Environmental Studies

The word environment is derived from the french word Environnen which means surrounde...

So, Our environment canbedefined as the physical, chemical & biological world that surround us as well as the complex of social & cultural conditions, affecting an indivisual or community.

Objectives -

→ The main objective of this subject is to develope concern for our own environment which will lead us to act at our own level to protect the environment we all live in.

① It is the need for information that clarifies modern environmental concepts like equitable use of Natural resources and more sustainable life styles etc.

② There is a need to change the way in which we view our own environment by using practical approach based on observation and self learning.

③ There is a need to create a concern for our environment that will trigger pro environmental action, including simple activities we can do in our daily life, to protect it.

→ Environment is of two types —

① Natural environment
② Man made environment (anthropogenic)

Natural environment :-
The environment in its original form without the interference of human beings is known as natural environment.

② Man made environment :-
The environment changed or modified by the interference of human beings is called man made environment.

Dt - 23/04/17

Scope of environmental studies -

(1) The subject educates the students to appreciate the complexity of environmental issues and citizens and experts in many fields.

(2) By studying environmental science, student may develop a breadth of the interdisciplinary and methodological knowledge in the environment fields.

(3) It enables them to facilitate the defination & solutions of the environmental problems.

(4) It helps to know the current trend of environmental degradation and which can be reverse if people of educated communities & organisation empowered, experts are involved in sustainable development.

Environmental issues	Subject knowledge
① Nature & Reaction of Air pollutants	Chemistry or chemical engineering
② Effect of Air pollutant on human beings	Zoology & Botany and various branches of life science
③ Human, elements, plants	Zoology, Botany
④ Effect of Air pollution on materials	Meteorology or material science
⑤ Air pollution control device	Physics, chemistry & Different subject of engineering
⑥ History of Air pollution & air pollution episodes	History
⑦ Economic impacts of Air pollution	Economics & Demography
⑧ Sociological impact of air pollution	Sociology
⑨ Alternative fuels & conservation	Physical science
⑩ ~~On the basis~~ of resources & pollution control	Different branch of physical & political science
⑪ Effect of climate on air pollution	Mathematical modeling
⑫ Ozone hole and global warming	Almost all fields under the sun has got something to contribute to the understanding and prevention of these phenomenon.

Importance of Environmental studies.

We live in the world where natural sources are limited. Without them life could be impossible.

If we use them more & more the earth resources must inevitably shrink.

& the earth can't be expected to sustain indefinitely due to over utilisation of resources, or misuse of resources.

Need for public Awareness-

(1) Join a group to study nature such as WWF-I, BNHS or another environmental group.

2) Begin reading news paper articles and periodicals like Down to earth, WWF-I News letter, BNHS, Hornbill, Sanctuary magazine etc which will tell you more about current environmental issues. There are also several environmental websites.

(3) Lobby for conserving resources by taking up the cause of environmental issues during discussions with friends and relatives.

(4) Practice & promote issues ~~during~~ such as saving paper, saving water, reducing use of plastic, practicing the 3Rs principle of reduce, reuse, recycle and proper waste disposal.

(5) Join local movements that support activities like saving trees in your area, go on nature treks, recycle waste, buy environmentally friendly products.

(6) Practice and promote good civic sense and hygiene such as enforcing no spitting or tobacco chewing, no throwing garbage on the road, no smoking in public places, no urinating or defecating in public places.

(7) Take part in events organized on World Environment Day, Wildlife Weeks etc.

(8) Visit a National Park or Sanctuary or spend time in whatever natural habitat you have near your home.

Environmental Issues of Global concern:

It can be categorized into 3 main issues

1. Population explosion
2. Land degradation
3. Environmental pollution:

Industrialization, agriculture/fertilizer pesticide/green house gases, air pollution, acid rain, ozone depletion, green house effect, water pollution and deforestation.

→ Environmental problems in India can be put into three classes: Poverty, problems arising as negative effects of the very process of development and problems arising from improper implementation of the directives and laws of environmental protection.

Natural Resource

Natural resources can be defined as 'variety of goods and services provided by nature which are necessary for our day-to-day lives.

Eg: Plants, animals and microbes, Air, water, soil, minerals, climate and solar energy.

→ They are essential for the fulfilment of physiological, social, economical and cultural needs at the individual and community levels. They are of two types namely

(1) Renewable Resources
(2) Non-renewable resources.

