

**LECTURE NOTES ON**

**Environmental Studies**

**PREPARED BY CHIRANJEEVI PATTNAIK**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**B.O.S.E Cuttack**

## SYLLABUS :-

### 1. THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, scope & importance, need for public awareness.

### 2. NATURAL RESOURCES

Renewable & non renewable resources:

(a) Natural resources & associated problems:

- Forest resources: Use & over exploitation, deforestation, case studies, Timber extraction mining, dams & their effects on forests & tribal people.

- Water resources: Use & over utilization of surface & ground water, floods drought, conflicts over water, dam's benefits & problems.

- Mineral Resources: Use & exploitation, environmental effects of extracting & using mineral resources.

- Food resources: world food problems, changes caused by agriculture & over grazing, effects of modern agriculture, fertilizers - pesticides problems, water logging, salinity.

- Energy resources: growing energy need, renewable & non-renewable energy sources, use of alternate energy sources, case studies.

- Land Resources: Land as a resource, land degradation man induces land slides, soil erosion & desertification.

(b) Role of individuals in conservation of natural resources.

(c) Equitable use of resources for sustainable life styles.



### 3. SYSTEMS

- Concept of an ecosystem.
- Structure & function of an ecosystem.
- Producers, consumers, decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs & ecological pyramids.
- Introduction, types, characteristic features, structure & function of the following ecosystem.
- Forest ecosystem
- Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries)

### 4. BIODIVERSITY AND ITS CONSERVATION

- Introduction - Definition: genetics, species and ecosystem diversity.
- Biogeographically classification of India.
- Value of biodiversity: consumptive use, productive use, social ethical, aesthetic & option values.
- Biodiversity at global, national & local level.
- Threats to biodiversity: Habitats loss, poaching wild life, man wildlife conflicts.

### 5. ENVIRONMENTAL POLLUTION:

Definition, causes, effects & control measures of:

- |                      |                       |
|----------------------|-----------------------|
| (a) Air pollution    | (e) Noise pollution   |
| (b) Water pollution  | (f) Thermal pollution |
| (c) Soil pollution   | (g) Nuclear hazards.  |
| (d) Marine pollution |                       |

Solid waste management: causes, effects and control measures of Urban & industrial wastes.

Role of an individual in prevention of pollution.

Disaster management: Floods, earth quake, cyclone & landslides.



## 6. SOCIAL ISSUES AND THE ENVIRONMENT

- Form unsustainable to sustainable developments.
- Urban problems related to energy.
- Water conservation, rain water harvesting, water shed management.
- Resettlement & rehabilitation of people; its problems & concerns.
- Environmental ethics: issue & possible solution.
- climate change, global warming, acid rain, ozone layer depletion, nuclear accidents & holocaust, case studies
- water Air (prevention & control of pollution) Act.
- water (prevention & control pollution) Act.
- public awareness.

## 7. HUMAN POPULATION AND THE ENVIRONMENT:

- population growth & variation among nations.
- population explosion - family welfare program.
- Environment & human health.
- Human rights
- value education
- Role of information technology in environment & human health.



## The Multidisciplinary Nature of Environmental Studies :-

### Definition :-

- The word 'environment' is derived from the French word "environner" means to encircle or surrounding.
- It is a composite word for the conditions surrounding in which organism or group of organism live.
- The environment is very wide term, which includes total physical & biotic world, where biological beings live, grow, get nourish & developed their natural characteristics.

**\*\* Environment** is the sum of all social, economical, biological, physical or chemical factors, which constitute the surroundings of the living organism who is both creator & moulder of this environment.

### Scope & importance :-

- Environment consist of all living & non-living things which surround us.
- Therefore the basic components of the environment are
  - i) Atmosphere or the air
  - ii) Hydrosphere or the water
  - iii) Lithosphere or the rocks & soil
  - iv) Biosphere
- Environment influence & shaped our life. It is from the environment that we get food to eat, water to drink, air to breath & all necessity of day to day life are available from our environment.
- Thus environment is the life support system. Hence the scope & importance the environment needs to be well understood.
- It is now universally realised that any future development activities have to be viewed in the light of it's ultimate environmental impact.
- The tremendous increase in industrial activities during the last few decades & the release of obnoxious (undesirable) industrial waste in the environment having considerable concern in recent year from the point of view of the environmental pollution.



→ Environmental pollution on one hand & deforestation, soil erosion, population explosion, global warming, etc. are threatening the very existence of life on the earth.

→ Environment is responsible for creating conditions suitable for the existence of a healthy biosphere on the planet.

→ The load of pollutant discharge is also diluted & chemically modified.

→ It regulates the temp on earth, where life activities are possible.

→ Over exploitation of natural resources & pollution of environment are destroying the vital life support system on which all life depends.

→ Air, water, soil, marine pollution, decreasing agricultural land, food adulteration, extinction of various plants & factors which are making our life more & more difficult. The future of entire humanity is at stake.

→ In state of these environmental problems are also there like solid waste management, mining impact, impact of hydroelectric projects, effect of nuclear hazards & effects of industrial effluents.



→ These problems should also have some solution because their effect is very dangerous.

→ More and more technology should be developed to reduce the pollution at every state.

→ Environment studies is very important for getting clean drinking water, hygienic living conditions, clean & fresh air, fertile land & healthy food etc.

### Need for public awareness:-

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→ After the scientific & industrial revolution in the recent past there has been immense impact of man on his environment.

→ Man has failed to realise that any new factor upsets the balance of the eco systems.

→ Huge industrial installations every year, introduction of a faster mode of transport, changing the food habits, deforestation & decreasing the agricultural land, wide spread use of insecticides, pesticides, improper use of fertilisers & chemicals in environment are the main contributing factors which challenge the life of man, animals & other organisms.

→ Air pollution, water pollution, soil pollution, marine pollution, noise pollution, global warming, effect of nuclear hazard are some measure factors for which public awareness is necessary.

→ The active co-operation of everyone at every level of social organisation, scientist, educationist, social worker, political politicians, administrators & public are needed for issues concerning environment.

→ Movement which begins at grass root levels effects



the ideology & policies of a country for the nation as a whole more effectively than the policies introduced from top to downward.

→ when the opinion of public will change it will effect the government policies will  $\uparrow$  in to action.

→ therefore little efforts on the part of each individual shall add up to introduce significant improvement of the environment.

→ Only by celebrating the world environmental day, we can't get rid of this concern.

→ Government alone can't do anything until & unless every citizen is aware of the environmental pollution & there effects.

→ This is the time to make aware & motivate each & every individual on environmental consciousness.

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for public awareness



→ Things / material of the nature that can be put to some use by human beings for their growth, development, comfort & other necessities are called as natural resources.

→ For example air, water, soil, forest, animals, minerals, metals, energy & other substances are some examples of natural resources. That are utilised by human beings.

→ The resources are not equally distributed throughout the world. We can realise the value of resources only when it is scarce.

### Types of Natural Resources:-

All the natural resources can be divided into 2 categories.

- i) Exhaustible natural resources
- ii) Inexhaustible natural resources

#### Exhaustible Natural Resources:-

→ These are soil, forest, water, coal, petroleum, natural gas, mineral, etc.

→ These are consumed or exhausted through continuous use or misuse.

→ Exhaustible natural resources can be further divided into 2 categories.

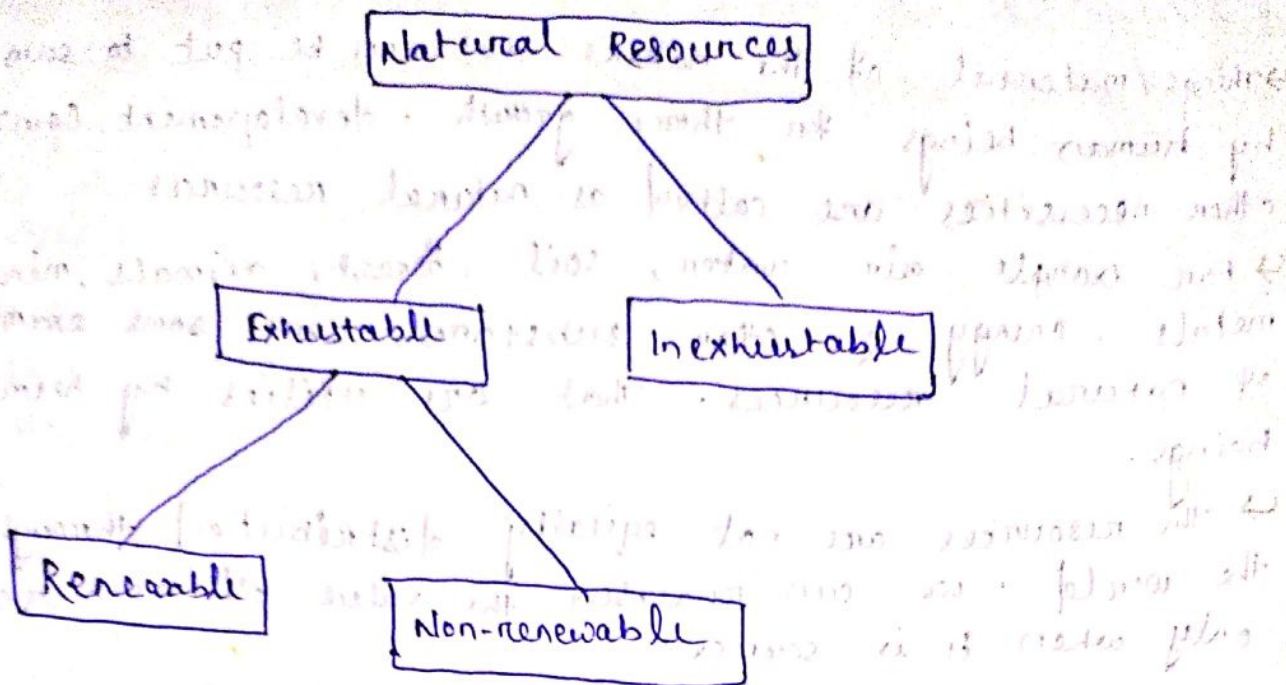
- i) Renewable natural resources
- ii) Non-renewable natural resources

#### Inexhaustible Natural Resources:-

→ These are those resources which can not be exhausted through continuous use or misuse.

→ Ex - air, sunlight etc.





### Renewable Resources:-

- The natural resources which are consumed/exhausted/depleted continuously & can be recovered by very hard efforts taken at long periods are called renewable resources.
- Ex - Soil, Forest, ground water, etc.
- In other words we can say that all renewable resources are replenished or refilled through natural cycle or manually.
- For example oxygen in air is replenished through photosynthesis.
- Most of the renewable resources are interdependent to each other.
- Forest maintained the environment/climate, plants need to check soil erosion & soil is needed for plants.
- Air and insects are needed for pollination these resources as the life support system which can fulfill all human needs but its productivity/renewability is limited or depend upon availability of water, nutrients & environmental condition.



## Non Renewable Resources:-

- Non renewable resources are not replenishable or we can't get back them in our lifetime if they consumed or exhausted completely.
- Non renewable resources are metals, coal, petroleum, minerals, stones, salts etc.
- Minerals are often called the "stock" resources because their new material can only be extracted from the earth's crust once.
- Coal, petroleum & natural gases are called as "FOSSIL FUELS" because they formed from dead remains of plants & animals buried in the earth long long ago.
- They called fuels because they are burnt to give energy.
- Minerals, rocks, salts & chemical etc are termed as "ABIOTIC RESOURCES" because biological activities are not involved in their formation.

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## Natural Resources & associated Problem:-

- Being most highly developed / evolved animal, man possess certain special characteristics.
- Man apply all their power & intelligent for food & development.
- They adopt new ways to fulfill their needs & often make improvement in old way derive resources to fulfill their desired more efficiently. This is how they developed new technology for utilization of natural resources.
- Human beings utilizes most of the resources like air, water, land, minerals, fuels, flora, fauna, energy etc. for their growth & development.
- Now the problem is how & up to what extent human being should utilizes various resources.



→ The use of natural resources should depend on knowledge, availability, type, quantity, value & necessity.

→ The use of resources should be in limit not to exhaust them & so that ecological balance within the nature should also remain undisturb.

### Forest Resources:-

→ India is one of the 12<sup>th</sup> mega diversity countries, commanding 7% of the world's bio diversity & supporting 16% of measure forest types.

→ But nearly half of the country area is degraded, affected by problem of soil degradation & erosion.

→ 16% forest are located in ecologically sensitive zone.

→ These forest need to be managed in way to ensure that they are ecologically protected & maintained.

→ According to the forest survey of 1997, the country has ~~76.5~~ 76.5 million hectare of forest.

→ The degraded area was 26.13 million hectare & there was another 5.72 million hectare of ~~scrub~~ <sup>thicket</sup> scrub. In total 31.85 millions hectare of forest were degraded or open.

→ It was reported that the country's achievement in raising forest plantation in terms of area has been impressive.

→ Up to 1998 the total area of tree plantation was 28.38 million hectare of which about 17 million hectare were planted before 1990.

→ The current annual rate of plantation is 1.2 million.



- The quality of these plantation varies considerably.
- It should be noted that forest plantation are a means to meet the increasing demands for industrial raw material or for direct consumption.
- Non wood forest product (NWFPs) have a great potential to support the socio-economic development of the country.
- These products are essential to local communities.
- Some products have great potential for export.
- Some products have also provided employment & income earning.

### Over Exploitation:-

#### Deforestation:-

- The conversion of forested areas to non-forest is called deforestation.
- This removal or destruction of a significant area of forest cover has resulted in a degraded environment with reduced biodiversity.
- Deforestation (whether deliberate or unintentional) is the result of the removal of forest trees without sufficient reforestation.
- There are many causes, ranging from extremely slow forest degradation to sudden catastrophic wild fire.
- Deforestation can be the result of the deliberate removal of forest cover for agriculture or rural development or it can be an unintentional consequence of uncontrolled grazing (which can prevent the natural regeneration of young trees).

### Causes of Deforestation:-

- Market driven forestry practices are often one of the leading causes of forest degradation.
- The principal human related causes of deforestation are agricultural & live stock grazing, degradation of petroleum extract etc.



→ The causes also include demand for farm land & fuel wood. The underline causes include poverty, lack of retention.

→ The causes of deforestation are complex & often differ in each forest & country.

→ Fire was ~~first~~ <sup>first</sup> tool that allowed humans to modify the landscape.

### Environmental effect :-

#### \* Atmospheric pollution :-

→ Deforestation is often cited as one of the major cause of the enhanced greenhouse effect.

→ Trees & other plants remove carbon (in the form of carbon dioxide) from the atmosphere during the process of photosynthesis.

→ Both the decay & burning of wood releases much of this stored carbon back to atmosphere.

#### \* Wild-life :-

→ Some forest are rich in biological diversity.

→ Deforestation can cause the destruction of the habitats that support this biological diversity, thus causing population shifts & extirpation.

→ The presence or absence of trees can change the quality & quantity of water from the surface & in the soil (ground water) or in the atmosphere.

→ This in turn changes erosion rates & the availability of water for either ecosystem function or human services.



### \* Soil erosion :-

- Deforestation generally increases rates of soil erosion by increasing the amount of rain that is reducing the protection of the soil from the tree litter.
- The trees themselves enhance the growth of grass both in the canopy and on the forest floor.
- The bare open canopy areas become highly erodible.

