by a large number of people for their daily needs such as drinking water, washing, cooking, watering animals & irrigation fields.

→ Water covers 70% of the earth's surface but only 3% of this is fresh water. out of this 2% is in polar ice caps and only 1% is usable water in rivers, lakes and subsoil aquifers. only a fraction of this can be actually used.

→ At a global level 70% of water is used for agriculture about 25% for industry and only 5% for domestic use. India uses 90% for agriculture, 7% for industry & 3% for domestic use.

JUNE

Overutilization & pollution of surface & ground water :-

→ With the growth of human population there is an increasing need for larger amounts of water to fulfill a variety of basic needs.

→ Overutilization of water occures at various levels such as during bathing & washing cloth. Many

agriculturists use more water than necessary to grow crops.

→ Agriculture also pollutes water & ground water stores by the excessive use of chemical fertilizers & pesticides.

→ Industry tends to maximize short term economic gains by not bothering about its liquid waste & releasing it into streams, rivers & sea.

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Floods

→ Floods have been a serious environmental hazard for countries. However the havoc raised by rivers overflowing their banks has become progressively more damaging as people have deforested catchments & intensified use of river flood plains that once acted as safety valves.

→ Deforestation in the Himalayas causes flood that year after year kill people, damage crops & destroy homes in the Ganges & its tributaries & the Brahmaputra.

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Droughts

→ Droughts has been a serious problem in our country especially in arid regions. It is an unpredictable climatic condition & occurs due to the failure of one or more monsoons. It varies in frequency in different parts of countries.

- When it is not feasible to prevent the failure of monsoon, good environmental management can reduce its ill effects.

Dam's Benifits & problems

- Today there are more than 45000 large dams around the world, which play an important role in communities & economies that tackle these water resources for their economic developement.

- Current estimates suggest that 30-40% of irrigated land world wide depends on dams, hydropower, another contender for the use of stored water, currently supplies 19% of the world's total electric power supply & is used in over 150 countries. The world's 2 most popular countries are China & India.

Dams problems

- Fragmentation & physical transformation of rivers
- Serious impact on river ecosystem.

* Mineral Resources

→ A mineral is a naturally occuring substance of definite chemical Composition & identifiable physical properties. An ore is a mineral or combination of minerals from which a useful substance such as a metal can be extracted & used to manufacture a useful products.

→ Mineral & their ores needs to be extracted from the earth's interior so that they can be used. This process is known as mining.

→ The operation generally progress through 4 stages :-

1. Prospecting :-
   Searching for minerals.
2. Exploration :-
   Assessing the size, shape, location & economic value of the deposit.
3. Development :-
   Work of preparing access to the deposit so that the minerals can be extracted from it.
4. Exploitation :-
   Extracting the minerals from mines.

→ In the past mineral deposits were discovered by prospectors in areas where mineral deposits in the form of layers exposed on the surface. Today however prospecting and exploration is done by teams of geologists, mining, engineers, geophysicists & geochemists who work together to discover new deposits.

→ Modern prospecting methods include the use of sophisticated instruments like GIs to survey & study the geology of the area.

Environmental problem

Mining operations are considered to be one of the main sources of environmental degradation.

* Food Resources

World food problem

→ In many developing countries where populations are expanding rapidly, the production of food is unable to keep place 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.

Changes caused by agricultural & over grazing

→ our fertile soil are being exploited faster than they can recover.

→ There are great difference in the availability of nutritious food. Some communities such as tribal

people still face Serious food problems leading to malnutrition especially among women & Children.

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Effects of modern Agriculture

→ These issues bring in new questions as to how demands will be met in future even with a slowing of population growth.

→ As living standards are improving, people are eating more non-vegeterian food. As people Changing from eating grain to meat, the world's demand for need of livelistock based on agriculture increases as well. This uses more land per unit of food produced & the result is that the world's poor do not get enough to eat.

→ To an improved flow of food across national borders from those who have surplus to those who have a deficit in the developing world is another issue that is concern for planners who deal with international trade concerns.

Fertilizers - pesticides, Water logging & salinity problem

→ Globally 5 to 7 million hectares of farmland is degraded each year. Loss of nutrients and over use of agricultural chemicals & major factors is land degradation.

→ Water scarcity is an important aspect of poor

agricultural outputs. Salinization & water logging has affected a large amount of agricultural land world wide..

Energy Resources

Energy sources

→ Sources from which energy can be obtained to provide heat, light and power is known as energy sources.

→ Energy is found on our planet in a variety of forms, some of which are immidiately useful to do work, while others require a process of transformation.

Growing Energy Needs

→ Energy has always been closely linked to man's economic growth and developement. present startegies for development that have focused on rapid economic growth have used energy utilization as an index of economic development. This index however, does not take into account the long term ill effects on society of excessive energy utilization.

→ For almost 200 years, Coal was the primary energy source fueling the industrial revolution in the 19th century. At the close of all the 20th Century, oil accounted for 39% of the world's Commercial energy consumption, followed by coal (24%) & natural gas (24%) with nuclear (7%) and hydro renewable (6%) accounted for the rest:

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Renewable Energy

→ Renewable energy systems are resources that are constantly replaced & are usually less polluting. Examples include hydropower, solar, wind and geothermal (energy from the heat inside the earth). We also get renewable energy from burning trees and even garbage as fuel and processing other plants into bio-fuels.

→ There are various types of renewable energy -

1. Solar energy
2. Wind energy
3. Hydroelectric energy
4. Geothermal energy
5. Tidal & wave energy.
6. Photovoltaic energy
7. Biomass energy
8. Bio gas energy

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Non-renewable Energy

→ A resource of economical value that cannot be rapidly replaced by means on a level equal to its consumption. Most fossil fuel such as oil, natural gas and coal are considered as non-renewable resources in that their use is not sustainable because their formation takes billion of years.

→ These consist of the mineral based hydrocarbon fuel such as coal, oil & natural gas that were formed from ancient prehistoric forests. These are called "fossil fuels" because they are formed

after plant life is fossilized.

→ There are various non-renewable energy -
1. oil
2. coal
3. fossil fuel
4. Nuclear power.

Land Resources

Land as a resource

→ Landforms such as hills, valleys, plains, river basins & wetlands include different resource generating areas that the people living in them depends on.

→ Many traditional farming societies had ways of preserving areas from which they used resources Example - In the 'sacred groves' of the western ghats, requests to the spirit of the grove for permission to cut a tree or extract a resource were accompained by simple rituals.

→ If land is utilized carefully it can be considered a renewable resource. The roots of trees and grasses bind the soil if forests are depleted or grasslands overgrazed.

→ The land become unproductive and wasteland is formed. Intensive irrigation leads to water logging & salvations on which crop cannot grow. Land is also converted into a non-renewable resource when highly toxic industrial & nuclear wastes are dumped on it.

→ Man needs for building homes, cultivating food, maintaing grazing lands for domestic animals, developing industries to provide goods and supporting the industry by creating towns & cities. Equally importantly man needs to protect wilderness area in forests, grasslands, wetlands, mountains, coasts etc to protect our vitally valuable biodiversity.

→ Thus a rational use of land needs careful planning. one can develop most of these different types of land uses almost anywhere, but protected areas (National parks and wildlife sanctuaries) can only be situated where some of the natural ecosystems are still undisturbed. These protected areas are important aspects of good land use planning.

Land Degradation

→ farmland is under threat due to more intense utilization. Every year between 5 to 7 Million ~~hacters~~ hectares of land worldwide is added to the existing degraded farmland.

→ When soil is used more intensively by farming, it is eroded more rapidly by wind and rain. over irrigation of farmland leads to salinization as evaporation of water bring the salts to the surface of soil on which crops cannot grow.

→ over irrigation also creates logging of the top soil so that crops roots are affected and the crop deteriorates.

→ The use of more and more chemical fertilizers poisons the soil so that eventually the land becomes unproductive.

→ As urban centres grow and industrial expansion occurs, the agricultural land & forests shrinks. This is a serious loss & has long term ill effects human civilization.

Soil Erosion

→ The characteristic of natural eco-systems such as forests and grasslands depend on the type of soil.

→ Soil of various types support a wide variety of crops. The misuse of an ecosystem leads to loss of valuable soil through erosion by the monsoon rains and to a smaller extent by wind.

→ The roots of the trees in the forest hold the soil. Deforestation thus leads to rapid soil erosion.

→ Soil is washed into streams and is transported into rivers and finally lost to the sea. The process is more evident in areas where deforestation has led to erosion on steep hill slopes as in Himalayas and in the western Ghats. These areas are called "ecologically sensitive areas" or ESAs.

→ The linkage between the existence of forests & the presence of soil is greater than the forest's physical soil binding functions alone.

Unit 2

Role of an individual in Conservation of natural resource –

→ Until fairly mankind acted as if he could go on forever exploiting the ecosystems & natural resources such as soil, water, forests & grasslands on the earth's surface & extracting minerals & fossil fuels from underground. But in the last few decades, it has become increasingly evident that the global ecosystem has the capacity to sustain only a limited levels of utilization.

→ Biological systems cannot go on replenishing resources if they are overused or misused. At a critical point increasing pressure destabilizes their natural balance. Even biological resources traditionally classified as 'renewable' such ase those from our oceans, forests, grasslands & wetlands are being degraded by over use and may be permanently destroyed and no natural resource is limitless. 'Non-renewable' resource will be rapidly exhausted if we continue to use them as intensively as at present.

→ The two most damaging factors leading to the current rapid depletion of all forms of natural resources are increasing "consumerism" on the part of the effluent sections of society and "rapid population growth".

→ Both factors are the results of choice we make as individuals. As individuals are we need to decide:-

* What will we leave to our children?
* Is my material gain someone else's loss?

Equitable use of resources for sustainable lifestyle

→ Reduction of the unsustainable & unequal use of resources & control of over population growth are essential for the survival of our nation and indeed of human kind everywhere.

→ Our environment provides us with a variety of goods & services necessary for our day to day lives, but the soil, water, climate and solar energy which form the abiotic support that we derive from nature are in themselves & not distributed throughout the world or within the countries.

→ A new economic order at the global & national level must be based on the ability to distribute the benefit of natural resources by sharing them more equally among the countries as well as among the communities within countries such as our own.

→ It is at the local level where people subsist by the sale of locally collected resources that the disproportion is greatest. "Developement" has not reached them & they are often accused of "Exploiting" natural resources.

→ They must be adequately compensated for the removal of the sources to distant regions and thus develop a greater stake in protecting natural resources.

UNIT-02

ECOSYSTEM

Introduction

The word "ecology" came from two Greek words 'oikos" meaning "household" or "home' or "place to live" or "habitation" & "Logos" means 'study'. Thus ecology deals with the organism & its place to live (i.e. environmental biology)

Def^{n} of ecosystem

→ Ecosystem is defined as a community of organism interacting with one another & the environment in which they live i.e. study of home.

→ A home for lion may be many miles of land over which it searches for food.

concept of ecosystem

An ecosystem concept is that the living organism of a community not only interact among themselves but also have functional relationship with their non-living environment. This structural & functional system of communities & their environment is called an ecosystem.

Functioning & types of ecosystem

→ Functioning of the ecosystem is self-regulating & self-sustaining. This depend upon flow of energy, cycling of materials.

→ Depending upon the species, diversity & the manner

is which they are organised. Ecosystem are of following types :-

1. permanent & Natural ecosystem

- These operate under natural condition without any interference even by human beings. These can be further classified into -
  (a) Terrestrial ecosystem
  (b) Aquatic ecosystem
- Terrestrial ecosystem operate on land hence forest, desert & grassland & agro-ecosystems included in this type. While aquatic ecosystem operates in water. It can be divided into -
  (i) fresh water ecosystem
  (ii) Marine ecosystem
- fresh water ecosystem are usually named after the size & nature of fresh water body such as pond, lake & river.
- Marine ecosystem's largest ecosystem on earth, which consists of several sub-divisions each having its physico-chemical & biological characteristic.

Ex- In deepest ocean producers are absent but many other organisms survive depending on dead organic matter coming from the upper layers of ocean.

2. Temporary & Natural ecosystem

These are short lived organism but operated under natural condn.

3. Artificial or Anthropogenic Ecosystem

These are man-made like fishery tanks, dams, croplands etc. fish aquarium also comes under this.

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ECOLOGY / ENVIRONMENTAL BIOLOGY

→ Ecology is defined as study of nature, the total relationship between the living organism to its environment.

→ It is basically of two types:-
(1) Autecology
(2) Synecology

(1) Autecology

study of individual organism & relationship with its environment.

(2) Synecology

It is the study of many individual organism & their relationship with their environment.

ABIOTIC

The non-living component of the ecosystem, such as physical and chemical components of an ecosystem (includes hydrosphere, lithosphere & atmosphere is called abiotic components.

BIOTIC COMPONENTS

It is the living component or organism of the ecosystem includes plants, animals & micro organism. The living components is highly influen

by non-living Components.

Biotic Components (Models of synthesis of their food)

Autotrophs (producers)	Heterotrophs (consumers)
(Synthesis their own food)	(Cannot synthesis their own food & depends upon the autotrophs either directly or indirectly for food)
Ex:- Green plants.	Ex:- Man

producers.