Renewable Resources

Natural resources which can be used but can be regenerated by natural processes provided if there is no intervention in natural regeneration cycle. Ex: water, wood.

Non Renewable Resources:-

Those which will be exhausted in the future if we continue to extract these without a thought for subsequent generations. Examples: Minerals, fossil fuels.

Different types of resources viz. forest, water, food, energy and land resources are detailed below.

Forest Resources –

A forest can be defined as a biotic community predominant of trees, shrubs or any other woody vegetation usually in a closed canopy.

India's forest cover is 6,76,000sqkm (20.55% of geographic area)

Forest functions –

1. Protective and ameliorative functions
2. Productive functions
3. Recreational and educational functions.
4. Development functions.

(1) Protective and ameliorative functions –

A. Watershed protection
Reducing the rate of surface run-off of water.
preventing flash floods and soil erosion
producing prolonged gradual run-off
and thus safeguarding against drought.

B. Erosion control
Holding soil (by preventing rain from directly washing soil away)

C Land bank
maintaining soil nutrients and structure.

D. Atmospheric regulation
→ Absorption of solar heat during evapotranspiration
→ Maintaining carbon dioxide levels for plant growth
→ Maintaining the Local climatic conditions

II) Productive functions –

Local use – Consumption of forest produce by local people who collect it for sustenance.

Food :– gathering plants, fishing, hunting from the forest.

→ Fooder for cattle
→ fuel wood and charcoal for cooking and heating.
→ Poles for building homes in rural and wilderness areas.
→ Timber for house hold articles and construction.
→ Fiber for weaving baskets, ropes, nets, strings, etc.
→ Sericulture for silk.
→ Apiculture for rearing bees for honey
→ Medicinal plants for traditional medicines, investigating them as potential source for new modern drugs.
→ Market use most of the products used for consumptive purposes and good source of income for supporting their livelihood of forest dwelling people.

→ Minor forest products; fuel wood, fruits, gum, fiber, etc which are collected and sold in local markets as a source of income for forest dwellers.

→ Major timber ~~extraction~~ extraction for construction, industrial uses, paper pulp etc. Timber extraction is done in India by the forest department, but illegal logging continues in many of the forests of India and the world.

III) Recreational & Educational functions:-

Eco tourism.

IV) Developmental ~~functions~~ :-

Employment functions.

Revenue.

Ecological significance of forests

1. Balances CO_2 and O_2 levels in atmosphere
2. Regulates earth temperature and hydrological cycle.
3. Encourage seepage and reduces runoff losses, prevents drought.
4. Reduces soil erosion (roots binding), prevents siltation and landslides thereby floods.

(5) Litter helps in maintaining soil fertility.
(6) Safe habitat for birds, wild animals and organisms against wind, solar radiation and rain.

Deforestation —

Deforestation refers to the loss of forest cover; land that is permanently converted from forest to agricultural land, golf courses, cattle pasture, home, lakes or desert.

The FAO (food & agriculture Organization of the UN) defines tropical deforestation as "change of forest with depletion of the tree crown cover more than 90%" depletion of forest tree crown cover less than 90% is considered forest degradation.

Causes for Deforestation —

(1) Agriculture: Conversion of forests to agricultural land to feed growing numbers of people.
2) Commercial logging: (which supplies the world market with woods such as mercanti, teak, mahogany and ebony) destroys trees as well as opening up forest for agriculture.

cutting of trees for fire wood and building material, the heavy lopping of foliage for fodder and heavy grazing of saplings by domestic animals like goats.

(3) The cash crop economy: Raising cash crops for increased economy.

(4) Mining

(5) Increase in population: The needs also increase and utilize forests resources.

(6) Urbanization & industrialization

(7) Mineral exploration

(8) Construction of dam reservoirs

(9) Infrastructure development

(10) Forest fires

(11) Human encroachment & exploitation

(12) Pollution due to acid rain

Environmental effects of deforestation

(1) Food problems

(2) Ecological imbalance.

(3) Increasing CO_2

(4) Floods leading to soil erosion

(5) Destruction of resources

(6) Heavy siltation of dams

(7) changes in the microclimate

(8) Loss of biodiversity

(9) Dessication of previously moist forest soil

(10) Heavy rainfall & high sunlight quickly damage the topsoil in clearings of the tropical rainforest.