### \* Land slides :-

- Tree roots bind soil together if the soil is sufficiently shallow they act to keep the soil in place by also binding with an underline bed rock.
- Tree removal on steep slopes with shallow soil thus increases the <sup>risk</sup> of land slides which can threaten people's living nearby.

### Controlling Deforestation :-

#### \* Farming :-

- New methods are being developed to farm more food crops on less farm land, (such as high yield hybrid crops).

#### \* Forest management :-

- Efforts to stop or slow deforestation have been attempted for many centuries because it has long been known that deforestation can cause environmental damage sufficient in some cases to cause society to collapse.

### Case studies :-

#### \* Brazil :-

- In Brazil the rate of deforestation is driven by commodity prices.
- Recent development of new variety of soybean

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has lead to displacement of farmers & other into the forest for beef ranches

### \* Indonesia:-

There are large area of forest in Indonesia that are being lost as native forest is cleared by large multinational pulp companies & being replace by plantations.

### \* United State:-

→ Upon arrival of European - Americans began clearing large areas of forest for wood & agriculture.

→ From 1850 to about 1920, the amount of forest land in the United state actually increase.

### Timber Extraction:-

→ One world bank study in 1989 has argued that tree crop estates are a better employment generation option than even forest plantations.

→ In Malaysia timber using industries that is timber extraction is on large scale.

→ In Indonesia timber manufacturing employment is as high as 3.7 million.

→ In India also, millions of people are engaged in timber industries not only their earning but solving the problem of unemployment to some extent.

→ Ply wood industries are also increasing day by day. So there is a gap bet demand & supply which result in import of logs from other countries like Malaysia, Indonesia, etc.



→ Day by day the demands of logs is increasing due to population growth which leads to timber shortage.

### Mining:-

→ Mining is the extraction of valuable minerals or other geological material from the earth.

→ Materials recovered by mining include bauxite, coal, diamond, iron, precious metal like Uranium, Molybdenum, Nickel, Lead, lime stone, rock stock etc.

→ Any material that can't be grown from agricultural processes must be mined.

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

### Dams & their effects on forests & tribal people:-

→ About 40,000 large dams with a height of more than 15 meter have already been built & several thousands are under construction.

→ All the reservoirs together have a water spread of more than 4,00,000 km<sup>2</sup>.

→ All measure dams are constructed in mountainous region where there is plenty of rain fall.

→ These places are clothed with rich vegetation & forest.

→ Besides the water spread, the space for residence of engg. and supporting staff for machinery & for roads are also required from the forest areas.



→ The trees, plants & other vegetation are removed & the fauna are driven away.

→ As more & more people accepted the dam side, forests are destroyed for getting fuel & timber to the developer.

→ The tribal & local people who have been occupying their land are displaced to remote areas.

→ Many of them are not properly rehabilitated by the government authorities.

→ Tribal not only lose their habitat & social setup but also lose their occupation & livelihood.

→ Fertile soil are lost in the reservoirs.

→ Such human rights violations create unrest among the tribal and courts alone can come forward for their health.

→ The massive resistance are visible in the case of Narmada valley project in India.

→ The story of Chipko movement in UP & Appiko movement in Karnataka are examples of popular movements against massive dam project.



## Water Resources:-

- water is a crucial natural resource & its availability greatly influences the health of the people & development potential of the area.
- water as a resource in a relation to its needs is becoming deficient now a days.
- Proper assessment of the availability of this resource from surface & sub surface sources is crucial for its proper planning, development & efficient management.
- About 70% of the global surface is covered with water in the form of oceans, seas, lakes, ponds. Total quantity of water available on the earth is 1386 million cubic kilometer.
- 97.3% of the water available on earth is saline & only 2.7% is available as fresh water.
- Most of which lies frozen in polarisation or in deep aquifer not available for use.
- The mean annual rainfall taking the country as a whole is 1170 mm.
- This gives an annual precipitation of about 4000 km<sup>3</sup> cube.
- A significant part of precipitation returns back to the atmosphere in the process of evaporation.
- A large part of the remaining precipitation seeps in to the ground & the balance flows through streams, rivers & water bodies adding to the surface flow.
- A part of the water which seeps in to the ground remains as soil moisture in the upper layer & the rest adds to the ground water resources.



## Over utilization of surface & ground water :

- The exploitation of ground water resources more than 21% annual replenishment as caused the continuous declining of water tables, with deterioration of ground water quality.
- Due to this high cost of energy is required to lift the water from great depths which become uneconomical for poor farmers to continue agriculture.
- Though India is placed with a good water resources but its distribution over the country is not uniform or improper.
- Even in the high rainfall area like Meghalaya & Kerala, water scarcity is failed in summer month due to over exploitation of water & mismanagement.
- There is large amount of rainfall annually flowing out as runoff to sea.
- There is an uneven distribution of water resources coupled with over utilization of ground water resources as resulted in an imbalance.
- There is exist gap bet<sup>n</sup> available utilisable water resources & future need of water for the country.
- Due to over utilization of water, Punjab, Haryana, Tamil Nadu, Gujarat & some other state where the water tables have declined steeply.



- In Gujarat more than 90% wells' water table dropped by 0.5 m to 9.5 m
- In Haryana the avg. depth of ground water is fallen 1 - 33 cm annually in different parts of the state

## Floods and Droughts :-

### Floods :-

- : not a new phenomenon

- Floods are the most common natural disasters. The properties of floods are
  - i) overflow of land are tidal water
  - ii) Surface waters unusual rapid water
  - iii) mudflow
- These might occur during continuous rainfall lasting for several days or by the collapse of land along the shore of a lake or river
- Floods may wash away houses & properties.
- Flash floods are caused by sudden & intense accumulation of water moving with great force & force.
- Hence the damage is also great.

### Drought :-

- Drought occur due to climate change.
- It takes place due to the deficiency of precipitation over a long time which result in water shortage.
- Agriculture, industry & domestic field gate affected by field which result in migration of people which other places.
- The impact of drought are famine, malnutrition, food insecurity, epidemics, migration to other places.



→ shortage & failure at rain may include people to clear whatever vegetation is left in order to sustain their lively wood.

→ Drought is also known as ~~the~~ crippling hazard because it develops over months & prolongs for years: eliquand pro abool  
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### Conflicts over water:-

→ water being the basic requirement for life & necessary of all most all socio-economic activities is facing greater demand.

→ It's relative demand increases with degree of scarcity.

→ A large part of the country already faces water scarcity conditions & it is expected that by the middle of the next century most regions of the country would face some degree of scarcity.

→ These conditions have already created a number of interstate water dispute.

→ If such condition continue, it is expected that the next world war will be on water.

→ Bitterness over these dispute is increasing with passage of time.

→ water demand in meg cities are growing much faster which putting heavy strains on the water resources.

→ It is creating difficult problem for the surrounding rural areas leading to serious conflicts.

→ Since the urban water supply are met from surface flows (river), there will be conflict with upstream users.



→ Over the quantum of withdrawal, while the downstream users will be affected by the less quantity of water as well as the polluted waste water released by urban areas.

→ Such conflicts already exist bet<sup>n</sup> Delhi & Haryana, bet<sup>n</sup> Chennai & the farmers in drought prone district of Andhrapradesh, bet<sup>n</sup> Chattisgarh & Odisha.

→ In future such conflicts are likely to increase in number & escalate in magnitude unless & untill & effective mechanism is evolved to resolve those conflicts judiciously & expeditiously.

### Dams Benefits & Problems :-

#### Benefits :-

- Water is essential for sustenance of all forms of life on earth.
- It is not evenly distributed all over the world & even its availability at the same location is not uniform over the year.
- Management of river waters has been therefore one of the most prime issues under consideration.
- Optimal management of river water resources demands that specific plans should be evolved for various river basins which are found to be technically feasible & economically viable after carrying out extensive surveys.
- ~~After~~ Man has been constructing dams & reservoirs for storing surplus river water available during rainy season & for utilisation of the same during lean period.
- The dams and reservoirs world wide playing important role for harnessing the river water.
- Dams & reservoirs contribute significantly in fulfilling the following the basic human needs.



- i) water for drinking & industrial use
- ii) Irrigation
- iii) Flood control
- iv) Hydro power generation
- v) Drought control
- vi) Recreation

### Problems:-

- For such dam projects thousand of acres of land is acquired, result the public become landless.
- As far as relief & rehabilitation are concerned people are not given properly.
- Due to these dams most affected people are tribal, poor, ~~lower~~ <sup>lower</sup> class people etc. they ~~they~~ can't oppose of their own.
- The condition of the rehabilitation are such that the affected family are to be offered choices that should in fact make the quality of their life better than the condition they encountered in their original habitation.
- Elaborate mechanisms have also been established to monitor & ensure these rehabilitations.



## MINERAL RESOURCES:

- Mineral brings the vital raw material for many basic industries, play an important role in the industrialisation & overall development of the nation.
- Minerals are generally called the 'stock' as they are the non-renewable resources.
- Minerals are the chemically bonded substances created through chemical process between organic & inorganic matters present in the earth's crust.
- They may be solid or liquid.
- Since the prosperity of a nation depends upon the proper use of minerals, hence they should be conserved & should not be misused.
- Government should promote the research in this field of mining minerals.

### Use & exploitation:-

→ Mineral available in earth's crust can be divided into 3 types:

- i) Metallic minerals
- ii) Non-metallic minerals
- iii) Mineral Fuels

### Metallic Minerals:-

- we can't extract metal directly from minerals so there is difference between minerals & ores.
- For extracting metal minerals are treated by different processes before extraction.
- Metallic minerals are generally found in combined state.



→ According to availability of metals, metallic minerals are further divided into following type:

### i) Ferrous Alloy:-

→ Most common metal (which is used largely) is iron.

→ Other than iron aluminium, lead, zinc, copper etc also present.

→ All are found in reach quantity, found in native as well as in combined state.

→ Iron pyrite, Lyonite, Haematite, magnetite, etc are examples of Ferrous alloy.

### ii) Non-Ferrous Alloy:-

→ The minerals / alloys of this type contain the metal like titanium, antimony, Arsenic, lithium, Beryllium, etc.

→ These metals are costlier than Ferrous alloy.

→ Here iron is found as impurities.

### iii)

The minerals or alloys containing very little quantity of metal whose extraction is costlier.

These metals are generally used in jewellery  
Ex - Gold, Platinum, silver, etc.



## ii) Non-Metallic Minerals :-

→ Minerals, whose yield product <sup>are</sup> other than metals comes in this head as non metals.

Ex - Graphite, Pyrolusite, Dolomite, Surtz, lene stone, Mica, Borax, phosphate, calcite, etc are the examples of non metallic minerals.

## iii) Mineral Fuels :-

→ These include the material used to provide energy, example - coal, natural gas, <sup>for</sup> fuel, & petroleum etc.

→ Coal is most commonly available fuel used as domestic as well as industrial fuel.

→ It is of different types example - anthracite, bituminous, lignite, pit.

→ The type & quality of the coal, depend upon the percentage of carbon present in them.

→ It is the principal source of energy in the world.

→ Petroleum is used in the manufacture of large number of petrochemicals.

→ It is drilled out from the source as crude oil.

→ crude oil is refined in petrol, diesel, kerosene etc, which is used as mineral fuels.

## Environmental effects of extracting & using Mineral resources.

→ Mining, minerals & mineral based industries play an extremely important role in the development of mankind.

→ The total geographical area of India is 329 million hectares. constitute 2.4% of the world's land area.

→ Out of this about 82500 hectares is sustaining mining.



- activities of some kind on the other.
- As the mining activities grow, the per capita availability of land is declined at a very high rate.
  - The environment is more damaging by open cast mining than underground mining.
  - Not only environment, mining also affects human health.
  - Over exploitation causes the wastage of mineral ~~wealth~~ <sup>wealth</sup> & quality of land surface.
  - Mineral deposits shouldn't be over exploited because they are non-renewable.
  - Derelict land is that land which has been abandoned as useless.
  - Dereliction is the result of thoughtless, uncontrolled exploitation of natural resources.
  - There are following environmental effects for mining.
    - (i) Land degradation due to lowering of the surface table at some places & creation of large mounds at other places.
    - (ii) Deforestation in the mining areas i.e. the loss of valuable soil cover resulting in enhancement of soil erosion.
    - (iii) The loss of top & sub soil.
    - (iv) Adverse effect on ground water table i.e. the local water table is lower as a result of open cast mining.
    - (v) Due to increased discharge of rain water passing through the terrains, disturbed by the surface mining, the local drainage system is polluted, which on joining the main drainage system affects it also.
    - (vi) The frequency of land slides increases substantially.
    - (vii) The erosion of soil is enhanced.



(viii) The agricultural land are affected by silt (clay or mud) & the fine material generated by mining. It also clogs the surface water channels.

(ix) The disturbance caused adversely affects the well balanced pH & diminishes or decreases the regenerative quality of soil.

(x) The heavy earth-moving machinery & blasting caused problem of noise, vibration, & the release of noxious (deadly or <sup>poisonous</sup> inferior) gases in the atmosphere.

(xi) Mine drainage has polluted stream, river, lakes even seas.

(xii) Mining & minerals based industries with their effluents (water mixed with waste material) create pollution problems.

(xiii) Asbestos, cement & other chemical industries are very hazardous. So people are not supposed to live in surrounding areas.

(xiv) The people related with mining & extraction affected by polluted environment (dust & poisonous gases) lead to skin & lung diseases.

(xv) Deforestation & climate change results poor rainfall & affects flora & fauna.

(xvi) Mining causes the reduction of forest i.e. deforestation. Wild life also affected, land becomes barren & there results in increased incidents of land slides.



## FOOD RESOURCES :-

### World Food Problems :-

- Before the 21st century it was felt that world food production is not sufficient for the present population.
- Food production was less because people were using the old techniques.
- Later on when population pressure starts, new ways of food production using fertilizer, pesticides, insecticides, etc. are discovered to increase the yield.
- In 1999 International Food Policy Research Institute (IFPRI) reported the increase in world food consumption by 2020, discussing the impact of this on both developed & developing countries.

→ The report considers the 6 emerging issues such as Nutrition, grain prices, WTO (World Trade Organisation), Agro Ecological approaches to small scale farming, Biotechnology, Information technology & precision farming.

→ In world food <sup>submit</sup> ~~some~~ 1996 in <sup>com</sup> the following points were discussed:

- (i) Reduce world hunger
- (ii) Agricultural supply and demands
- (iii) Population growth.

### Changes caused by agriculture & overgrazing :-

- Agriculture in USA & India was food rising activities & over half of the current crops comes from plants such as ~~some~~ corn, cotton, potatoes, Tobacco etc.
- The agricultural methods in most part of the world were primitive.



→ Fields were dug by oxen pulling wooden plows, seeds were broadcast by hand & grains were harvested with scythes (1917)

→ From the Indians the 1st American settlers learned how to clear land till the field & grow the corn that was crucial to their initial survival.

→ The mid 1800's began an era of great change which brought advances in cultivation method, breeding of improved crop varieties & use of fertilizer with crop rotations to maintain soil productivity.

→ Ever since colonial days, agricultural leaders have been interested in increasing the productivity.

→ As land became less available, people became more interested in maintaining soil fertility & increasing crop yields.

→ In 1914 govt. responded to this need by providing funds for state agricultural extension programmes to assist farmers in adopting improved farming methods.