(i) All the green plants are producers. They are also called ("converters" or "transformers").

(ii) They are living members of ecosystem that utilize seen light as their energy source & inorganic material from soil, air and water to transform them by photosynthesis in to more complex energy rich chemicals as their own food.

(iii) producers are largely photosynthesis plants & their kind varies with the kind of ecosystem.

(iv) In dense forest the trees are the most important producers. In lakes & ponds, the producers are rooted or large floating & microscopic plants usually algae.

(v) They are also known as photo-autotrophs i.e.

photo = light, auto = self, troph = food.

Consumers

(i) As we have seen earlier, consumers are hetero-trophs the living organism who derive their food directly or indirectly from the producers.

(ii) Consumers are of following types:-

i) Primary Consumers

These are also called "Herbivores" which directly feed on the producers. They vary with the kind of ecosystem.

ex:-

A deer & giraffe is primary Consumers forest ecosystem while cow & goat is grassland or cropland ecosystem.

protozoans & certain crustaceans which feed floating algae are also primary Consumers.

ii) Secondary Consumers

They are also called carnivores i.e. meat eaters. They are flesh eating animals.

ex:-

Tigers etc.

These feeds on primary Consumers for their food.

iii) Tertiary Consumers

In most of ecosystem some organisms that eat other carnivores i.e. the animals that depend upon both primary and secondary consumers

ex:-

Kite

iv) Top carnivores

(Some ecosystem have animals like lion & vulture, which are not killed or rarely killed & eaten by other animals are called top carnivores.

v) Detritivores

These are the bottom living which subsist on rain or organic detritus from autotrophic layers i.e. termites, ants, crabs etc.

Decomposers

(i) They are also known as living components, mainly bacteria & fungi which breakdown complex compounds of dead protoplasm of producers & consumers to simple organic compounds & ultimately into inorganic compounds.

(ii) They are also called as saprotrophs
(sapro = rotten, troph = feeder)

ENERGY FLOW IN ECOSYSTEM

~~(i) Ecosystem~~

(i) Energy is needed for every biological activity.

(ii) Solar energy is transformed into chemical energy by a process of photosynthesis. This energy is stored in plant tissues & then transformed to mechanical and heat form during metabolic activities.

(iii) In the biological world the energy flows from sun to plants & then to all heterotrophic organisms like animals & man.

(iv) The flow of energy follows two laws of thermodynamics

* IMP
1st Law of thermodynamics

(i) This law states that energy can neither be created nor be destroyed. But it can be transformed from one form to another.

(ii) Similarely as we have studied earlier solar energy utilized by green plants (producers) in photosynthesis. This energy is stored in p converted into biochemical energy of plants & later into that of consumers.

* IMP
2nd Law of thermodynamics

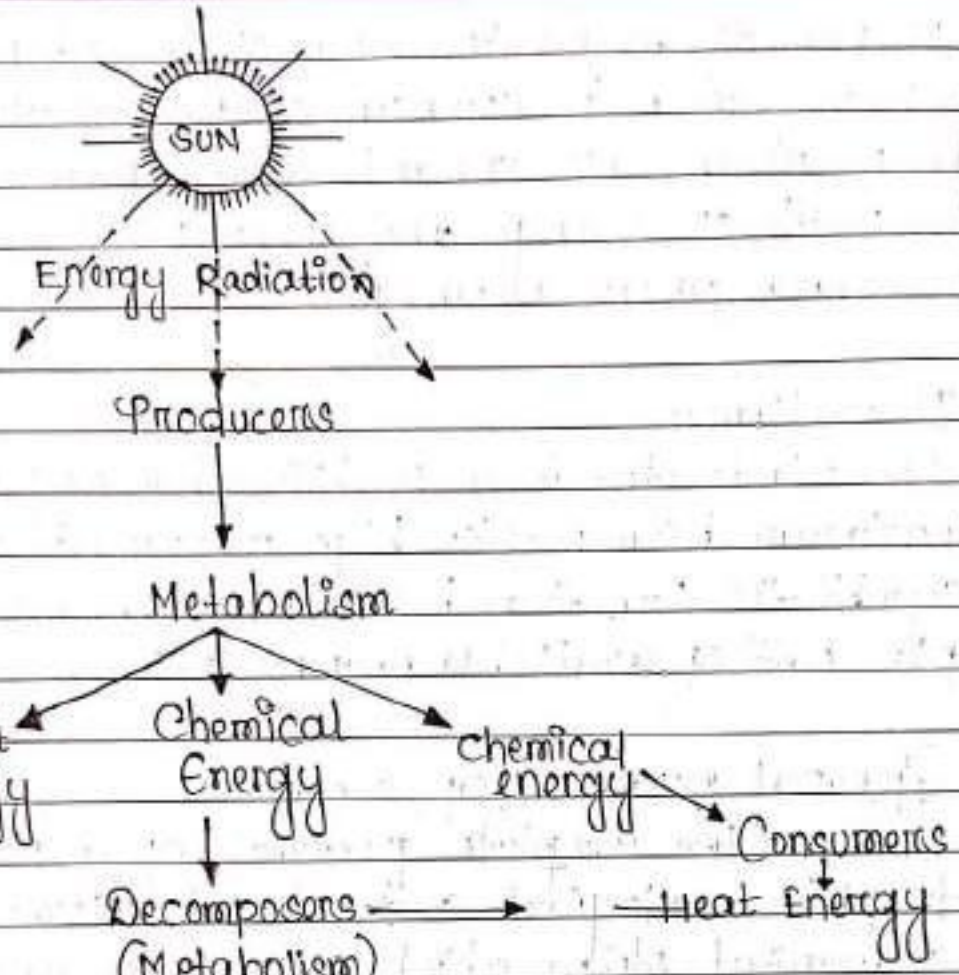
(i) This law states that energy transformation involves degradation or discipation of energy from a concentrated to a dispersed form.

(ii) We have seen dissipation of energy occurs at every trophic level. There is loss of 90% energy, only 10% energy is transfered from one trophic level to another.

IMP
Sun as a source of energy

(1) Sun is the source of energy which extends radiation from high freqiency to low freqiency. Approximately 99% of total energy is in the region between UV (ultra violet) & IR (Infra Red).

(ii) This visible spectrum spreads over involving about 50% of solar radiation.



→ Some autotraphs however utilize energy released from oxidation processes for the process of photosynthesis of organic food.

Ecological succession

→ Succession is the "birth" of an ecosystem & subsequent "aging" process of its abiotic and biotic features. It includes following 3 parameters in his definition of ecological succession.

1. It is an orderly process of community development that involves changes in species structure & community processes with time, it is reasonably directional & therefore predictable.

2. It results in modification of the physical environment i.e. succession is community controlled even though the physical environment determines the pattern, the rate of change and often sets limits as to how far development can go.

~~3. It culmi~~

3. It culminates in a stabilized ecosystem in which maximum biomass (or high information content) and symbiotic function between organisms are maintained per unit of available energy flow.

General process of succession

The complete process, of a primary autotrophic ecological succession involves the following sequential steps which follow one another –

1. Nudation

The process of succession begins with the formation of a base area or nudation by several reasons such as volcanic eruption, flood, landslide, erosion deposition, fire, disease etc. Some base areas are also created by man eg. walls, burning, digging etc.

2. Invasion

The invasion is the arrival of the reproductive bodies or propagules of various organisms and their settlement in the new or base area. plants ~~area~~ are the first invaders invaders in any area because the animals depend on them for food.

It includes the 3 steps-

i. Dispersal or migration -

It is the process in which propagul leaves the parent plant and arrives the bare area.

ii. Ecesis -

This is the successful establishment of migrated plant species in to new area.

iii. Aggregation -

This is the final stage of invasion where immigrant species increase their number by reproduction and aggregate in a large population in the area.

3. Competition

As the number of individual grows, there is Competition both inter specific (between different species) and intra specific (within same species) for space, water and nutrition. They influence eachother in a number of ways known as "Reaction".

4. Reaction

When living organism grow they use water and nutrients from substratum and in turn they have a strong influence on the environment which is modified to a large extent and is known as reaction. When they becomd unsuitable for existing species they favour some new one which replaced them.

5. Stabilization or Climax

Eventually a stage is reached when a final terminal community becomes more or less stabilized for longer period of time and it can maintain itself in the equilibrium or steady state with climate of that area.

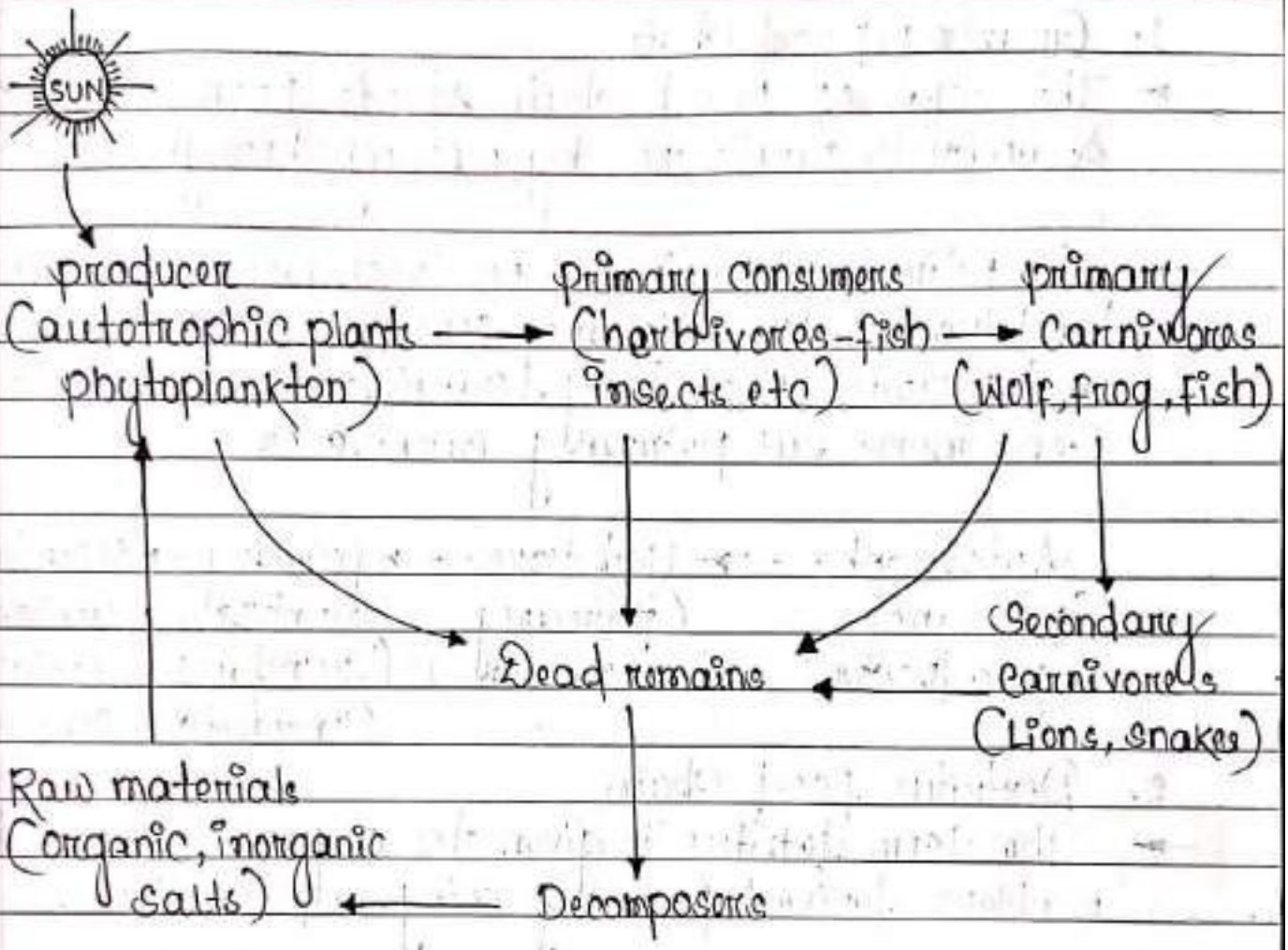
FOOD CHAIN

→ Small harbivorous organisms such as Caterpillars etc consume the vegetable material and convert it into animal material which serve as food to meat eating animal. They are eaten by larger Carnivores. This sequence of eating & being eaten with the resultant transfer of energy is known as food chain.

→ Thus in food chains organisms of an ecosystem are linked together. Each step is known as trophic level and the study of the energy flow through these steps is called trophic ecology.

→ In food chain energy flows from primary producers to primary consumers, from primary consumers to secondary consumers, from secondary consumers to tertiary consumer & so on.

→ In grassland ecosystem, a food chain starts with grass & forbs & goes through grasshopers, frogs, snakes, hawk in an orderly sequential arrangement on food habits.



