

SET-I		SET-II		SET-III		SET-IV					
<b>UNIT-1 : ENVIRONMENT, ECOSYSTEM, BIO DIVERSITY</b>											
1	CONSERVATION OF BIO-DIVERSITY (IN-SITU & EX-SITU)	15	4	INDIA AS A MEGA DIVERSITY NATION	11	7	HOTSPOTS OF BIO DIVERSITY (THE EASTERN HIMALAYAS, WESTERN GHATS)	12	10	LENTIC ECOSYSTEM (OCEAN, ESTUARIES)	19
2	FOREST,GRASSLAND,DESERT ECOSYSTEM	16, 17	5	THREATS TO BIODIVERSITY (HABITAT LOSS, POACHING,MAN WILDLIFE CONFLICT)	14	8	VALUES OF BIODIVERSITY (CONSUMPTIVE, PRODUCTIVE, SOCIAL, ETHICAL, AESTHETICAL, OPTIONAL)	13	11	LOTIC ECOSYSTEMS [POND,RIVER(STREAM), LAKE]	18
3	(i) FOOD CHAIN & FOOD WEB (ii) ECOLOGICAL PYRAMID (NUMBER, ENERGY, BIO MASS)	7	6	ENDANGERED & ENDEMIC SPECIES	10	9	ECOLOGICAL SUCCESSION	6	12	BIO DIVERSITY AT GLOBAL, NATIONAL,LOCAL LEVEL	21, 22
<b>UNIT- II: ENVIRONMENTAL POLLUTION</b>											
1	DISASTER MANAGEMENT: (FLOODS, EARTHQUAKE, CYCLONE,LANDSLIDES)	26	4	SOIL POLLUTION	28	7	AIR POLLUTION	23	10	THERMAL POLLUTION	28
2	SOLID WASTE MANAGEMENT: (LANDFILL, INCINERATION,COMPOSTING)	31	5	MARINE POLLUTION	28	8	WATER POLLUTION	24	11	WATER TREATMENT METHODS (PRIMARY,SECONDARY,TERTIARY)	
3	ROLE OF AN INDIVIDUAL IN PREVENTION OF POLLUTION		6	NUCLEAR HAZARDS	30	9	NOISE POLLUTION	30	12	CASE STUDIES FOR PART C (MAN-MADE DISASTER, NATURAL DISASTER)	64, 65
<b>Unit-3: Natural Resources</b>											
1	ENVIRONMENTAL EFFECTS OF EXTRACTING AND USING MINERAL RESOURCES (MINING)	37	4	NON RENEWABLE ENERGY RESOURCES (COAL, PETROLEUM,NATURAL GAS,LPG, NUCLEAR ENERGY)	39	7	SOIL EROSION	46	10	CONFLICTS OVER WATER	41
2	DAMS	34	5	EFFECTS OF MODERN AGRICULTURE (PROBLEMS OF FERTILIZER, PESTICIDE, WATER LOGGING, SALINITY)	38	8	ROLE OF AN INDIVIDUAL IN CONSERVATION OF NATURAL RESOURCES	40	11	TIMBER EXTRACTION, DESERTIFICATION	33
3	RENEWABLE ENERGY SOURCES(SOLAR, WIND, , TIDAL, OTE, GEO THERMAL, BIO MASS)	42	6	DEFORESTATION	32	9	FLOOD, DROUGHT	36	12	LAND DEGRADATION, MAN INDUCED LANDSLIDES	46, 47
<b>UNIT -IV : SOCIAL ISSUES AND THE ENVIRONMENT</b>											
1	ENVIRONMENT ACT – AIR ACT – WATER ACT – WILDLIFE PROTECTION ACT – FOREST CONSERVATION ACT	57	4	i. GLOBAL WARMING ii. NUCLEAR ACCIDENTS AND HOLOCAUST with CASE STUDIES.	52,53	7	i. CENTRAL AND STATE POLLUTION CONTROL BOARDS, ii. PUBLIC AWARENESS	55, 55	10	FROM UNSUSTAINABLE TO SUSTAINABLE DEVELOPMENT	48
2	RESETTLEMENT AND REHABILITATION OF PEOPLE WITH CASE STUDIES	50	5	(I)RAIN WATER HARVESTING, (II)WATERSHED MANAGEMENT	49	8	WASTELAND RECLAMATION	54	11	ENFORCEMENT MACHINERY INVOLVED IN ENVIRONMENTAL LEGISLATION	55
3	(i) CLIMATE CHANGE (ii) ACID RAIN, (iii) OZONE LAYER DEPLETION	52, 53	6	ENVIRONMENTAL ETHICS:	51	9	i. URBAN PROBLEMS RELATED TO ENERGY,	48, 51	12		
<b>UNIT -V: HUMAN POPULATION AND THE ENVIRONMENT</b>											
1	ROLE OF INFORMATION TECHNOLOGY IN ENVIRONMENT AND HUMAN HEALTH	61	4	FAMILY WELFARE PROGRAMME	59	7	HUMAN RIGHTS	60			
2	VALUE EDUCATION	60	5	POPULATION GROWTH (AMONG VARIATION NATIONS)	58	8	POPULATION EXPLOSION	58			
3	WOMEN AND CHILD WELFARE	61	6	HIV / AIDS	63	9	ENVIRONMENT & HUMAN HEALTH	59			

## GE 8291-Environmental Science and Engineering

### UNIT -- I : ENVIRONMENT, ECOSYSTEMS and BIODIVERSITY 14 Hr

#### Syllabus:

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common

plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc. **Definition Of Environment:**

Environment is sum total of water, air and land, inter-relationships among themselves and also with the human beings, other living organisms and property..

#### **Scope Of Environment**

Scope of environmental studies covers a large number of areas and aspects

- Natural Resources—their conservation and management
- Ecology and biodiversity
- Environmental pollution and control
- Social issues in relation to development and environment
- Human population and environment
- To get Awareness about problems of environment.

- To Motivate active participation in environment protection
- To improve skills for Identifying and solving environmental problems
- To know Necessity of conservation of natural resources.
- To develop Environmental programs

#### **Importance of Environmental studies:**

Environmental studies is very important since it deals with the issues like safe and clean drinking water, hygienic living conditions, clean and fresh air, fertile land, healthy food and development that is sustainable.

There is a need for trained manpower at every level to deal with environmental issues.

Environmental law, business administration and environmental engineering are emerging as new career opportunities for environmental protection and management.

With the pollution control laws becoming more strict, industries are finding it difficult to dispose off the produced wastes. In order to avoid expensive process, various companies are now trying to adopt green technologies, which would reduce pollution.

Investing in pollution control technologies will reduce pollution as well as cut on costs for effluent treatment. Market for pollution control technology is huge the world over.

In India also the Pollution Control Boards are seriously implementing pollution control laws and insisting on upgradation of effluents to meet the prescribed standards before they are discharged on land or into a water body.

Many companies not complying with the orders have been closed or ordered to shift.

This is infact essential if we want to live in a clean, healthy, aesthetically beautiful, safe and secure environment for a long time and wish to hand over a clean and safe earth to our children, grand-children and great grand children

#### **Need For Public Awareness**

Any government at its own level cannot achieve the goals of sustainable development until the public has a participatory role in it. Public participation is possible only when the public is aware about the ecological and environmental issues.

A drive by the government to ban the littering of polythene cannot be successful until the public understands the environmental implications of the same. The public has to be educated about the fact that if we are degrading our environment we are actually harming our ourselves.

This is because we are a part of the complex network of environment where every component is linked to another. It is all the more important to educate the people that some-times the adverse impact of environment are not experienced or noticed until a threshold is crossed. So we may be caught unawares by a disaster.

There is a Chinese proverb "If you plan for one year, plant rice, if you plan for 10 years, plant trees and if you plan for 100 years, educate people."

If we want to manage our planet earth, we have to make all the persons environmentally educated.

In 1991, the Supreme Court of our country issued directive to make all curricula environment-oriented. This directive was, in fact, in response to a Public Interest Litigation (PIL) filed by M.C. Mehta vs. Union of India (1988) that prompted the apex court to give a mandate for creating environmental awareness among all citizens of India.

Today everybody talks of environment, but only a few have clear ideas about what needs to be done and still fewer have the actual experience or expertise in the field.. "Environment" is very wrongly taken as a "fashion" by all walks of life, hardly realizing that it is our "real-life-situation" and our sustenance and security are at stake.

### **Concept of An Ecosystem**

Ecology deals with the study of organisms in their natural home interacting with their surroundings. The surroundings or environment consists of other living organisms (biotic) and physical (abiotic) components.

An ecosystem is a group of biotic communities of species interacting with one another and with their non-living environment exchanging energy and matter.

**Hence ecology is often defined as "the study of ecosystems"**

Thus the ecosystem is a unit or a system which is composed of a number of subunits, that are all directly or indirectly linked with each other. They may be freely exchanging energy and matter from outside(an open ecosystem) or may be isolated from outside(a closed ecosystem)

### **Biome**

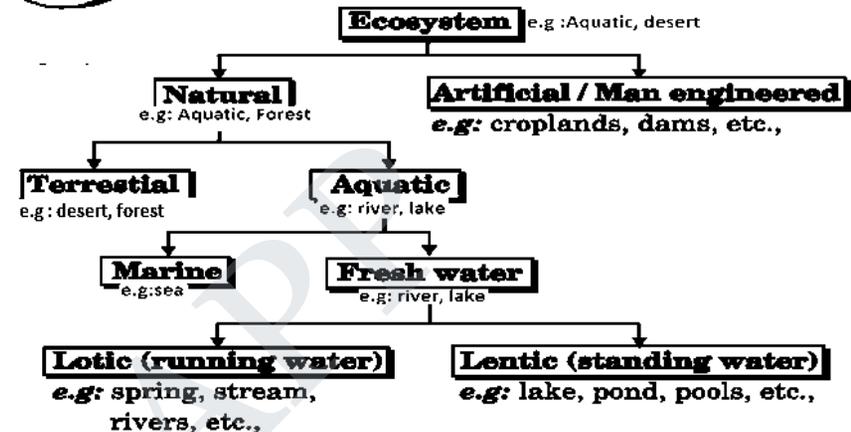
The biome is a small ecosystem in an ecosystem.

There are many sets of ecosystems which are exposed to same climatic conditions and having dominant species with similar lifecycle, climatic adoptions and physical structure. This set of ecosystem is called a biome

The Grassland Biomes are

- (i)The Savanna Grasslands
- (ii)The Temperate Grasslands

### **Types of Ecosystem:**



### **Type-1: Natural Ecosystem :**

It is created and operated by natural process under natural condition.

**Example :** Grassland ecosystem, forest ecosystem, river, lake, etc.

Natural ecosystem can be classified into two types. They are

- (i) **Terrestrial Ecosystem :** It is related to land and types of vegetation  
Example :Grassland ecosystem, forest ecosystem, desert ecosystem, etc
- (ii) **Aquatic Ecosystem :** It is related to water  
Example : river, lake, etc.

Aquatic ecosystem can be classified into two types. They are

- a) **Fresh water Ecosystem**—Standing water system(Lentic)  
--- Running water system(Lotic)
- b) **Marine water ecosystem**

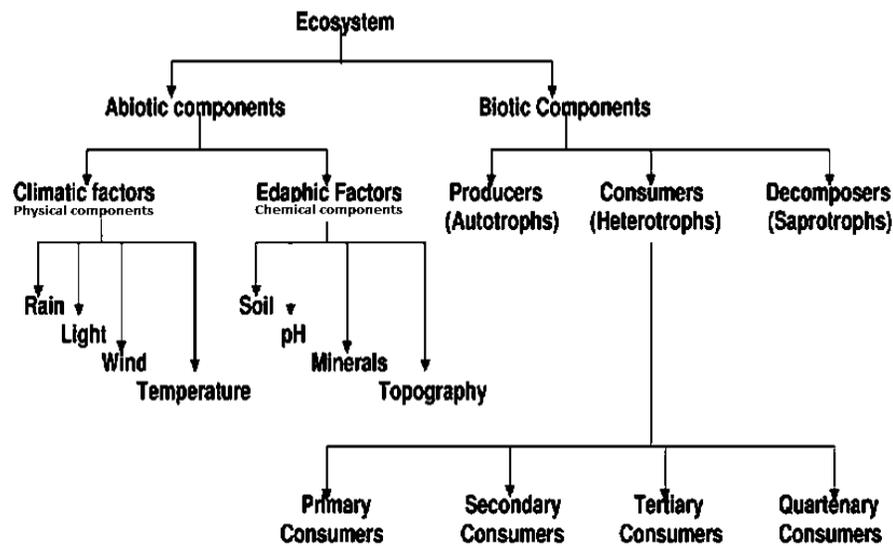
### **Type-2: Artificial Ecosystem :**

It is created and operated by man.

**Example :** Cropland, gardens, etc

### **Structure And Function Of An Ecosystem – Producers, Consumers And Decomposers:**

# Components of Ecosystem



The term structure refers to various components. So the structure of an ecosystem explains the relationship between abiotic (non-living) and biotic (living) components.

An ecosystem has two major components

1. Abiotic (non-living) components
2. Biotic (living) components

## Biotic components:

Living organisms in an ecosystem collectively form its community. Then it called biotic components (or) biotic community..

Based on how do they get their food, they are called Producers or Consumers

Autotrophic components (Producer)	Heterotrophic components (consumers, decomposer)
<ul style="list-style-type: none"> <li>➤ They are self-nourishing organisms.</li> <li>➤ They derive energy from sunlight and make organic compounds from inorganic substances.</li> </ul> <p>Example : Green plants, algae, bacteria, etc.,</p>	<ul style="list-style-type: none"> <li>➤ They are dependent on others for food).</li> <li>➤ They consume the autotrophs (producers).</li> </ul> <p>Example : Animals, man, etc.</p>

### a) Producer

Producers synthesize their food themselves through photosynthesis

Example : All green plants, trees.

### b) Consumer

Consumers are organisms, which cannot prepare their own food themselves and depend directly or indirectly on the producers.

They cannot make organic compounds, but can transform one form of organic compounds into other form of organic compounds

Example :

1. Plant eating species (Insects, rabbit, goat, deer, cow, etc)
2. Animal eating species (Fish, lion, tiger, etc)

Primary consumer (Herbivores)	Secondary consumer (carnivores)	Tertiary consumer (secondary carnivore)	Quaternary consumer (Omnivores)
They directly depend on the plants for their food.	They directly depend on herbivores for their food.	They depend on the primary carnivores for their food.	They feed on both plants and animals.
E.g. ants, insects, mice, deer, etc.	E.g. snakes, birds, fox, etc	E.g. lion, tiger, etc	E.g. man, crow, etc

### c) Decomposer (micro consumer)—SAPROTROPES

Decomposers are those organisms which feed on dead organisms (plants and animals) and decompose them into simpler compounds

Example : Microorganisms like bacteria and fungi

## Abiotic components :

Non-living components (physical and chemical) of an ecosystem collectively form a community called abiotic components (or) abiotic community

Example : Climate, soil, water, air, energy, nutrients, etc

<p><b>1. Physical Components (biological community needs)</b></p> <p>It includes the energy, climate, raw materials and living space that the biological community needs. It is useful for the growth and maintenance of its member.</p> <p><b>Example :</b> Air, water, soil, sunlight, etc.</p>	<p><b>2. Chemical Components:</b></p> <p>It is the sources of essential nutrients</p> <p><b>Example :</b></p> <p>i) Organic substances: Protein, lipids, carbohydrates, etc.,</p> <p>(ii) Inorganic substances: All micro (Al, Co, Zn, Cu) and macro elements (C, H, O, P, N, P, K) and few other elements</p>
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## Energy Flow in the Ecosystem (Function of an Ecosystem)

nutrients between biotic and abiotic components.

Energy flow in an Ecosystem is governed by following laws of thermodynamics;

**(i) First law of thermodynamics:**

It states that, “Energy can neither be created nor destroyed, but it can be converted from one form of energy to another form of energy”.

**Example :**

In photosynthesis process, solar energy is converted into chemical energy in the form of starch in plants.

**(ii) Second law of thermodynamics:**

It states that, “whenever energy is transformed from one place to another place , there is a loss of energy occur by loss of heat”.

**Example :**

In all ecosystem , whenever is transformed from one tropic level to another tropical level, there is a loss of energy takes place through respiration, running, hunting, etc.

Functions of an ecosystem is followed by 3 sequential steps. They are

**Primary function (or) primary production:**

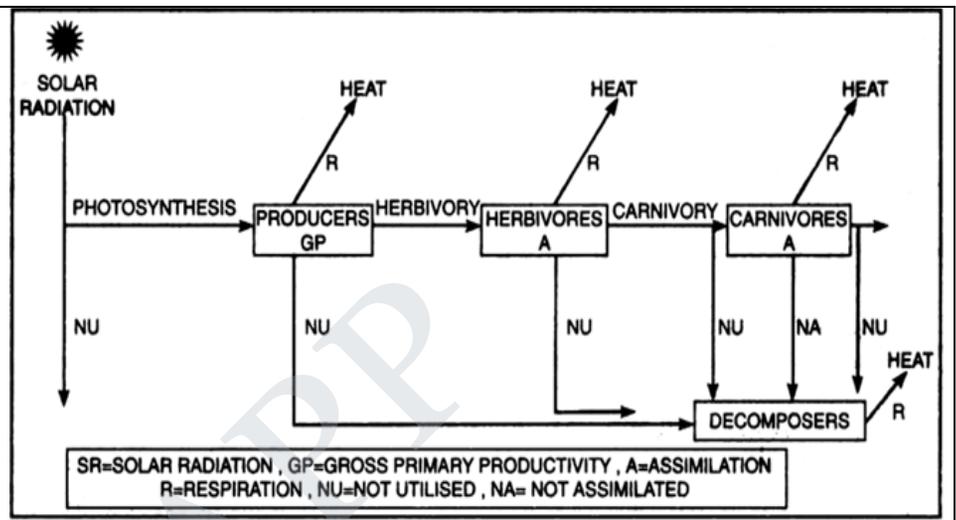
Primary function of all ecosystems is manufacture of starch (photosynthesis).



The green pigments, called chlorophyll, present in the leaves of plants, converts CO<sub>2</sub> and H<sub>2</sub>O in the presence of sunlight into carbohydrates.

**Secondary function (or) secondary production:**

Secondary function of all ecosystem is distributing energy in the form of food to all consumers (or) the energy stored by the consumer



**Tertiary Function:**

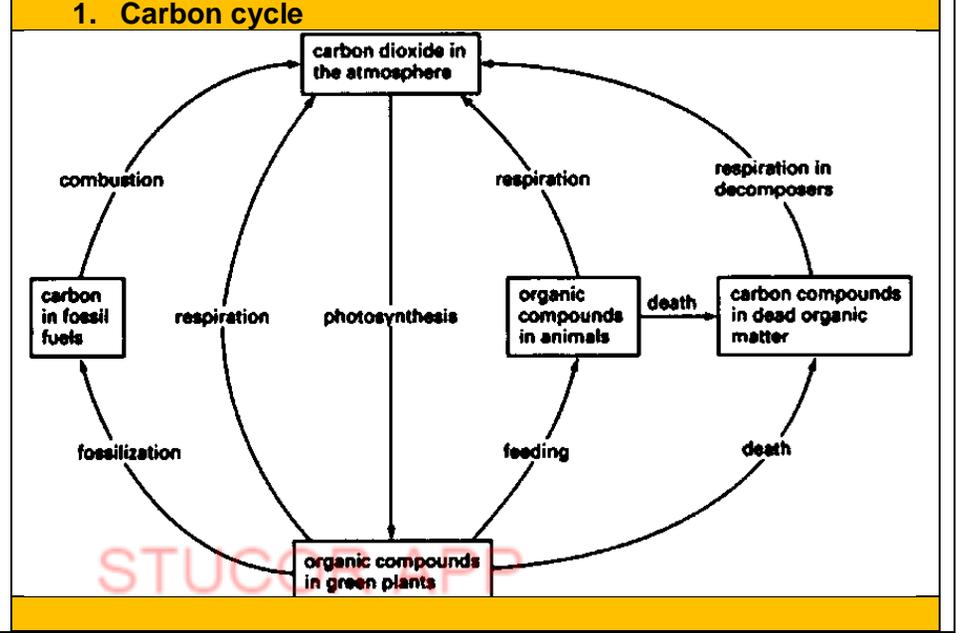
All living systems die at a particular stage. These dead systems are decomposed to initiate the third function of ecosystems namely “cycling

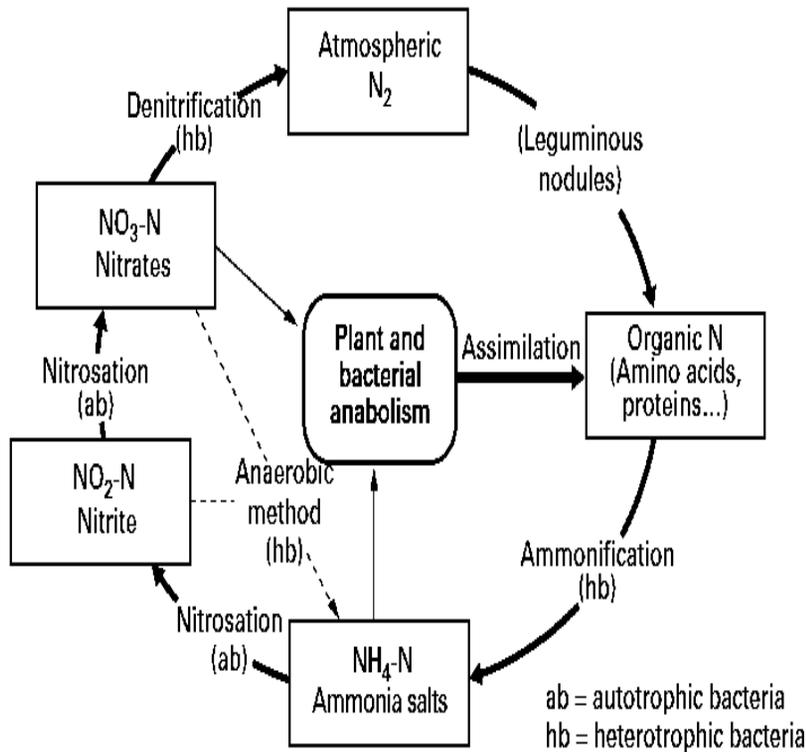
**Nutrient flow :**  
**( Nutrient Cycle (or) Bio-geochemical Cycles)**

Cyclic flow of nutrients between the biotic and abiotic components is known as nutrient cycle (or) bio-geochemical cycles (or) nutrient flow.