→ In 1930's National attention was focused on the need for soil & water conservation measures to maintain farm productivity.

### Over grazing:-

→ Grazing management is the foundation of grassland based livestock production since it affects both animal & plant health & productivity.

Over grazing can occur under continuous or rotational grazing.

→ It can be caused by having too many animals on the farm or by not properly controlling their grazing activities.



→ Over grazing reduces plant ~~leaf~~ areas which reduces intersection of sunlight & plant growth.  
→ Plants becomes weakend & have reduced root length.

→ The reduced ~~to~~ root length makes the plants more susceptible to ~~death~~ during dry weather.

→ Over grazing can increase soil erosion. Reduce soil depth, soil organic matter & soil fertility hence the land future productivity.

→ However the loss of soil depth & organic matter takes years to correct.

→ There loss is critical in determining the soil water holding capacity.

### Effect of Modern Agriculture:-

DT-17-08-19

→ Bet 1950 & 1975 agricultural productivity in American history change mode rapidly.

→ Total farm output increase more than half.

→ This change was due to technological innovation development of hybrid strains & other genetic improvement in the use of pesticides & fertilizers.

→ Not only in America, all over world productivity & means of farming were changed.

→ Thus the agriculture has become more intensive producing higher yields per acre.

→ Although the intensification of agriculture has vastly increase productivity, it also has some demerits such as rapid erosion of top soils to contamination of drinking water by the chemical used to enhance farm land productivity.



→ An avg. of 10 times as much soil erodes from American agricultural fields as is replaced by natural soil formation processes.

→ Because it takes of to ~~so~~ three hundred years for 1 inch agricultural top soil to form.

→ Soil i.e. lost is essentially irreplaceable.

### Fertilizers - Pesticides Problems

#### Fertilizers :-

→ Nutrients are lost from agricultural fields through run off, drainage or attachment to erode soil particle.

→ The amount losts depend on the soil type, organic matter content, the climate, slope of the land, depth to ground water as well as on the amount & type of fertilizer & irrigation used.

→ The 3 measure nutrient in fertilizers are Nitrogen, phosphorus & potassium.

→ Of these Nitrogen is most readily lost because of its high solubility in the nitrate form.

→ Leaching of Nitrate from agricultural fields can elevate concentration in underlie ground water to levels unacceptable for drinking water quality.

→ Phosphorus does not leach as readily as Nitrate because it is more tightly bound to soil particle.

→ Potassium does not cause water quality problems because it is not hazardous in drinking water & it is tightly held by



The soil particle so can't be removed easily by leaching.

### Pesticides :-

- The trends towards intensi crop production in modern farming has led to increased potential for damage by pests & diseases.
- Use of pesticides has risen 10 times over the past 40 years as agriculture has become more intensive.
- One drawback to is that pesticides generally killed not only the pest of concern but also a wide range of other organisms including beneficial insects & other pest predators.
- Once the effect of pesticides wears off, the pest species is likely to recover more rapidly.
- Another drawback to the increasing pesticides use is the development of resistance in pest species.
- The individual pests that survive the pesticide application continue to breed, gradually producing a population with greater tolerance to the pesticides.

### WATER LOGGING :-

- Another problem associated with excessive irrigation on poorly drained soil is water logging.
- This occurs in poorly drained soil where water can't penetrate deeply.
- There may be an impermeable clay layer below the soil.



→ The Irrigation water eventually raises the water table in the ground - the upper table of the ground water from the birth.

→ The raised water table results in the soil becoming water locked.

→ When soils are water locked air spaces in the soil are filled with water. & plant roots due to lack of oxygen suffocate.

→ water logging also damages soil structures.

Salinity:-

Dt - 20.08.19

→ In many areas of India, crop production is limited because of salinity or Alkalinity or both. It is estimated that about 7 million hectares in the country have either gone out of cultivation or produces low yield of crops.

→ Three class of Saline & Alkali soils are recognise.

Salin Soils :-

→ The soil contains toxic concentration of soluble salt in the root zone are called saline soils.

→ Electrical conductivity in the saturation extract of such soils taken as a measure of salts is greater than 4 millio per centimeter.

Non - Salin Alkali or sodic soil :-

→ These soil don't contain any large amount of neutral salts, so the electrical conducting is less than 4 millio per centimeter.



## Saline - Alkali Soils:-

- This group of soil is both saline & alkali.
- They have appreciable amount of soluble salt in it.

## Adverse effects of salinity:-

- Causing low yields of crops or crop failure in extreme cases.
- The limiting of the choice of crops because some crops are sensitive to salinity or alkalinity or to both.

Creating difficulties in the construction of building & roads & their maintenance.

## ENERGY RESOURCES

- Energy is needed by all living organisms & vegetation for biochemical reactions of their cells.
- It is a power which is needed in one form or other for work done.
- Long before most of the power available to human society was limited to solar energy trapped by green plants which produced organic matter.
- Biological oxidation of organic matter provides fuel to muscle power.
- For the developmental activity, energy sources have their own importance.



## Growing Energy needs:-

- Energy is the prime i/p of a country.
- It is converted into heat & electricity.
- For every activity perform, required energy in form of heat, light, electricity & food for our body (Food energy is measured in calories).
- India has 1<sup>st</sup> growing developing economy, with the GDP growth rate exceeding 6% in recent year.
- This growth has been accompanied by a steady increase in energy consumption.
- Primary commercial energy demand grows at annual rate of 6%.
- It will go more rapidly than in the past as countries reforms process accelerate.

## Renewable & Non-renewable Resources:-

→ There are 2 types of energy sources to meet the requirement.

i) Renewable or Non-conventional or inexhaustible energy sources.

ii) Non-renewable or conventional or exhaustible energy sources.

## Renewable Energy sources:-

- These sources are continuously replenished by natural process.
- Ex - solar energy, wind energy, bio energy, hydropower etc.
- These energy system converts such energy into a form which we can use.
- Renewable energy sources are essentially flows of energy.



→ At present total non-conventional potential of 1,26,000 mega watt assessed different non-conventional energy sources.

→ At present most important non-conventional energy source is wind energy for which a capacity of 18,000 megawatt has been set up in the country.

→ There is also a large potential on tapping of ocean energy, geothermal energy & tidal power.

→ But the technoeconomic viability for power generation from these sources has still to be established.

### Non-Renewable Energy sources:-

→ These are traditional sources available to us.

→ Ex are :- coal, petroleum, Natural gas, etc.

→ All the sources are limited & takes millions of years for formation.

→ As a result of unlimited use, they will exhaust one day. Therefore we should conserve this for longer period.

→ In addition to commercial fuel, coal, oil-natural gas, India consumes large quantities of traditional fuels.

→ The traditional energy sector is not well documented. Fire wood, dung cake & agricultural waste continued as the primary source of energy for cooking in over 90% of rural household.



## Use of alternate energy sources:-

### Bio energy:-

- Biomass a renewable energy resources derived from the carbonaceous waste of various human & natural activities.
- It is derive from numerous sources including the byproducts from the wood industries, agricultural crops, raw materials from the forest, household waste etc.
- Biomass does not add carbon dioxide to the atmosphere as it absorb the same amount of carbon in growing as it releases when consumed as a fuel.
- It's advantage is that can be used to generate electricity with the same equipment i.e. now being used for burning township well.
- Bioenergy in the form of bio gas which is derive from biomass is expected to become one of the key energy resources for global sustainable development.
- Biomass occurs higher energy efficiency in the form of biogas tank by direct burning.

### Hydrogen Energy:-

- Hydrogen is a clean fuel & energy storage medium for various applications.
- Hydrogen can be produced by biological conversion of various organic elements like distillery, starch etc. & as byproduct in chemical process.
- Hydrogen contained in metal hydride can be used in vehicles.



## Tidal & Ocean energy:-

### Tidal energy:-

- Tidal electricity generation involves the construction of a barrage across an estuary (river) to block the incoming & outgoing tide.
- The head of the water is then used to drive turbines hydroelectric dam.
- A tidal range of at least 7m. is required for economical operation for the turbines.

### Ocean energy:-

- Ocean covers more than 70% of earth surface making them world's largest solar collector.
- Ocean energy draught on the energy of ocean wave takes on the thermal energy stored in the ocean.
- The ocean contained 2 types of energy i.e. thermal energy from sun's heat & mechanical energy from the light & wave.
- Ocean thermal energy is used for many applications including electricity generation.

### Geo-Thermal Energy:-

- The earth's population lives bet<sup>n</sup> 2 grate sources of energy, the hot rocks beneath the surface of the earth & the sun in the sky.
- Geo thermal energy is based on the core of the earth which is very hot.
- Geo thermal energy which is derive from high temp. geo thermal fluids, can be utilies for power generation thermal applications like space heating & cooking.
- Geothermal energy has been commercially exploited in as many as 20 country with about 90,000 megawatt installed capacity.



## Chemical sources of energy:-

- Fuel cells electrochemically produce direct current through a reaction bet<sup>n</sup> hydrogen & oxygen.
- Such cells are electrochemical devices that convert the chemical energy of a fuel directly & very efficiently into electricity.

## LAND RESOURCES:-

- our life depend on the land for food, fiber, fuel & other basic amenities.
- Therefore it is the valuable gift of nature to human beings.
- Top layer of the land is called soil, which is renewable resource & essential for survival of life.
- Though it is life support system but it is over used so rises the environmental problems.

## Land as a Resource:-

- There are 4 class of land which are suitable for cultivation & other purposes.
- ~~They~~ Their details & limitation as follows:-

### Class - 1 (Green colour):-

- Soils in class - 1 have very few or no limitations that restrict their use.
- This type of land is nearly table & the erosion hazard is low.
- The soils are deep, well drained, easily worked & fairly well supplied with plant nutrients or are highly responsive to the application of fertilizers.



→ Soils in this class are suit to a wide range of plants, may be used for cultivated crops.

### Class-2 Soil (Yellow colour):-

→ Soils in class-2 have some limitation which reduces the choice of plants or require simple conservation practices.

→ The limitations of soil in class-2 may result from the effects of 1 or more of the following factors, a gentle slope, a slight susceptibility to erosion, less than ideal soil depth, occasional damaging overflow, weightness which can be corrected by drainage, slight to moderate salinity which is easily corrected but lightly to reoccur, a slight climatic limitation on soil use & management.

→ These soil may be use for growing cultivated crops, raising pastures, forest & for wildlife food & cover.

### Class-3 Soil (Red colour):-

→ Soils in class-3 have moderate limitation which reduce the choice of plant & require special conservation practices.

→ Limitations of soil class-3 may result from the effects of 1 or more of the following factors.

→ Moderately sloping land, moderately susceptible to water or wind erosion, frequent overflow accompanied with some crop damage, weightness or continuing water logging after drainage, low moisture holding capacity, moderate salinity & moderate climatic limitation.



→ The soils can use for raising limited cultivated crops, pasture, forest.

### Class - 4 soil (Blue colour) :-

→ soils in class 4 have serious limitations that restrict the choice of plants and require very careful management.

→ The restriction use of these soil are greater than those in class 3 & choice of plants is very limited.

→ The use of these soil for cultivated crops is limited as a result of the effect of 1 or more permanent features: such as :- steep slopes, serious susceptibility to water & wind erosion, frequent overflow, accompanied with serious crop damage, excessive weightness with a continuing hazard of water logging, serious salinity & adverse climate conditions.

→ The soils can be used for rarely selective crops, pasture & forest.

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### Soil Erosion :-

→ Soil erosion means the removal of material from the surface of the soil by an external agency like running water, high speed wind etc.

→ Since the superficial layer of the soil are the richest in plant food & thus the process of soil erosion involves a definite loss of valuable plant nutrients.

→ When soil erosion is intense, the natural soil profile is destroyed, may never attain full development.



## Types of soil erosion:-

### Normal OR Geologic erosion:-

→ Geologic erosion takes place steadily but so slowly that ages are required for it to make any mark upon the features of the earth surface.

→ There is always an equilibrium bet<sup>n</sup> the removal & formation of soil, so that unless the equilibrium is disturbed by some outside agency, the nature & characteristics of the soil are restored.

### Accelerated Soil erosion:-

→ The removal of surface soil from areas denuded of their natural protective cover as a result of human & animal interference takes place at a much faster rate than that at which it is built up by the soil forming process.

→ This accelerated detachment rapidly ravages the land & this type of soil erosion are ~~seriously~~ ~~concern~~ ~~seriously~~ concern.

### WIND EROSION:-

→ Wind erosion takes place normally in arid (dry or waterless) & semi-arid areas where the velocity is high.

→ The soil particles on the land surface are lifted & blown up as dust storms.

→ The fertile soil is blown away by winds & the ~~soil~~ subsoil is exposed as a result.



the productive capacity of the soil is considerable reduce.

### WATER EROSION:

→ Soil erosion caused by water can be distinguished in three forms:

**SHEET EROSION:** - It removes a thin covering of soil from large areas often from entire fields more or less uniformly during every rain which produces its runoff.

**RILL EROSION:** - when sheet erosion is allowed to continue unchecked, minute finger shaped grooves or forms over the entire field such thin channeling as rill erosion.

**GULLY EROSION:** - when a rill erosion is neglected, tiny groups grooves developed in to wider & dipen channels which may assume a huge size this is called gully erosion & the most spectacular evidence of the destruction of soil.

### LAND SLIDE & SLIP EROSION

→ The fundamental cause of lands slides, are topography of the region and geological structure the kinds of rocks and physical characteristics & a land slide is defined as a outward & downward movement of the slope forming material, composed up natural rocks, soil artificial fills etc.



## STREAM BANK EROSION

- Torrents are defined as hill streams characterized by wide spreading beds on emergence from the hill, with flashy flow & swift <sup>every</sup> current.
- During the rainy season when with heavy downpour in the catchment they get swollen with floods.

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## Land Degradation:-

- Due to use & over exploitation, land resources are degraded. It is due to the more & more pressure with increasing population.
- Land degradation is a real alarm because soil formation is a very slow process.
- In millions of years we have a layer crossed of fertile soil i.e. formation of 1cm soil crossed from parent material take 300 to 400 years.
- Fertile soil have high percentage of organic matter & micro organism.
- Some 1.9 million hectare of agricultural land have been degraded & million hectares are converted to non-agricultural use such as home, highway, shopping center, factories, reservoir etc.
- In India about 175 million land is affected by degradation problem.

## Land Slides:- (Man Induced)

- A land slides is a sudden collapse of a large mass of soil side.
- There are many different types of land slides where not only earth but rock, mud & debris flow down the side of a slope.



→ Man can also cause slides by mining the earth, underground excavation, pumping & draining ground water table.

→ Man induced land slides are generally done for the development process i.e. industrial forming roads & highways, agricultural use homes, etc.

→ No heavy damage occur in man induced land slides.

→ They use heavy explosives for that so in this case no serious casualties or damage occur because proper warning was issued earlier to shift to safer places.

### Desertification:-

→ It is a process by which productive potential of arid or semi-arid land falls.

→ The decrease in productivity is varies from 10% to 50%.

→ Thus desertification leads to the conversion of irrigated crop land to desert (where productivity is min).

→ It is characterized by devegetation, loss of vegetal cover, depletion of ground water, salinization & soil erosion.

→ Deforestation is also one of the cause of desertification because after forest grows land are huged by human. So human activity also responsible for desertification.