(A Generalised food chain of the ecosystem)

→ other examples of food chain are —

1. Grass → Rabbit → Fox → Wolf → Lion
   (Grassland ecosystem)
2. phytoplankton → Waterfleas → small fish → Tuna
   (pond ecosystem)
3. Lichens → Reindeer → Man
   (Arctic Tundra)

→ In nature food chains are of 2 types —

1. Grazing food chain
2. Detritus food chain

1. Grazing food chain

→ This type of food chain starts from green plants & ends to carnivores by passing through herbivores.

→ The primary carnivores or secondary consumers eat herbivores (or primary consumers) of the ecosystem and likewise secondary carnivores or tertiary consumers eat primary carnivores.

Autotrophs → Herbivores → primary → secondary → so on
(primary producers) (primary consumers) carnivores (secondary consumers) Carnivores (Tertiary consumers)

2. Destritus food chain

→ The term detritus is given to organic wastes, dead matters derived from grazing food chain.

→ The energy contained in this detritus is not lost to the ecosystem as a whole, rather it serves as the source of energy for a group of organisms (detrivores), they differ from grazing food chain & is called as detritus food chain.

→ These food chains are less dependent on solar energy but chiefly depend on organic matter produced in another system. Such food chains operates in the decomposing accumulated litter in a temperature forest.

→ In some ecosystem considerably more energy flows through detritus food chain then through grazing food chain.

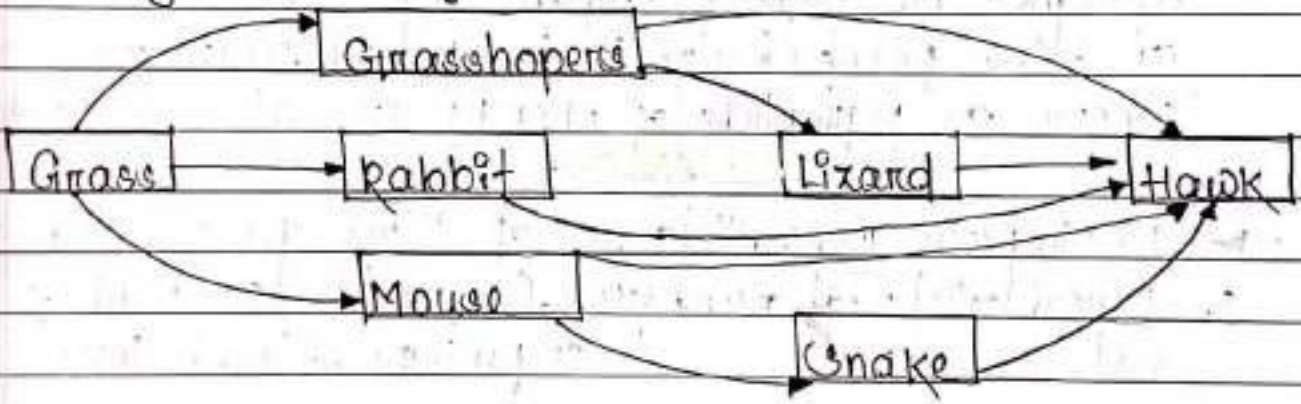
→ The organisms of the detritus food chain are bacteria, algae, fungi, protozoa, insects etc.

Detritus → Detrivores → Detrivore → Small → large consumers Carnivores Carnivores

IMP

FOOD WEBS

→ A network of food chains where different types of organisms are connected at different trophic levels so that there are a number of options of eating and being eaten at each trophic level.



(A food web in a grassland ecosystem with five possible food chain)

→ the following five types of food chains are interconnected to form food web in this fig.

1. Grass → Grasshoper → Hawk
2. Grass → Grasshoper → Lizard → Hawk
3. Grass → Rabbit → Hawk
4. Grass → Mouse/Rat → Hawk
5. Grass → Mouse/Rat → Snake → Hawk

IMP

Ecological Pyramids

→ The animals at the base of the food chain are relatively abundant while those at the end are relatively few in number i.e. there is progressively decrease in between the two extremes.

→ Secondly there is some sort of relationship between the number energy content of the primary producers Consumers of the first & second order and so on

→ The pyramids of number and biomass may be upright or inverted depending upon the nature of the food chain in the particular ecosystem where as pyramids of energy are always upright

→ Ecological pyramids are of three general types —

1. Pyramids of numbers — (Based on number of organisms at each level)
2. Pyramid of biomass — (Based on biomass of organisms)
3. Pyramid of energy - (showing rate of energy flow or productively at successive trophic levels)

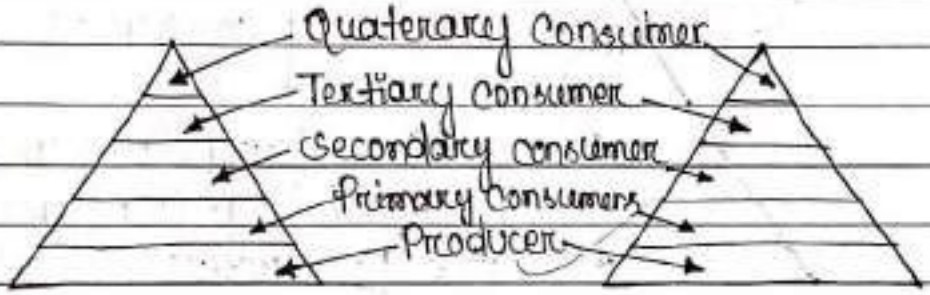
1. pyramid of numbers

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

→ At the base of such pyramid is always the number of primary producers and the subsequent structure on this base are represented by the number of

consumers at successive level.

→ In grassland ecosystem the producers which are mainly grasses are always many in numbers. This number then shows a decrease towards apex as the primary consumers & herbivores are less in number than the grasses. The secondary consumers are lesser in number than primary consumers. finally the tertiary consumers are least in number. Thus the pyramid becomes upright.



→ In a forest ecosystem, however the pyramid is inverted as the number of primary producers (tree) is less than that of herbivore birds feeding upon the tree fruits. The no. of parasites like bugs and lice living and feeding upon birds body is still higher and so on. Thus the pyramid of number may not be always pyramidal, it may even be completely inverted in shape.

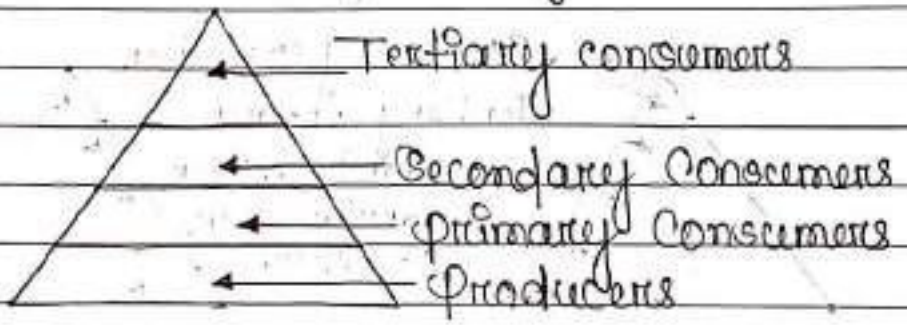
2. pyramid of Biomass

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

→ From the inverted nature of pyramid of number

the idea of pyramid of biomass is given where the weight of primary producers form the base.

→ In generally the pyramid of biomass is upright. The biomass of one tree is very high. The biomass of a number of birds feeding upon the tree is far less than that of tree. Similarly the biomass of a very large number of parasite in & on the body of birds is less. Thus the pyramid of biomass therefore becomes upright.



3. Pyramid of Energy

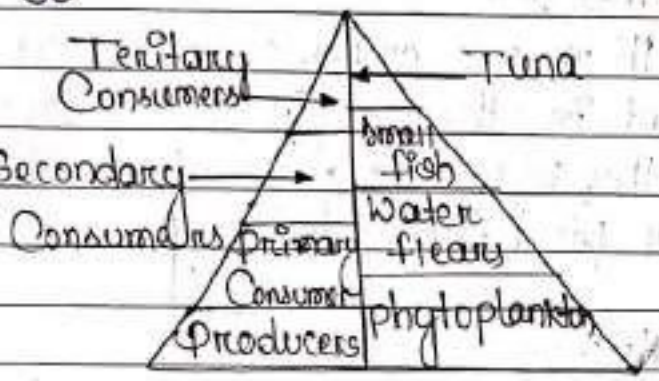
→ of the three types of ecological pyramid, the energy pyramid gives the best picture of overall nature of the ecosystem.

→ As against the pyramid of numbers & biomass the shape of the pyramid of energy is always upright, because in this type the time factor is taken into account.

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

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

→ Energy pyramids are always upright because less energy is transfered from each level.



→ The fig. shows organisms of both terrestrial & aquatic ecosystem. The quantity of energy trapped by green plants in an area over a period of highest compared to that of organisms of other trophic levels & therefore base of pyramid is broad.

The major ecosystems

There are 2 types of ecosystems in nature —

1. Terrestrial ecosystem
2. Aquatic ecosystem

1. Terrestrial ecosystem

The terrestrial ecosystem consist of

i. forest ecosystem
ii. Grassland ecosystem

iii. Desert ecosystem

i. forest ecosystem

→ Roughly 40% of the land is occupied by forest but in India it is 14%.

→ The different components of forest ecosystem(s) are :-

Abiotic components :-

There are organic & inorganic substances present in the soil & atmosphere. In addition to the minerals present in the present in the forest, we find the dead organic debris.

Biotic Components :-

The living organisms present in the food chain are the biotic components & occur in the following order -

I. producers

These are mainly trees show much species diversity & greater degree of stratification especially in tropical moist deciduous forest.

II. Consumers

The different classes of consumers are as follows-

(a) primary Consumers

These are herbivores that include the animals feeds on leaves as ants, flies, beetles, grasshopers etc.

(b) secondary Consumers

These are carnivores like snake, bird, lizard etc feeding on herbivores.

(c) Tertiary consumers

These are the top carnivores like lion, tiger etc. that eat carnivores of secondary consumers level.

III. Decomposers

These are wide variety of micro-organism like bacteria (Bacillus, clostridium etc); fungi (speci of aspergillus, coprinus etc). Rate of decomposition in tropical and subtropical forest is more rapid than that in the temperature ones.

ii. Grassland ecosystem

→ This type of terrestrial ecosystem occupy by the roughly 19% of the earth surface. Grassland dominated by grass species but sometimes allow the growth of a few trees & shrubs. Rainfall is average but erratic.

→ There are 3 types of grasslands depending upon climatic regions —

A. Tropical Grassland

Tropical biomass (grasslands with scattered trees or clump of trees) are found in warm regions with 40-60 inches of rainfall but with prelonged dry season when fires are an important part of the environment.

The largest area of this type is in Africa.

B. Temperature Grassland

In us & canada these grassland are known as ~~velds and in~~ prairies, in south America

pumpas, in Africa as velds and in untral Europe & Asia as steppes. This occur when the rainfall is too low (between 10-30 inches).

c. Arctic Tundra

There are two tundra biomes covering large areas of arctic, one in the palearctic and other in the Nearctic region. In both continents boundary between tundra & forest lies further north-west where climate is moderate by coarm westerly winds & the permanently frozen deeper soil layer is called permaforest.

→ The various components of the grassland are —

I. Abiotic components :—

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

II. Biotic components :—

(a) Primary consumers

The herbivores feeding on grasses are grazing animals as cocoo, buffaloes, mouse etc. Besides them some insects like leptocorisee, dystercus etc termites and milipeds etc also feed on the leaves of grasses.

(b) Secondary consumers

The animals like fox, jackles, snakes, birds etc. feed on herbivores. Some times the hawks feed on secondary consumers.

III. Decomposer :—

The microbes active in the decay of dead organic matter are different species of fungi, some bacteria and actinomycetes. They bring about the minerals back to the soil & thus making them available to the producers.

iii. Desert ecosystem

→ Desert generally occur in regions having less than 10 inches of rainfall. scarcity of rainfall may be due to —

1. High subtropical pressure as in the sahara & Australian desert.
2. Geographical position in rain shadow.
3. High altitude.

→ About 1/3rd of our world's land area is covered by deserts.

There are life forms of plants that are adapted to deserts:

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

→ Based on the climatic condⁿ, deserts may be classified as:—

(a) Sahara, Namib in Africa, thar Rajastan are called tropical desert which are driest.
(b) Mojave is southern california is called temperature desert where days are very hot & cool in winters.
(c) Gobi deserts in China called cold desert where cold

winters & warm summers.

Biotic Components

I. Producers :-
These are shrubs bushes, some grasses & few trees.

II. Consumers :-
The most common animals are reptiles and insects. Also some birds are found.

III. Decomposers :-
Due to poor vegetation, these are very few. They are some fungi & bacteria.

2. Aquatic ecosystem
More than 70% of the land is covered by water. The important ecosystems are:-
i. pond ecosystem
ii. Marine ecosystem

i. pond ecosystem:
→ ponds are small bodies of water in which the ecosystem is large. ponds may be found in most regions of adequate rainfall. They are continually being formed as a stream shift position, leaving the former bed isolated as a body of standing water. where organic materials are accumulated.