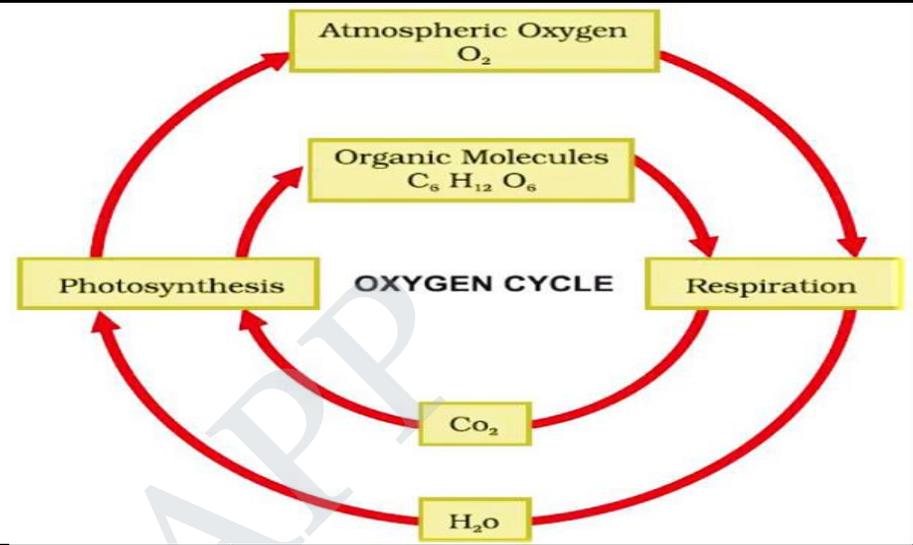
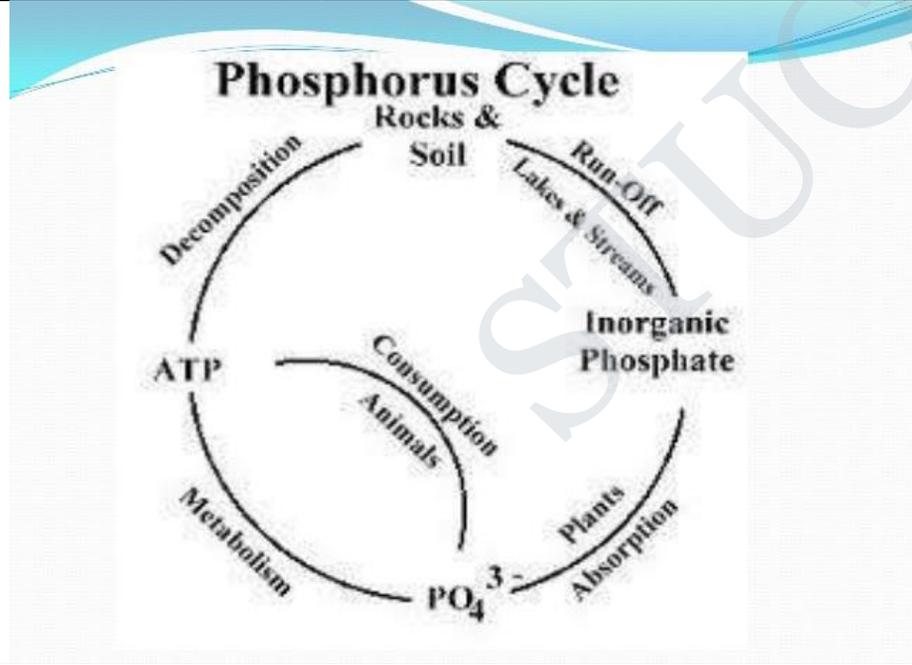
**Example :**

**Hydrological cycle:** Movement of water in a cyclic manner is known as hydrological cycle





### 3. Phosphorous cycle



### Ecological Succession

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

#### Stages of ecological succession:

##### 1. Pioneer community :

First group of organism, which establish their community in the area is called 'Pioneer' Community

##### 2. Seres (or) Seral stage:

Various developmental stages of a community is called 'seres'.

#### Types of Ecological succession

##### 1. Primary succession:

It involves the gradual establishment of biotic communities on a lifeless ground

###### (a) Hydrarch (or) Hydrosere:

Establishment starts in a watery area like pond and lake.

###### (b) Xerarch or Xerosere:

Establishment starts in a dry arealike, desert and rock

##### 2. Secondary succession :

It involves the establishment of biotic communities in an area, where some type of biotic community is already present

##### 3. Autogenic succession :

Replacement of existing community by internal condition (or) internal factors

**Example :**

Fish death due to several algal blooms in a pond

**4. Allogenic succession:**

Replacement of existing community by external condition (or) external factors

**Example :**

Fish death due to industrial pollution in a pond

**Process of Ecological succession**

**1. Nudation:**

Development of area any life

Bare area may be formed due to volcanic eruption, landslide, drought, over-grazing, agricultural & industrial activities.

Nudation is caused by the following factor

(i) **Topographic factor:** soil or topographic related

(ii) **Climatic:** due to glaciers, storm, dry period

(iii) **Biotic:** rest destruction, agriculture.

**2. Invasion:**

Establishment of species on bare area through migration followed by establishment.

Migration of seeds is brought about by wind, water or by birds.

Seeds germinate and grow and establish their pioneer communities

Invasion is caused by following methods’:

(i) Migration :seeds, pores reaching a bare area

(ii) Ecesis: seeds, pores germinate, grow and reproduce

(iii) Aggregation: individual of a species increase their number and stay closely.

**3. Competition (or) Co action:**

As the number of species increases, there is competition (inter specific & intra specific) for space, water & nutrition.

This process causes elimination of unfit species, and survival of fit species.

**4. Reaction :**

Living organisms take water, nutrients and grow & modify the environment is reaction.

Modifications become unsuitable for the existing species & favour for new species.

**5. Stabilization (climax):**

Leads to stable community (climax) which is in equilibrium with environment. Climax community is not replaced by other community.

Example: Forest, grassland ecosystem.

**Food chain**

The sequence of eating and being eaten in an ecosystem is known as food chain ( or )  
 Transfer of food energy from the plants through a series of organisms is referred to as food chain

**Sample Food Chains**

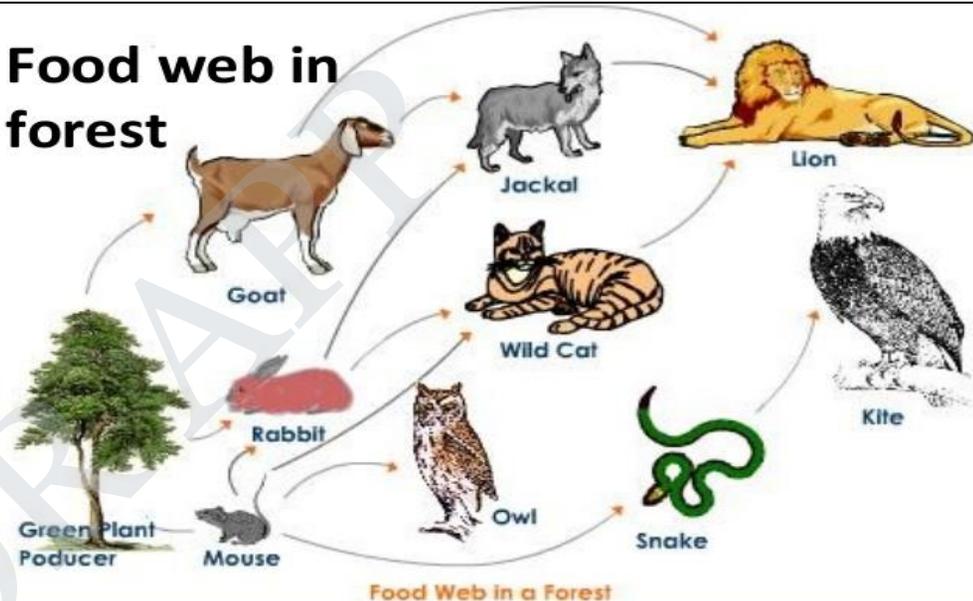
Trophic Level	Grassland Biome	Pond Biome	Ocean Biome
Primary Producer	grass	algae	phytoplankton
Primary Consumer	grasshopper	mosquito larva	zooplankton
Secondary Consumer	rat	dragonfly larva	fish
Tertiary Consumer	snake	fish	seal
Quaternary Consumer	hawk	raccoon	white shark

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**Food web**

Food web is a network (interlocking pattern ) of food chains where different types of organisms are inter connected at different tropic levels. (or)  
 The food chain in an area forms the food web

**Food web in forest**



**Types of food chain**

**I. Grazing food chain:** It starts with green plants (primary producers) and ends in carnivores

Eg: Grass → Rabbit → Fox (**Grassland ecosystem**)

**II. Detritus food chain:** It starts with dead organic matter which the detritivores and decomposers consume.

Eg:1.: Leaf litter → algae → crabs → small carnivorous fish → large carnivorous fish (**Mangrove ecosystem**)

Eg: Dead organic matter → fungi → bacteria (**Forest ecosystem**)

**Significance of food chain**

(i) Usually 80 to 90% of potential energy is lost as heat when energy is transferred from one level to another.

(ii) Shorter food chains provide greater available energy and vice –versa

(iii) Understand the feeding relationships and interaction between organisms in any ecosystem

(iv) Understand the movement of toxic substances and the problem of 'Biological magnification' in the ecosystem.

(v) A food chain is always straight (unidirectional flow of energy

**Types of food web**

1. (Connectedness Food Web:

- They are also known as topological food web.
- Such food web emphasises feeding relationships among organisms, portrayed as a links in the web.
- It depicts only the presence or absence of atrophic interaction.

2. **Energy Flow Food Web:**

- It sometimes referred to as flow web or as bioenergetics web.
- Here connections are quantified by the flux of energy between a resource and consumer.

3. **Functional Food Web:**

- Functional food web is also known as interaction food web.
- That identifies the feeding relationships within the topological food web that are most important to community structure.

**significance of food web**

(i) Food web provide stability to the ecosystem

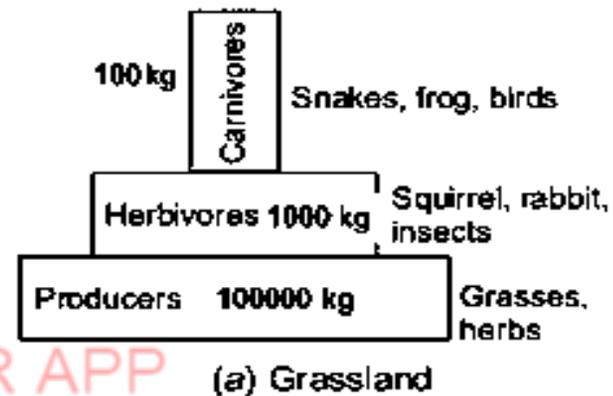
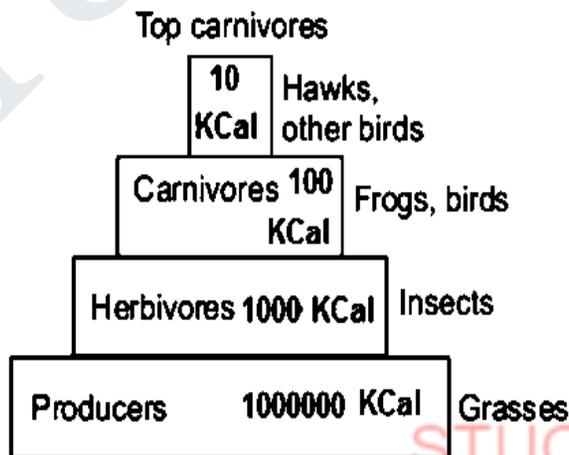
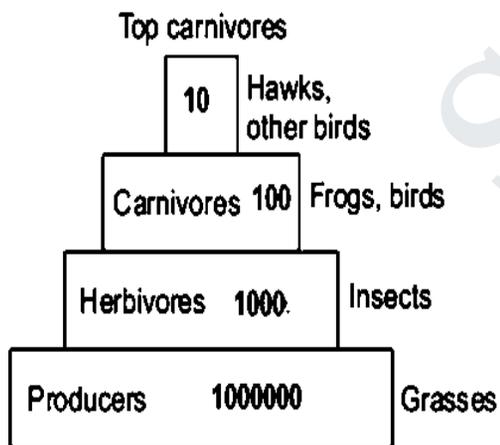
(ii) Food web provides that plants are the foundation of all ecosystem and ,food chains.

(iii) Understand the feeding relationships and interaction between organisms in any ecosystem

**Ecological pyramid:**

Graphic representation of trophic structure and function of an ecosystem starting with producers at the base and successive trophic levels forming the apex is known as ecological pyramid.

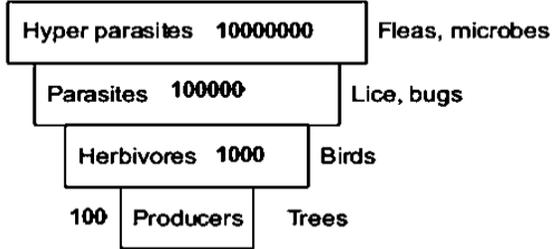
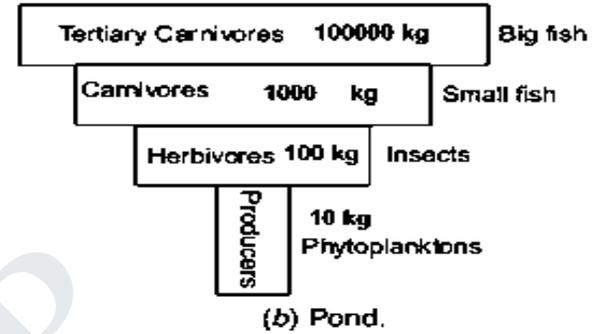
<u>(i)Pyramids of number</u>	<u>(ii)Pyramids of energy</u>	<u>(iii)Pyramids of biomass</u>
<p>It shows the number of individual organisms at each level</p>	<p>It shows the rate of energy flow and/or productivity at successive trophic levels.</p>	<p>It shows the total biomass of each trophic level in the food chain</p>
<p>Grass land:</p> <ul style="list-style-type: none"> <li>➤ In a grassland the producers, (mainly grasses) are always maximum in number.</li> <li>➤ The number decreases towards apex, as number of every other level is less than number of grasses.</li> <li>➤ The secondary consumers, snakes and lizards are less in number than the rabbits and mice.</li> <li>➤ In the top (tertiary) consumers hawks or other birds, are least in number</li> </ul>	<ul style="list-style-type: none"> <li>➤ The amount of energy present at each trophic level is considered for this type of pyramid.</li> <li>➤ Pyramid of energy gives the best representation of the trophic relationships and it is always upright.</li> <li>➤ At every successive trophic level, there is a huge loss of energy (about 90%) in the form of heat, respiration etc.</li> <li>➤ Thus, at each next higher level only 10% of the energy passes on. Hence, there is a sharp decline in energy level of each successive trophic level as we move from producers to top carnivores.</li> <li>➤ Therefore, the pyramid of energy is always upright.</li> </ul>	<ul style="list-style-type: none"> <li>➤ It is based upon the total biomass (dry matter) at each trophic level in a food chain. The pyramid of biomass can also be upright or inverted.</li> <li>➤ Pyramids of biomass in a forest and an aquatic ecosystem. The pyramid of biomass in a forest is upright in contrast to its pyramid of numbers.</li> <li>➤ This is because the producers (trees) accumulate a huge biomass while the consumers total biomass feeding on them declines at higher trophic levels, resulting in broad base and narrowing top</li> </ul>



**Parasitic food chain:**

Parasitic food chain shows an inverted pyramid of number.  
 The producers are big trees. Fruit eating birds acting like herbivores which are larger in number. A much higher number of lice, bugs etc. grow as parasites on these birds while a still greater number of hyperparasites like bugs, fleas and microbes feed upon them, thus making an inverted pyramid

**No inverted pyramid is obtained.**



**Biomass is calculated as**

**Biomass =**  
**mass of individual species x**  
**number of each individual**

**Advantage & Disadvantage**

- (i) It's a simple method
- (ii) Number of specific species calculation is highly difficult.
- (iii) It does not take into account juveniles,

**Advantage & Disadvantage**

- (i) It can be compared different ecosystem based on energy transfer
- (ii) It is difficult to collect energy data.

**Advantage & Disadvantage**

- (i) It overcomes the problems of pyramid of number
- (ii) Exact measurement of biomass is highly difficult
- (iii) Organism of same size do not have same energy

**Types, characteristics, structure and functions of ecosystem**

Forest ecosystem	Grassland ecosystem	Desert ecosystem
<ul style="list-style-type: none"> <li>➤ A forest ecosystem occupies a tall and dense tree.</li> <li>➤ They support many animals and birds.</li> <li>➤ The forest occupies about 40% of the world's land area.</li> <li>➤ In India forest occupies only 19% of its total land area</li> </ul>	<ul style="list-style-type: none"> <li>➤ A grassland ecosystem occupies grass species, some trees and shrubs</li> <li>➤ They support many insects and birds.</li> <li>➤ Grassland occupies about 20% of world's land area</li> </ul>	<ul style="list-style-type: none"> <li>❖ A desert ecosystem occupies sand, succulent plants.</li> <li>❖ Desert occupies about 35% of the world's land area.</li> </ul>
<b>Types</b>	<b>Types</b>	<b>Types</b>
<ol style="list-style-type: none"> <li>1. Tropical rain forests.</li> <li>2. Tropical deciduous forests.</li> <li>3. Tropical scrub forests.</li> <li>4. Temperate rain forests.</li> <li>5. Temperate deciduous forests</li> </ol>	<ol style="list-style-type: none"> <li>1. Tropical grasslands.</li> <li>2. Temperate grasslands.</li> <li>3. Polar grasslands.</li> </ol>	<ol style="list-style-type: none"> <li>1. Tropical deserts.</li> <li>2. Temperate deserts.</li> <li>3. Cold deserts</li> </ol>
<p><b>1. Tropical rain forests:</b></p> <ul style="list-style-type: none"> <li>➤ They are found near the equator.</li> <li>➤ They are characterized by high temperature.</li> <li>➤ <b>Plants :</b> teak and sandal</li> <li>➤ <b>Animals:</b> lion, tiger and monkey.</li> </ul> <p><b>2. Tropical deciduous forests:</b></p> <ul style="list-style-type: none"> <li>➤ They are found little away from the equator.</li> <li>➤ They are characterized by a warm climate and rain is only during monsoon.</li> <li>➤ <b>Plants :</b> maple, oak and hickory</li> <li>➤ <b>Animals:</b> deer, fox, rabbit and rat</li> </ul> <p><b>3. Tropical scrub forests:</b></p> <ul style="list-style-type: none"> <li>➤ These are characterized by a dry climate</li> <li><b>Plants :</b> oak, olive, cedar, etc.</li> <li>➤ <b>Animals :</b> deer, fox, etc.,</li> </ul> <p><b>4. Temperate rain forests:</b></p> <ul style="list-style-type: none"> <li>➤ They are found in temperate areas with adequate rainfall.</li> <li>➤ They are characterized</li> <li>➤ <b>Plants :</b> pines, red wood etc.,</li> <li>➤ <b>Animals :</b> squirrels, fox, cats, bear etc.,</li> </ul> <p><b>5. Temperate deciduous forests:</b></p> <ul style="list-style-type: none"> <li>➤ They are found in areas with moderate temperatures.</li> <li>➤ <b>Plants:</b> oak, hickory</li> <li>➤ <b>Animals:</b> deer, fox, bear, etc.,</li> </ul>	<p><b>1. Tropical grasslands</b></p> <ul style="list-style-type: none"> <li>➤ They are found near the borders of tropical rain forests.</li> <li>➤ They are characterized by high temperature and moderate rainfall (40 to 100 cm).</li> <li>➤ It is also known as Savanna-type.</li> <li>➤ <b>Plants :</b> scattered shrubs and stunted trees</li> <li><b>Animals :</b> zebras, giraffes, antelopes, etc.,</li> </ul> <p><b>2. Temperate grasslands</b></p> <ul style="list-style-type: none"> <li>➤ They are found in the centers of continents.</li> <li>➤ They are characterized by very cold winters and hot summers.</li> </ul> <p><b>3. Polar grasslands</b></p> <ul style="list-style-type: none"> <li>➤ They are found in arctic polar regions.</li> <li>➤ They are characterized by severe cold and strong winds along with ice and snow.</li> <li>➤ <b>Animals :</b> arctic wolf, weasel, arctic fox, etc.,</li> </ul>	<p><b>1. Tropical deserts</b></p> <ul style="list-style-type: none"> <li>➤ Tropical deserts are found in             <ul style="list-style-type: none"> <li>○ <i>Africa: Sahara desert.</i></li> <li>○ (ii) <i>Rajasthan: Thar desert.</i></li> </ul> </li> <li>➤ They are characterized by Windblown and sand dunes.</li> </ul> <p><b>2. Temperate deserts</b></p> <ul style="list-style-type: none"> <li>➤ They are found in <i>South California: Mojave.</i></li> <li>❖ They are characterized by cool winter and very hot summer.</li> </ul> <p><b>3. Cold desert</b></p> <ul style="list-style-type: none"> <li>➤ They are found in <i>China: Gobi desert</i></li> <li>❖ They are characterized by cold winters and warm summers</li> </ul>