## Role of an individual in conservation of natural Resources.

→ Planning of a suitable strategy for the conservation of our natural resources & most judicious execution of planned strategy is called as conservation management.

→ Environmental planning, evaluation, monitoring & impact assessment are methods of conservation management.

→ We have to learn to live with the nature. For this every individual has to play his role to conserve the nature & natural resources.

i) People should at once stop the over utilization of natural resources instate they must be proper use.

ii) we should take help from the government for plantation programmes. Every body should take part in plantation & care the plant.

iii) we should protect wild life.

iv) mixed cropping, crop rotation & proper use of fertiliser insecticides, pesticides should be taught to farmer. Encourage the use of manure, bio fertiliser & organic fertiliser.

v) we should make habit for waste disposal, compost & to restore biodiversity.

vi) Try to educate local people for the protection & judicious use of natural resources.



vii) we should use electrical appliances only when it is needed.

viii) Maintain a balance bet<sup>n</sup> resources and human needs.

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ix) Maintain the essential ecological processes & the life support system.

x) Install rain water harvesting system in houses & colonies.

xi) Recycling of the waste & the waste water for agriculture purposes.

xii) The toxic fuel should be used only when no other alternative source is available.

xiii) We must develop energy saving method to avoid wastage of energy.

xiv) Prevent soil erosion.

xv) Utilise renewable energy sources as much as possible.

Equitable use of resources for sustainable lifestyle.

→ The equal distribution of natural resources should be for all irrespective of rich or poor.

→ There must be an equilibrium balance bet<sup>n</sup> the need & consumption of drinking water, food, fuel, etc.

→ The developed countries are utilizing more resources as compared to developing countries.

→ This imbalance is responsible for sharp increase in population in developing country.

→ Developed country like USA, Canada, Japan, Australia etc have 22% of world's population.



utilizing 86% of natural resources.

→ There is needed to divert the resources to poorer countries to narrow down the gap bet<sup>n</sup> the ~~to~~ two.

→ To achieve sustainable life style there must be equal distribution of global resources to meet everyone's need.



- The scientific study of the interaction of organism with their physical environment & with each other is called "ecology".
- It mainly concern with the directive influences of abiotic & biotic environmental factors over the growth, distribution, behaviour & survival of organisms.
- The word ecology comes from to ~~base~~ <sup>greek</sup> words "oikos" meaning household or place to live or habitation & "logos" means study. Thus ecology deals with the study of organism & their habitat i.e. environmental biology.

### Concept of ecosystem:-

- Eco-system is defined as a community of organisms interacting with one another & the environment which they live.
- A home can be a drop of water for an amoeba or for a lion may be many miles of land over which it's searches for it's foods.
- A pond, forest, lake, river, an ocean, a dam, a garden, a cropland, a city, aquarium may be an examples of ecosystem.
- Further an ecosystem may be natural, manmade or artificial like an aquarium.
- An ecosystem concept is that the living organism of a community not only interact among themselves but also have functional relationship with their non-living environment. This structural & functional system of communities & their environment is called an ecosystem.

### Structural Function of an ecosystem:-

- Functioning:-
- Functioning of the eco system is self regulating & self sustaining.
- This depend upon flow of energy, cycling of material etc.



→ Depending upon the species, diversity & the manner in which they are organised, ecosystem are all following types:-

### i) Permanent & natural ecosystem:-

→ These operate under natural conditions without any interference (even by human beings)

→ These can be further classified into terrestrial ecosystem.

#### (a) Terrestrial Ecosystem:-

→ This ecosystem operate on land hence forest, desert, grass land & agro ecosystem included in this type.

#### (b) Aquatic Ecosystem:-

→ This ecosystem operates in water.

→ It can be further divide into 2 types

\* Fresh water ecosystem

\* Marine ecosystem

→ Fresh water ecosystem are usually name after the size & nature of the fresh water body such as ponds, lake & river.

→ Marine ecosystem is largest ecosystem on the earth, which consist of several sub division, each having it's physical, chemical & biological characteristics.

### (ii) Temporary & natural ecosystem:-

→ These are short lived but operate under natural condition

### (iii) Artificial Ecosystem:-

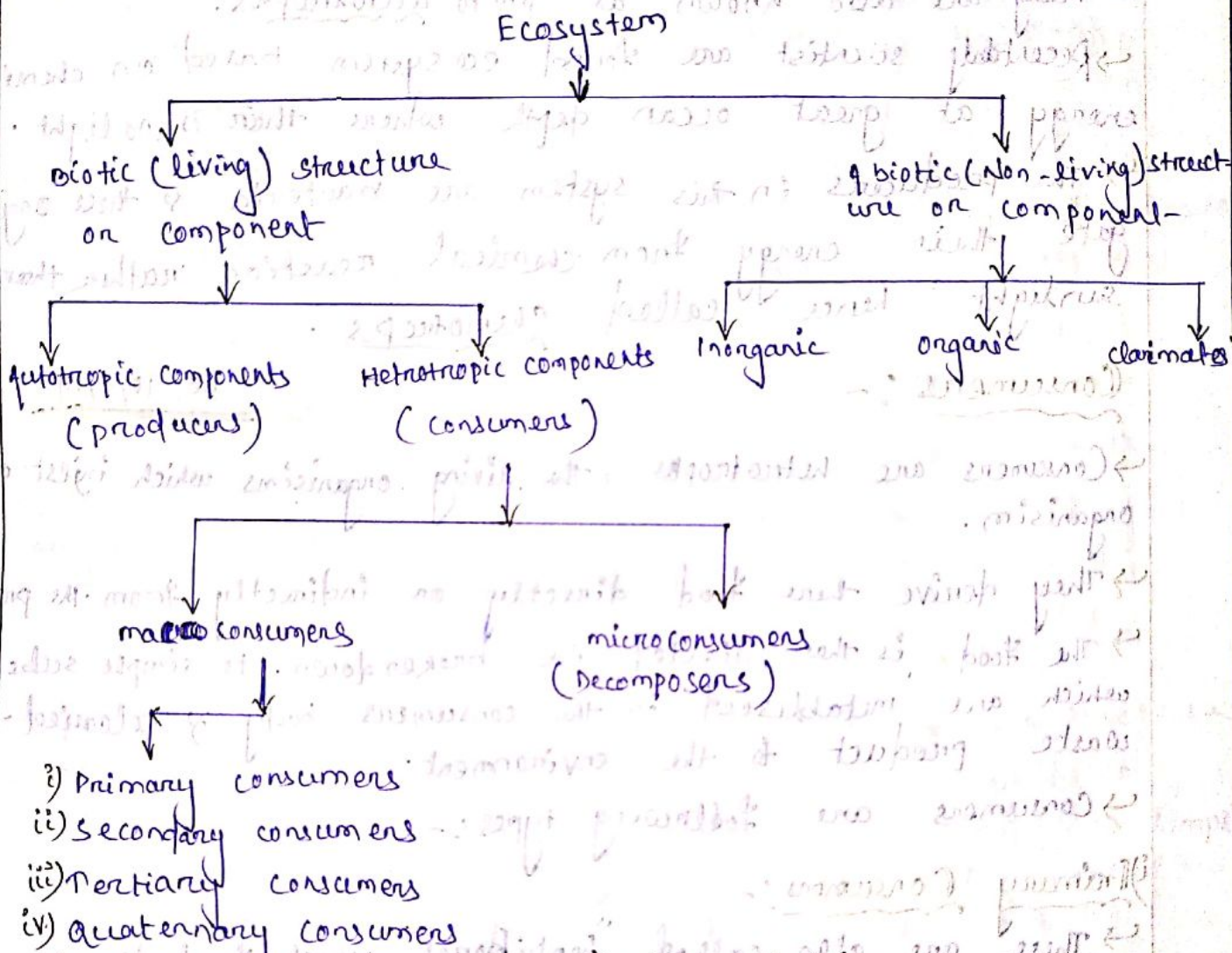
→ These are man made like fishery, tanks, dams fish aquirium etc.



# Structure of an ecosystem

## Structure :-

The structure of ecosystem provides information about the range of climatic conditions that prevail in the area, composition & organisation of biological communities & abiotic compounds.



## Producers, Consumers & Decomposers :-

### Producers :-

→ All green plants are producers. They are also called converters or transformers.

They are living members of the ecosystem that utilise sunlight as their energy sources & inorganic material from soil, air & water to transform them by the process of photosynthesis into more complex energy rich chemicals as their own food.



→ Producers are largely photosynthetic plants & their kind varies with the kind of eco system.

→ In these forest these trees are the most important producers.

→ In lakes & ponds the producers are rooted or large floating & microscopic plants (phytoplankton) usually the algae.

→ They are also known as photo autotrophs.

→ Recently scientist are found eco system based on chemical energy at great ocean depth where there is no light.

→ The producers in this system are bacteria & these organisms get their energy from chemical reaction rather than sunlight hence called chemotrophs.

### Consumers :-

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→ Consumers are heterotrophs, the living organisms which ingest other organisms.

→ They derive their food directly or indirectly from the producers.

→ The food is then digested i.e. broken down to simple substances which are metabolised in the consumers body & released as waste product to the environment.

→ Consumers are following types :-

#### 1) Primary Consumers :-

→ These are also called "herbivores" which feed directly on the producers.

→ They vary with the kind of eco-system.

→ If deer & giraffe is a primary consumer in forest-eco-system. while cow or a goat is in a grassland or crop eco-system.



ii) Secondary Consumers: -  
→ They are also called carnivores or meat eaters.

iii) Tertiary Consumers: -

→ The most of ecosystem are called tertiary consumers. Some organism that eat other

iv) Omnivore Consumers: -

A person or animal eating plants & animals is called omnivore.

v) Top Carnivores: -

→ Some ecosystem have animal like lion or vulture which are not killed or rarely killed by other animals are called top carnivores.

vi) Detritivores: -

→ These are the bottom living which subsist on the organic detritus from autotrophic layers.

→ Ex - Beetles, Termites, ants, crabs, etc.

Decomposers: -

→ They are also the living components mainly bacteria & fungi which breakdown complex compounds of dead protoplasm of producers & consumers to simple organic compound & ultimately into inorganic nutrients.

→ In all the ecosystem these biotic structure prevails.

→ Molds & mushrooms of the forest are the largest of the decomposers that are visible.

→ The role of decomposers in ecosystem is very important as they are responsible of the completion of ecosystem mineral cycle.



→ They are also called as micro consumers on saprophs or saprophits or saprotraps. (sapros means rotter)

→ Ex. Bacteria & Fungus.

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### Energy flow in the eco-system:-

- Energy is needed for every biological activity.
- Solar energy is transformed into chemical energy by a process of photosynthesis.
- This energy is stored in plant tissue & then it is transformed into chemical energy by a process of photosynthesis & heat during metabolic activities.
- In the biological world the energy flows from sun to plants & then to all heterotrophic organism like animals man & other heterotrophic organism i.e. from producers to consumers.
- 1% of the total sunlight falling on the green plants is utilised in photosynthesis, which is sufficient to maintain all life on this earth.
- There is no 100% flow of energy from producers to consumers.
- Some energy is always lost to environment.

### 1st law of thermodynamics:-

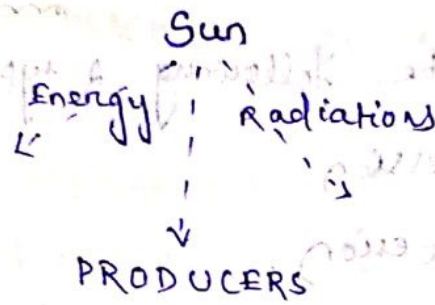
This law states that energy can neither be created nor be destroyed but it can be transformed from one form to another.

### 2nd law of thermodynamics:-

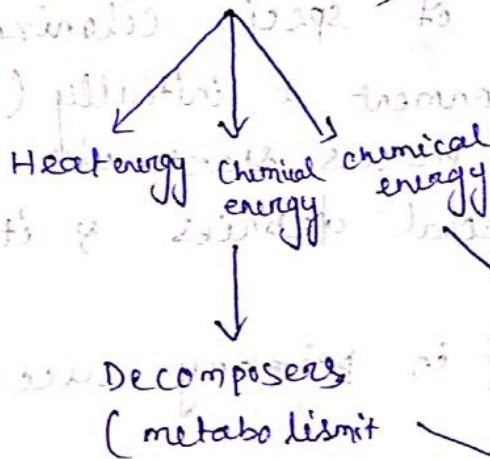
→ This law states that energy transformation involves degradation or dissipation of energy from a concentrated form to a dispersed form.



- we have seen dissipation of energy occurs at every trophic level.
- there is loss of 90% energy & only 10% is transferred from one trophic level to the other.



(Metabolism)



(Sun was the source of energy)

## Ecological Succession :-

- Biotic communities are non static, they change with time.
- this change can be understood on several levels.
- changes take place continuously in the community structure, organisation, the associated animals & the environment at a place in the course of time, this phenomenon is called "ecological succession".



→ The rate of successional change is rapid initially & gradually it slows until a point of dynamic equilibrium is reached & the community is more or less stable.

→ A complete succession is called a "SERE".

The succession may be following 2 types :-

i) Primary succession

ii) Secondary succession

i) Primary succession:-

→ It is the process of species colonization & replacement in which the environment is initially (vertically) free of life i.e. the process starts with base rock or river delta or glacial debris & it ends when climax is reached.

→ The SERE involved in primary succession is called "PRE-SERE".

→ Primary succession occurs when a community begins to develop on a site previously unoccupied by living organisms.

ii) Secondary succession:-

→ The term secondary succession refers to community development on locations or sites previously occupied by well developed communities.

→ It occurs where a community has been disrupted & the surface is completely or largely devoid of vegetation.

→ It may be due to earthquake, fire or even clearing of forest by man.



→ In each case organism modify the environment in a way that allow one species to replace another.

→ The SERE involves in secondary succession is called "SUB SERE".

Hydro SERE (HYDRACH) :- The succession which starts in the aquatic environment.

MESO SERE (MESARCH) :- The succession when begins in an area which is an intermediate type with adequate moisture is called MESARCH.

XERO SERE (XERACH) :- The succession when starts in dry habitat having min<sup>m</sup> amount of moisture such as rocks, dry deserts etc are called XERACH.

LITHO SERE :- The succession initiating on rocks.

PSAMMOSERE :- Succession initiating on sand.

HALO SERE :- succession initiating on saline water on soil.

Autotrophic Succession :-

It is characterised by early & continued dominance on autotrophic organisms like green plants.

Heterotrophic Succession :-

It is characterised by early dominance of heterotroph such as animal, bacteria, fungi etc.

Autogenic Succession :-

In some cases the replacement of one type of community by another is due to modification of the environment by community themselves is called autogenic succession.



## ALLOGENIC SUCCESSION

In some cases if replacement is largely due to forces other than the effects of communities on the environment is called ALLOCHENIC SUCCESSION!

Food change:







## FOREST ECO-SYSTEM:-

- Around 40% of land is occupied by forest. But in India it is 1/10.
- In India tropical rain forest are found in western ghats, Andamans & North-east Himalaya.
- So there have max biodiversity.
- The different components of forest eco system are

### Abiotic Components:-

- These are the inorganic & organic substances present in the soil & atmosphere.
- In addition to the mineral present in the forest we find the dead organic debris.