→ Temporary ponds are dry for part of the year are specially interesting & support a

unique community organisms is such ponds must able to survive in a dormant stage during dry period

→ The components of pond ecosystem are —

I. Abiotic components :-

Apart from heat, light and the basic inorganic & organic compounds, elements are water, CO_2, oxygen, phosphorus etc. The amount of the minerals present at anytime in the physical environment of pond is known as "standing state".

II. Biotic components :— They are as follows —

① producers

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

(a) Macrophytes

These are mainly rooted larger plants which include partly or completely submerged floating & emergent hydrophytes.

Ex:-

Trapa, Typha, sagittaria etc.

(b) phytoplankton

These are minute, floating or suspended lower plants like spirogyra, eudorina etc.

(2) Consumers

Most of the consumers are herbivores except insects & some large fish. But generally are heterotrophs. In pond consumers are distinguished as —

(a) primary Consumers

~~Most of the Consumer~~

These are herbivores also known as primary macro consumers feeding directly on living plants. They may be large or in small size. They are further differentiated as —

* Benthos
* Zooplanktons

(b) secondary Consumers

They are carnivores like insects and fish which feed on primary Consumer (herbivores).

(c) Tertiary Consumers

These are large fish feeding on smaller fish. In pond fish may occupy more than one levels.

III. Decomposers :—

These are micro consumers which absorb only a fraction of the decomposed matter. They decompose organic matter of both producers as well as miCroConsumers in simple forms.

(ii) Marine ecosystem (ocean)

→ The marine environment of seas & ocean occupy 70% of the earth surface. They have some major life zones i.e. coastal, euphotid etc.

→ The biotic components of an ocean are as follows:-

I. producers

These are autotrophic which are mainly phytoplanktons. They trap radiant energy from sun through their pigments. A number of macroscopic seaweeds also fall into this category. They are in distinct zones at different depths of water.

II. Consumers

These are heterotrophic macroconsumers being dependent for their nutrition on the primary producers. These are —

i. The herbivores like fishes etc which feed directly on producers are called primary consumers.

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

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

III. Decomposers

The microbes active in the decay of dead organic matter are chiefly bacteria & some fungi.

04-09

BIODIVERSITY & ITS CONSERVATION

BIODIVERSITY

It may be defined as the variability among living organisms from all sources including terrestrial, marine & other ecosystems & the ecological complexes of which they are part of. This includes diversity within species & between species & ecosystems.

GENETIC, SPECIES & ECOSYSTEM DIVERSITY

Biodiversity is usually analysed at 3 levels i.e. species, genetic & ecosystem, each of which has its own significances.

1. Diversity of Biotic Communities & Ecosystem

Depending largely upon the availability of abiotic resources & conditions of the environment; an ecosystem develops its own characteristic community of living organism.

Ex:- A pond constitutes an ecosystem & process a set of flora & fauna which is different rivers.

2. Diversity of species composition within a community.

The biotic component in an ecosystem may be composed of a few species only or a large number of species of plants, animals & microbes which react & interact with each other & with the abiotic factors of the environment. The richness of species is an ecosystem is usually reffered to as species diversity.

3. Diversity of Genetic organisation within a species

Within a species there are often found a number of varieties which slightly differ from eachother in one, two or a number of characters such as shape, sizes, quality of their product, resistance to insects, pests & diseases, ability to withstand adverse condition of environment etc. These differences are due to slight variations in their genetic organisations. This diversity in the genetic make up of a species is refer to as Genetic diversity.

BIOGRAPHICAL CLASSIFICATION

→ Biography deals with the geographical distribution of plants & animals. communities of plants and animals in different geographical areas of the world differ widely from each other.

→ The studies of distribution of biota (flora & fauna) is called biogeography.

→ There are 13 biogeographical regions have been identified in India & they are :-

1. Himalaya
2. The Desert
3. Decan peninsula
4. Malabar
5. Andaman Islands
6. Nicobar Islands
7. Gangetic Islands
8. Lakshadweep Islands
9. Maldive/Chagoas Islands
10. Western Ghats
11. Burman/Bangalian forest
12. Marine Coast
13. Coromondal Mahanandian

FLORISTIC (BOTANICAL) REGIONS OF INDIA

The country has been divided into following

nine floristic regions with respect to flora diversity :-

1. Western Himalayas

The region extends from central region of Kumaun to north west region of Kashmir & has annual rainfall of 200cm & there are 3 zones of vegetation.

(a) Submontane zone :

It constitute of tropical & sub-tropical parts & extends upto 1500m altitude It comprises mostly of saiwalik ranges. snowfall doesnot occur

(b) Temperate Zone :

Above submontane zone extend temperate zone upto 3500m altitude. They are dominated by plant species like Betula, ulmus, cornus, Taxus etc.

(c) Alpine zone :

It extends from 3500-4500 m altitude & is characterized with alpine forest vegetation. Most common tree species are juniperus, rhododendrus etc & herbs like primula, polygonum etc.

2. Eastern Himalayas

It includes regions of sikkim & NEFA & is characterised by more rainfall, less snow & higher temperature. This is also divided into following 3 zones :-

(a) Tropical Zone

Upto 1800 m altitudes, this zone has tropical semi-evergreen or moist deciduous forests. These forest comprise the plants like shorea robusta, Acacia, Sissoo etc.

(b) Temperate zone:

This zone extends between 1800-3800m altitude & has typical montane temperali forest which are dominalid by oaks like Michelia, pyrus, eugenia etc.

(c) Alpine zone:

Beyond the temperature zone, extends alpine zone upto 5000m altitudes. It has alpine vegetation including juniperus & rhododendron with its other typical flora.

Gangetic

3. ~~Indus~~ plains:

This region extends over uttar pradesh, Bihar, Bengal & part of odisha & is characterised by moderate amount of tropical moist & decidous & dry decidous forest type. The common plants of this zone are Madhuca india (Mahua), Terminilia Arjuna (Arjuna), Buchanania Lanzan (chiraunji), tendu, neem etc.

4. Indus plains:

This zone includes the arid & semiarid regions of punjab, Rajastan, kutch, part of Gujrat & Delhi the rainfall is less than 70cm. The vegeterian is tropical thron forest is semi-arid region & is typical desert in the arid region. The plants of this zone are Acacia, salvador, calotropis, panicum, Euphorbia etc.

5. Central India:

It comprises Madhya pradesh, parts of Orissa & Gujrat. The rainfall is 150-200 cm & its vegetation is thorny, mixed deciduous & teak type. The chief plants of this region are Mahua, Acacia, terminalia, butea etc.

6. Malabar (West Coast):

The region includes western coast of India from Gujrat to cape comorcin & has heavy rainfall. The forests are tropical evergreen in extreme west, semi evergreen towards interior subtropical or montane temperate evergreen forests in Nilgiris & near Bombay & Kerala coast.

7. Deccan plateau:

The region extends all over peninsular India (i.e. Andhra pradesh, Tamil Nadu & Karnataka) & has rainfall upto 100cm. Its central hilly plateau has tropical dry deciduous forests of Boswellia serrata, Tectona grandis & Hardwickia, while the low eastern dry coromandal coast has tropical dry evergreen forests of Chandan, Cendrela toona & plants like Acacia, euphorbia phyllanthus etc.

8. Assam

The region is characterised by heavy rainfall (200-1000 cm). The vegetation is either dense over green forests include trees like Mesua ferrea, shorea robusta, ficus elastica etc, bamboos & grasses like imperata cylindrica, saccharum etc.

plants as Nephenthes & also ferns & orchids.

9. Andamans :

This region possess a variety of vegeterian, mangroves at its coasts & evergreen forests of tall trees in the interior. Important plants species of this island are Rhizophora, calophyllum etc.

Values of Biodiversity

The value of biodiversity (interms of its commercial utility, ecological service & asthetic values) is enormous. There are several ways that biodiversity & its various forms are valuable to humans. We get benefits from organisms in an innumerable ways. sometimes, one realize the value of the organism only after it is lost from earth. Every year numerous species are lost before we get a chance to know anything about them.

The biodiversity 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 includes animals, fish & plant produces.

A large number of plants are consumed by human beings as food. A few animals species are consumed by people which comes from Cattle, pige, sheep, goats, chickens etc.

fish

Many fresh water fish can be grown in ponds. ~~It~~ Israel & china is already getting about half of their fish from aqua culture

Drugs & Medicines

About 75% of the worlds population depends upon plants or plants extracts for medicines. The drug penicillin used as an anti-biotic is derived from a fungus called penicillium, likewise Tetracyclin from a bacteria which is used to cure Malaria is obtained from the bark of cinchona tree.

fuel

The fossil fuels like coal, petroleum products & natural gas are the products of biodiversity.

2. productive value

Some of the organisms are commercially usable where the product is marketed & sold. The animal products like silk from silkworm, wool from sheeps or goats, fur and of many animals, tusks of elephants & musk from deer etc all of which are traded in the market.

3. Social value

These are the values associated with 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, the leaves, fruits, flowers of some of the plants are used for worship.

Many animals like cow, snake, bull, peacock also have significant place in spiritual & 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.

for e.g: a peculiar species of pigeon, grey/white bird with short legs is no more on this earth. similarely Dodo species is no more. Human being are not deriving anything from kangaroo, Giraffe but strongly feel that these species should exist in nature.

5. Asthetic value

Everyone of us would like to visit vast stretches of lands to enjoy the visible life. people from farther areas, spend a lot of time and money - to visit wild life areas where they can enjoy the asthetic value of biodiversity & this type of tourism is known as eco-tourism. Eco-tourism is estimated to generate 12 billion dollars of revenue annually that roughly gives the asthetic value of biodiversity.

6. option value:

Keeping future possibilites open for their use is called option value. It is impossible to predict which of our species or traditional

Varieties of crops & domestic animals will be of great use in future.

Biodiversity at Global, national & local levels

→ There are at present 1-8 million species found by scientists in the world.

→ World's most of the biorich nations are in south, which are the developing nations. The majority of the countries capable of exploiting biodiversity are Northern nations.

→ If biodiversity should from a 'common property resource' to be shared by all nations, there is no reason to exclude oil, or uranium etc as global assests.

→ Countries with diversity higher than India are located in south America such as Brazil & south Eastern Asian countries such as Malaysia & Indonesia.

→ precipication & temperature are the most important determinant of biodiversity.

→ The species found in these countries are however different from other. The other "mega biodiversity nations" have developed technology to exploit their species for biotechnology & genetic engineering & India is capable to do so.

→ International agreement such as "world heritage

Conservation to project & support biologically rich natural areas. In India these include Manas on the boarder between Bhutan & India, Kaziranga in Assam, Bharatpur in U.P, Nandadevi in the Himalays & the sundarbans in the Ganges delta in west Bengal.

India As A Mega Diversity Nation

→ Geological events in the landmass of India have provided conditions for high levels of biological diversity.

→ A split in the single giant Continent around 40 million years ago led to the formation of northern & southern continents with India a part of Gondwanaland (the southern landmass), together with Africa, Australia.

→ later the tectonic movements shifted India northward across the equator to join the Northern Eurasian continent. As the intervening sea closed down, plants & animals that had evolve both in Europe and in the far east migrated into India before the Himalayas had formed.

→ A final influx came from Africa with Ethiopian species which were adapted to the savanna & semi-arid regions. Thus India's special geographical position between three distinctive centres of biological evolution & radiation of species in responsible for our rich biodiversity.

→ Among the biologically rich nations, India stands among the top 10 or 15 countries for a great variety of plants and animals. India has 350 different mammals, 1200 species of bird 453 species of reptiles & 45000 plant species, 50000 known species of insects including 13000 butterflies & moths.

→ It is estimated that 18% of Indian plants are endemic to the country and found no where else in the world. Among the plant species the flowering plants have a much higher degree of endemism.

→ Among amphibians found in India, 62% are unique to the country. Among lizards of the 153 species recorded, 50% are endemic.

→ Apart from the high biodiversity of Indian wild plants & animals there is also a great diversity of cultivated crops and breeds of domestic livestock. The cultivars include 30,000 - 50,000 varieties of rice & a number of cereals, vegetables & fruits. The highest diversity of cultivars is concentrated in high rainfall areas of western ghats, eastern ghats, Northern Himalayas & North-Eastern hills.

Hotspot of Biodiversity

→ The earth's biodiversity is distributed in ecological regions. There are over a thousand major ecoregions in the world. But of these 200 are

said to be richest, rarest and most active natural areas. These are reffered to as the Global 200.

→ It has been estimated that 50,000 endemic plants which comprise 20% of global plants probably occur in only 18% hotspots in the world.

→ Countries cohich have a relatively large proportion of these hotspots are reffered to as "mega-diversity nations".

→ our globally accepted national hotspots are in the forests of the North-East & Western Ghats cohich are included in the coorlds biorich areas.

→ The Andaman & Nicobar islands are extremely rich in species & many sub species of different animals & birds. The Andaman & Nicobar islands alone have as many as 2200 species of flowering plants & 120 species of ferns. out of 135 land mammals in India 85 are found in Northeast.