Forest ecosystem	Grassland ecosystem	Desert ecosystem
<p style="text-align: center;"><b>Characteristics</b></p> <ol style="list-style-type: none"> <li>1. Forests are characterized by warm temperature and adequate rainfall,</li> <li>2. The forest maintains climate and rainfall.</li> <li>3. The forest supports many wild animals and protect biodiversity.</li> <li>4. The soil is rich in organic matter and nutrients, which support the growth of trees.</li> <li>5. Since penetration of light is so poor, the conversion of organic matter into nutrients is very fast.</li> </ol>	<p style="text-align: center;"><b>Characteristics</b></p> <ol style="list-style-type: none"> <li>1. Grassland ecosystem is a plain land occupied bygrasses.</li> <li>2. Soil is very rich in nutrients and organic matter.</li> <li>3. Since it has tall grass, it is ideal place for grazinganimals.</li> <li>4. It is characterized by low or uneven rainfall.</li> </ol>	<p style="text-align: center;"><b>Characteristics</b></p> <ol style="list-style-type: none"> <li>1. The desert air is dry and the climate is hot.</li> <li>2. Annual rainfall is less than 25 cm.</li> <li>3. The soil is very poor in nutrients and organic matter.</li> <li>4. Vegetation is poor.</li> </ol>
<p><b>Structure (Components) and Function of forest ecosystem</b></p>	<p><b>Structure (Components) and Function of grassland ecosystem</b></p>	<p><b>Structure (Components) and Function of desert ecosystem</b></p>
<p><b>I. Abiotic components</b>                      Abiotic components are physical components (inorganic and organic substances) found in the soil and atmosphere.                      In addition to minerals, the occurrence of litter is characteristic features of majority of forests  <i>Example</i> : Climatic factors (temperature, light, rainfall) and minerals</p>	<p><b>I. Abiotic Components</b>                      Abiotic components are physical components (inorganic and organic substances) found in the soil and atmosphere.                      These abiotic components are supplied by CO<sub>2</sub>, H<sub>2</sub>O, nitrates, phosphates and sulphates  <i>Example</i> :Nutrients, C, H, O, N, P, S, etc.,</p>	<p><b>I. Abiotic Components</b>                      Abiotic components are physical components (inorganic and organic substances) found in the soil and atmosphere.                      ➤ The temperature is very high and the rainfall is very low.                      ➤ The nutrient cycling is also very low  <i>Example</i>: Temperature, rainfall, sunlight, water,</p>
<p><b>II. Biotic components</b>  <b>1. Producers</b>                      ❖ The plants absorb sunlight and produce food throughPhotosynthesis  <i>Example</i> :Trees, shrubs and ground vegetation  <b>2. Consumers</b>                      a. <b>Primary consumers</b> (herbivores) :                      They directly depend on the plants for their food.  <i>Example</i> :Ants, flies, insects, mice, deer, squirrels                      b. <b>Secondary consumers</b> (primary carnivores)                      They directly depend on the herbivores for their food.  <i>Example</i> :Snakes, birds, fox                      c) <b>Tertiary consumers</b>                      They depend on the primary carnivores for their food.  <i>Example</i> : Tiger, lion, Hawks, eagle etc.,  <b>3. Decomposers</b>                      They decompose the dead plant and animal matter. Rate of decomposition in tropical and subtropical forests is more rapid than in the temperate forests.</p>	<p><b>II. Biotic Components</b>  <b>1. Producers</b>                      The plants absorb sunlight and produce food through Photosynthesis.  <i>Example</i> :Grasses, forbs and shrubs  <b>2. Consumers</b>                      a) <b>Primary consumers</b> (herbivores) :                      They directly depend on the grasses for their food.  <i>Example</i> :Cows, buffaloes, deer, sheep, etc                      2. <b>Secondary consumers</b> (primary carnivores)                      They directly depend on the herbivores for their food.  <i>Example</i> :Snakes, birds, fox, etc.,                      (c) <b>Tertiary consumers</b>                      They depend on the primary carnivores for their food.  <i>Example</i> :Hawks, eagles, etc.,  <b>3. Decomposers</b>                      They decompose the dead plant and animal matter.  <i>Example</i> :Bacteria and fungi</p>	<p><b>II. Biotic Components</b>  <b>1. Producers</b>                      The plants absorb sunlight and produce food through Photosynthesis.                      In deserts mostly Succulent (e.g., cacti) plants are found available.                      They have water inside them to stay alive. They have waxy layer on the outside to protect them from the sun  <i>Example</i> :Shrubs, bushes, some grasses and few trees  <b>2. Consumers</b>                      These animals dig holes in the ground to live in. They come out at night to find food. Most of the animals can extract water from the seeds they eat  <i>Example</i> :Squirrels, mice, foxes, rabbits, deer and reptiles  <b>3. Decomposers</b>                      Desert has poor vegetation with a very low amount of dead organic matter.                      They decompose the dead plant and animal matter.  <i>Example</i> :Fungi and bacteria</p>

<b>Aquatic Ecosystems</b>
<b>Ponds, Streams, Lakes, Rivers</b>
<b>Oceans, Estuaries</b>
<b>BIO DIVERSITY:</b>
<ul style="list-style-type: none"> <li>★ Biodiversity is defined as, “the variety and variability among all groups of living organisms</li> </ul>
<b>SIGNIFICANCE OR IMPORTANCE OF BIODIVERSITY</b>
<ul style="list-style-type: none"> <li>★ Biodiversity is very important for human life, because we depend on plants, micro-organisms, animals for our food, medicine and industrial products.</li> <li>★ Biodiversity protects the fresh air, clean water and land.</li> <li>★ It is also important for forestry, fisheries and agriculture, for rich variety of various biological resources available in nature</li> <li>★ The farmers prefer hybrid seeds, as a result, many plant species become extinct.</li> <li>★ For the production of drugs the pharmaceutical companies collect wild plants, so several medicinal plants now become extinct.</li> </ul>
<b>CLASSIFICATION OR LEVELS OF BIODIVERSITY</b>
<b>1. ECOSYSTEM DIVERSITY</b>
<ul style="list-style-type: none"> <li>★ The diversity at the ecological or habitat level is known as ecosystem diversity.</li> <li>★ A large region with different ecosystems can be considered as ecosystem diversity Example : river ecosystem</li> <li>★ The river which includes the fish, aquatic insects, mussels and variety of plants.</li> </ul>
<b>2. SPECIES BIODIVERSITY</b>
<ul style="list-style-type: none"> <li>★ Species diversity is the diversity between different species.</li> <li>★ The sum of varieties of all the living organisms at the species level is known as species diversity.</li> <li>★ Example:             <ol style="list-style-type: none"> <li>1. Plant species: Apple, mango, grapes, wheat, rice, etc.,</li> <li>2. Animal species: Lion, tiger, elephant, deer, etc</li> </ol> </li> </ul>
<b>3. GENETIC DIVERSITY</b>
<ul style="list-style-type: none"> <li>★ Genetic diversity is the diversity within species ie., variation of genes within the species</li> <li>★ Within individual species, there are number of varieties, which are slightly different from one another</li> <li>★ Example :</li> <li>★ Rice varieties: There are thousands of rice varieties, which show variation at the genetic level differ in their size, shape, colour and nutrient content.</li> </ul>

Burma teak, Malaysian teak etc)												
<b>Value of diversity</b>												
i) Consumptive use												
<ul style="list-style-type: none"> <li>★ These are direct use values, where the biodiversity products are harvested and consumed directly</li> <li>★ Example :             <ol style="list-style-type: none"> <li>(i) Food : A large number of wild plants and animals are consumed by human beings as food</li> <li>(ii) Drugs : Around 70% of modern medicines are derived from plant and plant extracts.</li> </ol> </li> <li>★ India uses 3000 Species of plants in Ayurveda, Homeopathy and Unani system of medicines</li> </ul>												
2. Productive use												
<ul style="list-style-type: none"> <li>★ Biodiversity products have obtained a commercial value.</li> <li>★ These products are marketed and sold. These products may be derived from the animals and plants</li> <li>★ Example:</li> </ul> <table border="1" data-bbox="1260 641 1837 852"> <tr> <td>plant product</td> <td>Animal product</td> </tr> <tr> <td>wood</td> <td>Silk</td> </tr> <tr> <td>Cotton</td> <td>Wool</td> </tr> <tr> <td>Fruit</td> <td>Musk</td> </tr> <tr> <td>vegetable</td> <td>Tusk</td> </tr> <tr> <td>pearl</td> <td>Leather</td> </tr> </table>	plant product	Animal product	wood	Silk	Cotton	Wool	Fruit	Musk	vegetable	Tusk	pearl	Leather
plant product	Animal product											
wood	Silk											
Cotton	Wool											
Fruit	Musk											
vegetable	Tusk											
pearl	Leather											
<b>3. Social use</b>												
<ul style="list-style-type: none"> <li>★ Social value refers to the manner in which the bio-resources are used to the society.</li> <li>★ These values are associated with the social life, religion and spiritual aspects of the people.</li> <li>★ Example:             <ul style="list-style-type: none"> <li>★ (i) Many plants and animals are considered as the holy plants and holy animals in our country</li> <li>★ Plants : Tulsi, peepal, lotus, bael, etc</li> <li>★ Animals : Cow, snake, bull, peacock, rat, etc</li> </ul> </li> </ul>												
<b>4. Ethical use</b>												
<ul style="list-style-type: none"> <li>★ It involves ethical issues like “all life must be preserved</li> <li>★ The ethical value means that a species may or may not be used, but its existence in nature gives us pleasure.</li> <li>★ Example             <ul style="list-style-type: none"> <li>★ (i) The river Ganga is considered as holy river.</li> <li>★ (ii) Vembu, Tulsi, Vengai are some of the trees, worshipped by the Tamilians.</li> <li>★ (iii) We are not deriving anything directly from Kangaroo, Zebra or Giraffe, but we feel that these should exist in nature.</li> </ul> </li> </ul>												
<b>5. Aesthetical use</b>												

- ★ The beautiful nature of plants and animals insist us to protect the biodiversity.
- ★ The most important aesthetic value of biodiversity is eco-tourism
- ★ Example:
- ★ 1. Eco - tourism: People from far place spend a lot of time and money to visit the beautiful areas, where they can enjoy the aesthetic value of biodiversity. This type of tourism is known as eco - tourism.
- ★ 2. The pleasant music of wild birds, colour of butterfly, are important for their aesthetic value

- 6.Optional use**
- ★ The optional values are the potentials of biodiversity that are presently unknown and need to be known.
  - ★ The optional values of biodiversity suggests that any species may be proved to be a valuable species after someday
  - ★ Example:
  - ★ 1.The growing biotechnology field is searching a species for causing the diseases of cancer and AIDS.
  - ★ 2. Medicinal plants and herbs play a very important role in our Indian economic growth

**biogeographical classification of India**

**Biogeography:**  
It is the study of distribution, evolution, dispersal and environmental relationship of plants and animals in time and space. Biogeographic classification of India was done by Rodgers and Panwar (1988)- They are describing 10 biogeographic zones in India. India occupies 10th place among plant rich countries of the world  
Each zone has its own characteristic climate, soil, topography and biodiversity

**Biotic provinces:** Next level of detail within the zones. e.g. **Northwestern Himalaya, Western Himalaya.**

**Biomes:** Major ecosystem groupings found within each province and region. e.g. **Alpine, sub alpine**

Biogeographical regions	Biogeographical zones	No.of Biotic Province	Biotic province	Land coverage of country
1.The Northern Mountains	1. Trans Himalayas	1	Ladakh (J&K) and Lahaul - Spiti (Himachal)	5.7 %
	2. Himalayas	1	North –West Himalayas	17%
		2	West Himalayas	

plains		4	East Himalayas	
	3. Indian Desert	1	Kutch	6.9%
3.The peninsular uplands		2	Thar	
	4. Semi Arid	1	Punjab	15.6%
		2	Gujarat –Rajwara	
4.The Indian coasts and islands	5. Western Ghats	1	A Malabar Coast	5.8%
		2	Western Ghats mountains	
6. Deccan Peninsula		1	Deccan Plateau South	4.3%
		2	Central Plateau	
		3	Eastern Plateau	
		4	Chhotanagpur	
		5	Central Highlands	
7. Gangetic Plain		1	Upper Gangetic Plain	11%
		2	Lower Gangetic Plain	
8. North-East India		1	Brahmaputra Valley	5.2%
		2	Assam Hills	
9. Islands		1	Andaman Islands,	0.03%
		2	Nicobar Islands,	
10. Coastal Marging		1	West Coast	negligible

**Biodiversity at global**

**Biodiversity at national level**

**Biodiversity at local level**

**India as a mega-diversity nation:**

**Mega-diversity nation—Definition:**

The country has a rich heritage of biodiversity, a wide spectrum of habitats from tropical rain forests to alpine vegetation, and from temperate forests to coastal wetlands is called mega diversity nation.

**Mega diversity nations in world :**

- ★ There are nearly 170 countries in the world and 12 of them contain 70% of our planet’s biodiversity
- ★ The following 12 countries, Australia, Brazil, China, Colombia, Ecuador, the United States, India, Indonesia, Madagascar, Mexico, Peru and Democratic Republic of the Congo regions are known as mega diversity regions.
- ★ These countries have the world’s selected few rich floral land and faunal zones

**Position of India in world**

- ★ India occupies 2.4% of the total land area of the world, but India contributes 8.22% of the known global biodiversity.
- ★ India is one of the 12 mega-diversity nations of the world.
- ★ India is in the 10th position in the world and 4th in the Asia in terms of plant diversity.
- ★ India ranks 10th in the world in terms of number of mammalian species.
- ★ India ranks 11th in the world in terms of endemic species of higher vertebrates
- ★ In terms of number of species contributed to agriculture and animal husbandry, it ranks 7th in the world.

### Biomes in India

India has three biomes

- (i) The tropical humid forests
- (ii) The tropical dry deciduous forests
- (iii) The warm desert/semi- deserts.

### Bio geographical zones of India

- ★ India can be divided into 10 biogeographic zones and 26 biotic provinces which represent the major ecosystems of the world.

### Hotspots of biodiversity in India

- ★ Out of 25 hotspots in the world, India has two 'hotspots'

(i)The Western Ghats

(ii)The Eastern Himalayas.

### Endemism in India

- ★ Species which are found and restricted only to a particular area are known as endemic species
- ★ About 33% of the flowering plants, 53% of fresh water fishes, 60% amphibians, 36% reptiles and 10% mammalian are endemic species. and 50% of lizards are endemic to India.
- ★ Western Ghats are the site of maximum endemism. India has 26 recognized endemic centers

### Plant diversity in India

- ★ Nearly 5000 flowering plants and 166 crop plant species have their origin in India.

### Marine diversity in India

he world are found here.

- ★ Several species of mangrove plants and sea grasses are also found in our country

### Agro-biodiversity in India

- ★ There are 167 crop species and wild relatives.
- ★ India is considered to be the center of origin of 30,000 to 50,000 varieties of rice, mango, turmeric, ginger, sugarcane, etc.

### Animal biodiversity in India

- ★ There are 75,000 animal species including 5,000 insects.
- ★ India is a home to about nearly 2,00,000 living organisms

### Biosphere reserves in India

- ★ Biosphere reserves : which protect larger areas of natural habitat .
- ★ it includes National Parks, preserves, along buffer zones that are open to some economic uses.
- ★ The World has 482 biosphere reserves in 102 countries.

### Hot-spots of biodiversity:

#### Hot spots of biodiversity

- ★ Hotspots are the main areas of biodiversity conservation
- ★ These are the areas that are extremely rich in biodiversity.
- ★ They have high level of endemism.
- ★ They are under constant threat of species extinctions and habitat destruction.
- ★ There are 25 hot spots at global level. Out of 25, two are present in India, namely the Eastern Himalayas and Western Ghats.
- ★ These are the areas of high diversity, endemism and are also threatened by human activities.
- ★ Nearly 70% of the bird species in this hotspot are endemic
- ★ About 40% of terrestrial plants and 25% of vertebrate species are endemic and found in these hotspots.
- ★ It has been estimated that 50,000 endemic plants, occur in only 18 hotspots in the world.
- ★ Countries which have a relatively large proportion of these biodiversity hotspots are referred to as mega-diversity nations.

#### Hotspots in India

#### The Eastern Himalayas

- ★ The area comprises Nepal, Bhutan, and neighboring states of northern India, along with Southwest china.
- ★ All Himalayan forests lie north of the Tropic of Cancer.
- ★ Some of the Himalayan forests are at 1780 to 3500 m, they can be considered tropical forests.

- ★ The Eastern Himalayas display an varied topography, species diversity and endemism.
- ★ Many deep and semi-isolated valleys are exceptionally rich in endemic plant species.
- ★ In Sikkim, in an area of 7298 Km<sup>2</sup> , totally 4250 plant species are available and 2550 (60%) are endemic.
- ★ In Nepal, there are around 7000 plant species available and 500(8%) are believed to be endemic to Nepal.
- ★ In Bhutan there are around 5000 species available and 750 (15%) are endemic to the Eastern Himalayas

#### **Western Ghats:**

- ★ In India's 49219 plant species are available and 1600 species are endemics found in an 17000 Km<sup>2</sup> along the sea side of the Western Ghats in Maharashtra, Karnataka, Tamil Nadu,
- ★ Kerala Forest is available in 500 Km<sup>2</sup> and one fifth of the entire forest is mostly evergreen, and also 500-1500 m range of forest are semi- evergreen.
- ★ There are two main centers of diversity, the Agasthyamalai Hills and the Silent Valley.

The forest cover in Western Ghats has reduced to 34 %.

## **Threats to biodiversity:**

**habitat loss, poaching of wildlife, man-wildlife conflicts**

### **THREATS TO BIODIVERSITY**

Any disturbance in a natural ecosystem tends to reduce its biodiversity.

Various threats to biodiversity are

#### **1. HABITAT LOSS:**

Loss of population of interbreeding organism.

#### **Factors influencing Habitat Loss:**

##### **Deforestation:**

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

##### **Destruction of wetlands:**

- Wetlands are destroyed due to pollution, draining etc.

##### **Developmental activities:**

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

##### **Habitat fragmentation:**

- So, many animal & birds are vanishing.

#### **Raw materials:**

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

#### **Production of Drugs:**

- Pharmaceutical companies collect wild plants for drugs production.
- So, largenumber of medicinal plants is on the verge of extinction.

#### **Illegal Trade:**

Trade on wild life reduces bio-diversity

### **2. POACHING:**

Killing / Hunting of animals is poaching.

#### **Types:**

*Subsistence Poaching*- killing animals for surviving.

*Commercial Poaching*- hunting animals for selling

#### **Factors influencing Poaching:**

***Human Population:*** increase in population increases pressure on forest resources.

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

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

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

#### **Examples:**

1. Male gorilla for its body parts
2. Blue morph butterfly – making attractive trays
3. Snowy large egret – used for white feathering
4. ladies hat.US
5. Elephant feet – for making Ashtrays
6. Elephant – for ivory
7. Bengal tiger – soled for \$1,00,000 in foreign market
8. Dynamite fishing – high tech fishing, exhaust
9. Marine life. Sea horses, Sea turtles

### **3. MAN-WILDLIFE CONFLICTS:**

#### **Examples:**

- ★ **Sambalpur – Orissa:**

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

Sugarcane & cotton crop, explosives

- ★ **Royal Chitwan National Park – Kathmandu**  
Man-eating tiger killed 16 Nepalese, 4 yrs child
- ★ **Sanjay Gandhi National Park – Mumbai**  
Leopards killed– 14 persons

**Factors Influencing man-animal conflicts:**

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

**Endangered and endemic species of India**

**ENDANGERED & ENDEMIC SPECIES OF INDIA:**

Species are classified into various types:

- Extinct species :** No longer found in the world
- Endangered species :** A species is said to be endangered when it's no has been reduced to a critical level. Unless it is protected it is in danger of extinction.
- Vulnerable species ;** when its population is facing continuous decline due to habitat loss.
- Rare species :** when it is localized within restricted area

**ENDANGERED SPECIES OF INDIA:**

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

**No of threatened species of India:**

Plants	250
Birds	70
Mammals	86
Reptiles	25
Amphibians	3
Fishes	3
Molluscs	2, Insects -50

**Important Endangered Species:**

- Reptiles :** Tortoise, green sea turtle, gharial, python
- Birds :** Peacock, Siberian white crane, pelican, Indian Bustard
- Mammals :** Indian wolf, red fox, tiger, Indian lion, golden cat, desert

**Primates :** lion tailed monkey, capped monkey, golden monkey

**Plants :** medicinal plants, sandal wood tree

**Red List of Threatened Species(Red data book)**

IUCN: International Union for Conservation of Nature and Natural Resources publishes Red Data Book

It contains list of threatened species of plants and animals.