### Biotic Components:-

The living organisms present in the food chain occur in the following order.

#### Producer:-

- These are mainly trees that so much species diversity & greater degree of stratification. Specially in tropical moist deciduous forest.
- In northern coniferous forest needle leaf evergreen tree, specially the spruces, firs, pines are found with poor development of shrub & herb layers.
- Deciduous forest is greatly modified by man & much of it is replaced by cultivated & forest edge communities.
- These trees are of different kinds depending upon the kind of forest.
- Besides trees shrubs & ground vegetation are also present.



## Consumers :-

### Primary Consumers :-

→ These are the herbivores that include the animals feeding on tree leaves as ants, flies, beetles, leafhoppers, bugs etc.

→ Many of the larger herbivorous vertebrates like moose, snow shoe are found on grassland leaf developmental community.

→ Similarly some animals like elephant, deer, Nilgai, mole, flying foxes, fruit bats etc are grazing.

### Secondary Consumers :-

These are the carnivorous like snake, birds, lizards, fox etc feeding on herbivores.

terti

These are the top carnivorous like lion, tiger etc. that are carnivores of secondary consumer level.

### Decomposers :-

These are wide variety of microorganism like bacteria (bacillus), clostridium, escherichia, fungi, species like aspergillus, capricorn, puliparose, fusarium, trichoderma.

Rate of decomposition in tropical & subtropical forest is more rapid than that in the temperate one.



## Aquatic eco-system:-

→ More than 70% of land is covered by water.  
The important aquatic ecosystems are  
Marine (ocean)  
and ecosystem:-

→ The marine environment of seas & ocean is large occupying 70% of the earth's surface.

→ Each ocean indeed represents a very large & stable eco-system.

→ Oceans play an important role in regulating meaning geochemical & hydrological cycle, there by regulating the earth's climate.

## Producers:-

→ These are autotrophs which are mainly the phytoplankton. They trap radiant energy from sun through their pigments.

→ A number of macroscopic sea weeds (brown & red) are also come in this category.

→ There in the disting zone are different depth on the water.

## Consumers:-

These are heterotrophs - macro consumers being dependent for their necessities on the primary producers.

The herbivores like crustaceans, molluscs, fishes etc which feed directly on producers are called primary consumers.

The carnivores like shark, herring etc feeding on herbivores are called



secondary consumers.

The top carnivorous fishes like cod, halibut etc that feed on secondary consumers are called tertiary consumers.

### Decomposers :-

The microbes active in the decay of dead organic matter are mainly bacteria some Fungus like.

### Pond ecosystem :-

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→ Ponds are small bodies of water in which the littoral (costal) zone is relatively large & the limnetic & profundal regions are small or absent  
→ Ponds may rebound it's most reasons of adequate rainfall.

→ They are continually ring form as a body of standing water where organic material accumulates.

### Abiotic components :-

→ Apart from heat, light, the "basic" inorganic & organic compound elements are water,  $CO_2$ , oxygen, calcium, nitrogen, phosphorus, Amino acid etc.

### Biotic components :-

#### Producers :-

These are autotrophic, green plants & bacteria.

They fix radiant energy with the help of minerals from the water & inorganic carbon complex organic substance like carbohydrates.



protein & lipids.

### i) Macrophytes :-

→ These are mainly rooted large plants which includes mostly or completely submerged, floating hydrophytes.

→ Ex are :- Nymphaea, Sagittaria, Hydrochara, Stratiotris, Azolla, Sylvania.

### Phytoplankton :-

These are like Ulothrix, Spirogyra, Chlorella, Oedogonium etc.

### Consumers :-

Most of the consumers are herbivores, except insects & some large fish.

#### Primary consumers :-

These are herbivores also known as primary macro consumers feeding directly on living plants.

#### Secondary consumers :-

These are carnivores like insects & fish which feed on primary consumers (herbivores) like zooplankton.

#### Tertiary consumers :-

These are some large fish which feed on smaller fishes.



## Decomposers :-

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

Thus they play an important role in return of mineral elements again to pond.

## Marine or Ocean eco system :-

The marine environment of sea & ocean is large.

## Estuaries :-

→ Estuaries derive from the word "aestus" means tide.

It is a semi enclosed coastal body of water which has a free connection with the open sea.

It is thus strongly affected by tidal action & within it sea water is mixed with fresh water.

Not all rivers open in to estuaries some simply discharge their run of in to the ocean.

Estuaries differ in size, rate & volume of water flow.

Estuaries could be considered as transition zones bet<sup>n</sup> the fresh water & marine habitats.



## physico chemical aspects on estuaries:-

current & salinity both are important here.

Estuarine currents result from the interaction of an one direction stream flow which varies with season & rainfall with oscillation ocean tide & with wind.

The salinity vary betw. 0.5 to 0.35%.

The water level in the estuarine fluctuates regularly ~~and~~ that of river & the temp. also fluctuate.

The seasonal & tidal cycle cause changes in nutrient concentration in the estuary.

## Biotic community of estuary:-

The reason of estuaries as classified into upper, middle, lower reaches increasing range of salinity & the mouth with salinity nearly equal to the sea.

The animals inhabiting the estuarine reason has been classified into 2 types:-

(i) Oligohaline (0.5% to 5%)

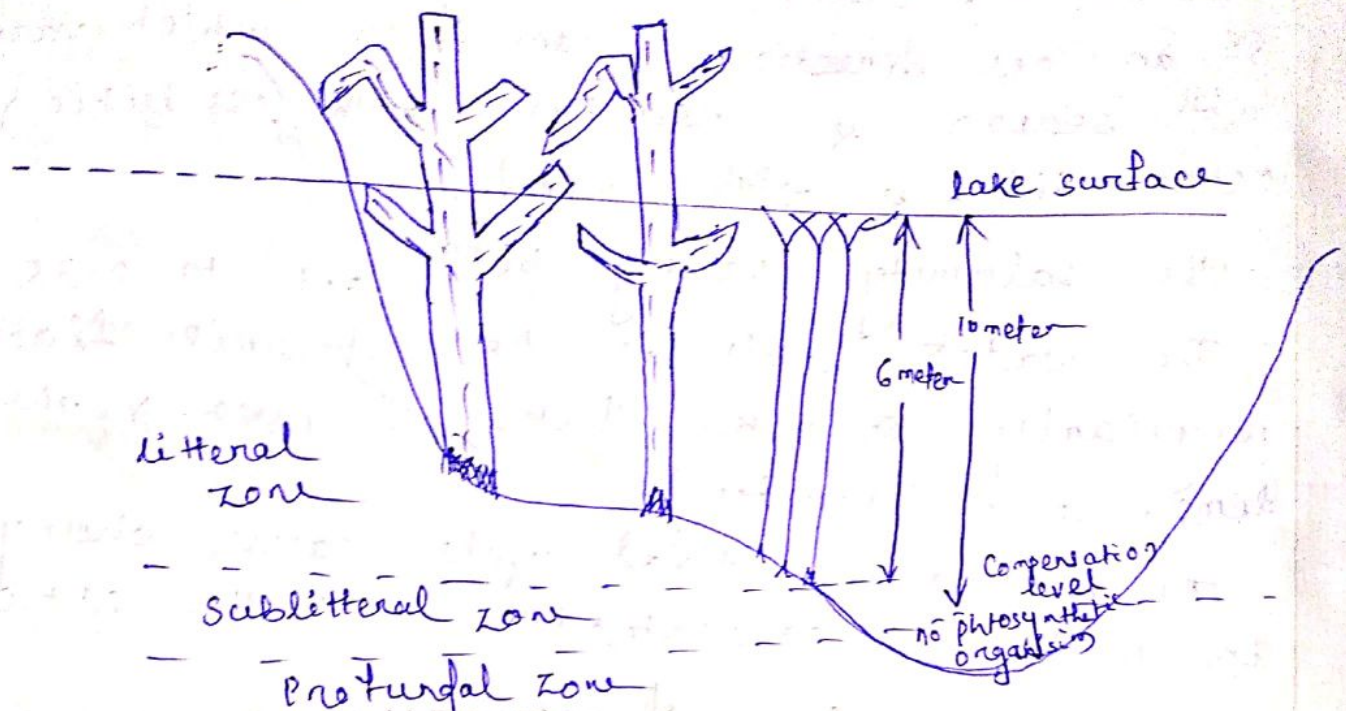
(ii) Mesohaline (5% to ~~18~~ 18%)

It has also reported an abundance of phytoplanktonic several species of diatoms, *Synedra*, *Navicula* etc & blue green algiclike microcysties, *Oscillatoria* etc.

In short the estuarine ecosystem is a complex & interesting one.



# Lake eco system



( Different zone of a deep fresh water lake )

→ Lakes are inland depression containing standing water.

→ They vary in size & depth.

→ In lake there are 3 to 5 well recognised horizontal zones.

**Littoral zone** :- Shallow water near the shore forms this zone which contains upper warm & oxygen rich circulating water layer.

**Sublittoral zone** :- It extends from rooted vegetation ~~to~~ to the non circulating cold water with poor oxygen content.

**Limnetic zone** :- It is the open water zone away from the shore.



profundal zone:- It is the deep water area beneath limnetic zone. It is beyond the depth of effective light penetration.

Abyssal zone:- It is found only in deep lakes since it begins at about 2000 meter from the surface.

Physico chemical properties of lake:-

→ Lakes have the tendency to become thermally stratified during summer & winter to undergo definite seasonal periodicity in depth.

→ Light too penetrates only to a certain depth depending on turbidity.

Biotic Community of lake:-

Organisms depending on different layers are found.

Neuston:- These including floating plant such as duck weeds & many types of animals. Animals are called epineuston while other including insects called hyponeuston.

Plankton:- These are small plants & animals whose power of self locomotion is very limited. Shorter zooplankton are very active called as nekto plankton.

Nekton:- These animals are swimmers.

Benthos:- These include the organism living at the bottom of the water mass.

Streams:-

→ Biotic community in streams is quite different from that of pond.



- More streams in the vicinity of urban area are collected.
- streams are fresh water aquatic system where water current is a measured controlling factor.

### Stream Communities:-

- stream generally exhibits 2 measure habitats i.e. (i) Rapid & (ii) Pools.

→ Some with in the categories the type of the bottom whether sand, pebbles, clay, bed rock is very important in determining the nature of communities & population density.

→ Current is the measure factor for rapid but had bottom may offer favourable surfaces for organisms.

→ Benthic invertebrates have higher density in rapid but class clams, burrowing odonata & ephemeroptera are more abundant in pools.

→ planktons are at the mercy of the current - organism in rapids & in lesser extent in pools.



→ Biological diversity means the variability among living organisms from all sources.

→ The variety & variability among living organisms & the ecological complexes in which they occur is called biodiversity. i.e. biodiversity is a property of living system.

→ Biological diversity of total variety of life on our planet.

→ Total number races, variety or species i.e. the sum total of various types of microbes, plants, animals present in a system is record as biological diversity or biodiversity.

Genetic, species & ecosystem diversity:-

→ Biodiversity is usually analyzed at 3 levels i.e. species, genetic & ecosystem.

Diversity of biotic community & ecosystems:-

→ Depending largely upon the availability of abiotic resources & condition of the environment an ecosystem develops its own characteristics community of living organisms.

→ A small pond constitutes an ecosystem & possesses a set of flora & fauna different from a river which is another type of ecosystem.

→ Different types of forest, grassland, lakes, ponds, rivers etc represent diverse ecosystems with a characteristic biotic community.



Diversity of species composition within a community:-

→ The biotic components in an ecosystem may be composed of a few species only or a large number species of plant, animals & microbes which react & interact each other & with the abiotic factors of the environment.

→ The richness of species in an ecosystem is usually records are species diversity.

Diversity of genetic organisation within a species:-

→ Within a species there are often found a no of variety or races or strains which slightly ~~never~~ differ from each other in 1, 2 or a no of character such as shape, shine, quality of their product, resistance to insects, pests & diseases, ability to withstand adverse condition of environment.

→ These differences are due to slight variation in their genetic organisation.

→ This diversity of in genetic make up of a species is referred to as genetic diversity.

Biogeographical classification of India:-

→ India is one of the 12th mega biodiversity country in the world.

→ The country is divided into 10 biogeographic regions.

→ The wide variety in physical features & climatic condition have resulted in a diversity of ecological habitats like forest, grasslands



wait lands, Coastal, marine ecosystem & elements.  
→ Biogeographically India is situated at the  
trijunction of 3 realms namely afro-tropical  
Indo-malayan & palio-arctic realms &  
therefore has characteristics elements each of  
them.

→ This assembles of 3 distinct realms makes  
the country rich & unique in biological  
diversity.

→ with only 2.4% of the land area, India  
accounts for 7-8% of the recorded species  
of the world.

→ Following 13 biogeographical realms have been  
identified in India.

- i) Himalaya
- ii) The Desert
- iii) Deccan peninsula
- iv) Malabar
- v) Andaman Islands
- vi) Nicobar Islands
- vii) Gangetic plains
- viii) Laccadive Islands
- ix) Maldive chagos Islands
- x) Western Ghats
- xi) Barman Bangalian Forest
- xii) Marine coast
- xiii) Coromandal Mahanadigan



## Values of Biodiversity :-

- Biodiversity is a valuable natural resource for the survival of ~~the~~ mankind.
- Man has domesticated a no of economically important plants & animal species.
- Many plants & animals including wild life are of very important for human being.
- They can be used directly or indirectly to have consumptive, productive, social, ethical, aesthetic & option values.

### Consumptive Value :-

- Most of the developing countries obtained fuelwood from forest.
- Still more than 1500 million people cook their food by burning wood.
- About 1000 million cubic meters wood is used for fuel across the globe.
- Various tribal societies fully depend on forest for their habitation & lively food.

### Productive Value :-

- Bamboos, grasses, canes, essential oils, tanning materials, dyes, gums, resins, drugs, spices, soap substitute, nutcrackya, latex, honey wax, topper, mahua seeds, mahua flowers & other seeds are forest products have their high commercial values.
- In addition to these various herbs & animal body parts are sold in commercial market both at national & international levels.
- Some benefits like water quality, recreation, education, scientific research, regulation of climate etc are indirect values to biodiversity that provide economic advantage to the people without consumption of the resource.



### Social Values:-

→ Social value is one of the instrumental values.

→ The biodiversity has disting social value attached with different societies.

→ Goods & services provided by ecosystems to our society include

(i) Provision of food, fuel & fibre

(ii) Provision of shelter & building materials

(iii) Purification of air & water.

(iv) Detoxification & de-composition of waste.

(v) Generation & renewable of soil fertility including

(vi) nutrients cycles.

(vii) Stabilization & moderation of earth climate.

(viii) Life stock breeding, medicines & other products.

(ix) Maintenance of genetic resources as key input to our society.

### Ethical Values:-

→ Ethical or religious values are also one of the indirect values of biodiversity.

→ The Ethical & religious values of biodiversity is rooted in the understanding that humanity is a part of the nature & we are just one species among others.

→ All species have an inherent right to exist.

→ Future generation also have an inherent right to know them & to have the choice of using them or not.

→ Religious is also have a significant impact on our attitude to our nature resources.

### Aesthetic Value:-

→ The Aesthetic value of biodiversity has been expressed in many ways through Arts, poetry, songs, literature, music & dance.

→ Forests are closely link with our religious & culture.