→ A major proportion of amphibian & reptile species especially snake are concentrated in the western Ghats cohich is also a habitat for 1500 endemic plants species.

Air Pollution

Air pollution:-

The unwanted particles or materials and gases in excess as present in the outdoor atmosphere which is injurious to health of human beings. plant or animals is known as pollutants. And these pollutants which causes pollution in air is known as "Air pollution".

Causes of air pollution:-

Pollutants may be classified into two types:-

① Natural
② Man-made

→ The air pollutants generated from natural sources such as volcanic eruption, forest, fired, earth quake, stationary sources such as industries.

→ The pollutants also belong to primary pollutants which are produced and directly injected into the atmosphere.

Causes of air pollution (or) effects of Air Pollution:-

① Effects on Human:-

→ All the air pollutants directly affected the Respiratory system.

→ when the carbon monoxide gets attached to heroglobin, transport of oxygen to the tissues is immediately stopped, leading to death (choke beaking)

(2) Effects on Animals:-

→ when plants are effected with pollutants like fluoride, Arsenic, lead etc, it enters into the body of the grazing cattle.

→ Fluoride is a poison for cells. It causes motting of tooth in cattle and sheep.

→ However horse and chicken have hig resistance to fluoride.

→ Excess of fluoride leads to abnormal growth of bones. It leads to weight loss, lower fertility and lower milk production from animals.

→ ozone causes lungs disease in the cat, dog, rabbit etc.

(3) Effects on plants:-

→ Sulphur Dioxide is absorbed through the small pores present on the leaves.

→ when the concentration becomes more the leaves dies and the effected leaves appear brown-red and the disease is called chlorosis.

→ Sulphur dioxide effects photo-synthesis and respiration in plants.

→ Fluoride effects wheat, apple, fig, lemon, orange etc.

→ Smog damages lettuce, beans etc.

→ ozone bleaches ~~cotton~~ and develops path on the leaves of Tobacco, grapes etc.

④ Effects on House-Hold, Articles and Materials:-

→ sulphur dioxide gets changed to sulphuric acid when mixed with moisture.
→ These acids are corrosion in nature.
→ Iron, Aluminium & Copper get corroded by these acids.
→ Hydrogen sulphide affects the door, window paints containing lead turning the brown colour to black and discolouring the points.

Effects of Air pollutants on Man and his Environments:-

① Damage to Materials:-

→ The air pollutants includes metals like building Materials, rubbers, elastomers, paper, textiles, leather, dyes, glass, enamels and surface coating.
→ The damages occur by air pollutants include corrosion abrasion, deposition, direct chemical attack and indirect chemical attack.
→ The intensity of damage depends upon moisture, temperature, sunlight, air movement etc.

② Damage to vegetation:-

→ Air pollutants such as sulphur dioxide, smog particulate fluoxide, particulate fluoride, oxidants like ozone, ethylene (from automobiles), NO_x, chlorine and herbicide and weeding sprays exert toxic effects on vegetation.

→ The damages are chlorotic marking, banding, silvering or bronzing of the underside of the leaf.
→ Retardation of growth also occurs due to air pollution.
→ The damage depends upon the nature and concentration of the pollutant, time of exposure, soil and plant condition, stage of growth, extent of sunlighting.

(III) Damage to farm animals –

→ Arsenic, lead and fluoride are the main pollutant which cause damage to live stock.
→ Arsenic occurs as an impurity in coal & ores. It also used in insecticides.
→ Diseases like salivation, thirst, live necrosis, inflammation of depression of central nervous system seen in animals.
→ Lead poisoning occurs in horses & other animals with symptoms such as depression, lethargy, paralysis & breathing troubles.

(IV) Darkening of sky and reduction in visibility:-

→ sky darkening may be caused by heavy smoke and fog or by dust storms.
→ The reduction in visibility may be due to smoke, fog and industrial fume contain particulate in 0.4 to 0.9 μm size scatter light.
→ The intensity of these effects depends upon the particle size angle of sun, aerosol density, thickness of affected air mass and also the meteorological factor such as in-version height, wind speed and humidity.

(v) Effect on Human Health and Human Activities:-

→ Air pollution can effect the health of workers in the industrial area causing absenteeism, sickness and drop in production.

→ Due to air pollution disease like chronic bronchitis, bronchial, asthma, pulmonary emphysema and lung cancer sun in human beings

→ Irritation of nose, eyes and throat and bad odours due to air pollutants cause annoyance, allergy and health hazards.

Control Measures Against Air pollution:-

The following are the general methods of air pollution control -

(1) Controlling the air pollution at source.
(2) site selection / zoning
(3) controlling air pollution by devices / equipments / process modification.
(4) Air pollution control by growing vegetation.
(5) Air pollution control by fuel selection and utilization.

(1) controlling of air pollution at source:-

(i) Before the release of pollutants, they should be control or minimised at source.
(ii) we can select the raw material in such a way to release minimum pollutants or we can use suitable fuels avoiding sulphur fuel.
(iii) Non essential ingredients are removed before processing of the raw material.

→ Equipment alternations such as the use of vented tanks should be avoid and use floating roof tanks.

→ By using modified equipment, the pollutants are stored at one place form where they should removed timely.

② selection of fuels –

→ To prevent the formation of smoke, coal can be substituted with oil.

→ However the ratio of fuel and air should be maintained properly for complete combustion.

③ site selection / zoning –

→ To instal the industry, site selection is important which result in the production of single source of pollution.

→ control measure based on the knowledge of the mechanics of the atmosphere is called zoning.

→ some factors like material supply, transport labour and market for products are important for selecting the site of industry.

④ controlling of Air pollution by Devices / Equipments / process modification –

→ To control the air pollution two types of method are used –

ⓐ methods used to control gaseous pollutants –

For gaseous pollutants following methods are used – ① Absorption ② Adsorption ③ combustion ④ cold trapping or condensers ⑤ others

Soil pollution

→ Solid and liquid waste industries garbage from cities, pesticides and fertilizers from agricultural operation have brought harmful changes in the nature of soil & is called soil pollution.

→ The agents causing soil pollution are known as soil pollutants.

Causes & Sources

There are 3 types — 1. Domestic & commercial waste
2. Industrial waste
3. Agricultural sources.

1. DOMESTIC AND COMMERCIAL WASTE

Refuse containing garbage, plastic, glasses, cans, fibres, street sweeping, containers, dead animals comes in the catagory.

2. INDUSTRIAL WASTE

→ The industrial waste may be solid or liquid come of the highly polluting industries include paper & pulp, milk, oil refineries, textile industries, metal processing industries, drug & pharmaceutical industries.

→ It is estimated that more than 50% of raw materials from these industries emerge

as wastes.

3. AGRICULTURAL SOURCES

→ Now-a-days we use modern agricultural practices. These practices are dependent on fertilizers pesticides etc.

→ It is reported that the world's average fertilizer application of the order of 55 kg/ha.

→ The fertilizers residue remain in the soil & bring about a permanent change in the soil characteristics.

Soil pollutants

The important soil pollutants are :-

1. Garbage
2. Rubbish
3. Industrial solid waste
4. Mining waste
5. Metals
6. Fertilizers

1. GARBAGE

The degradable waste from food, shelter houses etc. are loaded on the land which emits foul smell and increase nutrients contain.

2. RUBBISH

These include both combustible and non-combustible organic & inorganic substances. combustible waste include paper, wood, cloth etc. where as non-combustible include metals, glass, ceramics etc.

3. INDUSTRIAL SOLID WASTE

chemicals, paints, explosive material etc compriss the industrial solid waste acting as solid pollution.

4. MINING WASTE

The different minings extracting some waste materials including slag heaps, ore heaps, some ashes causing some serious problem deterioration of the soil quality of region.

5. METALS

Areas surrounding mining are always exposed to metal pollutants. Metals like zinc, iron, copper, lead, Arsenic etc are included in the catagory.

6. FERTILIZERS

Unskilled application of fertilizers on agricultural land gradually deteriorating the soil quality.

EFFECTS OF SOIL POLLUTANTS

Soil pollutions is receiving greater attention due to its direct impact on public health. The major effects of soil pollutants are -

1. Effects of modern agricultural practices

Following are the effects of modern agricultural practices :-

* SYNTHETIC FERTILIZERS -

Synthetic fertilizers are employed to increase the soil fertility & crop productivities. These fertilizers contain the essential nutrient in the toplayer in the soil.

Excessive use of nitrogenious fertilizers leads to the accumulation of nitrates in the soil which may contaminate the ground water.

* PESTICIDES -

As per the report of world (health organisation) about 50000 people in developing countries are poisoned and about 5000 people died of improper use pesticides and other chemicals in modern agricultural practices.

2. Effects of industrial effluents

→ Solid, liquid & gaseous chemicals from various industries such as paper and iron & steel, fertilizers automobile etc contain a

variety of pollutants such as toxic heavy metals, detergents, pesticides, suspended particulates etc.

→ If they are not properly treated at the source, they give rise to water, soil and soil pollution.

3. Effects of urban waste.

→ Million tonnes of urban waste are produced every year from critically polluted cities. The inadequately treated and untreated sewage cause serious health hazards and also reduces the fertility & productivity.

Control of Soil pollution

The various approaches to control the soil pollution are as follows —

1. Implementing pro-active population control program.
2. Launching extensive afforestation & a community forestry program.
3. Implementing measures against deforestation.
4. formulation of strict pollution control legislation & effective implementation with powerful administration.
5. Banning the use of highly toxic & synthetic chemical pesticides or atleast regulating or restricting their use.
6. Increasing the use of bio-pesticides in

place of toxic chemical pesticides.

(7) Effective treatment of domestic sewage by suitable biological & chemical methods.

(8) Municipal waste have to be properly collected & disposed scientifically in landfills.

(9) Recycling & reuse of material should be done as far as possible.

(10) Industrial waste have to be properly treated at source by segregation of waste, adopting integrated waste treatment method.

(11) Avoiding use of chemical fertilizers & insecticides & providing more organic manures in the field.

(12) Enforcing environmental audit for industries & promoting ecolebelled products.

Thermal pollution

Defination

→ Thermal pollution can be defined as accumulation & entry of unused heat generated by different activities. This disrupts ecosystem.

→ Discharge of heated effluents from thermal plants, nuclear power station or other industrial operations into water sources creates undesirable changes in the aquatic ecosystem.

Sources of thermal pollution

The following sources contribute to thermal

pollution.

1. NUCLEAR POWER PLANTS

→ Nuclear power plants including drainage from hospital, institute, nuclear experiment & explosions, discharge a lot of unutilized heat into near by water bodies.

→ Emissions from nuclear reactors & processing industries are also responsible for increasing the temperature of water bodies.

→ Heated effluents from power plants are discharges ~~effluents having a temperature~~ at 10°C higher than other and severely effect the aquatic flora & fauna.

2. THERMAL / COAL - FIRED POWER PLANTS

→ Some thermal power plants ultimately discharges effluents having a temperature difference of 15°C between effluents & water body

→ The thermal power plants utilize coal as fuel & they constitute the major source of thermal pollutants.

3. INDUSTRIAL EFFLUENTS

Industries generating electricity using coal as fuel and nuclear & thermal power plants

require huge amount of cooling water for heat removal which results in discharge of heated effluent to the water body at a higher temperature.

4. HYDRO-ELECTRIC POWER PLANTS

→ The generation of hydro-electric power sometimes results in negative loading in water system.

→ Apart from electric power industries various factries with cooling system Contribute to thermal loading.

5. DOMESTIC SEWAGE

→ Domestic sewage is commonly discharge into rivers, lakes, canals, with or without waste treatment.

→ The municipal sewage normally has a higher temperature than the receiving water bodies. The discharge water only raise the stream temperature but also Creates deleterious effects on aquatic ecosyste

Effects of thermal pollution

The various effects of thermal pollution are-

1. Reduction in dissolved oxygen

(i) Concentration of dissolved oxygen decrease

with increase in temperature of water body.
(ii) The DO content is 10·6 PPM in water at a temperature of 32°F & 6·6 PPM at 64°F.
(iii) Thus the cold water fish which requires about 6 PPM of DO to survive could not tolerate higher water temperature.

2. Change in water properties
→ A rise in temperature changes the physical & chemical properties of water. The vapour pressure increases sharply while the velocity of water decreases.

3. Interference with reproduction
→ In fishes several activities like nest building, hatching, migration & reproduction etc depends on some optimum temperature.

→ For example the maximum temperature at which trout spaton successfully is 8·9°C.

4. Increase Metabolic Rate
→ Fishes show a markable rise in rate of metabolism with the change in temperature

→ The respiratory rate, oxygen demand & swimming speed in fishes are generally increased.

5. Destruction of organism in cold water
The volume of water required for cooling purpose from a stream is enormous. Unfortunately many plankton, small fishes, insects are sucked into the condenser along with cooling water are killed by thermal shock.

6. Bio-Chemical oxygen Demand (BOD)
→ When the temp^{r} of stream rises, the stream carrying bio-degradable material also rises.
→ The intensive fired action of aquatic organism causes BOD to be accomplished at a lower temp^{r}.