**The main objectives of this book :**

- ★ Identification and documentation of endangered species
- ★ Providing a global index of the decline of biodiversity
- ★ Create awareness about the importance of threatened biodiversity
- ★ Defining conservation priorities and guiding conservation action

**Factors affecting Endangered Species:**

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

**Remedial Measures:**

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

**ENDEMIC SPECIES:**

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

**Fauna:**

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

**Flora:**

- ★ Plants present in a particular region or period is Flora
- (ex) Sapriahimalayana, ovarialurida, pteridophyta, angiosperms etc.

**Factors affecting endemic species:**

Habitat loss, fragmentation, pollution

# conservation of biodiversity:

## In-situ and ex-situ conservation

### CONSERVATION OF BIO DIVERSITY:

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

#### Factors affecting biodiversity:

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

#### Advantages or Need of Biodiversity:

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

#### Types of Biodiversity:

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

Due to their genetic, commercial, medical, aesthetic importance of bio diversity, it must be conserved. It is followed by two methods

#### D) In situ conservation:

It involves protection of fauna and flora within its natural habitat, where the species normally occurs is called in - situ conservation.

#### Methods of In-situ conservation

In-Situ conservation	Numbers available
Biosphere reserves	7
National parks	80
Wild - life sanctuaries	420

#### Biosphere Reserves:

- It covers area of more than 5000 sq.km.
- It protects species for long time

#### (example)

Nandadevi	U.P
Nokrek	Meghalaya
Nilgiri	Kerala, TN, Karnataka
Manas	Assam
Sunderbans	WestBengal
GulfofMannar	TN

#### Role of Biosphere reserves:

- Protects endangered species

- It is useful for education & research purpose
- It gives long term survival

#### Restriction:

No tourism & explosives are permitted into the bio sphere

#### National Park:

Covers area of about 100 to 500sq.kms

Conserves wildlife & environment

#### (ex) Gir

National Park	Gujarat
Periyar	Kerala
Dudwa	UP
Sariska	Rajasthan
Ranthambore	Rajasthan
Kaziranga	Assam

#### Role of National Park:

For tourism without affecting environment

Protect, propagate & develop wild life

#### Restrictions:

- Grazing of domestic animals is prohibited
- All private rights & forestry activities are prevented.

#### Wildlife Sanctuaries:

- ★ Conserve animals & Birds only

(examples)

Mudumalai wildlife sanctuary –TN
Vedanthangal Birds sanctuary-TN
Sultanpur Birds sanctuary- Haryana
Ghana Birds sanctuary-Rajasthan
Wild Ass sanctuary-Gurajat

#### Role of wildlife Sanctuaries:

- ★ Protects animals only
- ★ Harvesting of timber,
- ★ Collection of forest products

#### Restrictions:

Killing, hunting, shooting of wildlife is prohibited

#### Gene Sancturay:

- ★ They Conserve Plants

#### Examples:

Citrus sanctuary – North India

Pitcher plant -North India

#### Other Projects for conservation of animals:

Examples:

Gir Lion Project, Crocodile Breeding Project, Project Elephant, Project Tiger etc

#### Merits of In-situ conservation:

- It is Very cheap & convenient method
- Species adjust to floods, drought, forest fires etc

**Demerits**

- Large area is needed, Maintenance is not proper due to pollution and lack of staff

**(ii) Ex situ conservation**

It involves protection of fauna and flora outside the natural habitat is called ex-situ conservation.

**EX-SITU CONSERVATION:**

Involves protection of fauna & flora outside the natural habitats.

**Role of Ex-situ conservation:**

Maintenance of endangered plant & animal species under controlled conditions  
Preserves more important species

**Methods of Ex-situ conservation:**

**NBPGR**

National Bureau of Plant Genetic Resources :uses cryo technique

**Cryo Technique:** Preservation of seeds, vegetables, fruits, crops, etc by using liquid nitrogen at -196° C

**NBAGR :**

National Burea of Animal Genetic Resources : preserves semen of bovine animals

**NFPRCR:**

National Facility for Plants Tissue Culture Repository  
: preserves crops or trees by tissue culture

**Merits**

- Survival / life span of species increase by special care.
- Species are assured for food, water, shelter etc Endangered species are preserved

**Demerits:**

- Expensive method
- Freedom of wildlife is lost

Animal cant survive in natural environment

**Field study of common plants, insects, birds**

**Field study of simple ecosystems – pond, river, hill slopes, etc.**

**UNIT--II : ENVIRONMENTAL POLLUTION**

**-8Hr.**

Definition – causes, effects and control measures of:

- (a) Air pollution
  - (b) Water pollution
  - (c) Soil pollution
  - (d) Marine pollution
  - (e) Noise pollution
  - (f) Thermal pollution
  - (g) Nuclear hazards –
- solid waste management:  
causes, effects and control measures of municipal solid wastes –  
role of an individual in prevention of pollution –

disaster management:

- floods,
  - earthquake,
  - cyclone
  - landslides.
- Field study of local polluted site – Urban / Rural / Industrial / Agricultural

**Air pollution: Definition – causes, effects and control measures**

**Water pollution : Definition – causes, effects and control measures**

**Soil pollution : Definition – causes, effects and control measures**

**SOIL POLLUTION**

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

**Types**

**1..Industrial wastes**

**Sources:**

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

**Effects:**

- ★ Affect and alter the chemical and biological properties of soil.
- ★ Hazardous chemicals enter into human food chain from the soil and finally lead to serious effects.

**2.Urban wastes**

**Sources and effects:**

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

**3.Agricultural practices**

**Sources and effects:**

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

**4.Radioactive pollutants**

**Sources and effects:**

These are resulting from explosions of nuclear dust and radioactive wastes penetrate the soil and accumulate there by creating land pollution.

**5.Biological agents**

Sources and effects: Soil gets large quantities of human, animal

pollution by biological agents.

### **Control measures of soil pollution**

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

**Marine pollution : Definition – causes, effects and control measures**

### **MARINE POLLUTION**

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

#### **Source of marine pollution:**

##### **1. Dumping the wastes:**

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

##### **Effects:**

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

##### **2. Oil pollution of Marine water:**

Caused by petroleum and its products.

##### **Effects:**

Oil films inhibit photosynthesis & formation of oxygen. This inhibit the growth of marine plants

##### **Effects of marine pollutants**

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

##### **Control measures of marine pollution**

account of human needs.

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

**Noise pollution : Definition – causes, effects and control measures:**

### **NOISE POLLUTION**

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

#### **Types of noise**

- ★ Industrial noise (drilling sound, mechanical saws)
- ★ Transport noise (bus, trucks, motors, scooters, rail traffic noise)
- ★ Neighborhood noise (Musical instruments, TV, VCR, Radios, telephones, loudspeakers)

#### **Effects of Noise pollution**

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

#### **Control and preventing measures**

- ★ **Source control**– acoustic treatment to machine surface, design changes, limiting the operational timings.
- ★ **Transmission path intervention**- the source inside a sound insulating enclosure, construction of a noise barrier or provision of sound absorbing materials.
- ★ **Oiling** – Proper oiling will reduce the noise from the machines.

- ★ **Receptor control:** Protection of the receiver by altering the work schedule, by using ear plugsetc
- ★ **Planting trees** also act as effective noise barriers
- ★ **Different absorptive materials** can be used to control interior noise.

**Thermal pollution :Definition – causes, effects and control measures:**

### **THERMAL POLLUTION**

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

#### **Sources of thermal pollution**

1. **Nuclear power plants**(drainage from hospitals, research institutes, nuclear experiments & explosions, emission from nuclear reactors)
2. **Coal fired power plants**(some thermal power plants use coal as fuel, condenser coil are cooled & discharge the hot water back to the nearby lake, & kills the fish & marineorganisms)
3. **Industrial effluents**(Textile, paper, pulp, sugar industries dischargewastes)
4. **Domestic sewage**(Municipal sewage has higher temperature which decrease the dissolved oxygen content & result in foul & offensive smell inwater)
5. **Hydro – electric power.**

#### **Effects of thermal pollution**

- ★ Reduction in dissolvedoxygen
- ★ Increase inToxicity
- ★ Interference with biologicalactivities
- ★ Interference with reproduction
- ★ Direct mortality
- ★ Food storage forfish.

#### **Control measures of thermal pollution**

- ★ **Cooling towers** - This is used as a coolantwet cooling tower, dry cooling tower.
- ★ **Cooling ponds and spray ponds.**
- ★ **Artificial lakes** – The heated effluents can be discharged into the lake at one end and the water for cooling purposes from the otherend.

es, effects and control measures

### **NUCLEAR HAZARD**

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

#### **Sources of Nuclear Hazards:**

1. **Natural sources:** Space which emits cosmic rays, soil, rocks, air, water, food, radioactive radon-222 etc.
2. **Man-made sources:** Nuclear power plants, X-rays, nuclear accidents, nuclear bombs, diagnostic kits etc.

#### **Effects of Nuclear Hazards**

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

#### **Control measures from Nuclear Hazards:**

- ★ In nuclear reactor coolants may be used to prevent extraneous activationproducts
- ★ Tightly sealed boxes & closed cycle system can be used to decrease the radioactiveemissions
- ★ Production of radioisotopes should be minimized
- ★ Minimum no of nuclear installations should becommissioned
- ★ Fission reactions should be minimized
- ★ The use of radio isotopes may be carried under jet of soil or water instead of gaseousforms
- ★ Wet drilling may be employed along with underground drainage
- ★ Extreme care should be exercised in disposal of industrialwastes
- ★ Use of high chimneys & ventilations at the working place for dispersingradio-pollutants
- ★ Disposal methods are the possible ways to distribute theradio-pollutants

#### **Disposal of Radioactive wastes:**

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

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

**Low level wastes (LLW):**LLW are disposed off in steel drums in

## solid waste management:

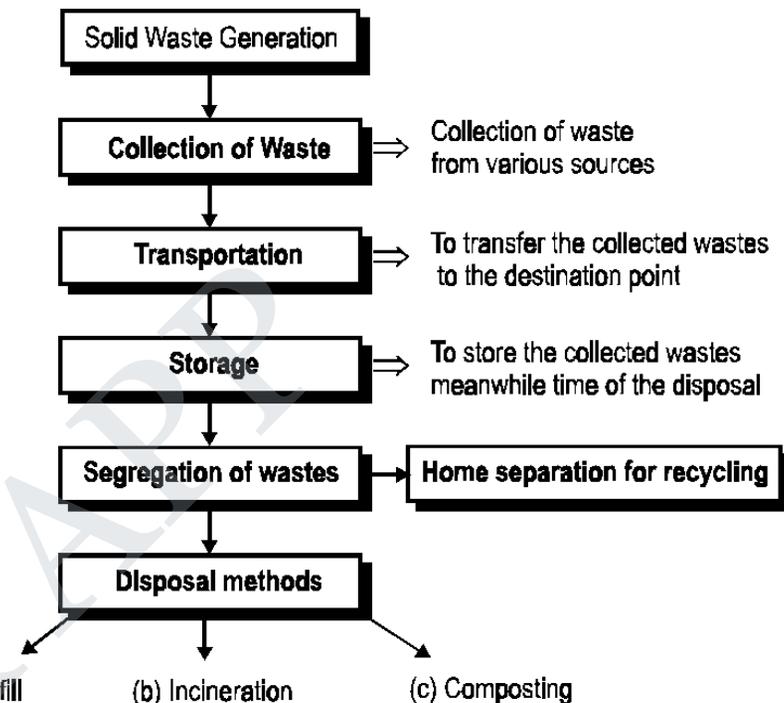
causes, effects and control measures of municipal solid wastes:

### Sources of Urban and Industrial Wastes

Urban waste consists of medical waste from hospitals; municipal solid wastes from homes, offices, markets (commercial waste) small cottage units, and horticulture waste from parks, gardens, orchards etc.

- 1) **Waste from homes** (Domestic waste) contains a variety of discarded materials like polyethylene bags, empty metal and aluminium cans, scrap metals, glass bottles, waste paper, diapers, cloth/rags, food waste etc.
- 2) **Waste from shops** mainly consists of waste paper, packaging material, cans, bottles, polyethylene bags, peanut shells, eggshells, tea leaves etc.
- 3) **Biomedical waste** includes anatomical wastes, pathological wastes, infectious wastes etc.
- 4) **Construction/demolition waste** includes debris and rubbles, wood, concrete etc.
- 5) **Horticulture waste** and waste from slaughter houses include vegetable parts, residues and remains of slaughtered animals, respectively

### PROCESS OF SOLID WASTE MANAGEMENT



### Steps Involved

#### I. Reduce, Reuse, Recycling (3R)

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

#### II. Discarding wastes:

Methods: a) Land fill b) Incineration c) Composting

#### 1. Land fill:

- ★ Solid wastes are placed in sanitary landfill system in alternate layers of 80 cm thickness of refuse
- ★ Covered with selected earth fill of 20 cm thickness
- ★ After 2 or 3 days solid wastes volume shrinks by 25-30% etc.

**Advantages**

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

**Disadvantages:**

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

**2.Incineration (or) Thermal process**

- ★ In this method combustible substances (rubbish, garbage, dead organisms) & non-combustible substances (glass, porcelain and metals) are separated first.
- ★ The combustible waste substances are first dried in a preheater
- ★ Then it is taken in a large incinerating furnace which incinerate about 100 to 150 tones' per hour
- ★ The temperature is maintained between 700°C to 1000°C
- ★ The left out ashes & clinkers from the furnace is further disposed by landfill method
- ★ The heat produced in the incinerator is used for generating electricity through turbines
- ★ The non-combustible substances are left out for recycling & reuse.

**Advantages**

- ★ Require little space
- ★ Cost of transportation is not high Safest and hygienic.
- ★ Capacity 300 tones' per day and can generate 3MV of power

**Disadvantages:**

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

**3.Composting:**

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

**Advantages:**

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

**Disadvantages:**

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

**Role Of An Individual In Prevention Of Pollution:**

The role of every individual in preventing pollution is of paramount importance because if every individual contributes substantially the effect will be visible not only at the community, city, state or national level but also at the global level as environment has no boundaries. It is the responsibility of the human race which has occupied the commanding position on this earth to protect the earth and provide conducive environment for itself and innumerable other species which evolved on this earth. A small effort made by each individual at his own place will have pronounced effect at the global level. It is aptly said, "Think globally act locally".

Each individual should change his or her life style in such a way as to reduce environmental pollution. It can be done by following some of the following suggestions.

Help more in pollution prevention than pollution control.

Use ecofriendly products.

Cut down the use of chlorofluorocarbons (CFCs) as they destroy the ozone layer. Do not use polystyrene cups that have chlorofluorocarbon (CFC) molecules in them which destroy ozone layer.

Use the chemicals derived from peaches and plums to clean computer chips and circuit boards instead of CFCs.

Use CFC free refrigerators.

The manufacture and operation of such devices should be encouraged that don't pollute. If they cost more then their higher prices may be offset by including environmental and the social costs of pollution in the price of such products which pollute environment.

Air pollution can be prevented by using really clean fuel i.e. hydrogen fuel. Hydrogen for that matter should not be produced by passing current in water as for generation of this current, again the environment will be polluted. So solar powered hydrogen fuel is the need of the hour.

Save electricity by not wasting it when not required because electricity saved is electricity generated without polluting the environment. Put on warm clothes rather than switching on a heater.

Adopt and popularize renewable energy sources.

Improve energy efficiency. This will reduce the amount of waste energy, i.e. more is achieved with less energy.

Promote reuse and recycling wherever possible and reduce the production of wastes.

Use mass transport system. For short-visits use bicycle or go on foot. Decrease the use of automobiles.

Use pesticides only when absolutely necessary and that too in right amounts. Wherever possible integrated pest management, including alternate pest control methods (biological control), should be used.

Use rechargeable batteries. Rechargeable batteries will reduce metal pollution.

Use less hazardous chemicals wherever their application can be afforded. Baking soda, vinegar and borax can help in cleaning, bleaching and softening. Baking soda can replace modern deodorants.

The solid waste generated during one manufacturing process can be used as a raw material for some other processes.

Use low phosphate, phosphate-free or biodegradable dish washing liquid, laundry detergent and shampoo. This will reduce eutrophication of water bodies.

Use organic manure instead of commercial inorganic fertilizers.

Do not put pesticides, paints, solvents, oils or other harmful chemicals into the drain or ground water.

Use only the minimum required amount of water for various activities. This will prevent fresh water from pollution

When building a home, save (don't cut) as many trees as possible in the area.

Plant more trees, as trees can absorb many toxic gases and can purify the air by releasing oxygen

Check population growth so that demand of materials is under control.

**pollution case studies:**

**POLLUTION CASE STUDIES:-**

1. Bhopal gas tragedy:- (Air Pollution)

Pesticide factory-Union Carbide- corporation leak large volume of methyl iso cyanate –atmosphere Bhopal- India-midnight on December 3,1984-city- change-gas chamber-within a week 10,000 people died – 1000 people turned blind-lakhs of people still continue to suffer various diseases

2. Gulf War: (Marine Pollution)

Gulf war was fought between Iraq and US-Period of 6 weeks in 1991-American fighters dropped a lakh of bombs-force the Iraq army to withdraw from Kuwait- retreat of Iraq-burning of 700 oil wells-near sea shore –oil from well spills out into the sea-the floating oil oversea water nearly 80 km long-burning of oil wells nearly 10 months-released huge amounts of pollutants likeCO<sub>2</sub> and SO<sub>2</sub> into the atmosphere-1 million birds killed.

3. Chernobyl Disaster : ( Nuclear pollution)

Occur at Chernobyl in USSR 28 th April,1986-the reactor exploded-result of uncontrolled nuclear reactions-radioactive fuel spread out in to the surrounding areas –killed at least 20,000 people-damage to soil, water and vegetation around 60 km.

4. Minamata Disease :( Marine Pollution)

Minamata- Small hostel village in Japan –Chicago-chemical company produces Vinyl polymer plastics-industry release its effluent into Minamata sea-Effluents containing mercury ions- converted into methyl mercury- highly toxic consumed by fishes – affect human being through food chain-damage central nervous system-loss of vision and hearing-loss of muscular coordination and severe headache- nervous disorders

**DISASTER MANAGEMENT**

**Hazard**

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

**Disaster**

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

**Type:**

1.Natural disasters – refers to those disasters that are generated by

**2.Manmade disasters** - refers to the disasters resulting from manmade hazards.

### **Significance Of Disaster Management**

- ★ Disasters management requires government intervention and a proper planning as well as funding.
- ★ Their worst effects can be partially or completely prevented by preparation, early warning, and swift, decisive responses.
- ★ Disaster management reduces the occurrence of disasters and to reduce the impact of those that cannot be prevented.
- ★ The government White paper and Act on Disaster Management define government
- ★ National and Provincial as well as Authorities Local of roles the management.
- ★ Disaster management forces come into action as soon as a disaster strikes and helps individuals, and trained are process **floods**

### **FLOODS**

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

### **Causes of floods**

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

increased severity of floods

### **Effects:**

- ★ Submerges the flooded area
- ★ Loss of soil fertility due to soil erosion
- ★ Extinction of civilization at costal area

### **Flood Management**

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

**disaster management: earthquake**

### **EARTH QUAKES**

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

### **Causes**

- ★ Disequilibrium in any part of the earth crust
- ★ Underground nuclear testing
- ★ Decrease of underground water level.

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

Richter scale	Severity of an earthquake
Less than 4	Insignificant
4-4.9	Minor
5-5.9	Damaging
6-6.9	Destructive
7-7.9	Major
More than 8	great

### **Effect**

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

### **Earthquake Management**

- ★ Constructing earthquake resistant building
- ★ Wooden houses are preferred

Seismic hazard map should give the information about the magnitude of intensity of anticipated earthquakes

**disaster management: cyclone**

### **CYCLONES**

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

### **Effect**

- ★ The damage depends on the intensity of cyclone the damage to human life, crops, roads, transport, could be heavy.
- ★ Cyclone occurrence slows down the developmental activities of the area.

### **Cyclone management**

- ★ Satellite images are used by meteorological

the strength and intensity of the storm.  
Radar system is used to detect the cyclone and is being used for cyclone warning

**disaster management landslides.**

**LAND SLIDES**

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

**Causes**

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

**Effects of landslides**

- ★ Block roads and diverts the passage.
- ★ Soil erosion increases.
- ★ Causes damages to houses, crops and livestock

**Control measures**

- ★ Planting of deep rooted vegetation
- ★ Encouragement for construction of bridges water ways
- ★ Create national parks, sanctuaries biosphere.

**TSUNAMI**

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

This activity displaces the overlying water in the ocean.

**Causes of tsunami**

- ★ Seismic activities like earthquakes, landslides, volcanic eruptions, explosions, can generatetsunami.
- ★ Deformation of the sea floor due to the movement of plates.