→ Human race has great visionary attachment with forest has our ancestors lived in forest.

→ Many type of trees are worshiped by hindus in all over India & tribal societies also i.e pipple, tulsi, banyan etc.



→ Some animals like cow, is worshiped by hindus.

### Option values:-

→ Biological resources exist in this biosphere are very important for human beings.

→ The option value biodiversity suggest that any species may prove to be a miracle species.

→ Option value is indirect to human society at some point in near future.

### Biodiversity at global national & local level:-

#### Biodiversity at global level:-

→ It is estimated that there exist 5 to 30 millions species of living forms on our earth & of them only 1.5 millions have been identified which includes 3 lakh species of green plants & fungi, 8 lakh species of insects, 4000 species of vertebrates & 3,60,000 species of micro organisms.

→ The data related to different species in different parts of the world are different.

\* For example:- Approximately 2 lakh species of plants are in south America.

→ Precipitation & temp as among the most important determinants of diversity.

### Estimated no. of species world wide:-

#### Taxonomic Group

#### No. of species

Bacteria

3600

Blue green algi

1700

Fungi

4698

Gymnosperms

17000

Angiosperms

750

Insects

50,000

Sponges

7,500,000

Custard

5000



|               |   |        |
|---------------|---|--------|
| invertebrates | → | 38000  |
| Fishes        | → | 50,000 |
| Amphibians    | → | 19,056 |
| Reptiles      | → | 6,300  |
| Birds         | → | 9036   |
| Mammals       | → | 4008   |

### Biodiversity at National levels:-

- India is located in south Asia bet<sup>n</sup> latitudes  $8^{\circ}$  &  $38^{\circ}$  N & longitude  $69^{\circ}$  &  $97^{\circ}$  E.
- The Indian land mass, extending over a total geographical area of about 329 million hectares is bounded by Himalayas in the north, the Bay of Bengal in the East, the Arabian sea in the west & Indian Ocean in the South.
- The wide variety in physical feature & climatic situation have resulted in a diversity of ecological habitats.
- This richness in biodiversity is due to immense variety of climate & altitudinal condition coupled with various ecological habitats.

Number of recorded

### FLORA

| <u>Taxon</u> | <u>no. of species</u> |
|--------------|-----------------------|
| Bacterial    | 850                   |
| Algal        | 2500                  |
| Fungi        | 23000                 |
| Lichens      | 16000                 |
| Bryophyta    | 2700                  |
| Pteridophyta | 1022                  |
| Gymnosperms  | 64                    |
| Angiosperms  | 1700                  |
| <b>Total</b> | <b>48736</b>          |



# FAUNA:-

|                               |   |         |                        |
|-------------------------------|---|---------|------------------------|
| Protozoans                    | → | 2577    |                        |
| Peritrea                      | → | 519     |                        |
| Cnidaria                      | → | 237     |                        |
| Ctenophora                    | → | 10      |                        |
| Platyhelminthes               | → | 1627    |                        |
| Nematoda                      | → | 2350    | related to pterovibose |
| Rotifera                      | → | 310     |                        |
| kinorhyncha                   | → | 10      |                        |
| Gastrotrecha                  | → | 88      |                        |
| Acanthocephals                | → | 110     |                        |
| Sipuncularia                  | → | 38      |                        |
| Mollusca                      | → | 5042    |                        |
| Echinurs                      | → | 33      |                        |
| Annelida                      | → | 1093    |                        |
| Oryctophora                   | → | 1       |                        |
| Aarthropoda                   | → | 57525   |                        |
| Phoronida                     | → | 3       |                        |
| Brachyzoa                     | → | 170     |                        |
| Entoprocta                    | → | 10      |                        |
| Brachiopoda                   | → | 3       |                        |
| Chaetognatha                  | → | 30      |                        |
| Echinodermate                 | → | 765     |                        |
| Hemichordata                  | → | 12      |                        |
| Fishes                        | → | 2546    |                        |
| Amphibians                    | → | 204     |                        |
| Reptiles                      | → | 428     |                        |
| Birds                         | → | 1228    |                        |
| Mammals                       | → | 372     |                        |
| Total based on available data | → | 5206188 |                        |



## Biodiversity at local level:-

- The biodiversity at local level can be well understood by demarcating plants, places, zones, rich in biodiversity.
- This can be understood as compositional i.e. rich in plants & animals of same habitats & genetic make up.
- The local biodiversity is studied on following lines:
- (i) Richness of species at a given place.
  - (ii) Physical characteristics of habitat & vegetation in particular area.
  - (iii) Change in species composition across different habitats.
  - (iv) Local diversity based on climate, geographical, ecological & other processes responsible for creation.
  - (v) Rate of change across gradient & conditions.
- It is said that environmental variables are responsible for diversity but temperature play an important role in affecting biodiversity of an area. These local areas are well affixed in a heterogeneous & homogeneous habitats.

## 2. Hotspots of Biodiversity:-

The most threatened of on all biologically rich areas are called hotspot.

### Threads of Biodiversity:-

- One of the major threat to biodiversity is space, food & raw material for expanding human & plant establishment.
- The following major causes & issues related to threads to biodiversity:
- i) Habitat loss
  - ii) poaching of wildlife
  - iii) Man wild life conflicts.



## (i) Habitat loss :-

- Habitat loss due to human activity & other disturbances well known factor.
- Varying human disturbance are changing ecosystem & are thus threatening the bio-diversity.
- Due to habitat degradation & loss wild population becomes more vulnerable to predators & diseases.
- This is especially true for wild life which suffer due to habitat loss & fragmentation.
- Habitat loss is installment so that the habitat is divided in to small & scattered patches i.e habitat fragmentation.

## (ii) Poaching of wild life :-

- Poaching is another threat to wild life.
- As an anxic period, Hunters, collectors & smugglers are the major threats to the no. of species including in dangered species.
- They collected furs, hides, Horns, tusks & some living specimens, herbal products are smuggled.



Introduction to Organic Chemistry

The study of organic chemistry is the study of the chemical and physical properties of the compounds of carbon. Carbon is a unique element in that it is the only one that can form a stable covalent network solid. This property of carbon is the basis for the vast diversity of organic compounds. The study of organic chemistry is essential for understanding the behavior of many of the substances that make up the world around us.

Classification of Organic Compounds

Organic compounds are classified into two main categories: hydrocarbons and non-hydrocarbons. Hydrocarbons are compounds that contain only carbon and hydrogen atoms. They are further divided into aliphatic and aromatic hydrocarbons. Aliphatic hydrocarbons are those in which the carbon atoms are arranged in a straight or branched chain. Aromatic hydrocarbons are those in which the carbon atoms are arranged in a ring. Non-hydrocarbons are compounds that contain carbon atoms along with one or more other elements, such as oxygen, nitrogen, sulfur, and halogens. These compounds are often referred to as functional groups.

Properties of Organic Compounds

Organic compounds exhibit a wide range of physical and chemical properties. They are generally less soluble in water than inorganic compounds. Many organic compounds are flammable and volatile. The boiling and melting points of organic compounds are generally lower than those of inorganic compounds. Organic compounds also exhibit a wide range of chemical reactivities. Some are highly reactive, while others are relatively inert. The study of organic chemistry is essential for understanding the behavior of these compounds and for developing new materials and drugs.



Air Pollution:-

Air pollution may be defined as the presence in the outer atmosphere of one or more contaminants or combination thereof in such quantities & of such duration, may tend to be injurious to human, plant or animal life or property or which non reasonably interfere with the comfortable enjoyment of life.

Causes of Air Pollution:-

The air pollutants may be classified in different ways.

imp (1) According to Origin:-

i) Primary pollutants which are directly emitted into the atmosphere are found as CO, NO<sub>2</sub>, SO<sub>2</sub> & hydrocarbons all these are primary pollutants.

ii) Secondary pollutants which are derived from the primary pollutants due to chemical or autochemical reaction in the atmosphere.

Ex - Ozone, peroxy-acetyl nitrate (PAN), Photochemical smog etc.

(2) According to chemical composition:-

(i) Organic pollutants. Ex - hydrocarbons, aldehydes, ketones, amines & alcohols.

(ii) Inorganic pollutants. Ex - carbon compounds such as:-

CO & carbonates, nitrogen compounds such as:-

NO<sub>x</sub>, N<sub>2</sub>O, sulphur compound :- H<sub>2</sub>S, SO<sub>2</sub>, SO<sub>3</sub> & H<sub>2</sub>SO<sub>4</sub>.

Halogen compound :- HF, HCl & metallic fluoride.

Oxidising agent :- O<sub>3</sub>

(iii) Inorganic particles such as fly ash, silica, asbestos, dust from transport, mining, metallurgical & other industrial activities.



According to state of matter:-

(i) Gaseous pollutant which gets mixed with the air & don't normally set out.

Ex - CO, NO<sub>x</sub> & SO<sub>2</sub>

(ii) Particulate pollutants which comprise of finely divided solids or liquids & often exist in colloidal state as aerosol.

Ex:- Fumes, smoke, mist, fog, smog, dust & sprays

Effect of Air Pollution:-

Damage to material:-

- The material may be affected by air pollutant include metal, building material, rubbers, paper, textile, leather, glass, dyes, enamels, surface coating
- The types of possible damage to these material by air pollution includes corrosion, deposition, abrasion, direct & indirect chemical attack etc.
- The intensity of damage depends upon factor such as moisture, temperature, sunlight, air movement & the nature & concentration of the pollutant.

Damage to vegetation:-

- Air pollutant such as sulphur dioxide, HF, smog, oxidant like ozone, ethylene from automobiles, NO<sub>x</sub>, chlorine & herbicides exert toxic effect on vegetation.
- The damage usually manifest in the form of visual injury such as chlorotic mottling, banding, silencing, bronzing of the underside of the leaf.
- Retardation of plant growth may occur in some cases.



### Damage to farm animals:-

- Arsenic, lead, fluorides are the main pollutants which cause damage to life stock.
- These air <sup>borne</sup> contaminant accumulate in vegetation & poison the animal when they eat the contaminated vegetation.
- Cattle & sheep are particularly susceptible to fluoride toxicity which may cause fluorosis of teeth & bones.
- Life stock <sup>near</sup> ~~near~~ smelting & other industrial operation suffer from arsenic poisoning with symptoms like salivation, thirst, liver necrosis, inflammation and depression of central nervous system.
- Lead poisoning occurs in horses and other animals with symptoms such as lethargy, gastric paralysis & breathing troubles.

### Darkening of sky & reduction in visibility:-

- Sky darkening may be caused by heavy smoke & fog or by dust storms.
- The reduction in visibility may be due to smoke & fog & industrial fumes which contain particulates in the size range of 0.4 to 0.9 micrometer that scatter light.
- The intensity of these effect depends upon the particle size, the angle of the sun, aerosol density, thickness of the air, wind speed, humidity.

### Effect on human health & human activity:-

- Air pollution can affect health of workers with in the industrial premises causing slakness, absenteeism & drop in production.
- However apart from the effect on industrial workers, air pollution also affects larger segments of general population.



→ Epidemiological & toxicological studies indicate a link bet<sup>n</sup> air pollution & respiratory condition, like chronic bronchitis, asthma, pulmonary diseases & lung cancer.

→ Irritation of nose, eyes & throat & bad odours, due to air pollutant, cause annoyance, allergy & other health hazards.

### Control measure of Air pollutant:-

The following are the general methods of air pollution control:-

- (i) Controlling the air pollution at source
- (ii) site selection / zoning
- (iii) controlling air pollution by device on equipments or process modification
- (iv) air pollution control by growing vegetation
- (v) air pollution control by fuel selection & utilization

### Controlling of air pollution at source:-

→ Modifying the process in such a way that pollutants don't form at all beyond the permissible limit.

→ Before release the pollutants they should be reduce to tolerable level by methods equipment to destroy, alter & trap.

→ This step can also be done in 2 ways first is that we should select the raw material in such a way to release min<sup>m</sup> pollutants.

→ The substituents may also be used if needed.

→ Secondly use suitable fuels avoiding sulphur content.

→ Equipment alteration, such as the use vented tanks should be avoided & for industry new furnaces & modified equipment should be used.

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## ii) Site selection on zoning:-

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

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

→ while setting the factories the metrological & micro metrological condition should be considered.

## iii) Controlling air pollution by devices or equipments or process modification:-

Methods .. equipment used in control gaseous pollutants

For gaseous pollution the following methods are

- \* absorption
- \* adsorption
- \* combustion
- \* Cold trapping & condenser

\* absorption:- scrubbers are mostly used for the removal of gaseous pollutants which use suitable liquid as absorbent to remove or modified one or more of the pollutants.

\* adsorption:- → Here the gaseous effluents are passed through consolidated absorbent taken in suitable containers.

→ the efficiency of adsorption depends upon the surface area for unguate of the absorbent.



## Pollutants

## Absorbant

## Absorbant

NOx

H<sub>2</sub>O & aqueous HNO<sub>3</sub>

silica gel, commercial zeolites

HF

H<sub>2</sub>O & NaOH

porous pellets of sodium chloride, lime stones

H<sub>2</sub>S

Ethanol amines, formal, sodium alanine, soda ash, etc.

iron oxide

SO<sub>2</sub>

water, alkaline H<sub>2</sub>O, aluminium sulphate, sulphites of calcium, calcium, sodium

alkaline, flue gas, dolomite

## Controlling of air pollution by growing vegetation

→ planting of trees is very helpful in reducing air pollution.

→ Trees should be planted all around the sources in order to reduce the spreading of air pollution from pollutant coming out from the industries on source.

## Air pollution control by fuel selecting & utilization:-

Fuel should be selected in such a way that combustion gives more efficiency & less polluting gases.

Incomplete combustion of hydrocarbon fuel should be avoided.



## Water pollution:-

The water i.e. feed for drinking is called potable water.

Characteristics of potable water are

- It should be colourless, odourless & tasteless.
- Free from turbidity & other suspended impurities.
- Free from germs, bacteria & other pathogenic organisms.
- Shouldn't contain toxic chemical impurities such as heavy metal, pesticide etc.
- Should have pH in the range of 7 to 8.5.
- It should be moderately soft having hardness 50-100 ppm (parts per million).

## Causes of water pollution:-

The various type of water pollutant are:-

### oxygen demanding waste:-

- These include domestic & animal sewage, biodegradable organic compound & industrial wastes from food processing plants, meat processing plant, slaughter house, paper & pulp mills, tanneries, etc.
- All these waste under go degradation & decomposition by bacteria activities in presence of dissolved oxygen.
- This results in rapid depletion of dissolved oxygen from the water which is harmful to aquatic organisms.
- The optimum dissolved oxygen in natural water is 4-6 ppm which is essential for supporting



aquatic life.

→ Any decrease in this dissolved oxygen value is an index as pollution.

### Things causing wastes:-

These include pathogenic micro organisms which may enter the water along with sewage & other waste & may cause tremendous damage to public health, which cause dangerous water born diseases. Such as cholera, typhoid, dysentery, polio, infectious hepatitis, etc.

### Synthetic organism compound:-

These are the man made material such as synthetic pesticides, synthetic detergent, food additives, insecticides, pharmaceutical byproduct, plastics, etc.

Most of these chemical are potential toxic to plant animals & human.

### Sewage & agricultural run off:-

Sewage is run off agricultural land supply plant nutrient which may stimulate the growth of algae & other aquatic weeds in the receiving water body, which degrade the value of the water body.