7. Effect of Marine life
Temperature plays an vital role in effecting physiology, metabolism, growth & development of marine animals.

8. Effects on bacteria
→ Due to heated discharges from industries & plants the bacterias are severly damaged.
→ The effect includes melting of shell fats, toxic action of metabolic product etc.

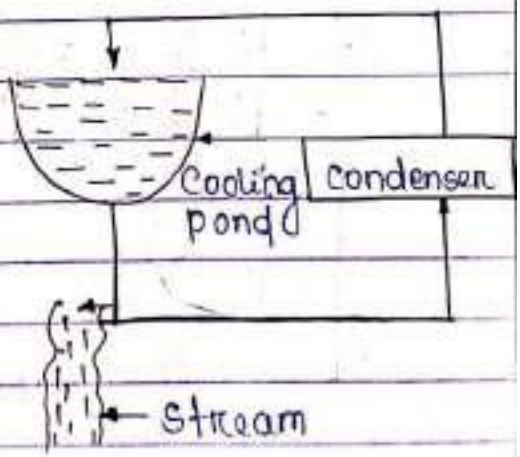
Control of thermal pollution

* The major principles involved in the process of heat loss are – 1. conduction
  2. Convection
  3. Radiation
  4. Evaporation

* The following methods can be adopted to control high temperature caused by thermal discharges:
  1. cooling ponds
  2. spray ponds
  3. Cooling towers

1. COOLING PONDS:

→ The cooling ponds are used in dissipation of heat as shown in fig.

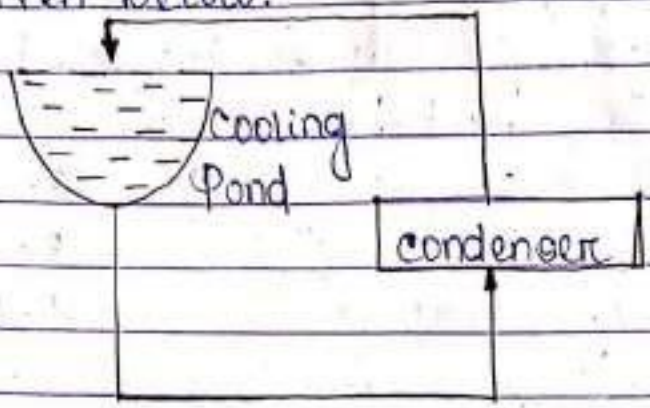


→ The water from the condenser is stored in the earth like ponds where natural evaporation brings down the temperature.

→ The water is recirculated again.

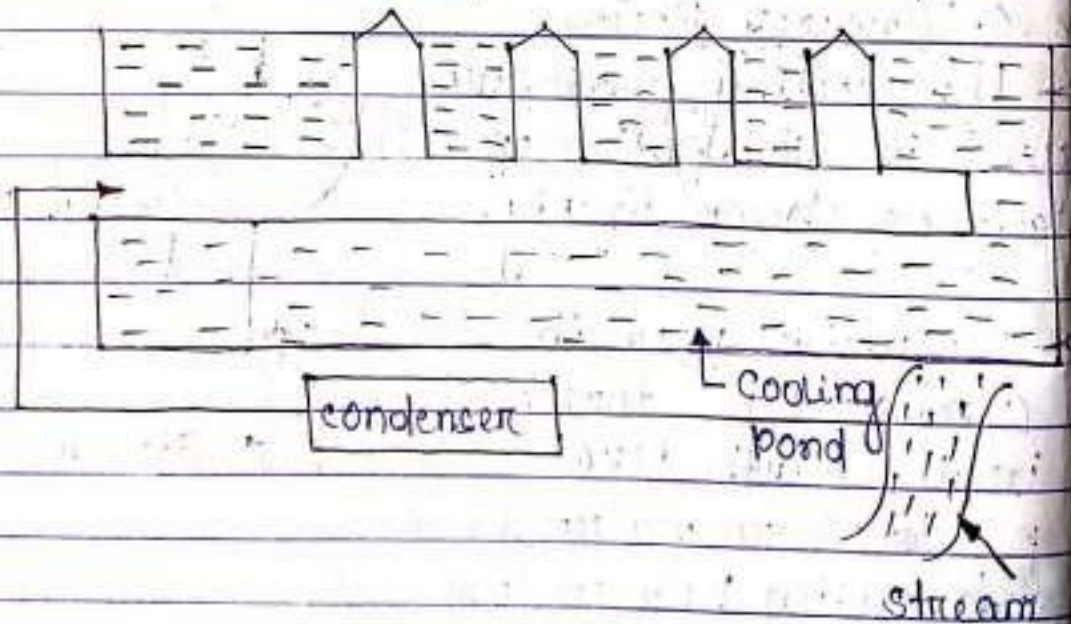
→ Another method for installation of cooling

pond is given below:



2. SPRAY POND

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



3. COOLING TOWERS

* Wet cooling Towers

→ In wet cooling towers the heated water is brought in direct contact with continuously flowing air.

→ The evaporation brings down the temperature.

→ To increase the surface area of contact the water is broken down into droplets by use of spray nozzles or by splashing it on packing of battles in the cooling tower.

→ To handle large quantity of heated effluents large tanks or reservoirs should be constructed to retain for a little longer time.

→ The heated effluents discharged from chemical industries & thermal power plants can put into certain beneficial use like forest protection during colds, aquaculture, heating the building etc.

NUCLEAR POLLUTION/ NUCLEAR HAZARDS

HAZARDS

→ Hazard means dangerous element which is harmful to human being by external sources.

→ The external source is from environment.

→ Protons & neutrons constitute the mass while

electron constitute charges to the element. Thus radio active element is defined to be the collection of radio active mass with some changes, of the nucleus.

Sources of radio-active pollution

The two main sources of radio-active pollution are -

1. Natural source
2. Manmade source

1. NATURAL SOURCE

→ The natural source of radio-activity are considered mainly the cosmic radiation received from the space and the naturally occuring radioisotropes present in the environment and those contained within the body of the organisms.

→ Another source of natural radiation is the presence of radionuclides in the lithosphere, hydrosphere & atmosphere.

2. MAN-MADE SOURCE

Man causes radioactive pollution by testing of nuclear weapons, establishment of nuclear power plant, mining & refining of plutonium and thorium and preperation

of radioactive isotrope.

(1) Nuclear weapons:

Testing of unclear arms comprises:

(a) The use of uranium 235 & plutonium 239 for fission.

(b) Hydrogen or lithium as fusion material.

→ Atomic explosions are uncontrolled chain reactions. They give rise to very large neutron flux conditions that cause other materials in the surrounding environment to become radioactive.

→ Huge clouds of fine radioactive particles & gases are thrown up in the environment & are carried away to distant areas by the agency of wind.

(2) Atomic reactors & Nuclear fuels

→ The most-common fuel used for fission in the nuclear power plants are uranium, thorium & plutonium.

→ uranium undergoes several process right from its mining to its inception into the reactors.

→ The spent materials obtained from the reactors after the energy has been

utilized are reprocessed to recover unburnt uranium, plutonium, plutonium & some other important isotropes, which can be used in medicine or for some other useful purposes.

→ The whole operations from the mining of the fuel to its final disposal is called "nuclear fuel cycle".

(3) Radioactive isotropes

→ Radioactive isotropes such as ^{125}I, ^{14}C & ^{32}P & their compounds find wide usage in scientific research institutions contain varying amounts of radioactive materials.

→ When this waste water reaches the different water sources such as rivers, streams, lakes etc through the sewers they cause water pollution.

(4) Other sources

During different medical treatments varying concentration of radiation enters the human body. For instance x-rays are common for detecting skeletal disorders & therapy for cancer patients often includes radium & other isotrope radiations.

Harmful Effects of Radiations

→ The molecules forming the tissues of organisms can be splitted into free ions when ionizing radiation pass through the body of an organism.

→ These split away molecular fragments may from another compound which may react and cause hazardous effects on the organisms.

→ These ~~split~~ effects may be categorized into Somatic & Genetic categories.

① SOMATIC RADIATION EFFECTS

→ The radiation effect on all the cell or the tissues of an organisms body is called Somatic effect.

→ In plants, it is observed that a dose of 400 to 500 R is fatal to the body in 50% cases, where as a dose of 600 to 700 R is fatal for body in 100% cases. R = Roentgen

→ A lethal dose destroys the red & white blood cells. Decayed somatic effects are detected in patients suffering from leukemia, eye cataracts, premature aging, cardiovascular disorders etc.

② GENETIC RADIATION EFFECTS

→ The chromosome & genes of the victims are

generally greatly effected by the radiation x-rays operatores, radiologists, painters of radium dials, uranium mine workers are suffering from genetic disorderes.

→ Nuclear explosions and radiations released from nuclear plants cause the coorect situation in damaging the genetic system of the organisms.

Control of Radioactive pollution

→ Control of natural radioactive pollution may not be possible. Radioactive pollution can be controlled by strict enforcement of the following safety measures.

→ All low or high level wastes have tremendous capacity to pollute the environment. As low level wastes are often produced in large quantities, their containment is not possible. They are visually subjected to a treatment for removal of radioactivity and then discharged in water bodies or on land in usual way. High level wastes on the other hand cannot be disposed of freely in the environment, but have to be concentrated, contained and stored out of reach of human's environment.

→ The radioactive wastes concerned with water pollution are usually in liquid or soil state. These different kinds of waste possess various problems as disposal techniques suitable for one kind may be risky for other. All techniques however have a single goal: that radioactive constituents of wastes are not allowed to cause harm to organisms and in particular humans.

Marine pollution

→ Seas are the unlimited source of water for man. Secondly they are the main source of food & earnings for persons living in coastal areas.

→ Generally drainage from rivers, industri human activities from coastline area, disposal of radioactive waste and toxic materials, leakage from ships are main source of marine pollution.

→ Dumping of waste material from outside which is harmful too in ocean affect their ecosystem. This is known as marine pollution.

Source of marine pollution

The main sources of marine pollution are-

① Rivers are the main source of marine pollution. They carry waste in their drainage and joins sea/ocean.

② Catchment are like India & other countries too. Many big cities and industries are situated along the coast line. Very large amount of wastes from holes, wastes effluents mixed with detergents, sewage from corporations and industries,

other wastes from human activities are mixed in sea water.

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

(4) Testing of atomic weapons, space aircrafts, missles and other radioactive wastes when dumped in seas cause heavy loss to aquatic biota.

(5) Harmful effluents from nuclear power stations ~~are~~ or from scientific organization when mixed in marine water causes harmful effects to marine life.

(6) Marine pollution also caused by oil drilling in seas, tourism activities and heat released from industries etc.

Effect of Marine pollution

The major effects of marine pollution are as follows -

(1) oil is most dangerous pollutant when afloat on sea or mixed with water, a great threat to marine life specially

fish, birds, algae etc.

(2) oil of sea also effects sensitive flora & fauna, phytoplankton, zooplankton & other animals.

(3) plastic or plastic materials when dumped into sea by commercial ships or from drainage, animals take it through their food in stomach. It causes ulcer & reduces hunger.

(4) Marine pollution effects the food chain in seals. Serious disease like cancer are caused when affected animals are taken by man from ocean.

(5) Heavy metals (like lead & mercury), factory materials mineral oils, acids & other biocides are also major threat to marine life when mixed with sea water.

(6) Detergents either from cleaning up the spills or from drainage, also responsible for high mortality of marine life.

(7) Apart from these major effects, there is heavy loss of economy after getting polluting animals & chemicals from marines.

Control of marine pollution

The following measures can be taken to control marine pollution.

(1) Dumping of oil, hazardous & toxic substances, gases from radioactive labs into sea should be banned or should be properly treated before dumping.

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

(3) Developmental activities on coastal areas should be minimized.

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

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

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

(7) Nuclear explosions and other nuclear activities in sea should be minimized.

(8) Certain biological & other methods should be followed to restore species diversification & ecobalance in the water body to prevent pollution.

(9) We should develop awareness in people to reduce the amount of waste in their daily life.

(10) Drilling should not be allowed in coastal areas.

Noise pollution

Noise:

The word "noise" can be defined as any unwanted or unpleasant sound causing discomfort to the listener.

→ It can be said as the wrong sound in the wrong place in the wrong time.

Noise pollution

Noise pollution is the unwanted sound that is dumped into the environment and leading to health hazards.

Sources of Noise pollution

The main source of noise pollution are natural & manmade.

* Natural sources :-

Thunder, volcanic eruption, sound produced during land-slide etc. can be catagorised as natural sources of noise pollution.

* Manmade sources :-

following are some of the manmade sources of noise pollution.

1. Automobiles

In advanced countries, urban areas are subjected with noise of automobiles

i.e. cars, truck, fire engine etc.

2. Industries

factories and ~~e.g.~~ industries are one of the main sources of noise pollution. workers are observed complaining for loss of hearing due to their continuous exposure to high industrial noise.

3. Audio systems

Recorders, radio, loud speakers are some of the devices of audio system.

In developing countries like india they are the prime sources of noise pollution.

In public meetings, social functions festive occasions loud noise from audio instruments cause major noise problems.