**Concept of Tsunami**

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

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

**Tsunami Management**

- ★ Earthquakes under the water are monitored by sensors on the floor of the sea.
- ★ The sensors send the information of floating buoys on the surface, whenever they detect any changes in pressure of thesea.
- ★ The information is then relayed to satellites, which passes it on to the earthstations.

necessaryprecautions

**Field study of local polluted site – Urban / Rural / Industrial / Agricultural.**

**UNIT-III : Natural Resources 10 Hr**

Forest Resources:  
Use And Over-Exploitation,  
Deforestation,  
Case Studies-  
Timber Extraction,  
Mining,  
Dams And Their Effects On Forests And Tribal People  
Water Resources:  
Use And Over- Utilization Of Surface And Ground Water,  
Floods,  
Drought,  
Conflicts Over Water,  
Dams-Benefits And Problems –  
Mineral Resources:  
Use And Exploitation,  
Environmental Effects Of Extracting And Using Mineral Resources,  
Case Studies –  
Food Resources:  
World Food Problems,  
Changes Caused By Agriculture And Overgrazing,  
Effects Of Modern Agriculture,  
Fertilizer-Pesticide Problems,  
Water Logging,  
Salinity,  
Case Studies –  
Energy Resources:  
Growing Energy Needs,  
Renewable And Non Renewable Energy Sources,  
Use Of Alternate Energy Sources.  
Case Studies –  
Land Resources:  
Land As A Resource,  
Land Degradation,  
Man Induced Landslides,  
Soil Erosion And Desertification  
– Role Of An Individual In Conservation Of Natural Resources –  
Equitable Use Of Resources For Sustainable Lifestyles.  
Field Study Of Local Area To document environmental assets – river / forest / grassland / hill / mountain

**Forest Functions(Uses of forest)**

- 1) **Protective and ameliorative functions**
  - a. Watershed protection
  - b. Erosion control
  - c. Land bank
  - d. Atmospheric regulation
- 2) **Productive functions**
  - a. Fodder for cattle
  - b. Fuel wood and charcoal
  - c. Poles for building homes
  - d. Food: (consumptive use)
  - e. Sericulture & Apiculture
  - f. Medicinal plants for traditional medicines
- 3. **Recreational and educational functions**
- 4) **Development functions**
  - a. Employment functions
  - b. Revenue

**Ecological uses**

The ecological services provided by our forests may be summed up as follows:

- i. **Production of Oxygen:** The main greenhouse gas carbon dioxide is absorbed by the forests as a raw material for photo synthesis. Thus forest canopy acts as a sink for carbon dioxide thereby reducing the problem of global warming caused by green house gas CO<sub>2</sub>
- ii. **Wild life habitat:** Forests are the homes of millions of wild animals and plants. About 7 million species are found in the tropical forests alone.
- iii. **Regulation of hydrological Cycle:** Forested watersheds act like giant sponges, absorbing the rainfall, slowing down the runoff. They control climate through transpiration of water and seed clouding.
- iv. **Soil Conservation:** Forests bind the soil particles tightly in their roots and prevent soil erosion. They also act as wind breakers.
- v. **Pollution moderators:** Forests can absorb many toxic gases and can help in keeping the air pure and in preventing noise pollution

**OVER EXPLOITATION OF FOREST**

Due to overpopulation, the forest materials like food, medicine, etc. are being exploited to meet the people's demand.

Hence exploitation of forest increases day by day

**Reason for over exploitation in India:**

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

**Causes of over exploitation:**

- ★ Increasing agricultural production
- ★ Increasing industrial activities
- ★ Increase in demand of wood resources

**Effects of Over exploitation:**

- ★ Led to migration of the farmers
- ★ Environment damage is heavy
- ★ Tropical forests are destroyed very fastly
- ★ Countless plants and animal species are endangered
- ★ Marine population will go into extinction

Dumping of wastes into land, water, & air is a severe problem

**Deforestation**

**DEFORESTATION**

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

**Deforestation in India:**

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

**Causes of Deforestation**

1. **Developmental projects**  
(Example) Big dams, hydroelectric projects, road construction etc
2. **Mining operations**  
(Example) Mica, coal, manganese, limestone etc.
3. **Raw materials for industries**  
(Example) for making boxes, furnitures, plywood, match boxes, pulp etc.
4. **Fuel requirements**  
(Example) Both rural & tribal population depend on forests for fuel
5. **Shifting cultivation** - Replacement of natural forest ecosystem lead to loss of plants & animal species
6. **Forest Fires:**

Due to human interruption & increase in temperature forest fire happens

### Effects or Consequences of deforestation:

- ★ **Global Warming** :Cutting & burning of forest trees increase CO<sub>2</sub> content in atmosphere. This causes global warming and depletion of ozone layer.
- ★ **Soil erosion**: Forest trees act as natural barrier to reduce the wind velocity & reduce soil erosion. Deforestation causes soil erosion, floods, landslides, and drought.
- ★ **Loss of genetic diversity**: Destroy the genetic diversity on earth which provides food & medicines for entire world.
- ★ **Loss of Biodiversity** When plants does not exist, animals that depend on them for food & habitat become extinct.
- ★ **Loss of Food grains**▶ Due to soil erosion, the countries loose the food grains.
- ★ **Flood & landslides** :Frequent floods, landslides in hilly areas and wind speed are heavy.
- ★ **Unemployment Problems** : People living around forest areas losses their livelihood.

### Preventive measures of conservation of forests

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

### **Case Studies**

#### **Timber Extraction**

#### **And Their Effects On Forests And Tribal People**

Timber Extraction: Logging for valuable timber, such as teak and rge trees per hectare but about a

dozen more trees since they are strongly interlocked with each other by vines etc. Also road construction for making approach to the trees causes further damage to the forests  
The major activities in forest area are

- 1) Timber extraction
- 2) Mining

The important effects of timber extraction are

- i) Thinning of forests
- ii) Loss of biodiversity, particularly tree breeding species
- iii) Soil erosion and loss of soil fertility
- iv) Migration of tribal people from one place to another in search of new forest
- v) Extinction of tribal people and their culture

### **Mining, And Their Effects On Forests And Tribal People:**

#### **MINING**

**Definition:** Mining is the process of extracting of metals from the mineral deposit.

#### **Types:**

1. **Surface mining**: It is process of extraction of raw materials form surface.
  2. **Underground mining**: It is the process of extraction of raw materials below the earth's surface  
**Open-Pit mining**: machines dig holes & remove the ores. **Example**: Iron, copper, limestone, marble etc
- a) **Dredging**: Scraping the minerals from under-water mineral deposit by chained buckets & draglines.
- b) **Strip mining**: The ore is stripped off by using bulldozers, stripping wheels.

#### **Effects of over exploitation of mineral resources**

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

#### **Environmental Damage caused by mining activities**

1. **De-vegetation & defacing of landscape:**

- ★ De-vegetation leads to severe ecological losses.
  - 2. **Groundwater contamination:**
    - ★ Mining pollutes the ground water.
    - ★ Sulphur present in many ores, is converted into sulphuric acid by microbial action.
    - ★ Hence water becomes acidic.
    - ★ Some heavy metals also leach into ground water
  - 3. **Surface water pollution:**
    - ★ The drainage of acid mine contaminates streams & lakes.
    - ★ Radioactive substances like Uranium contaminate the surface water & Kill the aquatic animals
  - 4. **Air pollution**
    - ★ Smelting & roasting done to purify the metal causes air pollution & affects the nearby vegetation.
- The SPM (suspended particulate matter) like Arsenic, cadmium, lead etc. contaminate the atmosphere & affects public health.
5. **Subsidence of Lands:**  
 Mining results in cracks in houses, tilting of buildings, bending of rail tracks etc
- Conservation of mineral resources:**
- ★ Search for new deposits
  - ★ Use, reuse and recycling of the mineral
  - ★ The low grade ores can be utilized by microbial leaching technique.
  - ★ Recharging of minerals can be done by plantation in and around the mining site

**Dams And Their Effects On Forests And Tribal People:**

**DAMS & THEIR EFFECTS ON FORESTS & TRIBAL PEOPLE:**

**Definition:** Dams are artificial structures built across the river to create reservoir to store water.

**Indian Scenario:**

- Maharashtra = more than 60
- Gujarat = more than 250 dams
- Madhya Pradesh = more than 130 dams

**Effects of dam on forest:**

- ★ Thousands of hectares of forest are cleared for river valley projects
- ★ Forest is also cleared for residential, office, buildings, storing materials, laying roads etc.

- ★ Dam construction kills wild animals & aquatic life
- ★ Hydroelectric projects spread water borne diseases.
- ★ Water logging leads to salinity & reduces the fertility of land.
- ★ **Example:**

**Narmada Sagar Project** = submerged 3.5 lakhs hectares of forest

**Tehri dam** = submerged 1000 hectares of forest

**Effects of dam on tribal people:**

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

**DAMS BENEFITS PROBLEMS:**

**Benefits of Constructing Dams:**

- ★ Control flood & store water
- ★ Divert water from river into a channel
- ★ Used for drinking & agricultural purposes
- ★ Built for generating electricity
- ★ Used for recreational purposes
- ★ Navigation & fishery can be developed in dam areas
- ★ Help for the socio economic development of the society
- ★ Used for irrigation during dry seasons
- ★ Prevent drought

**Problems of Constructing Dams:**

**Upstream Problem:**

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

**Down stream problems:**

- ★ Water logging causes salinity
- ★ Silt deposition in rivers
- ★ Salt water intrusion in river

- ★ Structural defects of dam destroy many living organisms

## Water Resources: Use And Over- Utilization Of Surface And Ground Water

### Use and over- utilization of surface and ground water

Water is used for domestic, irrigation and also industrial purposes. Out of the total

available water 75% is used for agriculture, 20% for industrial usage.

In our country ~93% of water is used for agricultural purposes.

**Ground water:** 9.86% of fresh water is ground water and it is 35-50% greater than surface water.

**Aquifer:** The layer of soil which is permeable has the ability to store water is called an

aquifer. It is generally made up of gravel, sand etc.

**Unconfined aquifer:** it is covered by permeable layer. The recharge of this layer is by rainfall or snowmelt.

**Confined aquifer:** sandwiched between impermeable layers. The recharge is through unconfined aquifer layers.

### HYDROLOGICAL CYCLE:

#### Evaporation:

Heat energy from the sun evaporates water from oceans, rivers, streams, lakes, ponds etc.

#### Condensation & Precipitation:

Precipitation (rainfall) occurs due to the condensation of water & falls to earth. Once water condenses, it is pulled into the ground by gravity.

#### Transpiration & respiration:

Plants absorb water through their roots & lose water through their leaves to the atmosphere & this process is transpiration.

Animals & plants break down sugars and produce energy with liberation of CO<sub>2</sub> & H<sub>2</sub>O is respiration.

**Thus the process of evaporation, condensation & transpiration is called hydrological cycle**

### OVER UTILIZATION OF WATER (EFFECTS)

#### *1. Decrease of Ground water:*

##### *Reason:*

- ★ Increased usage of ground water
- Inadequate rainfall
- Reduces the area for percolation of

rainwater

#### *2. Ground subsidence :*

When the groundwater withdrawal is more than recharge rate ground subsidence occur.

##### *Problems:*

- ★ Structural damage in buildings
- ★ Fracture in pipes
- ★ Reversing flow of canals & tidal flooding

#### *3. Lowering of Water table*

Water pressure is lower than the atmospheric pressure, hence disturb the hydrological cycle.

##### *Problems:*

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

#### *4. Intrusion of salt water:*

- ★ Over-exploitation of ground water lead to rapid intrusion of salt water from the sea
- ★ Water cannot be used for drinking & agricultures

#### *5. Earthquake & landslides*

Over utilization of ground water leads to earthquake, landslides & famine

#### *6. Drying up of wells:*

- ★ The groundwater withdrawal is more than recharge rate
- ★ This leads to drying up of dug wells & bore wells

#### *7. Pollution of water:*

- ★ Water containing nitrogen as nitrate fertilizer, percolates rapidly into ground & get polluted.

Water becomes unsuitable for potable when nitrate concentration exceeds 45 mg/lit.

### Floods

**Flood:** over flow of water, whenever the water in flow is greater than the carrying capacity of the channels flood occurs.

##### **Causes:**

- ★ Heavy rainfall, snow melt, sudden release of water from dams.
- ★ Prolonged down pour leading to overflowing of rivers and lakes
- ★ Reduction in carrying capacity due to obstructions or sediments etc.
- ★ Deforestation, overgrazing, mining increases water run off
- ★ Removal of dense forests from hilly regions

- ★ Submerges the flooded area
  - ★ Loss of soil fertility due to soil erosion
  - ★ Extinction of civilization at costal area
- Flood management:**
- ★ Dams and reservoirs can be constructed
  - ★ Embankments and proper channel management
  - ★ Flood way should not be encroached
  - ★ Forecasting or flood warning
  - ★ Decrease of run off by infiltration through afforestation or rain water harvesting etc

**Drought**

**DROUGHT**

Unpredictable delay in climatic condition occurring due to monsoon rain failure.

**Types:**

- Meteorological: in order of month or year, actual moisture supply at a given place consistently falls below critical level.
- Hydrological: deficiency in surface and subsurface water supplies
- Agricultural: inadequate soil moisture to meet the need of a particular crop at particular time or susceptibility of crops during different stages in its development
- Socioeconomic: reduction in the availability of food and social securing of people

**Causes:**

- Deforestation and lesser rainfalls coupled with cutting of trees for timber leads to desertification.
- Over drafting of ground water, subsidence of soil, drying of wetlands
- Pollution of soil with solid waste, industrial effluents etc makes land useless and dry
- Population explosion in man and livestock leads to enhanced requirement of timber, fuel wood, grazing
- Shifting cultivation

**Effects:**

- Increase of water in stream pond
- Ground water table get declined
- Loss of agricultural crops
- Loss of biodiversity
- Government spent a lot of money as drought relief fund

**Control measures:**

- Rain water harvesting
- Watershed management

- Encourage afforestation

**Conflicts Over Water**

**CONFLICTS OVER WATER:**

Unequal distribution of water led to inter-state or international disputes

**1.Conflicts through use:**

**a.Internation conflicts:** India & Pakistan fight to water from the Indus

Iran & Iraq fight for water from Shatt-al-Arab water

India & Bangladesh fight for Bhramaputra river

Mixico & USA fight over Colorado river

**b. National Conflicts:**

Cavery problem between Karnataka & Tamilnadu

Krishna problem between Karnataka & Andhra Pradesh

Siruvani water problem between Tamilnadu & kerala

**2.Construction of Dams/Power stations:**

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

**3.Conflict through pollution:**

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

**EXAMPLES OF WATER CONFLICTS:**

**Conflicts on Indian river:**

*Damodar river* → It is the most polluted river, carrying 43 industries discharges/

*Yamuna river* → 19,000 cubic meters of Water containing DDT derivatives are dumped in the river. *Ganga river* → 1000 cubic meters of polluted water from 68 industries are discharged in the river.

*Periyar river* → The River is dying due to mining of 4,37,000 tonnes of sand everyday & become salty due to intrusion of sea water

*Suriyapalayam river* → 34 tanneries located around this river contaminate drinking water, & make soil unfit for agriculture.

*Thamraparani river* → Continous brick making on its bank has converted the river into mud pools.

**Cavery water dispute:**

The Cauvery water dispute Tribunal set up on 2<sup>nd</sup> June 1990, directed Karnataka to ensure 205 TCMF of water to Mettur dam every Year  
Water conflicts in the middle east:

In Ethipia, Sudan & Egypt:

Problems in sharing Jordan, Tigris-Euphrates & Nile river water

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

## Dams-Benefits And Problems

### **DAMS & THEIR EFFECTS ON FORESTS & TRIBAL PEOPLE:**

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- ★ Thousands of hectares of forest are cleared for river valley projects
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- ★ Hydroelectric projects have led to loss of forest.
- ★ Dam construction kills wild animals & aquatic life
- ★ Hydroelectric projects spread water borne diseases.
- ★ Water logging leads to salinity & reduces the fertility of land.

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#### **Problems of Constructing Dams:**

##### **Upstream Problem:**

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- ★ Soil erosion, sedimentation, siltation occurs
- ★ Water logging retards plant growth
- ★ Spread of vector-borne & water borne diseases
- ★ Reservoir Induced Seismicity (RIS) causes earthquake

##### **Down stream problems:**

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

organisms

## Mineral Resources: Use And Exploitation

### **MINING**

**Definition:** Mining is the process of extracting of metals from the mineral deposit.

#### **Types:**

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

##### **mineral resources**

- Rapid depletion of mineral deposits
- Wastage & dissemination of mineral deposits
- Causes environmental pollution

- Vibration developed during mining causes earthquake
- Causes Noise pollution
- Reduces size & shape of forest areas
- Continuous mining causes landslides, Causes migration of tribal people.

### **Environmental Damage caused by mining activities**

#### **4. De-vegetation & defacing of landscape:**

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

#### **5. Groundwater contamination:**

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

#### **6. Surface water pollution:**

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

#### **4. Air pollution**

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

#### **5. Subsidence of Lands:**

Mining results in cracks in houses, tilting of buildings, bending of rail tracks etc

#### **Conservation of mineral resources:**

- ★ Search for new deposits
- ★ Use, reuse and recycling of the mineral
- ★ The low grade ores can be utilized by microbial leaching technique.
- ★ Recharging of minerals can be done by plantation in and around the mining site

### **Environmental Effects Of Extracting And Using Mineral Resources**

#### **Case Studies**

### **Food Resources: World Food Problems**

#### **World food Problems**

- ★ Problems mainly under nutrition and malnutrition

- ★ Natural calamities:-famine, drought, earthquake, flood, gale, storm
- ★ Disease and medical facilities
- ★ Pest damage:-insects, bacteria, viruses, parasites consume 60% of world"s food production
- ★ Hunger
- ★ Population explosion in rural areas
- ★ Environmental pollution
- ★ Lack of water for irrigation
- ★ Less rainfall due to deforestation
- ★ Livestock overgrazing

Overfishing

### **Changes Caused By Agriculture And Overgrazing**

#### **CHANGES CAUSED BY OVERGRAZING AND AGRICULTURE**

**Overgrazing:** Process of eating away the vegetation along with its roots without giving a chance to regenerate

- ★ Land degradation-leads to organically poor, dry, compacted soil cannot be used for further cultivation
- ★ Soil erosion-cover of vegetation gets removed from soil
- ★ Loss of useful species-good quality grasses and herbs with high nutritive value, when grazed lose even the root stocks which carry the reserve food for regeneration get
- ★ destroyed which gives raise to secondary species like parthenium, Lantane, Xanthium etc

To prevent –match the forage supplement to the herd"s requirement.eg.Switch grass

### **Effects Of Modern Agriculture, Fertilizer-Pesticide Problems**

#### **EFFECTS / IMPACTS OF MODERN AGRICULTURE:**

#### **1. Problems in using Fertilizers:**

##### **1. Micronutrient imbalance:**

- ★ Chemical fertilizers used in fields contain nitrogen, phosphorus & potassium (NPK)
- ★ Excess of fertilizers used in field's cause's micronutrient imbalance.

##### **2. Blue Baby syndrome:**

- ★ Nitrogenous fertilizers used in fields, contaminate the ground water.

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serious health problem called "Blue Baby syndrome"

- ★ This disease affects infants & leads to death.

### **3. Eutrophication:**

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

### **2. Problems in using pesticides:**

#### ***I. 1st generation Pesticides:***

Sulphuric, arsenic, lead or mercury are used to kill the pests.

#### ***II. 2nd generation pesticides:*** DDT

Dichlorodiphenyltrichloroethane is used to kill the pests. These chemicals produce number of side effects. They are as follows

- ★ **Death of non-target organisms** = Insecticides not only kill the target species, they also kill the non-target species.
- ★ **Producing new pests:** Some pest species survive even after the pesticide spray; they are immune & are called super pests.
- ★ **Bio-magnification:** Many pesticides are non-biodegradable & keep on concentrating in food chain.
- ★ The process is called bio-magnification & is harmful to the human beings
- ★ **Risk of cancer:** It directly acts as carcinogens, It indirectly suppress the immune system.

#### **Quality of an ideal pest:**

- ★ Must kill only the target species
- ★ Must be biodegradable
- ★ Should not produce new pests
- ★ Should not produce any toxic pesticide vapour
- ★ Excessive pesticides should not be used
- ★ Chlorinated & organophosphate pesticides are hazardous & they should not be used

#### **Water logging:**

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

#### ***Problems in water logging:***

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

#### **Causes of Water logging:**

e croplands

- ★ Heavy rain, Poor drainage.

#### **Remedy:**

- ★ Preventing excessive irrigation preventing water-logging by
- ★ Preventing water-logging by sub surface technology,
- ★ Bio drainage by eucalyptus tree etc

#### **Salinity:**

#### **Definition:**

- ★ Water evaporation leaves behind a thin layer of salts in the topsoil. & this process of accumulation of salts is called salinity of soil.
- ★ Saline soils are due to Sodium chloride, calcium chloride, magnesium chloride, sodium sulphate, sodium bicarbonates & sodium carbonates.
- ★ The pH of the water exceeds 8.0

#### **Problems in salinity**

- ★ Due to salinity the soil becomes alkaline & crop yield decreases

#### **Remedy:**

- ★ The salt deposit is removed by flushing them by good quality water

Salt water is flushed out by using sub-surface drainage system

#### **Water Logging**

#### **Salinity**

#### **Case Studies**

### **Energy Resources: Growing Energy Needs**

Growing energy needs: Population explosion, Luxurious life, Industries, Agriculture, mining, transportation, lighting, cooling, heating, building all need energy. Fossil fuels like coal, oil,

natural gas produce 95% of energy Sources of energy.