### Oil:-

Oil pollution may take place because of oil spill from cargo oil tanker on the seas, or leakage from oil pipe line crossing water waste from reservoir.

Oil pollution result in reduction of light transmission through surface water thereby reducing photosynthesis by marine plants.



## Effect of water pollution:-

Some important effects of various types of water pollutant are

i) Wastewater effluents contains several constituents which are deleterious, irrespective of the fact that where they are discharge in to river, stream, land or sea.

ii) It impacts persistence of all brown colour to the receiving water causing aesthetic & other problems described earlier.

iii) Highly repulsive odour is imparted to the receiving water by the detritive constituent like proteins, amino acids.

iv) The acidic or alkaline effluents are corrosive to concrete & metal pipes.

v) Excess iron in the effluents is also corrosive & is unsuitable for irrigation.

vi) The effluents may contains pathogenic bacteria.

vii) The dissolved chromium with toxic to peria & aquatic life.

viii) The suspended solid interfere with the photosynthetic activities aquatic flora.

ix) Radio active isotopes are toxics to life form.



## Control measures of water pollution:-

- Scientific techniques are necessary to be adopted for the environmental control of catchment areas of rivers, lakes, ponds & streams.
- Industrial plants should be based on recycling operation.
- The possible reuse or recycle of treated effluents & industrial waste should be initiated & encouraged.
- Instead of throwing waste in to the water, the recycling should be done for better use.
- Min. appropriate quantity & concentration of fertilizers, pesticides & insecticides should be used because excess will cause pollution.
- Frequent plant should be concentrated & govt. should also help by funding for domestic, sewage & industrial effluence.

Water resources should be used in the best possible economic ways.

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

Govt. should encourage people to participate in research program like disposal of solid waste & industrial effluence.



Local authorities, industrial list, govt. official with public participation should coordinate to find different ways to control water pollution.

## SOIL POLLUTION:-

### Causes of soil pollution:-

- Soil pollution differs from water pollution & air pollution because the pollutant remains in direct contact with the soil for relatively longer period & hence alter the chemical & biological properties of the soil.
- The hazardous chemical can also enter the human food chain from soil or water plants.
- The major sources of metallic contamination of soil include mining, smelting, sludge, fertilizer, pesticides, etc.
- Metal such as Cd, Pb, Hg, Ni, Mo, Cr, etc are toxic to plant & animal life.

In discriminate dumping of industrial waste & municipal waste leads to the leaching & seepage of toxic substances into the soil & pollution of ground water.

as generated from thermal power plants industrial waste discharged into streams or dumped into the surrounding land, mining waste non-biodegradable organic pollutants, industrial sludges, heavy metal cause a serious soil pollution problems.



commercial & domestic urban waste such as plastic metal cans, glasses, waste paper, fiber, rubber etc contribute to soil pollution.

### Effects of soil pollution:-

- Soil pollution was originally defined as the contamination of the soil system by considerable quantities of chemical or other substances resulting in the reduction of its fertility or productivity with respect to the qualitative & quantitative yield of the crops.
- Soil pollution is receiving greater attention due to its direct impact on public health.
- The measure effects of various types of pollution are

### Effect of modern agricultural practice:- of synthetic fertilizers:-

These are employed to increase the soil fertility & crop productivity.

These fertilizers concentrate the essential nutrients in top soil layer however the soil enriched by chemical fertilizers can't support the microbial flora which are so essential to enrich the humus that health in plant growths.

Excessive & indiscriminate use of chemical fertilizer may result in the reduction of crop yield.

### Pesticides:-

Pesticide pose potential hazard to animals, human & aquatic life.

They also caused deleterious effect on soil fertility & crop productivity.



pesticides applied to crops are weathered in the soil in considerable quantities.

they entered in the cyclic environmental process such as absorption by soil leaching by water & contaminate both lithosphere & biosphere.

Pesticides including herbicides, fungicides & rodenticides are persistent pollutants.

Pesticide may enter the food chain & poses serious health hazards.

Some of them undergo metabolic transformation & their degradation product are even more dangerous than their respective parent compound.

Some of the pesticides are carcinogenic while their metabolic product too are toxic.

### Effect of Industrial effluents:-

Solid, liquid & gaseous chemical from various industries like paper, iron, fertilizer, automobile, steel, plastic pesticides, tanning, coal based thermal power plants etc. contain a variety of pollutants such as toxic heavy metals, solvents, detergents, plastics, suspended particles & non biodegradable chemicals.

If these not properly treated are sources of give rise to water, air & soil pollution.



Fly ash resulting from coal based thermal power plant is one of the alarming & continuously increasing source of soil pollution leading to degradation of soil.

### Effects of urban waste:-

Millions tons of urban waste are produced every year from critically polluted cities.

The is inadequately treated or untreated sewage not only poses serious health hazards but also pollute soil & decrease its fertility & productivity.

Some solid waste clogging of ground water filter.

Suspended matter present in sewage can act as a blanket on the soil & interfere with its productivity.

### Control <sup>measures</sup> of soil pollution:-

The various approaches to control soil pollution are

implementing stringent & proactive pollution control program.

Launching extensive afforestation & community forestive program.

Implementing deterrent measure against deforestation.

Discouraging the use of highly toxic & resistant synthetic chemical pesticides.



Encouraging use of bio pesticides in place of toxic chemical pesticides.

Impacting informal & formal public awareness programmes to educate large no of people regarding the health hazard & undesirable effects of pollution.

Effective treatment of domestic sewage by suitable biological & chemical method & adopting modern methods of sludge disposal.

Industrial waste have to be properly treated & disposed.

Municipal waste have to be properly collected & segregated scientifically.

Avoiding excessive use of chemical fertilizer & insecticides & providing more organic manures to the field.

### \* Marine Pollution :-

When marine water is polluted it affects the animal & other food chain components.

### \* Sources of marine pollution :-

Rivers are the main source of marine pollution. They carry waste in their drainage & join the sea or ocean. The drainage includes sewage sludge, industrial effluents, detergents, agrochemical, plastics.



, metal scraps etc.

Cathement area like India & other countries, many big cities & industries are situated along the coast lines. Large amount of waste from vehicles & other human activities, sewage from corporation & industries are mixed in sea water.

Ships which carry toxic substances lubricating oil, paints, heavy oil, fuels, some time by accident or by leakages pollute the marine water. Testing of atomic weapons, space air craft, missiles & other radioactive wastes when dumped in seas causes marine pollution.

Marine pollution also caused by oil drilling in seas, mining activities & heat release from industry etc.

### Effects of Marine pollution:

Oil is most dangerous pollutants when it float on sea or mixed with water is a great threat to marine life. specially fish

birds, invertebrates, algae.

Oil at sea also affect sensitive flora & fauna, phytoplankton, zoo plankton & other animals.

plastic & plastic material when dumped in to sea animal take it through their food in stomach which causes also & replaces



hunger.

Marine pollution, the effect of food change in sea, serious illness like cancer are the caused when affected sea food are taken by human beings.

Heavy metals, factory material, mineral oil, acids & other bioacides are also measure threats to marine life when mixed with sea water.

major effect there is a heavy loss of economy after getting polluting animal & chemicals from marine.

Control measure of marine pollution:-

Dumping of oil, hazardous & toxics substances, radio active lab bioproducts in to sea ~~shall~~ be banned or should be properly treated before dumping.

Drainage, sewage sludge & effluents from industries should not be discharge in to the river which joins sea.

Developmental activities on coastal areas should be minimize:

Toxic pollutants from industries & treatment plants should not be discharge in to sea.



Nuclear explosions & other nuclear activities in sea should be minimized.

oil drilling should not be allowed in coastal areas.

ships & boats should have certain facilities for rescue.

Effective major should be developed to check the leakage in ships & oil tankers.

Noise pollution:-

The tongue may be defined as unwanted sound at a wrong time & a wrong place.

Sources:-

prolonged & a loud sound is generally considered as noise which is mostly caused because of industries, vehicle, aeroplane, etc.

Although noise is undesirable it should be meaningful or meaning less. A meaningful noise is generally needed for inviting attention or expecting a consequent response such as a cry of baby or a screaming by a person for health.

On the contrary & irresponsible or meaning less noise is disturbing & annoying.



## Effects of noise :-

### Physiologically effects :-

At high levels of about 150 dB, immediate permanent hearing impairment may be caused.

At sound level in the range of 120 to 150 dB effects on respiratory system, dizziness, disorientation, loss of physical control, other physiological changes resulting from stress, nausea & vomiting may be caused.

Local sound can cause increased secretion of many hormones in turn trigger various effects such as increase of blood sugar level, suppression of immunity system, decreasing the efficiency of liver to detoxified blood.

### Psychologically effects :-

Local continuous noise reduces the working efficiency, interferes the communication, increase the frequency of error which may at time cause accident.

Noise reduces the mental capability.

Noise has psychologically effect on humans ranging from mild distress to complete disorder.

Noise interferes with deep sleep & interrupts sleep.

Because sleep is important to emotional stability, noise may contribute to distress & emotional disturbance.



Noise also aggravates many existing psychological condition & mental illness.

### Hearing loss :-

Prolonged exposure to loud noise can cause temporary or permanent loss of hearing.

People working in noisy places such as industrial establishment, factory etc. often suffer from temporary loss of hearing.

Very loud, sudden & impulsive noise are capable of causing a quiet damage to auditory system & permanent loss of hearing.

~~Other health~~

### Other health effect of noise pollution :-

Noise affect the cardiovascular system also.

Loud noises ~~may~~ tend to decrease the flow of blood from heart which results in decrease heart beat rate.

Changes in breathing amplitude have been reported due to sudden & impulsive noises.

High noise may cause headache, irritability & fatigue.

### Control measures of noise pollution :-

Reduction of noise at the source of its origin :-

Often a little precaution can reduce much of the nuisance caused by loud noise.

This can be achieved by replacement of noisy rattling devices or machines with quieter ones. Noise level can be reduced effectively by



replacement of noisy & rattling parts,  
providing better cushioning to check the vibration,  
proper oiling & greasing to ensure smooth running  
& using effective silencers.

### Application of sound proofing techniques:-

Sound waves are absorbed by porous materials  
such as perforated sheets & other objects.

Sound barriers placed around the source of  
origin of local noises drastically reduce the  
intensity of sound on the other side of the  
obstacle.

Keeping near

Keeping residential locality free of noisy industries!

Residential locality should be established  
away from noisy industries, busy highways,  
aerodromes.

This shall curb much of the nuisance caused  
by noise pollution.

Enactment of strict legislation & it's  
effective complains:-

We most of the countries including our  
own, legal frame work against noise pollution  
has been developed.

However in most of the cases little efforts  
are made to enforce these rules & regulating  
effectively.



## Noise control method in Industrial plants:-

Excessive noise is produced from various types of machine, petrol & diesel engine, electric motors, construction site equipment, pumps & pumping system, compressed air system, air distribution system etc.

It is always advantageous, economical & effective to identify the noise sources & noise problems right in the design & erection stages & incorporate the necessary noise control measures rather than attending to the problems at the latter stage.

## Thermal Pollution:-

The term thermal pollution has been used to indicate the detrimental effects of heated effluents discharge by various power plants.

Addition of excess of undesirable heat to water or environment which makes it harmful for living organisms.

## Sources of thermal pollution:-

### Nuclear powerplants:-

Nuclear powerplants, including drainage from hospitals, institutes, nuclear experiments & explosions discharge a lot of utilised heat & trapped radio nuclides in to the nearby water streams.

Heated effluents from power plant are discharge at  $10^{\circ}\text{C}$  higher than the coolest receptor & seriously affect the aquatic



Thermal & Nuclear power plants are better known

### Coal fired power plants:-

Some thermal power plants ultimately discharge effluents having temp difference of  $15^{\circ}\text{C}$  bet<sup>n</sup> effluent & water body.

The thermal power plant utilise coal as fuel & they constitute major source of thermal pollutants.

The heated coil are cooled with water from near by lake ~~from~~ river & discharge the hot water back to the receptor water body & then by increasing the temp. of the water body.

The heated effluents decrease the dissolved oxygen content of the water which results in killing of aquatic organisms.

### Industrial effluents:-

Industries generating electricity like coal as fuel & nuclear power thermal plant require huge amount of cooling water for heat removal.

Other industries like textiles, paper & pulp as well as sugar also release heat in water but to a much lesser extent.



## Hydroelectric power:-

The generation of hydroelectric power sometimes results in -ve loading in water systems.

Apart from electric power industries, various factories with cooling contribute to thermal loading.

It has been reported that about 18% more heat is given to cooling ponds in nuclear power plants than any other plant of equivalent size.

## Domestic sewage:-

The municipal sewage normally has a higher temp than receiving water.

The discharge water not only raises the stream temp. to a measurable extent but also creates numerous deleterious effects on aquatic biota which measures major the decrease in oxygen content of dissolved oxygen.

## Effects of thermal pollution:-

Reduction in dissolved oxygen:-

Concentration of dissolved oxygen decreases with increase in temp of water.

Ex:- The dissolved oxygen content is 14.6 ppm in water at a temp of 32° F, & 6.6 ppm at 64° F.

Change in water properties:-

A rise in temp. changes the physical & chemical properties in the water.

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The vapour pressure increase sharply while the viscosity of water decreases.  
Increase in toxicity:-

The rising temp increases the toxicity of the poison present in water.

A  $10^{\circ}\text{C}$  rise in temp. doubles the toxic effect of potassium cyanide while a  $20^{\circ}\text{C}$  rise in temp. triples the toxic effect of o-xylene causing massive mortality of fish.

Interference with biological activities:-

Temp is considered to be of vital importance to physiology, metabolism & biochemical process in controlling respiratory rates, digestion, excretion & overall development of aquatic organism.

The temp changes totally disturb the ecosystem.

change in metabolic rate:-

Fishes show a marked rise basal rate of metabolism with temp to the lethal point.

The respiratory rate, oxygen demand, food intake & swimming in fishes increase.

Increase vulnerability to diseases:-

Activities of several pathogenic microorganism are inhibited by high temp.

Hot water causes bacteria diseases in certain fishes such that they fail to develop above critical temperature.

Undesirable changes in algal population:-

The life in an ecosystem is greatly influenced by the algal growth.

Excess nutrients from the wash out water



cause an excessive algal growth with consequent acceleration of eutrophic & other undesirable changes.

### Bio chemical oxygen demand :- (BOD)

When the temp of stream carrying biodegradable organic matter rises, the intensified action of aquatic organism causes BOD to be accomplished at a lower temp.

When the temp of stream carrying biodegradable organic matter rises, fish death may occur.

### Control of thermal pollution :-

Heat must be removed from the condensed cooling water prior to their disposal in to water bodies.

The measure principles involved in the process of heat losses are

- i) Conduction
- ii) Convection
- iii) Radiation
- iv) Evaporation

### Nuclear Hazard :-

Hazard means dangerous to human being or show by external source.

This external source is from environment.

### Sources of nuclear hazards :-

The 2 main sources of radioactive nuclear power are natural & man made.

Natural :-

The natural sources of radio activity are considered mainly of the cosmic radiation received from the space. & the naturally occurring radio isotopes



presence in the environment. The main source of natural radiation is the presence of radio nuclides in the lithosphere, hydrosphere & atmosphere.