4. Domestic Appliances

Modern & advanced domestic appliances are included with washing machines, vaccum cleaners, grinders, fans etc. are the sources of noise pollution.

5. Air crafts

Aeroplanes, jet, missiles, space crafts may also be considered as the sources of noise pollution.

Effects of noise pollution

In several ways noise effects human life and they are -

1. Interference with sleep :-

→ Noise very often interferes in human sleep.

→ In a near airport area it is generally complained ~~night hours~~ that the noise of aeroplane & aircrafts during night hours severly effect sleep.

→ Noisy conditions in residential area during night adversely affect on the health condition of patients.

2. Effects on hearing :-

→ Continuous exposure of noise level at 100 db or above exert an adverse effect on hearing.

→ persons working in factories & air jets under high sound are found with hearing problems.

3. Effects on communication :-

Verbal communication is effected by external noise. Telephone talks & hearing of radio & TV broadcasting are interrupte

by unwanted noise.

4. Effect on mental & physical condition :-

→ Some people complain that noise makes them physically & mentally sick.

→ Damage to internal ear may occur if one is exposed to continuous noise in excess of 100 dB.

5. Noise from industries :-

→ Industries are considered as the primary noise making unit.

→ operation of machines, loading & unloading of material & gathering of workers cause a cummulative noise in factory sides.

6. Air Craft noise :-

→ Noise caused due to air crafts also cause a serious effect on the persons staying near the air port.

→ At an average of 150 dB can be observed during the operation of an air engine.

7. Traffic noise :-

→ Traffic noise is caused due to noise from

engine & transmission, exhaust noise, slamming of vehicle doors, break sequel of an individual vehicle.

→ use of horns is a serious concern causing noise.

Prevention & control of Noise pollution

Some of the methods may be propos to control noise pollution and they are-

(1) Control of noise at source

Design and fabrication of silencing devices & their application in air engines, trucks, cars, motorcycles & also in industrial machines & domestic appliance somehow reduce noise pollution.

→ Segregating the noisy machines of industries or factories is also effective in reducing noise pollution.

→ Ear plugs & ear muffs may be provided to the industry workers to protect their ears against the adverse effect of noise.

2. Control of transmission

Sound absorbing materials can be used in the room walls & construction of enclosures around sound producing machine may be made to control the transmission of sound.

3. Change in the design of machine

Effects of noise can be reduced by making change in design in operation of machines.

4. Creation of vegetation buffer

→ forest zones & tree plantation can be increased to reduce the ~~forest~~ effect of sound from industries & factory.

→ Neem, mange, coconut etc are said noise absorbing plant which are to be grown in cities, urban areas, factory sites to reduce the effect of noise pollution.

5. Education

→ people should be aware of the health hazards due to noise pollution.

→ Newspaper, electronic media should be more utilized to aware public on the dicaster caused due to noise pollution.

6. Traffic Control

→ Noise can be reduced by prescribing sound limits for vehicular traffic, ban on honking of horns in certain areas.

→ Silent zones are to be maintain near school, hospital, college areas.

7. Legislation

→ More over the government should pass laws, rules & regulations to control noise pollution.

→ Noise control boards are to be installed to impose restriction in sound and noise in cities in urban areas.

Water pollution

Any chemical, biological & physical change in water which makes the water unportable & not suitable for use is known as water pollution.

Sources of water pollution

The different sources of water pollution are as follows —

1. Industrial effluents
2. Sewage
3. Agricultural practice

4. Ground water pollution
5. Coastal water pollution

1. Industrial Effluents

Waste water from industries are discharged into rivers.

→ It contains organic and inorganic material
→ Sometimes the effluents contain heated material which rise to temperature of water causing drastic ecological changes.
→ River Brambani of orissa is one of the most polluted river in India.

2. Sewage

→ Municipal sewage is a major source of water pollution in cities.
→ Rise in population leads to a rise in the production of waste.
→ Sewage contain considerable quantity of decompose organic matter, causing a change in the dissolved oxygen level of the water to which it is drained.
→ Municipal drains of cuttack city discharge their waste into river Kathajodi.

3. Agricultural practices

→ Drainage from dairy, poultary contain

waste feed as well as excreta.
→ plant nutrients, pesticides, insecticides are washed into the agricultural land and added into the nearby water source.
→ Sediments from land erosion contains mostly organic materials polluting the nearby water bodies.

4. Ground water pollution
→ under ground water gets polluted by substances like linking from the fertilizers & garbage heap spread over the land.
→ Disposal of waste into abandoned land pollutes the ground water.
Ground water pollution is more dangerous then surface water pollution.

5. Coastal water pollution
Discharge of sewage, industrial effluents, discharge of rubbish from ships transporting oil; leakage of oil tankers, are the major sources of pollutants.

Effects of water pollution
Some important effects of various types of water pollutants are as follows-

(1) Tannery effluents contains several constituents which deleterious, irrespective of the fact that where they are discharged.

(2) It imparts persistent dark brown colour to the receiving water causing asthetic & other problems described earlier.

(3) Highly repulsive odour is imparted to the receiving water. The dissolved constituents like proteins.

(4) The acidic or alkaline effluents are corrosive to concrete and metal pipes.

(5) Excess NaCl in the effluent is also corrosive & receiving water is unsuitable for irrigation.

(6) The effluents may contain pathogenic bacteria.

(7) If the waste water is discharged into sewer, the suspended impurities such as $CaCO_3$ hairs etc may choke the sewage pipes. The sulphides present in the waste water cause "Crown corrosion" to the concrete structures etc.

(8) The presence of excessive salt & chromium in the wastewaters may deteriorate the quality of the ground water in the affected areas.

(9) Volatile substances such as alcohols, aldehydes ethers & gasoline may cause explosion in sewers.

(10) Suspended solids such as silt and coal may injure the gills of the fish and cause asphyxiation.

(11) Suspended solids may also cause bad odour & tastes and also may promote conditions favourable for growth of pathogenic bacteria.

Control of water pollution.

We should adopt the respective safety measures to achieve acceptable water quality at the least cost some of these are -

(1) Scientific techniques are necessary to be adopted for the environmental control of catchment areas of river, lakes, ponds or streams.

(2) Industrial plants should be based on recycling operations.

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

(4) Instead of throwing wastes into water, the recycling should be done for better use. Gobar gas plant, composting manufacture of hardboard, paper etc. Such examples where respective waste can be used.

(5) Minimum appropriate quantity and concentration of fertilizers, pesticides & insecticides should be used because excessive will cause pollution.

(6) There should be propaganda for water pollution control on radio, TV, newspaper etc because public awareness is a must.

(7) Local authorities, industrialists, Govt. officials with public participation should co-ordinate to find ways to control water pollution.

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

(9) To conduct seminars and training

courses for helping those who are directly or indirectly engaged in water management & water pollution control.

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

(11) Techniques like adsorption, electro dialysis, ion exchange & reserve osmosis etc can be used for the remove of water pollution.

(12) plants should be developed to recover metal from metal bearing waste water.

Dissolved oxygen (DO) :-

→ The amount of oxygen dissolved in water or waste water & which is needed for the organism to grow is called dissolved oxygen.

→ Dissolved oxygen (DO) is a essential for sustaining the flora & fauna in any aquatic ecosystem.

→ ex:- warm water requires minimum DO of

5 mg/ltrs.

Bio-chemicals oxygen Demand (BOD)

→ The bio-chemical oxygen demand (BOD) is a measure of oxygen utilize by micro organism during the oxidation of organic matter.

→ It is the most widely adopted measure for accessing the pollution potential of a given organic waste.

→ The demand for oxygen is directly proportion to the amount of organic waste which has to be broken down by micro-organism.

Chemical oxygen Demand (COD)

It is the amount of oxygen required by the organic matters in a sample of water for it's oxidation & is expressed as ppm.

Solid waste management

→ Any material that is thrown away or discarded as useless & unwanted by human or from animal activities is considered as solid waste.

→ In early days the disposal of solid waste was simple but now-a-day has become quite difficult.

purpose

The purpose of the study of solid waste are –

1. To identify the various types of solid waste & their sources.
2. To examine the composition of wastes.
3. To consider the elements involved in their management.

Sources of solid wastes

Source	Location-wastes are generated	Types of solid wastes
1. Residential	single & multi-family houses, apartments.	food wastes, rubbish, ashes, special waste
2. commercial	Restaurants, hotel, office, market, stores	food waste, rubbish, ashes, special wastes, demolition & constructional waste.

3. Industrial	Construction, fabrication, Chemical plants, power plants.	Food waste, rubbish, ash special waste, demolition & constructional waste and hazardous waste.
4. open area	Streets, park vacant lands, playgrounds beaches etc.	special waste, rubbish
5. Treatment	water, waste water & industrial treatment processes etc.	Sludge.
6. Agriculture	field & row crops, dairies etc.	spoiled food waste agricultural waste, rubbish
7. Municipal	Courts, office, school, Colleges etc	Rubbish, food waste ashes, street sweepings etc.
8. Hazard wastes	Hospitals, research laboratories etc.	Metals & chemical substance & their solutions, washings.
9. construction	Demolition & construction sites	pipes, timber, brick pieces etc.

Types of solid wastes

1. Garbage :-

Food wastes are the animals, fruit or vegetable residues resulting from handling preparation, cooking & eating of foods.

It is also known as garbage.

2. Rubbish :-

Rubbish consists of combustible and non-combustible solid wastes of households institutions, commercial activities etc excluding food wastes or other highly pursuable materials.

Ex:-

Combustible - paper, cardboard, leather etc
Non combustible - Aluminium can, tin can, glass

3. Ashes & Residue

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

4. Demolition & construction wastes

Wastes from buildings & other structures are classified as demolition wastes. Wastes from construction, remodeling and repairing of individual residences, commercial buildings & other structures are classified as construction wastes.

5. Agricultural wastes

Wastes & residue resulting from diverse agricultural activities such as,

planting & harvesting, production of milk, production of animal for slaughter etc are called as agricultural wastes.

6. Hazardous wastes

Chemical, biological, flammable, explosive or radioactive waste that are harmful to human, plant or animal life are classified as hazardous wastes.

7. Special wastes

Wastes such as street sweepings, catch basin debris, dead animals etc are classified as special wastes.

Effects of solid wastes

→ The accumulation of waste at any place is a bad and risky situations. Varieties of micro-organisms like bacteria, fungi, viruses etc creep into the accumulated waste & starts its decomposition. Later on they grow and increase in number.

→ Various types of germs develop in waste. They reach us through air, water & food and cause different infectious diseas like cholera, diarrhea, dehydration etc.

→ Harmful fumes from industries and other

wastes effect eyes, skin, historical monuments etc.

→ Waste materials when accumulated here & there disturbs drainage systems.

→ Improper disposal of municipal wastes & throwing the household wastes here & there effects the community & produces bad smell & breads various types of insects.

WATER CONSERVATION

- Conserving water has become a prime environmental concern.
- Clean water is becoming increasingly scarce globally.
- With increase in deforestation, surface runoff subsoil water table drops as water has no time seep into the ground once after vegetation is removed
- As many areas depend on wells, it has become necessary to go on ~~wells~~ making deeper wells. This adds to the cost & further depletes the underground storage of water. This could take years to recharge the area if the present rate of water extraction is reduced which seems hardly possible in current situations.
- When we waste water, we do not realize that it is affecting the lives of all of us in so many different ways.
- water has to be equitably and fairly distributed so that thousand household use, agriculture & industry can get a share of water.
- It is over use and misuse due to various activities that waste water or causes of pollution has led to a serious shortage of portable drinking water. Thus water conservation is linked closely with overall human well-being.
- Conservation of water was done in traditional homes through a consious effort. saving water for agriculture is done by drip irrigation which supplies water to plants near its root through a system of tubes thus saving water.

IMP

RAIN WATER HARVESTING

→ As our world faces serious water shortage, every drop of water we can use efficiently become of great value.

→ one method is to manage rain water in such a way that it is used at the source.

→ If as much as possible rain water is collected & stored this can be use after the rainy season is over. In many parts of the world especially in every dry areas this has been traditionally practiced.

→ However the stored water has to be kept pollution free and clean so that it can be used for drinking purpose as well.

→ current technologies of rain water harvesting require that all roof and terrace water passed down into a covered tank where it can be stored for use after the monsoon. this is the advantage in arid areas where clean water is very scare.

→ However there is practical difficulties such as constructing large storage tanks which is expensive.

→ Another way of using rooftop rain water harvesting is to collect water so that it percolates into the ground to recharge wells instead of flowing over the ground into rivers.

→ Thus by recharging ground water harvested from roop tops, the water table rises & the surrounding wells retain water through out the year.

WATERSHED MANAGEMENT

→ Rivers originate is streams that flow down mountains & hills slopes. A ground of small stream flow down hillsides to meet larger streams in the valley which forms tributaries of major rivers.

→ The management of single unit of land with its water drainage system is called watershed management.

→ It is a technique that has several components. This includes soil & water management of developing vegetative cover.

→ As it provides water throughout the year, this improves health of community, as clean water became available.