Development in different sectors relies largely upon energy. Agriculture, industry, mining, transportation, lighting, cooling and heating in buildings all need energy. With the demands of growing population the world is facing further energy deficit. The fossil fuels like coal, oil and natural gas which at present are supplying 95% of the commercial energy of the world resources and are not going to last for many more years. Our life style is changing very fast and from a simple way of life we are shifting to a luxurious life style. If you just look at the number of electric gadgets in your homes and the number of private cars and scooters in your locality you will realize that in the last few years they have multiplied many folds and all of them consume energy.

Developed countries like U.S.A. and Canada constitute about 5% of the

An average person there consumes 300 GJ (Giga Joules, equal to 60 barrels of oils) per year. By contrast, an average man in a poor country like Bhutan, Nepal or Ethiopia consumes less than 1 GJ in a year. So a person in a rich country consumes almost as much energy in a single day as one person does in a whole year in a poor country. This clearly shows that our life-style and standard of living are closely related to energy needs. Fig. 2.5.1 shows the strong correlation between per capita energy use and GNP (Gross National product). U.S.A., Norway, Switzerland etc. with high GNP show high energy use while India, China etc have low GNP and low energy use. Bahrain and Quata are oil rich states (UAE) and hence their energy consumption and GNP are more, although their development is not that high.

Table : refef Kousik

Renewable And Non Renewable Energy Sources

**RENEWABLE ENERGY RESOURCES**

**Nonconventional energy sources)**

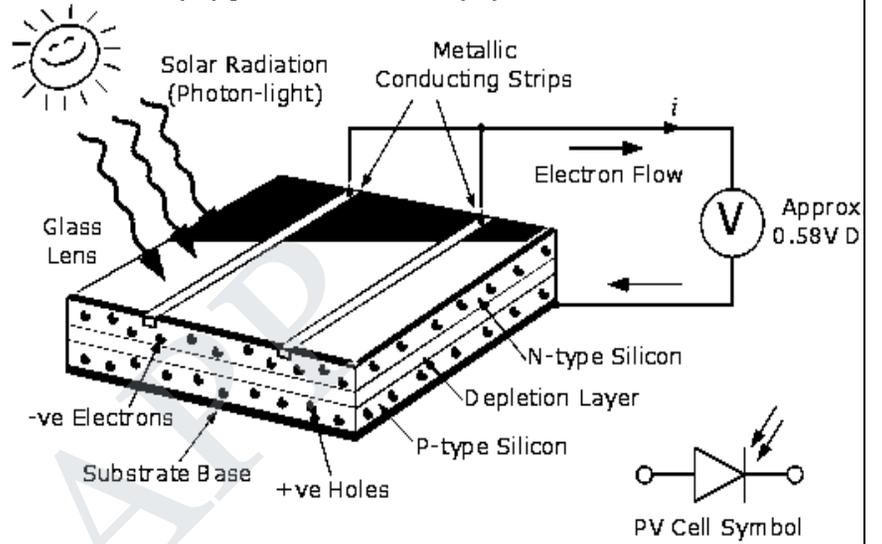
- Definition:** They are natural resources which can be regenerated continuously
- Examples:** **Solar energy** = Solar cells, Solar heat collectors, Solar water heater
- Wind energy** = Wind mills, Wind farms
- Ocean energy** = Tidal energy, Ocean Thermal energy, Geothermal energy
- Biomass energy** = Biogas, Bio fuel, Hydrogen fuel

**1. SOLAR ENERGY:**

The Energy which is received from the sun is called solar energy

**Methods of Harvesting Solar Energy**

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



- Solar cells consist of a p-type semiconductor and n-type semiconductor
  - They are in close contact with each other.
  - When the solar rays fall on the top layer of p-type semiconductor, the electrons from the valence band get promoted to the conduction band and cross the p-n junction into n-type semiconductor.
  - Thus potential difference produced between two layers causes flow of electrons (ie.,an electric current)
- Uses : It is used in calculators, electronic watches. Street lights, water pumps and to run radios and TVs,etc.

2.Solar Battery

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

3.Solar heat collectors

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

Uses :It is used in cold places, where houses are kept in hot condition .

4.Solar water heater

★ It consists of an insulated box inside of which is painted

- ★ It is also provided with a glass lid at the top to receive and store solar heat.
- ★ Inside the box, it has black painted copper tube placed
- ★ When the cold water is passed through the copper tube, water absorb the heat energy; in the form of IR radiation and is heated the cold water.
- ★ Then flows out into a storage tank.
- ★ From the storage tank, we can get hot water for further use through pipeline..

Significance of Solar energy:

They are noise & pollution free technique

Solar water heaters, solar cookers require no fuels

Solar cells can be used in remote & isolated forest & hilly regions

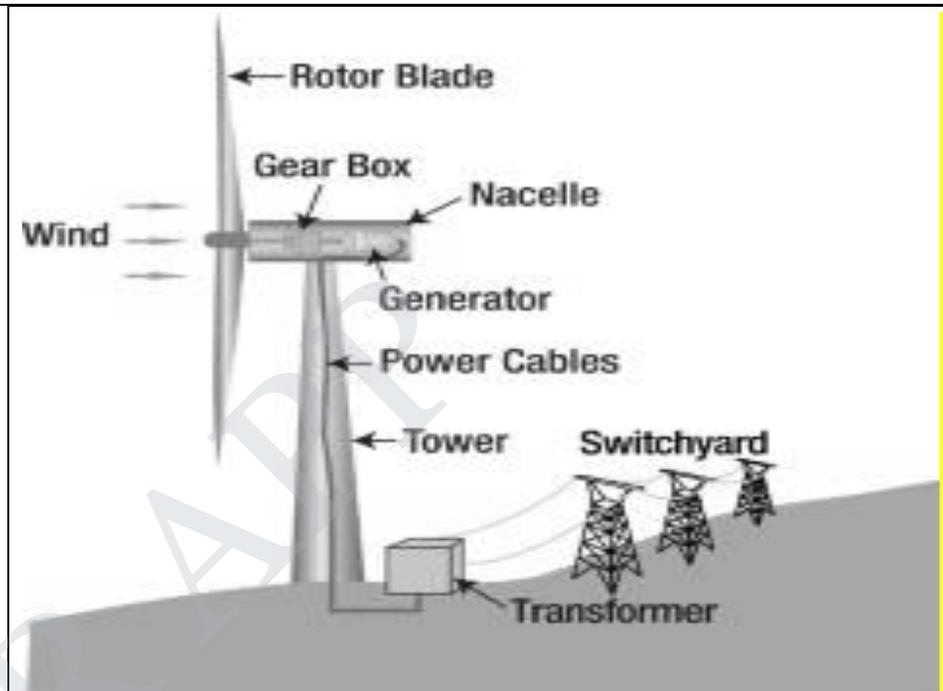
I. **WIND ENERGY**

*Definition*

- ★ Moving air is called wind.
- ★ Energy recovered from the force of the wind is called wind energy.
- ★ The energy possessed by wind is because of its high speed.
- ★ The wind energy is harnessed by making use of wind mills.

**Methods of Harvesting wind energy**

1. Wind Mills



- ★ The strike of wind on the propeller blades of the wind mill rotates it continuously.
- ★ The rotational motion of the blade drives causes low speed shaft which is connected with high speed shaft.
- ★ Also High speed shaft is connected with armature of generator which produce electricity.
- ★ Then produced electricity is used to run water pump, flour mills, electric generators etc

2. Wind farms

- ★ When a large number of wind mills are connected in serious way it forms wind farm. .
- ★ The wind farms produce a large amount of electricity.

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

**Advantages :** It does not cause any air pollution It is very cheap

**OCEAN ENERGY**

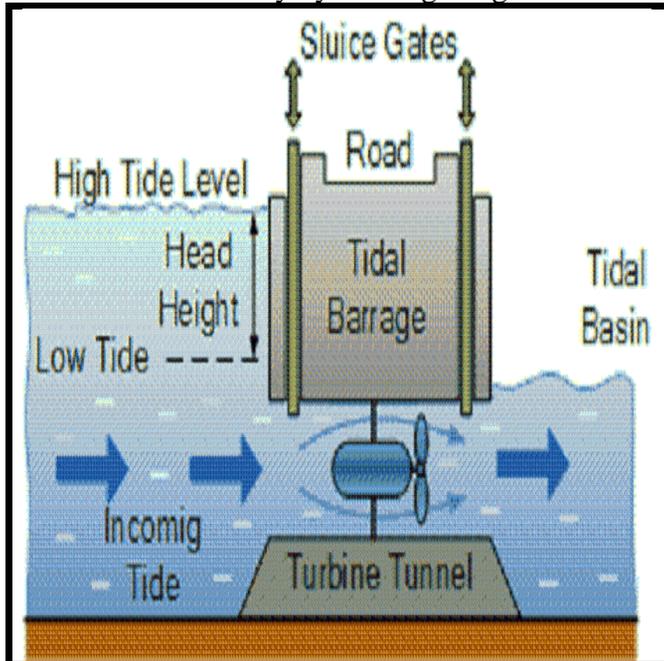
It can be generated by following ways.

**1. Tidal energy (or) Tidal power**

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

water in the oceans.

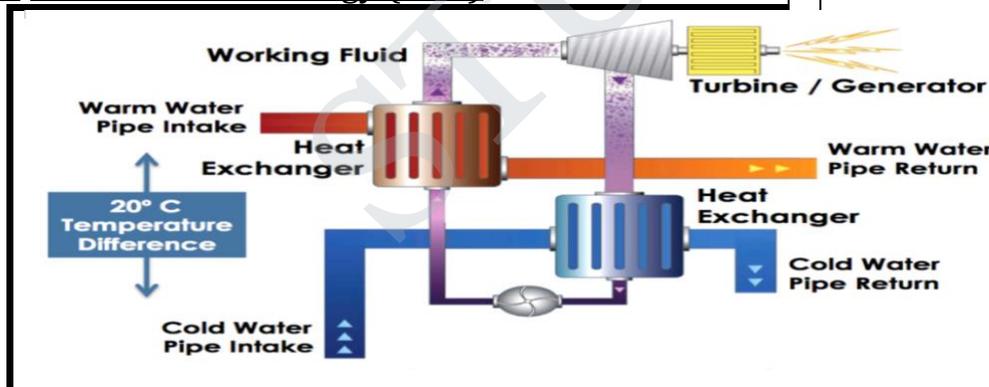
- ★ The tidal energy can be harnessed by constructing a tidal barrage.
- ★ During high tide, the sea-water which flow into the reservoir of the barrage, rotates the turbine, which inturn produces electricity by rotating the generators



Significance of tidal energy:

- ★ Do not require large areas Pollution free energy source
- No fuel is used & does not produce any wastes

## 2. Ocean thermal energy (OTE)



- ★ The temperature difference between the surface level & deeper level of the oceans are used to generate electricity

water is called ocean thermal energy

### Condition:

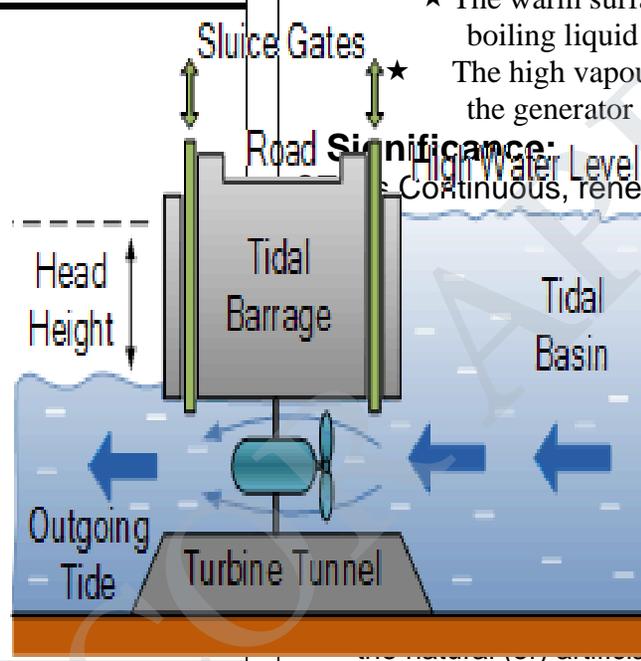
- ★ The temperature difference should be of 200C or more between surface water and deeper water

### Process

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

### Significance:

- ★ Continuous, renewable, pollution free, used to produce H<sub>2</sub>



### Significance:

energy  
used from high temperature & pressure  
the earth is called geothermal energy.

the hot water (or) steam comes from the  
cracks naturally

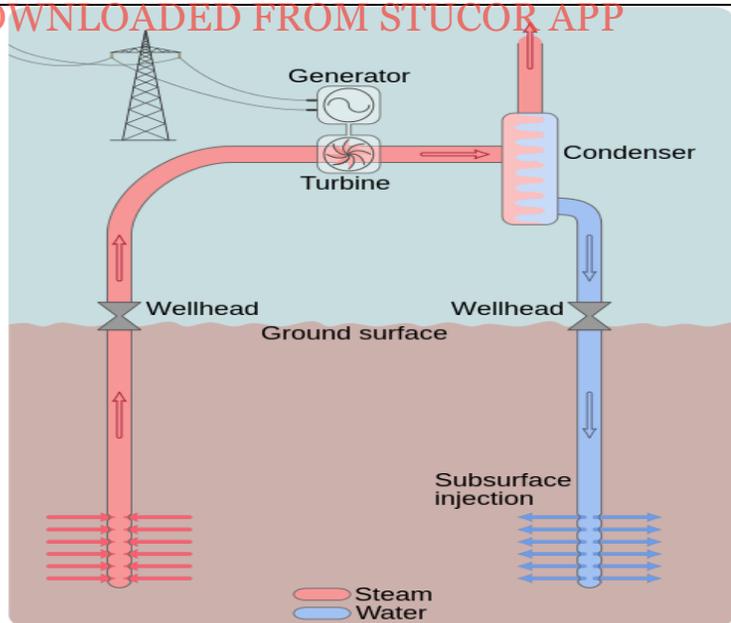
, we can drill a hole up to the .hot  
water to rush out through the  
ssure.

water (or) steam coming out from  
geysers is allowed to rotate the

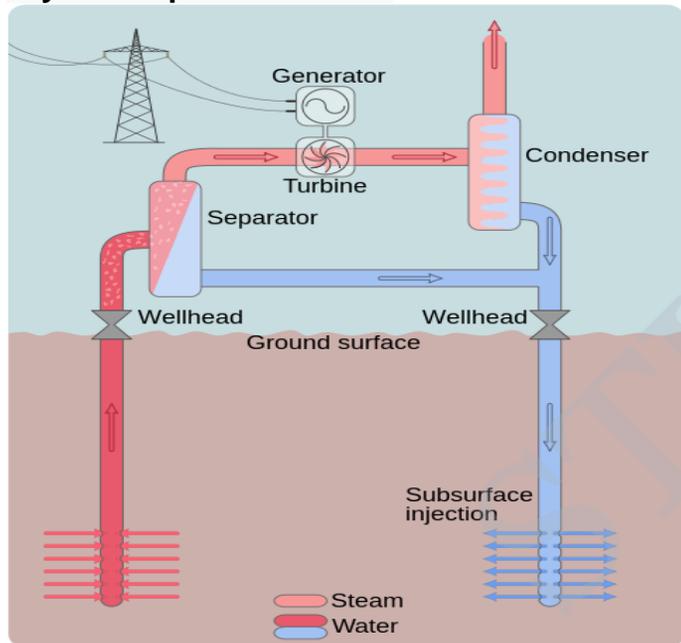
turbine of a generator to produce electricity.

### Significance:

- ★ Power generation is higher than solar & wind energies, Can be brought online quickly,  
act uses such as hot water bath, resorts, aquaculture,



**Dry steam power stations**

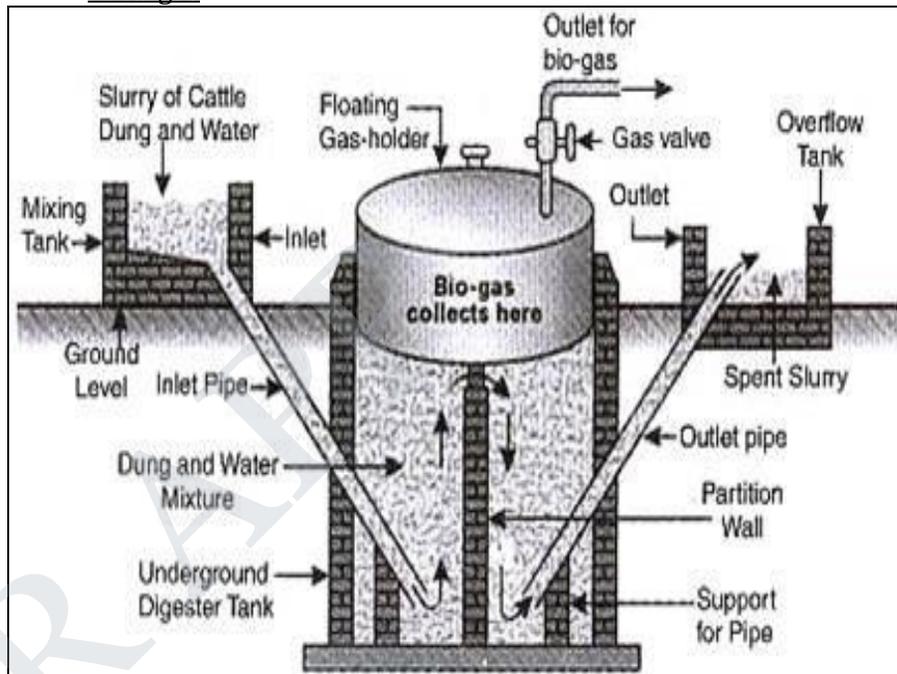


**flash steam power stations**

**BIOMASS ENERGY**

Biomass is the organic matter, produced by plants or animals,  
**Eg:** Wood, crop residues, seeds, cattle dung, sewage, agricultural wastes

1. Bio gas



**Fig. 4.11. Floating gas holder type plant**

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

2. Bio fuels

Biofuels are the fuels, obtained by the **fermentation** of biomass.

*Examples:*

- (a) Ethanol** : Easily produced from the **sugarcane**. Its calorific value is less than petrol,
- (b) Methanol** : obtained from **ethanol or sugar**-containing plants. calorific value is also too low than gasoline and diesel.
- (c) Gasohol** : Gasohol is a mixture of **ethanol and gasoline**.

3. Hydrogen Fuel

- ★ Hydrogen can be produced by thermal dissociation or photolysis or electrolysis of water
- ★ It possesses high calorific value



### Disadvantages of hydrogen fuel

1. Hydrogen is highly inflammable and explosive in nature
2. Safe handling is required

It is difficult to store and transport

### NON-RENEWABLE ENERGY (CONVENTIONAL ENERGY)

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

#### Various stages of coal:

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

#### Disadvantages

1. When coal is burnt it produces CO<sub>2</sub> causes global warming coal contains impurities like S and N, it produces toxic gases during burning

### 2.Petroleum

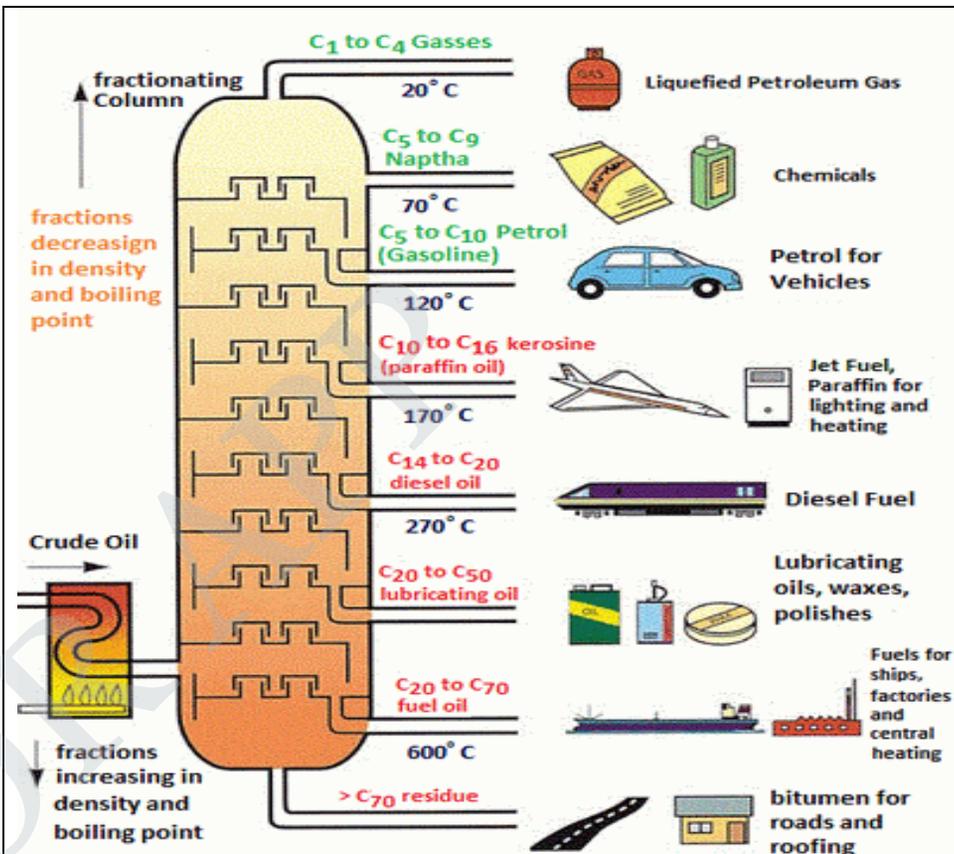
Petroleum or crude oil= hydrocarbons +small amount S, O, N.