All the elements above atomic no 82 (lead) are radio active in nature & emit a variable quantity of radiations.

The most abundant naturally occurring radio nuclides on the earth are Uranium, thorium, Potassium - 40.

### Man made source:-

Man causes radio active pollution by testing of nuclear weapons, establishment of nuclear power plant mining & refining of protactinium, thorium & preparation of radio active isotope.

### Nuclear weapons:-

Testing of nuclear arms comprises,

→ The use of Uranium 235 & protactinium 239 for fission.

→ Hydrogen & lithium are fusion material.

Large clouds of fine radio active particles & gases are thrown into the environment & are carried away a distance by wind.



## Atomic reactors & Nuclear fuels:-

At almost all stages of the nuclear fuel cycle liquid, gaseous & solid radio active waste are released having a tremendous potential to contaminate the environment.

## Radio active isotopes:-

Radio active isotopes & their compounds find wide uses in scientific research institutions containing varying amounts of radio active material.

When this waste water reaches different water sources such as rivers, streams, lakes etc. it causes serious water pollution.

Radio active Iodine & phosphorus also enter the food chain to water & may finally reach man through fish eating.

## Other sources:-

During the different medical treatments, varying concentrations of radiation enter the human body for instance.

X-ray & therapy for cancer patients often includes radium & other isotope radiation.

## Effects / Hazards associated with Radio active pollution

No physical, chemical & biological process can influence the process of radio active emission.

Most of the radiations have a high penetrating power. Thick sheets of lead, cement concrete walls etc. can't contain them.

They can easily penetrate to deep seated organs & cause injury.



1 no of radio active isotopes have a very long half life i.e. almost ~~the~~ more than thousand of years. This make this radio active waste almost a permanent hazard to the biosphere.

Nucleic acid (DNA & RNA) effectively absorb these radiations, which causes carcinogenic, mutagenic effects.

Like any other element, radio active isotopes are also absorbed, accumulated & biomagnified thousand of times.

Thus, the entire food chain becomes contaminated organism. At higher trophic level may therefore receive a highly concentrated source of radio active material through their food supply.

There is no other way to dispose of these hazardous waste except to store them for thousands or millions of year away from living organism.

Even the safest burial places for radio active waste which represent the base of human efforts have shown signs of radio active effect.

Control

Control of natural radio active pollution

may not be possible.

Out of all the sources, only artificial radio activity is the scope of intervention, where ever controls can be brought off.

Radio active pollution can be controlled by strict enforcement of laws & safety measures.



low or high labile waste have preponderant capacity to pollute the environment.

As low labile waste are often produced in large quantity, their containment is not possible.

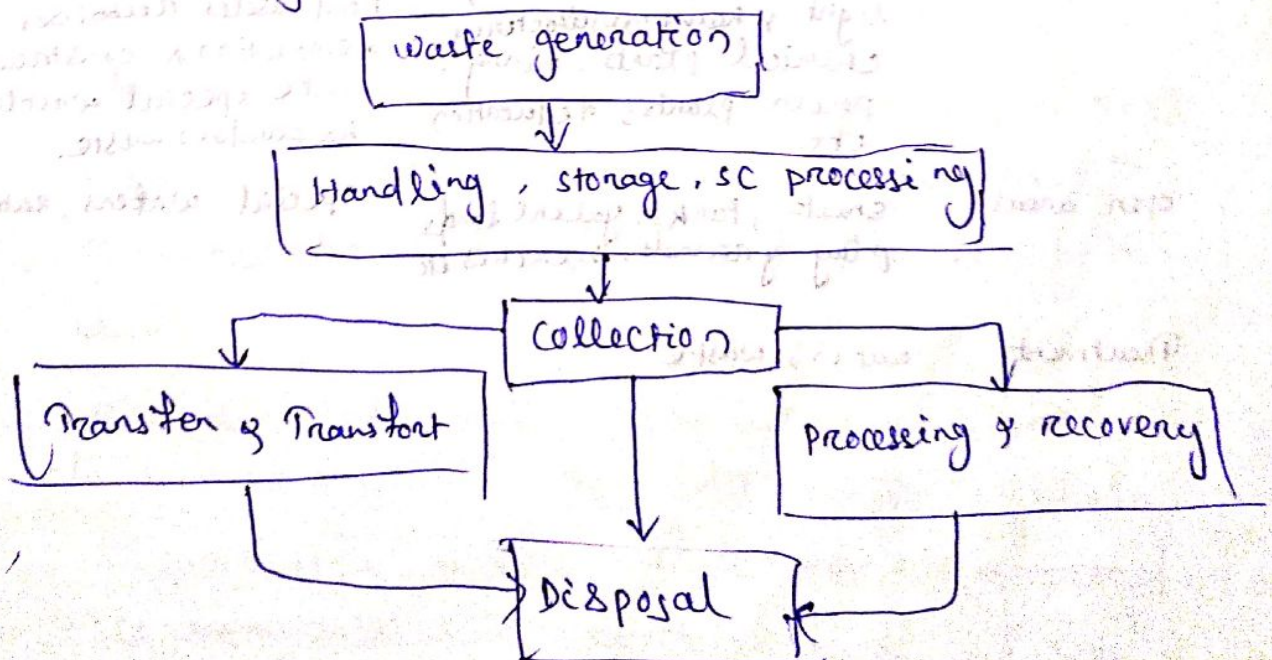
They are subjected to a treatment for removal of radio activity & then discharged in to water bodies or land in usual ways.

High labile waste on the other hand can't be disposed freely in the environment but have to be contained & stored out of the reach of human environment.

### Solid waste management :-

Any material is thrown away or discharged as useless & unwanted by human or animal activities is considered as solid waste.

The management of waste is the fundamental concern of the activities encompassed in solid waste management.





## Sources of solid waste:-

Sources of solid waste can be classified into following categories.

- i) Residential
- ii) Commercial
- iii) Municipal
- iv) Industrial
- v) Open areas
- vi) Treatment plants
- vii) Agriculture
- viii) Hazardous waste construction sites.

### Residential

single family & multi family houses low medium & high rise apartments etc.

Food wastes, rubbish, ashes, special wastes.

### Commercial

Restaurants, markets, stores, hotels, institutes, office, workshops etc.

Food wastes, rubbishes, ashes demolition & construction wastes, special wastes.

### Industrial

construction, fabrication, light & heavy manufacturing, chemical plants, mining, power plants, deduction etc.

Food wastes, rubbishes, ash demolition & construction waste special wastes, hazardous waste

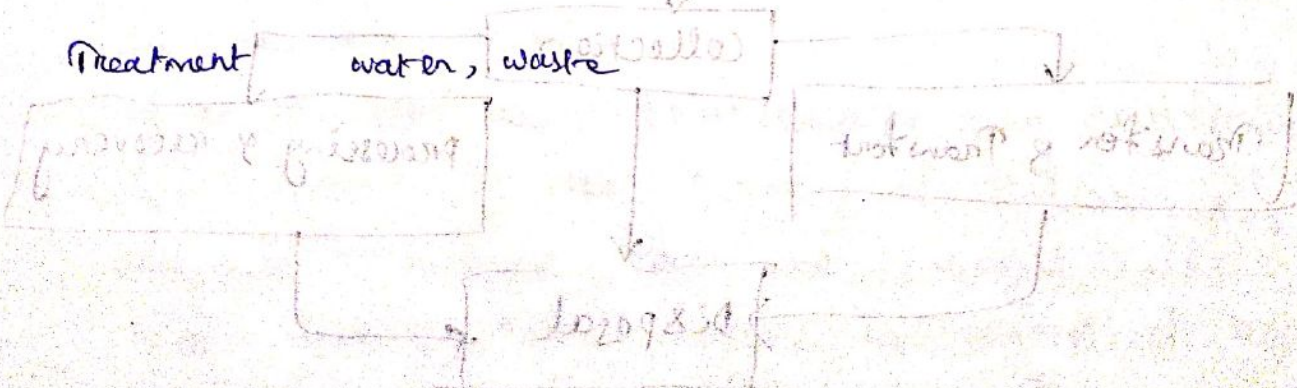
### Open areas

Streets, Parks, vacant lands, play grounds, beaches etc.

Special wastes, rubbish

### Treatment

water, waste





### Effects of solid waste:-

The accumulation of waste at any place is a bad & risky situation.

varieties of microorganism like bacteria, fungi, viruses, worms, etc. creep in to the accumulated waste & start it's decomposition. Later on they grow & increase in no.

various types of germs developed in the waste. they rich us through air, water & food.

Most of the infectious diseases like cholera, diarrhoea, dikhidration etc spread in this ways.

Air pollution, water pollution & soil pollution are caused due to the accumulation of different types of the waste.

waste material when accumulated here & there disturb the drainage system.

Decomposing waste rich under ground contaminates under ground water & soil.



Improper disposal of solid waste produce foul smell & breed various types of insects.

Control measures of urban & industrial waste:  
waste management in the collection, transport processing disposal of waste material so as to reduce their effect on local environment & community.

Method of solid waste disposal:-

Physical removal:-

It is generally done by manual activity like collection of waste & sorting out in to reusable, decomposable & non decomposable. Then disposal become easy.

Dumping:-

Transfer of solid waste from a place of collection to the site of disposal is called dumping.

Corporation & municipal bodies collect or dump them on some suitable & safe site located far away from human habitation.

Compaction & bailing:-

The solid waste are often spread on a plane & hard surface & latter pressed by bulldozer which is called compaction.

These compacted layer are rolled & piled. This called bailing.



Now such compacted & baled solid waste are easy to handle.

3-R (Reduce, Reuse, Recycle) of solid waste:-

Reduce:-

We should reduce the household waste by using max parts of the goods.

When we purchase a thing avoid polythene & heavy packages.

Hazardous waste can be controlled by reduction at source.

Opportunistic waste are generally reduced & removed to combustion, absorption, adsorption technique.

Reuse:-

After selecting the waste (which can be reused after proper treatment).

Some of the waste materials can be reused after washing.

Furniture, clothes & other repairable article should be reused after repair instead of throwing.

Recycling:-

Drainage system are associated with sewage treatment devices that centralized toxic effect of sewage before releasing it to the local water system.



with the help of following processes recycling of waste occurs.

- i) Sledge treatment (setting, neutralization, pulverisation, composting)
- ii) Sanitary land filling (scientifically treated)
- iii) Thermal process (burning under controlled conditions)

N.B.:-

Burning in the presence of air incineration  
& absence of air pyrolysis.

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Role of an individual in prevention of pollution:

An individual can do the following safety measure to prevent the pollution.

- i) One should start fight in the field of environment ourselves to protect from pollution.
- ii) One should go place to place to teach the lesson of ourselves & prepare volunteers.
- iii) Give the message to save environment through papers, ads, magazines, TV & radio.
- iv) To promote for plantation & conservation of forest to organize seminar on the subject related to pollution.
- v) Ourness is very effective in childhood so once to go to the school, organize rallies to teach the lesson on environment.
- vi) World forest day, world environmental day & other source functions should be organized from general ourness.



Population growth should be reduced. One should use & promote mass (public) transport system.

One should discourage the use of chemical fertilizers insecticide & pesticides but should encourage the use of biofertilizers.

Disaster management:-

Flood:-

Floods ~~are~~ one of the very few well recorded natural phenomena, the catastrophic damages caused by them attracted focused attention in recent decades.

With increasing population pressure & accelerated economic development, the adverse effect of flood are being increasingly felt now.

Floods caused greatest distressed whenever + damage crops, properties & endanger ~~the~~ lives.

Adverse effect of flood:-

Apart from the causality, injuries & disablement, many sections of the population get affected by the floods.

Cropland area get submerged, eroded & strewn with sand leading to loss of crop production & consequential disruption.

Many houses are destroyed completely & other area damaged.



Damage & loss to public & private utility as well as industrial disruption occurs

Breakdown of economic activity occurs with corresponding loss of wells.

### Preparedness :-

Desirestened preparedness would be defined as the detailed planning for the prompt & efficient response immediately as soon as the anticipated event materialises.

This effort <sup>to be</sup> very comprehensive inclusive of public education & awareness camps, provision for the issue of timely warning, development of orderly evacuees plans & preparation for providing the evacuees with food, clothing & shelter on emergency basis.

The moment the disaster strikes will also mark the start of the emergency response period.

The immediate onsite responses are ~~at~~ contrarian action of local residence but their effectiveness should be improved by their advance training.

### Earthquake :-

Earthquake are considered to be one of the most dangerous & destructive natural hazards.

The commencement of these phenomenon is usually sudden with little or no warning.

It is not yet possible to predict earthquakes.



to make preparation damage & collapse of building & other manmade structure.

Actually earthquake consist of a sudden series (vibration) of ground caused by disturbances in the earth's crust.

An earthquake generate a set of horizontal & vertical vibration of the ground which are random in character.

### Impact & effect :-

Typical impact & effects of earthquake disasters are :-

- i) loss of life
- ii) Injury
- iii) Damage to & destruction of property
- iv) Disruption of production
- v) Disruption of life style
- vi) loss of livelihood.
- vii) Disruption of essential services.
- viii) Damage to national infrastructure & disruption to administrative & organizational system.
- ix) National economic loss
- x) Sociological & psychological after effects, etc.



## Cyclones:-

cyclones are one of the most devastating natural hazards in the tropics & are responsible for deaths & destruction of more than any other natural calamities.

cyclones bring with them extremely violent winds, heavy rain causing floods & storm surges causing coastal destruction.

### Effects:-

Severe tropical cyclones are responsible for large casualties & considerable damage to property & agricultural crops.

The destruction is confined in the coastal district & the max<sup>m</sup> destruction begins within 100 km from the center of the cyclone.

Principal dangers from the cyclones are extremely strong wind, potential rain & high storm surges.

Heavy rainfall & floods cause in order of devastation.

They are often responsible for much loss of life & damage to property.

The collapse of building, falling of trees, flying debris, air craft accidents & disease from contaminated food stream.



water in the post cyclone period also contribute to loss of life & destruction of property.

### Preparedness:-

preparedness means major with govt organisation, community & individual to respond rapidly & effectively to disaster situations.

The preparedness major include the formation of variable disaster mitigation plans.

It would consist of a plan of action to be implemented on the received of the cyclone alert message from cyclone warning center.

A cyclone alert is issued generally 48 hours before the possibility of the area being affected.

The identification of strong buildings which would withstand the fury of the storm is an important segment of the action plan.

The safe storage of non-perishable food, other essential needs, adequate collection of drinking water or medicine have to be made.

### Land slides:-

Often it is not realised that a large part of India consist of mountainous terrain. Land slides affect the remotely located often isolated, small community in village or regions of the country where external assistance takes time to reach.



Many times the information about the occurrence of such events and the damaged on the days to which to discredit of state headquarters.

Because of these regions landslide assume the status of measure natural disasters even though affected area & population ~~of~~ though may be rather small.

### Relief & Rehabilitation:-

Essentially the relief states comprises the following

- i) Search & rescue
- ii) Medical assistance to the injured
- iii) Disposal of the dead
- iv) Food & water
- v) Emergency shelter for the homeless
- vi) Opening of access road if block & restoration of communication channels.
- vii) Psychological counselling of the survivors who have lost their close relative.
- viii) Repair of houses & facilities.
- ix) Technical & financial assistance to restart economic activity to restore regular work & income.

↳ Reconstruction to proper planning.