→ watershed management enhances the growth of agricultural crops & even makes it possible to grow more than one crop in a year in dry areas.

→ watershed management begins by taking control over a degraded site through local participate people must appreciate the need to improve the availability of water both in quantity & quality for their own area wise

→ The first technical step is to take appropriate soil

conservation measures. This is done by constructing a series of long trenches & mounds along contours of the hill to hold the rainwater & to allow it to percolate into the ground. This ensures that the underground storage of water is recharged.

→ The next measure is to make 'nala' plugs in the streams so that the water held in the streams & does not rush down hillside.

→ In selected sites, small check dams are built which together hold large amount of water.

→ All these measures constitutes sound watershed management. It improves the water table & keeps the stream & nala flowing throughout the year.

PRINCIPLE OF WATERSHED MANAGEMENT

→ This is a land management programe it looks at a region from the perspective of all its water related issues.

→ It can be used to manage a river from its source to its termination.

→ watershed management could also consider the management of a single valley as a unit based on its small streams.

→ saving water from its local source by allowing it to percolate into the ground by nala plugs & check dams instead of allowing it to run off

rapidly along the surface during the monsoon is a major aspect of good watershed management.

→ This allows ground water aquifers.

IMP GLOBAL WARMING

→ About 75% of the solar energy reaching the earth is absorbed on earth's surface which increases its temperature.

→ The rest of the heat radiates back to the atmosphere (some of the heat is trapped by green house gases, mostly CO_2.

→ As CO_2 is released by various human activities, it is rapidly increasing. This is causing global warming.

→ The average surface temperature is about 15°C. This is about 33°C higher than it would be in the absence of the green house effect.

→ Without such gases most of the earth's surface would be frozen with a mean temperature of 18°C.

→ Human activities during the last few decades of industrialization & population growth have polluted the atmosphere to the extent that has begun to seriously effect the climate.

→ carbon dioxide in the atmosphere has increased by 31% since pre-industrial times, causing more

heat to be trapped in the lower atmosphere.

→ This would lead to not only temperature changes but in the amount of rainfall. India may see great annual fluctuations in rainfall leading to floods & drought.

OZONE LAYER DEPLETION

→ Ozone is formed by the action of sunlight on oxygen.
→ It forms a layer 20 to 50 kms above the surface of earth.
→ Ozone is a highly poisonous gas with strong odour.
→ The action takes place naturally in the atmosphere, but is very slow.
→ It is a form of oxygen that has 3 atoms in each molecules.
→ It is considered as a pollutant at ground level & constitutes a health hazard by causing respiratory problem like asthama & bronchitis.
→ It is also causes harm to vegetation & leads to deterioration of certain materials like plastic and rubber.
→ This layer in the atmosphere protects life on earth from the dangerous uv radiation from sun.

ACID RAIN

→ When fossil fuel such as coal, oil & natural gas are burned. chemicals like sulphur dioxide & nitrogen oxides are produced.

→ These chemicals react with water & other chemicals in the air to form sulphuric acid, nitric acid & other harmful pollutants like sulphates & nitrates.

These acid pollutants spread upwards into the atmos here.

→ The corrosive nature of acid rain causes many forms of environmental damage.

EFFECTS OF ACID RAIN

The various effects of acid rain are as follows:-

1. Acid rain dissolves & washes away the nutrients of soil which are needed by plants.
2. Acid rain indirectly affect plants by removing nutrients from the soil in which they grow.
3. Acid rain that falls on ground and flows to reach water bodies & makes the water acidic.
4. Acid rain also affect the wildlife.
5. Acid rain & dry acid deposition damages buildings, automobiles & other structures & monuments made of stone or metal.
6. Although surface water polluted by acid rain doesn't directly harm people, the toxic substances from soil can pollute water supply.

PREVENTION & SOLUTION OF ACID RAIN

(i) The best way to stop formation of acid rain is to reduce the emissions of sulphur dioxide & nitrogen oxides into the atmosphere.

(ii) This can be achieved by using less energy from fossil fuels in power plants, vehicles, and industries.

(iii) Switching to cleaner burning fuels is also a way out.

(iv) For instance using natural gas which is cleaner than coal, using coal with lower sulphur content & developing more efficient vehicles.

(v) If the pollutants have already been formed by burning fossil fuels, they can be prevented from entering the atmosphere by using scrubbers in smokestacks in industry.
(vi) These spray a mixture of water & limestone into the polluting gases, recapturing the sulphur.

NUCLEAR ACCIDENTS

(i) Nuclear energy was researched & discovered by man as a source of alternate energy which would be clean & cheap as compared to fossil fuel.
(ii) Along with the benefits of nuclear energy, came its downfall.
(iii) In this short history of nuclear energy there have been accidents that have surpassed any natural calamities or any other energy source extraction in their impacts.

NUCLEAR HOLOCAUST

(i) The use of nuclear energy in war has devasting effects on man & earth.
(ii) The Hirosima & Nagasaki incident during world war I, the only use of Nuclear power in wars in history
(iii) In 1945 the united states dropped atomic bomb in Japan over the town of Hirosima & Nagasaki.
(iv) These 2 atomic bombs killed thousands of people, left many thousands injured & devastated everything for miles around.
(v) The effects of the radiation from these nuclear bombs can still be seen today in the form of cancer & genetic mutation in the affected children & survivors of the incident.

CLIMATE CHANGE

Though climate is an average weather of an area or environmental factors of an area. These include quantity of light, temperature, humidity, wind, gases, water etc in an average of about 30 years.

The changes in the environmental conditions of an area over long period of time is called climate change.

HOW ACID RAIN IS FORMED ?

In day time Nitric oxide is oxidized by oxygen

$$NO + O_3 \longrightarrow NO_2 + O_2$$
$$H_2O \longrightarrow H^+ + OH^-$$
$$NO_2 + OH^- \longrightarrow HNO_3$$

Similarly formulation of H_2SO_4 in the atmosphere takes place with a wide range of reduced

$\therefore HNO_3$ = Nitric acid
H_2SO_4 = Sulphuric acid
SO_3 = Sulphur trioxide
HOO^- = Hydroperoxy radical

AIR (PREVENTION & CONTROL OF POLLUTION) ACT / AIR ACT

(i) The Government passed this act in 1981 to clean up our air by controlling pollution.

(ii) Sources of air pollution such as industry, vehicles, power plants etc are not permitted to release particulate matter, lead, carbon monoxide, sulphur dioxide, nitrogen oxide, volatile organic compounds (VOCs) or other toxic substances beyond a prescribed level.

(iii) To ensure this, pollution control Boards (PCBs) have been set up by Government to measure pollution levels in the atmosphere and at certain sources by testing the air.

ACCORDING TO THIS ACT AN INDIVIDUAL CAN DO THE FOLLOWING TO CONTROL AIR POLLUTION:

1. When you see a polluting vehicle take down the number and send a letter to Road Transport office (RTO) and the pollution control Board (PCB).

2. If you observe an industry polluting air, inform the pollution control Board (PCB) in writting & ascertaining action is taken.

3. Use cars only when absolutely necessary, walk or use cycle as much as possible instead of using fossil fuel powered vehicles.

4. Use public transport as far as possible, as more people can travel in a single large vehicle rather than using multiple small vehicles which add to pollution.

5. Share a vehicle space with relatives & friends, Carpools minimize the use of fossil fuel.

6. Do not use air freshners and other aerosols & sprays which contain CFCs that deplete the ozone layer.

7. Do not smoke in a public place. It is illegal & endangers not only your own health but also that of others.

8. Coughing can spread bacterias & viruses. Use a handkerchief to prevent droplet infection which is air borne. It endangers the health of other people.

LINE

WATER (PREVENTION & CONTROL OF POLLUTION) ACT

1. Government has formulated this act in 1974 to be able to prevent the pollution of water by industrial, agricultural, household waste water that can contaminate our water sources.
2. Waste water with high level of pollutants that enter wet lands, rivers, lakes, wells as well as the sea are serious health hazards.
3. controlling the point sources by monitoring levels of different pollutants is one way to prevent pollutants ions by giving a punishment to a polluter.
4. Individuals can also do several things to reduce water pollution such as using biodegradable chemicals for households use, reduce use of pesticides in gardens, and identifying polluting sources at workplaces and in industrial units where oil and other petroleum products & heavy metals are used.
5. Excessive organic matter, sediments and infecting organisms from hospital wastes can also pollute our water.
6. Citizens need to develop a watchdog force to

inform authorities to take appropriate action against different types of water pollution.

7. A polluter must pay for his actions. The main objectives of water act are to provide prevention, control and abatement of water pollution and maintainance and restoration of the wholesomeness of water.

8. It is designed to assess pollution levels & punish polluters.

Human population & The environment

Population Growth & variation Among Nations

→ our global human population is 6 billion at present and will cross 7 billion very soon.

→ The needs of this huge number of human beings cannot be supported by earth's natural resources without degrading the quality of human life.

→ If we continue to use the natural resources then very soon the fossil fuel from oil fields will run dry.

→ It will be impossible to meet the demands for food from existing agro systems. The grazing land will be overgrazed by domestic animals & industrialization will create evergreen problems due to pollution of soil, water, air etc. Seas will not have fish.

→ Larger ozone holes will develop due to the discharge of industrial chemicals in to the atmosphere which will affect the human health.

→ Global warming due to industrial gases will lead to rise in sea levels & floods in all low-lying areas submerging coastal agriculture as well as towns & cities will be seen.

→ water famines due to depletion of fresh water will create unrest & eventually mark countries to go for war.

→ To control over regional biological diversity, which is vital for producing new medical industrial products which will lead to economical conflicts between biotechnological advanced nations & the biorich countries.

→ Degradation of ecosystem will lead to extinction of thousands of species, degradation of natural

ecosystem of great value.

→ These are only some of the environmental problems related to increasing human population & more intensive use of resources that we are likely to face in future.

→ These effects can be avoided by creating a mass environmental awareness movement that will bring a change in people's way of living.

ENVIRONMENT & HUMAN HEALTH

→ Environment related issues that affect our health have been one of the most triggers that have been led to creating an increasing awareness of the need for better environmental management.

→ Changes in our environment induced by human activities in nearly every sphere had an influence on the pattern of our health.

→ We expect urbanization & industrialization to bring prosperity, but on the down side, it lead to disease related to overcrowding and an inadequate quality of drinking water resulting an increase of water borne disease such as infective diarrhea and airborne disease such as tuberculosis.

→ High density city traffic leads to an increase in respiratory diseases like asthama.

→ Agricultural pesticides that enchances food supplies during green revolution have affected both farm workers and all of us who consume the produce.

→ Morden medicines promised to solve many health problems, especially associated with infectious diseases through antibiotics, but bacteria found ways to reduce resistant power frequently even changing their behavior in the process, making it necessary to keep on creating newer antibiotics.

→ Many drugs have been found to have serious side effects. At times the cure is as damaging as the disease process itself.

→ A better health status of the society will bring about a better way of life if it is occupied with stabilizing population.

VALUE EDUCATION

→ value education in the context of our environment is expected to bring about a sustainable way of life.

→ Education both through formal & informal process must address understanding environmental values, valuing nature & cultures, social justice, human heritage, use of resource, managing common property resources & appreciating the cause of ecological degradation.

→ Essentially environmental values cannot be tought they are imprinted through a process of appreciating our environmental assests and experiencing the problems caused to destruction of our environment.

→ The problems that are created by technology & economic growth are a result of an improper thinking on what development means.

→ It is only recently that the world has come to realize that there are more other important environmental values that are essential to bring about a better way of life.

→ values in environmental education must bring in several new concepts like why we need to keep our surrounding clean? How can we use less energy & resources? etc. All these issues are linked to the quality of human life to go beyond simple economic growth.

→ They deal with a love and respect for nature. These are the values that will bring about better humanity, one in which we can live healthy, productive and happy lives in harmony with nature.

V.V.I

ROLE OF INFORMATION TECHNOLOGY IN ENVIRONMENT & HUMAN HEALTH

(i) The understanding of environmental concerns & issues related to human health have exploded during last few years due to the sudden growth of information technology.

(ii) The computer age has turned the world around due to the incredible rapidity with which spreads knowledge. I.T. can do several information through the world's network of millions of computer systems.

(iii) A few examples of the use of Computer technology that aid environmental studies include software such as Geographical Information Technology (GIS).

(iv) GIS is a tool to map land use patterns & document change by studying digitized to satellite imagery.

(v) one of this is done, an expert can ask a variety of questions which the software can answer by producing maps which helps in land use planning.

(vi) The internet with its thousands of websites has made it extremely simple to get the appropriate environmental information for any study or environmental management planning.

(vii) this not only assists scientists & students but is a powerful tool to help increase public awareness about environmental issues.

(viii) specialized software data for epidemiological studies population dynamics & a variety of key environmental concern.

(ix) The relationship between the environment and health has been established due to the growing utilization of Computer technology. This looks at information rates, morbidity and mortality & causes of a disease.

(x) As knowledge expands, computers will become increasingly efficient. They will be faster, have greater memory & even perhaps begins to think for themselves.