#### Occurrence

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

#### Fractional distillation

Hydrocarbons are separated by fractioning the crude oil



### 3.LPG (Liquefied Petroleum Gas)

- ★ The petroleum gas, converted into liquid under high pressure is LPG
- ★ LPG is colorless and odorless gas.

During bottling some mercaptans is added, to detect leakage of LPG from the cylinder

#### Natural Gas

1. Mixture of 50-90% methane and small amount of other hydrocarbons.
2. Its calorific value ranges from 12,000-14,000 k-cal/m<sup>3</sup>.

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

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

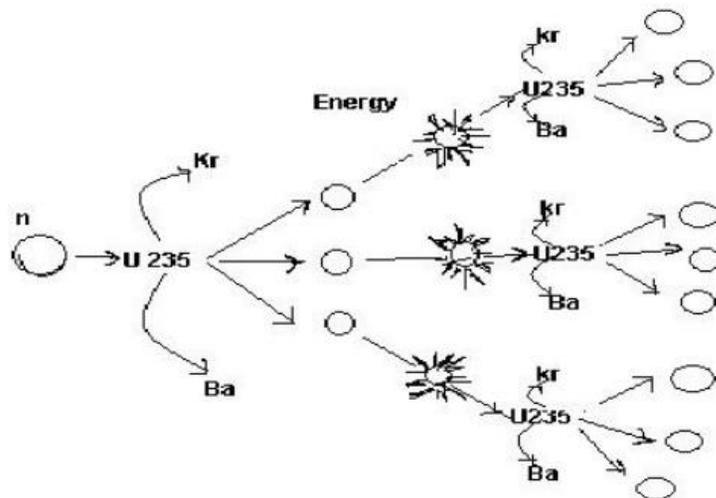
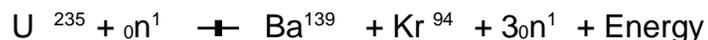
### 5.Nuclear Energy

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

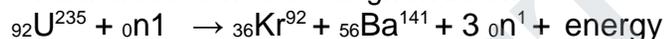
#### a) Nuclear Fission

Heavier nucleus is split into lighter nuclei, on bombardment by fast moving neutrons, and a large amount of energy is released. When  $U^{235}$  nucleus is hit by a thermal neutron, it undergoes the following reaction with the release of 3 neutrons

Eg: Fission of  $U^{235}$



- ★ Each of the above 3 neutrons strikes another  $U^{235}$  nucleus causing  $(3 \times 3)$  9 subsequent reactions.
- ★ These 9 reactions further give rise to  $(3 \times 9)$  27 reactions.
- ★ This process of propagation of the reaction by multiplication in threes at each fission is called chain reaction.
- ★ Fission reaction of  $U^{235}$  is given below.



**b) Nuclear fission-chain reaction**

**c) Nuclear fusion:**

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

Eg: Fusion of  $H^2$ . Two hydrogen-2 (Deuterium) atoms may fuse to form helium at 1 billion $^{\circ}C$  with the release of large amount of energy



**d) Nuclear power of India**

- ★ Ranapratap Sagar (Rajasthan)
- ★ Kalpakkam (Tamilnadu) Narora (U.P).

**Use Of Alternate Energy Sources**

**Use of alternate energy sources:** Refers to energy sources which are not based on the burning of fossil fuels or the splitting of atoms.

**Case Studies**

**Land Resources: Land As A Resource**

- ★ Land is the most important valuable resource for mankind.
- ★ It provides food, fiber, medicine.
- ★ It is a mixture of inorganic materials and organic materials.
- ★ It is used to construct building
- ★ It can acts as a dustbin for most of the wastes created by the modern society.

**Land degradation:**

It is a process of deterioration of soil or loss of fertility

Effects of land degradation:

1. Soil texture and soil structure are destructed.
2. It causes Loss of soil fertility.
3. It causes Loss of valuable nutrients.
4. It increase water logging, salinity, alkalinity and acidity problem.
5. It causes Loss of economic social and biodiversity.

Causes of land degradation:

1. **Population:**  
As population increase, more land is needed for producing food, fibre and fuel wood. So land is degraded due to over exploitation.
2. **Urbanization:**  
Urbanization reduces the agricultural land. Urbanization leads to deforestation, which in turn affects millions of plants and animals.
3. **Fertilizers and pesticides:**  
It affects fertility of the soil and causes land pollution.
4. **Damage of top soil:**  
Increase in food production generally leads to damage of top soil through nutrient depletion.
5. **Water logging,** soil erosion, salination and contamination of the soil with industrial wastes and cause land degradation.

**Soil erosion:**

The process of removal of superficial layer of the soil from

## Harmful effects of soil erosion:

1. Soil fertility decreases due to the loss of top soil layer.
2. Loss of its ability to hold water and sediments.
3. Sediments run off can pollute water and kill aquatic life.

## Types of soil erosion:

### 1. Normal erosion:

It is caused by gradual removal of top soil by the natural process. The rate of erosion is less.

### 2. Accelerated erosion:

It is caused by man made activities. The erosion is much faster than the rate formation of soil.

## Causes of soil erosion:

### 1. water

water causes soil erosion in the form of rain, run off, rapid flow and wave action.

### 2. Wind

It is an important climatic agent, which carry away the fine particles of soil creates soil erosion

### 3. Biotic agent:

Over grazing, mining and deforestation are the major biotic agent cause soil erosion. 35% of soil erosion is due to over grazing and 30% is due to deforestation.

### 4. Land slide:

It causes soil erosion.

### 5. Construction:

Construction of dams, buildings, roads removes protective vegetal cover and leads to soil erosion.

**Control of soil erosion (or) Soil conservation practices:** The art of soil conservation is based on following basic principles

1. To slow down the water for concentrating and moving down the slope in a narrow path.
2. To slow down the water movement when it flows along the slope
3. To encourage more water to enter into the soil.
4. To increase the size of soil particles.
5. Reduction in the wind velocity near the ground by growing vegetation.

## Methods of soil conservation :

### 1. Conservational tillage:

The process of mixing the residues from previous crops into the soil by ploughing is called conservational

organic matter, which in turn improve soil moisture and nutrients.

### 2. Organic farming:

Process of increasing organic input to the soil. E.g bio fertilizer

### 3. Crop rotation:

Process of growing different crops in successive year on the same land. It prevents the loss of fertility of the soil.

### 4. Contour Ploughing:

It is very useful areas with low rain fall, i.e placing some furrows to store water, which reduces runoff and erosion.

### 5. Mulching:

Soil is covered with crop residues and other form of plant litters.

### 6. Strip cropping:

Planting of crops in rows to check flow of water.

### 7. Terrace farming:

Conversion of steep slopes in to a series of broad terraces which run across the contour. It reduces soil erosion by controlling run off.

### 8. Agroforestry:

Planting crops in between rows of trees or shrubs, that can provide fruits and fuel wood. After harvesting the crops the soil will not be eroded because trees and shrubs will remain on the soil and hold the soil particles

### 9. Wind break:

Trees are planted in long rows along the boundary of cultivated lands, which block the wind and reduces soil erosion.

## Desertification:

It is a form of land degradation. It is a progressive destruction or degradation of arid or semi arid lands to desert.

### Causes:

#### 1. Deforestation:

Deforestation causes the formation of desert. If there is no vegetation, soil can not hold the water. It increases soil erosion, loss of soil fertility.

#### 2. Over grazing;

Cattle population increases overgrazing which increases soil erosion.

#### 3. Overutilization of water;

Over utilization of groundwater cause intrusion of saline water which is unfit for irrigation.

#### 4. Mining and quarrying:

These activities increase loss of vegetal cover leading to desertification.

**5. Climate change:**

Desertification causes Climate changes like failure of monsoon, frequent drought.

**6. Excessive use of fertilizers and pesticides:**

It leads to desertification due to increasing level of toxic substance

**Effects of desertification:**

- ★ Around 80% of productive land in the arid and semi arid regions are converted in to desert.
- ★ Around 600 million people are suffered by desertification

**Control methods of desertification:**

1. Afforestation and planting of soil binding grasses can reduce soil erosion, floods and water logging.
2. Crop rotation and mixed cropping improve the fertility of the soil .and reduce desertification.
3. Desertification is reduced by artificial covering with proper type of vegetation.
4. Shifting of sand can be controlled by mulching (use of artificial protective covering.)

**Man induced Landslides:**

If the landslides occur due to man made activities such as mining , construction of dams, roads, building, etc then it is called man induced landslides.

**Refer: Landslide**

**Land Degradation**

**Man Induced Landslides**

**Soil Erosion And Desertification**

**Role Of An Individual In Conservation Of Natural Resources**

**ROLE OF INDIVIDUAL IN CONSERVATION OF NATURAL RESOURCES:**

**1. Conservation of energy**

- Turn off lights, fans and other appliances when not in use.
- Dry the clothes in sun instead of drier
- Use solar cooker for cooking food on sunny days and will cut down LPG expenses.
- Grow trees and climbers near the houses and get a cool breeze and shade. This will cut off electricity charges on coolers and

- Ride bicycle or just walk instead of using your car or scooter.
- Always use pressure cooker.

**2. Conservation of water:**

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

**3. Conservation of soil:**

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

**4. Conservation of food resources:**

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

**5. Conservation of forest:**

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

6. Conservation of mineral resources:

- Search for new deposits
- Use, reuse and recycling of the mineral
- The low grade ores can be utilized by microbial leaching technique.
- Recharging of minerals can be done by plantation in and around the mining site.

Equitable Use Of Resources For Sustainable Lifestyles

Equitable Use of Resources for sustainable Life Style

Sustainable Development:

Sustainable development is defined as, "Meeting the needs of the present, without compromising the ability of future generations, to meet their own needs

UnSustainable Development:

Unsustainable development is defined as the degradation of the environment due to over utilization and over exploitation of the natural resources.

Lifestyle in most developed countries:

The most developed countries have only 22% of world's population, but they are using 88% resources, and their income is 85%. of global income

They are consuming more natural resources and polluting more. It causes the sustainability under threat.

Lifestyle in less developed countries:

The less developed countries have only 78% of world's population, but they are using 12% resources, and their income is 15% of global income.

They are consuming less natural resources and but polluting more due to more population. It causes the sustainability under threat.

Causes of unsustainability:

- Over population in poor countries , consume too low resource with low income.
- Rich countries consume more resource with more income.

Conditions for sustainable lifestyle:

- It is essential to distribute equally the natural resources equally income to everyone.

- The developed countries should minimize the usage of natural resource and provide the excess resource to poor countries.

Field Study Of Local Area To Document Environmental Assets : River / Forest / Grassland / Hill / Mountain.

UNIT – IV: SOCIAL ISSUES and THE ENVIRONMENT 7 Hr

Syllabus:

1. From Unsustainable To Sustainable Development
2. Urban Problems Related To Energy
3. Water Conservation, Rain Water Harvesting, Watershed Management –
4. Resettlement And Rehabilitation Of People; Its Problems And Concerns, Case Studies
5. Role Of Non-Governmental Organization
6. Environmental Ethics: Issues And Possible Solutions
7. Climate Change,
8. Global Warming,
9. Acid Rain,
10. Ozone Layer Depletion,
11. Nuclear Accidents And Holocaust,
12. Case Studies.
13. Wasteland Reclamation
14. Consumerism And Waste Products
15. Environment Production Act
16. Air (Prevention And Control of Pollution) Act
17. Water (Prevention And Control Of Pollution) Act –
18. Wildlife Protection Act
19. Forest Conservation Act
20. Enforcement Machinery Involved In Environmental Legislation
21. Central And State Pollution Control Boards-
22. Public Awareness

From unsustainable to sustainable development

## **(SUSTAINABLE DEVELOPMENT)**

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

### **Few parameters for achieving sustainable growth**

- ◆ Does it protect our biodiversity?
- ◆ Does it prevent soil erosion?
- ◆ Does it slow down population growth?
- ◆ Does it increase forest cover?
- ◆ Does it cut off the emissions of CFC, SO<sub>x</sub>, NO<sub>x</sub> and CO<sub>2</sub>?
- ◆ Does it reduce waste generation and does it bring benefits to all?

### **Dimensions of sustainable development**

Derived from interactions between society, economy and environment.

#### **Aspects**

#### **of sustainable development**

- ★ **Inter-generational equity** : states to hand over safe, healthy & resourceful environment to future generation.
- ★ **Intra-generational equity** : Technological development of rich countries should support the economic growth of poor countries.

### **Approaches for sustainable development**

- ★ **Developing appropriate technology** - locally adaptable, eco-friendly, resource efficient and culturally suitable.
- ★ **Reduce, reuse, recycle [3R] approach** – reduces waste generation and pollution
- ★ **Providing environmental education and awareness** – changing attitude of the people
- ★ **Consumption of renewable resources** – attain sustainability
- ★ **Conservation of non-renewable resources** – conserved by recycling and reusing
- ★ **Population control.**
- ★ **Resource utilization as per carrying capacity:** Any system can sustain a limited number of organisms on a long-term basis which is known as its carrying capacity
- ★ Carrying capacity has two basic components:
  1. **Supporting capacity** :The capacity to regenerate
  2. **Assimilative capacity** :The capacity to tolerate different stresses

#### **The Indian Context**

- ★ India has still to go a long way in implementing the concept of sustainable Development
- ★ **The National Council of Environmental Planning and Coordination (NCEP)** set up in 1972 was the focal agency in this regard.

The Ministry of Environment & Forests, set up in 1985 has

formulated guidelines for various developmental activities keeping in view the sustainability principles

### **Urban Problems Related To Energy**

#### **Urban Problems Related to Energy**

#### **Urbanization:**

Movement of human population from rural areas to urban areas for betterment of education, communication, health, employment etc.

#### **Causes:**

Cities are main centers of economic growth, trade, transportation, education, medical facilities and employment

#### **Urban sprawl:**

Urban growth is fast, so difficult to accommodate with their limited area. So cities spread into rural areas.

#### **Urban energy requirement:**

- i. Residential and commercial lighting.
- ii. Transportation means including automobiles and public transport for moving from residence to workplace.
- iii. Modern life-style using a large number of electrical gadgets in everyday life.
- iv. Industrial plants using a big proportion of energy
- v. A large amount of waste generation which has to be disposed off properly using energy based techniques.
- vi. Control and prevention of air and water pollution which need energy dependent technologies.

#### **Solution:**

- ◆ Use public transport instead of motor cycles
- ◆ Energy consumption must be minimized
- ◆ Use solar and wind energy

Impose strict laws, penalty, and energy audit

### **Water Conservation : Rain Water Harvesting, Watershed Management**

#### **WATER CONSERVATION**

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

#### **Need for water conservation**

- ◆ Changes in environmental factors
- ◆ Better lifestyles need more water
- ◆ Increase in population

- ◆ Over-exploitation of ground water leads to drought
- ◆ Agricultural and industrial activities require more water.

### Strategies of water conservation

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

### Methods of water conservation

1. Rain water harvesting
2. Watershed management

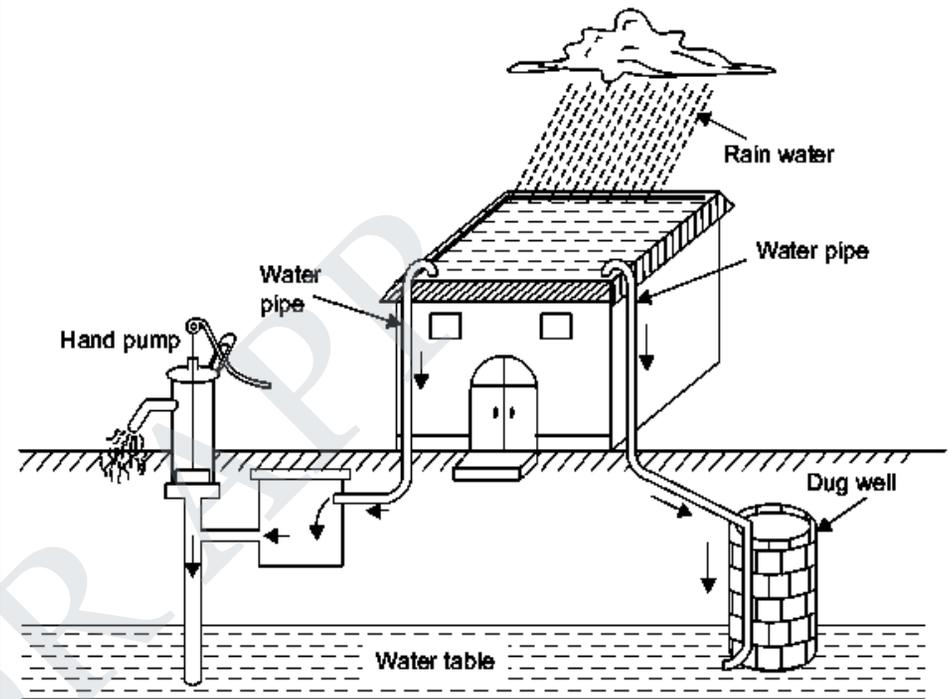
#### RAINWATER HARVESTING

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

Objectives of rain water harvesting

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

### Roof top Rainwater Harvesting Method:



Roof-top rainwater harvesting by recharging  
(i) through hand pump or (ii) through abandoned dugwell.

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

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

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

#### Advantages of Rain water Harvesting:

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

#### WATER SHED MANAGEMENT

Watershed is defined as the land area from which water drains due to

gravity into stream, Lake Etc. The management of rainfall and resultant run-off is called watershed management

### Objectives

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

### Factors affecting watershed

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

### Watershed management Techniques

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

### Maintenance of Watershed

- ◆ Water harvesting
- ◆ Afforestation
- ◆ Reducing soil erosion
- ◆ Scientific mining & Quarrying
- ◆ Public participation.

Minimizing livestock population

### Resettlement And Rehabilitation Of People

## RESETTLEMENT and REHABILITATION

### Causes

**Due to Developmental activities:** Dams, mining, roads, airports, etc

### **Due to Disaster**

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

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

**Due to conservation initiatives:** National park, sanctuary, forest reserves,

**Resettlement:** It is simple relocation / displacement of human population.

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

### Rehabilitation issues

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

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

### Its Problems And Concerns

### Case Studies

### ,- Role Of Non-Governmental Organization-

### Role of Non-Governmental Organization(NGOs)

1. Organization of literacy, post literacy and out of school education programmes;
2. Organization of saving and credit groups;
3. Organization of income generating programme to poor people through skills training;
4. Learning materials development and publication;
5. Capacity building of local organizations;
6. Organization of seminars for awareness building among the community people.
7. Monitor to the grass root organizations and service organizations;
8. Organization of training, seminars, workshops, meetings etc.
9. Research and evaluation of development program

### Some NGOs in India.

- ◆ Bombay Natural History Society (BNHS), Mumbai
- ◆ World Wide Fund for Nature (WWF-I), New Delhi:
- ◆ Center for Science and Environment (CSE), New Delhi
- ◆ CPR Environmental Education Centre, Madras:

Ahmedabad

- ♦ Bharati Vidyapeeth Institute of Environment Education and Research (BVIEER), Pune:
- ♦ Uttarkhand Seva Nidhi (UKSN), Almora:
- ♦ Kalpavriksh, Pune
- ♦ Salim Ali Center for Ornithology and Natural History (SACON), Coimbatore
- ♦ Wildlife Institute of India (WII), Dehradun:
- ♦ Botanical Survey of India (BSI):
- ♦ Zoological Survey of India (ZSI):

### Environmental Ethics: Issues And Possible Solutions

#### Environmental ethics:

#### Issues and possible solutions

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

#### *Function of Environment:*

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

#### *Environmental problems*

- ♦ Deforestation
- ♦ Population growth & urbanization
- ♦ Pollution due to effluent and smoke
- ♦ Water scarcity
- ♦ Land degradation

#### *Solutions to environmental problems*

- ♦ Reducing the energy sources & waste production
- ♦ Recycle and reuse of waste products
- ♦ Soil degradation must be minimized
- ♦ Sustainable development by conservation on resources
- ♦ Over-exploitation of natural resources must be reduced

- ♦ Protection of Bio – diversity
- ♦ Reducing the population & increase the economic growth

#### ***Ethical Guidelines***

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

Should share the precious earth resources

#### Climate Change

#### CLIMATE CHANGE

Climate is the average weather of an area. It is the general weather conditions, seasonal variations and extremes of weather in a region. Such conditions which average over a long period- at least 30 years is called climate.

The intergovernmental Panel on Climate Change (IPCC) in 1990 and 1992 published best available evidence about past climate change, the green house effect and recent changes in global temperature.

It is observed that earth's temperature has changed considerably during the geological times.

However, during the past 10,000 years of the current interglacial period the mean average temperature has fluctuated by 0.7- 1°C over 100 to 200 year period.

We have relatively stable climate for thousands of years due to which we have practised agriculture and increased in population. Even small changes in climatic conditions may disturb agriculture that would lead to migration of animals including humans.

Anthropogenic (man-made) activities are upsetting the delicate balance that has established between various components of the environment. Green house gases are increasing in the atmosphere resulting in increase in the average global temperature

This may upset the hydrological cycle, result in floods and droughts in level rise, changes in agri-

culture productivity, famines and death of humans as well as live stock.

The global change in temperature will not be uniform everywhere and will fluctuate in different regions. The places at higher latitudes will be warmed up more during late autumn and winter than the places in tropics. Poles may experience 2 to 3 times more warming than the global average, while warming in the tropics may be only 70 to 100% on an average.

The increased warming at poles will reduce the thermal gradient between the equator and high latitude regions decreasing the energy available to the heat engine that drives the global weather machine. This will disturb the global pattern of winds and ocean currents as well as the timing and distribution of rainfall. Shifting of ocean currents may change the climate of Iceland and Britain and may result in cooling at a time when rest of the world warms.

By a temperature increase of 1.7 to 4.7°C the global hydrological cycle is expected to intensify by 7 to 10%. Disturbed rainfall will result in some areas becoming wetter and the others drier. Although rainfall may increase, higher temperatures will result in more evapo-transpiration leading to annual water deficit in crop fields

**Global Warming,**

## **GREEN HOUSE EFFECT**

The progressive warming of earth surface due to blanketing effect of manmade CO<sub>2</sub> in the atmosphere is greenhouse effect.

**Greenhouse gases** like CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, CFC causing global warming.

Human activities increase the greenhouse effect & raise the atmospheric temperature. This is called **global warming**.

**Effect on global warming**

**Sea level:**

Glacier melting & thermal expansion of ocean raise the sea level

**Agriculture and forestry:**

- Climatic pattern shifts, rainfall is reduced,
- Soils are dried, result in drought and less crop production

**Water resources:**

- Rainfall pattern change,
- Drought & Floods will become common,
- Rise in temperature will increase water demand

**Terrestrial ecosystems**

- Animals & plants will have problems in adapting.
- They will be in risk of extinction

**Human health**

- This increase water borne diseases, infectious diseases caused by mosquitoes.

**Preventive Measures of Global Warming:**

- Reducing CO<sub>2</sub> emission by reducing use of fossil fuels
- Utilizing renewable resources like wind, solar, hydro power etc.
- Plant more trees
- Adopt sustainable agriculture.
- Use natural gas instead of coal
- Stabilize population growth

Remove CO<sub>2</sub> by photosynthetic algae

**Acid Rain**

## **ACID RAIN**

Normal rain is slightly acidic due to CO<sub>2</sub> gas.

The pH of the rain water is further acidic due to SO<sub>2</sub> & NO<sub>2</sub> gases. This type of precipitation of water is called acid rain

**Formation of Acid rain**

Thermal power plants, industries, & vehicles release nitrous oxide & sulphur dioxide into atmosphere. When these gases react with water vapour they form acids



**Effects of acid rain**

**On terrestrial and Lake Ecosystem**

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

**Control measures**

- By Clean combustion technologies
- Using pollution control equipment's
- Replacement of coal by natural gas
- Liming of lakes and soils.
- Coal with lower sulphur content can be used

Emission of SO<sub>2</sub> & NO<sub>2</sub> from industries can be reduced

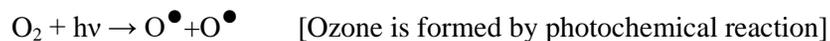
**Ozone Layer Depletion**

## **OZONE LAYER DEPLETION**

- Ozone gas O<sub>3</sub> found throughout the atmosphere is formed in the stratosphere by photo-chemical reaction.
- It protects us from the Ultraviolet radiation of the sun.
- Recent evidence shown that ozone layer is becoming thinner & holes have developed.

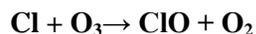
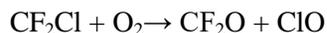
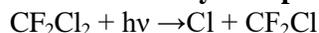
**Ozone depleting chemicals**

Chlorofluorocarbon (CFC) [Used in refrigerators, propellant, spray cans, blowing agent, foam agent],  
Hydro chlorofluoro carbon (HCFC), [Used in refrigerants, blowing agents]  
BromofluoroCarbon (BFC) [Used in fire extinguisher].  
Formation of Ozone:



$O^\bullet + O_2 + M \rightarrow O_3 + M$  [atomic oxygen reacts with molecular oxygen to form ozone, M = third body like Nitrogen]

**Mechanism of ozone layer Depletion:**



- In 1970 it was found that ozone layer was attacked by CFCs
- Each Chlorine atom attack ozone molecule.
- Loss in ozone increases the UV radiation reaching the earth surface

**Effects**

**On human health** – Skin cancer, Non melanin skin cancer, slow blindness called keratitis, cataracts, Allergies, reduces human resistivity, infectious diseases

**On aquatic systems**- Affects phytoplankton which absorb more CO<sub>2</sub>, affects fish, larval crabs

**On materials**- Degradation of paints, plastics, & other polymeric material result in economic loss.

**On climate** – increasing the average temperature of the earth surface & cause global warming.

**Unit of Ozone**

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

**Control Measures**

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

**Nuclear Accidents And Holocaust**

## **NUCLEAR ACCIDENTS & HOLOCAUST CASE STUDIES**

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

### **1. Bhopal gas tragedy:**

On night of 3rd December 1984 in Bhopal city of Madhya Pradesh at Union carbide India Ltd, which manufacture carbonate pesticides using methyl ant, the reactor got exploded & 40 tons

of MIC leaked over 40 sq.km area.

**Nature of MIC:** It is a toxic gas, affects lungs, eyes & causes irritation in skin. Remove oxygen from lungs & cause death.

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

### **2. Chernobyl Nuclear Disaster: (Nuclear Pollution)**

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

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

### **3. Nuclear holocaust in Japan:**

- ❖ In 1945 two nuclear atom bombs were dropped on Hiroshima & Nagasaki cities in Japan.
- ❖ This explosion emitted neutrons, gamma radiations, strontium (Sr\*90)
- ❖ This Sr90 has the property of replacing calcium in the bones & so many people were affected by bone deformities
- ❖ 1,00,000 people were killed,

**Effects of nuclear holocaust:**

- ❖ Nuclear winter [Black soot formed will absorb all UV-radiations & prevent UV radiation to reach the earth.
- ❖ This result in cooling effect & water evaporation will also reduce.
- ❖ This process opposite to global warming is called nuclear winter.
- ❖ Ignition of all combustible material, destroy all living beings, material crushing, destruction of homes

**Control Measures**

- ❖ Suitable precautions to avoid accident
- ❖ Constant monitoring of the radiation level

Checks and control measures done by Atomic Energy Regulatory Board

**Case Studies**

**Wasteland Reclamation**

## **WASTE LAND RECLAMATION**

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

**Types of waste land**

1. **Uncultivable waste land** – Barren rocky areas, hilly slopes, sandy deserts.
2. **Cultivable waste land**- degraded forest lands, gullied lands. Marsh lands, saline land etc.

**Causes for waste land formation**

- ★ Soil Erosion, Deforestation, Water logging, Salinity.

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

### Objectives of waste land reclamation

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

### Methods of waste land reclamation

- ❖ Drainage
- ❖ Leaching
- ❖ Irrigation practices
- ❖ Green manures and bio fertilizers
- ❖ Application of Gypsum

Afforestation programme

### **Consumerism And Waste Products**

### **CONSUMERISM AND WASTE PRODUCTS**

- ❖ Consumerism – Consumption of resources.
- ❖ Traditionally favorable rights of sellers
- ❖ Right to introduce product, price, Incentives
- ❖ Traditionally buyer rights
- ❖ Right to buy, right to expect the product to perform as claimed

### Important information to be known by buyers

- ❖ About ingredients,
- ❖ Manufacturing dates,
- ❖ Expiry date, etc.
- ❖ Health and happiness.

### Objectives of Consumerism

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

### **SOURCES OF WASTES**

- ❖ Glass, papers, garbage's, food waste, automobile waste, dead animals etc.

### E – Waste

- ❖ Computers, printers, mobile phones, Xerox machines, calculators etc.

### Factors affecting consumerism and generation of wastes

- ❖ People over – Population
- ❖ Consumption over – Population

### Effects of wastes

- ❖ Dangerous to human life Degrade soil
- ❖ Non-biodegradable plastics reduce toxic gases.

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

### **Environment Production Act**

### **Air (Prevention And Control Of Pollution) Act**

### **Water (Prevention And Control Of Pollution) Act**

### **Wildlife Protection Act**

### **Forest Conservation Act**

### **Enforcement Machinery Involved In Environmental Legislation**

### **ENFORCEMENT MACHINERY INVOLVED IN ENVIRONMENTAL LEGISLATION**

- ★ Target of 33% of land to be covered by forest not achieved
- ★ Rivers turning to open sewers
- ★ Big towns and cities polluted
- ★ Wild life endangered
- ★ EFP (Effluent Treatment Plant) or Air Pollution Control devices are expensive – leads to closure of units. Government should provide subsidy for small units.
- ★ Pollution control laws not backed up by policy pronouncements or guidelines
- ★ Chairman of PCB – political nominee. Hence political interference. Involving public in decision making envisaged by policy statement of the ministry of environment and forest (1992) is only in paper

### **Central And State Pollution Control Boards**

### **CENTRAL AND STATE POLLUTION CONTROL BOARDS**

### **CENTRAL POLLUTION CONTROL BOARD (CPCB)**

- ❖ Advices Central Government in matters – prevention and control of water pollution
- ❖ Coordinates SPCB and provide technical assistance and guidance

- ❖ Training programs for prevention and control of pollution by mass media and other ways
- ❖ Publishes statistical and technical details about pollution
- ❖ Prepares manual for treatment and disposal of sewerage and trade effluents
- ❖ Lays STD for water quality parameters
- ❖ Plans nation-wide programs for prevention, control or abatement of pollution
- ❖ Laboratories for analysis of water, sewage or trade effluents

**STATE POLLUTION CONTROL BOARD (SPCB)**

SPCB has similar functions as SPCB and governed by CPCB

- ❖ SPCB advises state government w.r.t. location of any industry that might pollute
- ❖ Lays std for effluents to take samples from streams, wells or trade effluents or sewage passing through an industry. Samples taken are analyzed at recognized labs. If the sample is not confirming to the water quality std, then the unit is neglected
- ❖ Every industry to obtain consent from PCB before commencing an effluent unit by

applying in prescribed form with fe

**Public Awareness.**

**PUBLIC AWARENESS**

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

**Objectives of public awareness**

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

**Methods to create environmental awareness**

- ♦ **Environmental awareness** must be imparted in schools and colleges.
- ♦ **Through mass – media** can educate the people on various environmental issues through cartoons, street plays etc.
- ♦ **Cinema-** the films exposing environmental awareness may be released with tax free.
- ♦ **Newspapers-** write an article about issues.
- ♦ **Audio - Visual media-** Special audio-visual and slideshows

ic places.

- ♦ **Voluntary organizations-** NSS, NCC should be effectively utilized for spreading the environmental issues.
- ♦ **Traditional techniques-** Dramas, folk plays are used to spread environmental messages to the public.
- ♦ **Arranging competitions-** Essay writing, story writing and painting competitions are organized about environmental problems.
- ♦ **Leader’s appeal-** Politicians, cine actors can make an appeal to the public about the environmental protection.

**NGOs-** They can effective in organizing public movements for protection of environment

**UNIT- V:HUMAN POPULATION and THE ENVIRONMENT 6 Hr**

**Syllabus:**

- 23.Population Growth, Variation among Nations**
- 24.Population Explosion**
- 25.Family Welfare Programme**
- 26.Environment And Human Health**
- 27.Human Rights**
- 28.Value Education**
- 29.HIV / AIDS**
- 30.Women and Child Welfare**
- 31.Role of Information Technology in Environment and Human Health**
- 32.Case Studies**

**Population Growth (Among various nation)**

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

**Causes of rapid population growth**

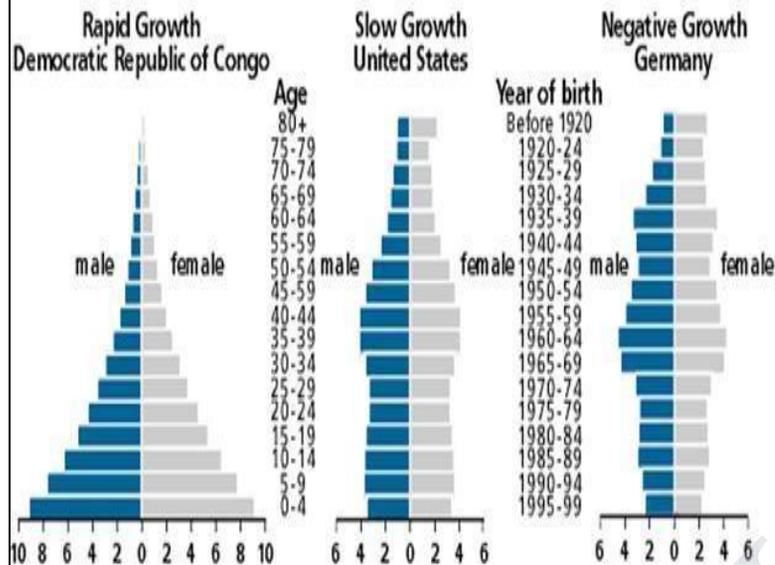
- ★ The rapid population growth is due to decrease in death rate and increase in birth rate.
- ★ Availability of antibiotics, immunization, increased food production, clean water and air decreases the famine-related deaths.

In agricultural based countries, children are required to help parents in the field that is why population increases in the developing countries.

## Characteristics of population growth

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

## Variation of population based on age structure



- ★ Pre-productive population (0-14 years)
- ★ Reproductive population (15 – 44 years)
- ★ Post reproductive population (above 45 years)

### 1. Pyramid shaped :

- ★ India, Bangladesh, and Ethiopia. [Large no of young people enter into reproductive age group, hence Population growth increases].
- ★ This is characteristic of traditional poor countries indicated by:-

- High Fertility
- High Morality
- High proportion of children (young age)
- Moderate Growth Rate.

### 2. Bell shaped :

- ★ France, USA, and UK. [ pre-productive age group population & reproductive age group population are almost equal, hence **population growth is stable**].

★ levelled countries characterised

by:-

- Declining Fertility
- Declining Mortality
- Moderate Growth Rate
- Aging population

### 3. Urn shaped :

Germany, Italy, and Japan [ pre-productive population is less than reproductive age group, hence **population growth decreases**

- ★ These are future developed countries characterised by:-

- Low fertility
- Low Mortality
- Ceasing Growth Rate

Very old Population

## Population Explosion: Population Explosion:

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

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

Causes of population explosion:

- \* Modern medical facilities reduces death rate & increases birth rate,
- \* Increase of life expectancy,
- \* Illiteracy.

### Effects of population explosion

- ★ Poverty : infant mortality is the tragic indicator of poverty
- ★ Population Explosion leads to Environmental degradation,
- ★ population Explosion causes over-exploitation of natural resources,
- ★ Renewable resources like forests are under threat,
- ★ Increase in population decrease disease, communal war
- ★ Overcrowding leads to development of slums
- ★ Lack of basic amenities like water, education , health etc.
- ★ Unemployment and low living standard of people

### Remedy

- ★ Reducing fertility rate through birth control programme.
- ★ Adoption of any family planning methods

- ★ Health and sanitation
- ★ Recreation facilities
- ★ Changes in social outlook
- ★ High standard of living
- ★ Changes in religious outlook
- ★ Respectful position for women
- ★ Creating awareness
- ★ Easy accessibility to control methods

**Population Stabilization Ratio:**

- ★ **Developed Countries:**  
Stabilization ratio = 1, indicate zero population growth

- ★ **Developing countries :**

Stabilization ratio = nearing 3, expected to slow down by 2025

**Family Welfare Programme**

**FAMILY WELFARE PROGRAMME**

**Objectives**

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

**FAMILY PLANNING PROGRAMME**

**Objectives**

- ★ Reduce infant mortality rate.
- ★ Achieve 100% of birth, death, marriage, pregnancy registration
- ★ Encourage late marriages, late child-bearing.
- ★ Improve women's health, education, employment.
- ★ Prevent & Control of communal diseases.
- ★ Promote small family norms
- ★ Making free & compulsory education upto 14 yrs.
- ★ Constraint spread of AIDS

**Fertility control methods:**

1. **Traditional method :** taboos and folk medicine

2. **Modern method:**

(i) **Permanent method :** (Sterilization done by minor surgery)

a) **Tubectomy:** female sterilization done by tying the tubes carrying ovum to uterus.

b) **Vasectomy:** male sterilization, done by tying the tubes carrying the sperms.

(ii) **Temporary method**

- ★ Condoms used by males to prevent sperms
- ★ IUDs inserted by doctor in the uterus

**Environment And Human Health**

**ENVIRONMENT AND HUMAN HEALTH**

1. **Physical Hazards :**

- ◆ **Radioactive and UV radiations:** affects the body cell, causes skin cancer
- ◆ **Global warming:** cause famine & mortality,
- ◆ **Chlorofluro carbons:** damage ozone layer

2. **Chemical Hazards :**

- ◆ **Combustion of Fossil fuels:** Asthma & lung diseases,
- ◆ **Industrial effluence:** cause cancer & death, **Pesticides:** affect food chain,
- ◆ **Heavy metals:** contaminate water.

3. **Biological Hazards:**

**Bacteria, Viruses, Parasites:** Diarrhea, malaria, parasitic worms, cholera

**Human Rights**

**HUMAN RIGHTS**

- ❖ Human rights are the fundamental rights, which are possessed by all human beings irrespective of their caste, nationality, sex and language.
- ❖ IN 1948 Universal Declaration of Human Rights UNKHR was established by UN.

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

## INDIAN CONSTITUTION

- ★ **Article 14:** provides equality
- ★ **Article 15:** prohibits discrimination on caste, sex, religion
- ★ **Article 16:** equal opportunity for all citizens
- ★ **Article 19:** freedom of speech, expression, forming union
- ★ **Article 20:** protection from conviction
- ★ **Article 22:** rights of person in custody
- ★ **Article 23:** prohibits traffic in human being
- ★ **Article 24:** prohibits exploitation of labor children
- ★ **Article 25:** freedom of profession, religion & practice
- ★ **Article 26:** right to establish charitable & religious institution
- ★ **Article 27:** prohibits paying tax for any religion
- ★ **Article 28:** guarantees secular character in educational institution
- ★ **Article 29:** guarantees to conserve language of minorities
- ★ **Article 30:** right of linguistic minority
- ★ **Article 32:** right to constitutional remedies

### Value Education

## VALUE EDUCATION

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

### Types

1. **Formal education:** Self related learning process, all will read, write, get jobs, and tackle any problem with formal education.
2. **Value education:** Analyze our behavior, provide proper direction to youth, and know right & wrong.
- 3.

**Value-based environment education:** knowledge about principles of ecology, biodiversity, care for natural resources, know to safe and clean environment.

### Objectives

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

### Concept of value Education:

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

### Methods of Imparting value Education:

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

### Types of values

1. **Universal values:**[Importance of the human conditions, reflect in life, joy, love, compassion, tolerance, truth etc].

2. **Cultural value:-**[Right, wrong, good and bad, behavior of human being].

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

4. **Global values:-**[Human civilization, if harmony is disturbed anywhere there will be an ecological imbalance].

5. **Spiritual values:**[Self-restraint, discipline, reduction of wants]

### Hiv / Aids

### Women And Child Welfare

## WOMANS WELFARE

### Need of Women Welfare

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

### Objectives

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

### Objectives of A National Commission For Women

- ★ To examine constitutional & legal rights for women
- ★ To review existing legislations
- ★ To sensitize the enforcement & administrative machinery to women's causes

## Various Organizations towards Women Welfare:

- i. **The National Network for Women & Mining (NNWM) :** *fighting for gender audit of India's mining companies*
- ii. **United Nations Decade for Women:** *inclusion of women welfare related issues on international agenda.*
- iii. **International Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW):** *Protection & Promotion of women's upliftment*
- iv. **Non-Government Organizations(NGO's):** *Empower, educate village women & making self-dependent*
- v. **Ministry for Women and Child Development :** *work for upliftment of women by family planning, health, education & awareness*

## ROLE OF INFORMATION TECHNOLOGY IN ENVIRONMENT:

Information technology means collection, processing storage & dissemination of information

### 1. REMOTE SENSING [RS]

- ★ Gathering information about an object without coming in contact with it is called remote sensing.
- ★ Any force like acoustic, gravity, magnetic, electromagnetic etc. could be used for remote sensing.

### Applications

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

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

**Landover :** *Gives spatial information on land, RS data is converted to map*

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

### 2. DATA BASE:

Collection of inter related data on various subjects.

### Applications

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

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

3. **Environmental Information System (ENVIS) :** *Database on pollution control area, clean technology, biodiversity, remote*

### 3. GEOGRAPHICAL INFORMATION SYSTEM (GIS)

It is a technique of superimposing various thematic maps using digital data on a large number of inter-related aspects.

#### Application

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

### 4. SATELLITE DATA

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

### 5. WORLD WIDE WEB :

It provides **Current data.**

#### Applications

- ★ Online learning

Digital files or photos, animations on environmental studies

### ROLE OF INFORMATION TECHNOLOGY IN HUMAN HEALTH

The health service technology involves three systems

- ★ Finance and accounting
- ★ Pathology
- ★ Patient Administration – clinical system.

#### Applications

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

Drugs and its replacement

### **Role Of Information Technology In Environment And Human Health**

#### **Case Studies**