(11) Where forests are replanted, their replacement can mean a loss of quality.

(12) Loss of future markets for ecotourism.

(13) Some indigenous peoples' way of life and survival are threatened by the loss of forests.

(14) Deforestation can cause the climate to become extreme in nature.

(15) The stress of environmental change may make some species more susceptible to the effect of insects, pollution, disease and fire.

(16) Most humid regions change to desert.

(17) Environmental pollution

(18) Global warming

Conservation –

Conservation derived from two Latin words, con - together, servare - to keep or guard measures, i.e. an act of preservation or to keep together.

Concepts of conservation

1. Restraining cutting of trees and submerging the forests.
2. Reforestation
3. Afforestation
4. Control forest diseases and forest fire.
5. Recycling forest products
6. Replacing forest products
7. Avoids diversion of forest lands for other activities through acts like forest Conservation Act and wild life act.
8. Bringing awareness among people ex: Chipko movement, Appiko, Narmada Bachao Andolan.
9. Implementing people's participatory programmes.
   Ex: Joint Forestry Manangement (JFM)

Water resources

Water covers 70% - 75% of earth's surface of which 97.2% is locked in sea or ocean 1332 million cu.km, considering total availability as 1400 million cu.km,

3% is fresh water

2.15% in polar ice caps (29.20 cu.km)

<1% available as surface & subsurface water (rivers, stream, lakes)

Out of 1400 million cukm. of water available on earth, only 14 million cukm is fresh water.

Main Sources of water for our use are.

(i) Rainfall -
(ii) Surface water
(iii) Ground water

Resons for decline of ground water -

(1) Population explosion
(2) Overutilization of surface and Groundwater.
(3) Deforestation
(4) Hydropower generation
(5) Dams
(6) Rainfall

Dams

Large dams are designed to control floods and to help the drought prone areas, with supply of water.
But large dams have proved to cause catastrophic environmental damage.
Multiple small dams have less impact on the environment.

Benefits -

Dams ensure a year round supply of water for domestic use and provide extra water for agriculture, industries and hydropower generation.

problems -

→ Dam construction and submersion leads to significant loss of arable farmlan and forest and land submergence.
→ Siltation of reservoir, water logging and salination in surrounding lands reduces agricultural productivity.
→ Serious impacts on ecosystem - significant and irreversible loss of species and ecosystems, deforestation and loss of biodiversity, affects aquaculture.
→ Socio economic problems for example, displacement, rehabilitation and resettlement of tribal people.
→ Fragmentation and physical transformation of rivers.
→ Displacement of people - People living in the catchment area, lose property and livelihood.
→ Impacts on lives, livelihoods, cultures & spiritual existence of indigenous and tribal people.
→ Dislodging animal population.
→ Disruption of fish movement and navigational activities.
→ Emission of green house gases to rotting of vegetation.

Sustainable Water management -

① Building several small reservoirs instead of few mega projects.
② Developing small catchment dams and protecting wetLands.
③ Soil management, micro-catchment development and afforestation permits recharging of underground aquifer, thus reducing the need for large dams.

(4) Treating and recycling municipal waste water for agricultural use.
(5) Preventing leakages from dams & canals and loss in municipal pipes.
(6) Effective rainwater harvesting in urban environments.
(7) Water conservation measures in agriculture, such as using drip irrigation, control of growing water intensive cash crops, control of waterlogging.
(8) Pricing water at its real value makes people use it more responsibility and efficiently and reduces wastage.
(9) In defonested areas where land has been degraded, appropriate soil management practices, making bunds along the hill-slopes and making nalla plugs can help retain moisture and make it possible to revegetate degraded areas.
(10) Domestically use water by VED principle - use for vital activities, control for Essential activities, cut down for Desirable activities.
(11) Use waste waster for activities that does not need fresh water - Recycling.
(12) Adopt mini water harvesting models for domestic usage.
(13) Protect existing tanks.
(14) "save waste campaigns" for public awareness on water scarcity.

Contribution of rainfall to world's water supply :-

Rain is the main source of fresh water. Its contribution is as

1. Water in sea & oceans
2. Water in glaciers and ice caps
3. Underground water
4. Surface water
5. Soil moisture

Highest rainfall in India is about 250cm which is in Cherrapunji (Meghalaya) rain fall is about 1087 cm annually.

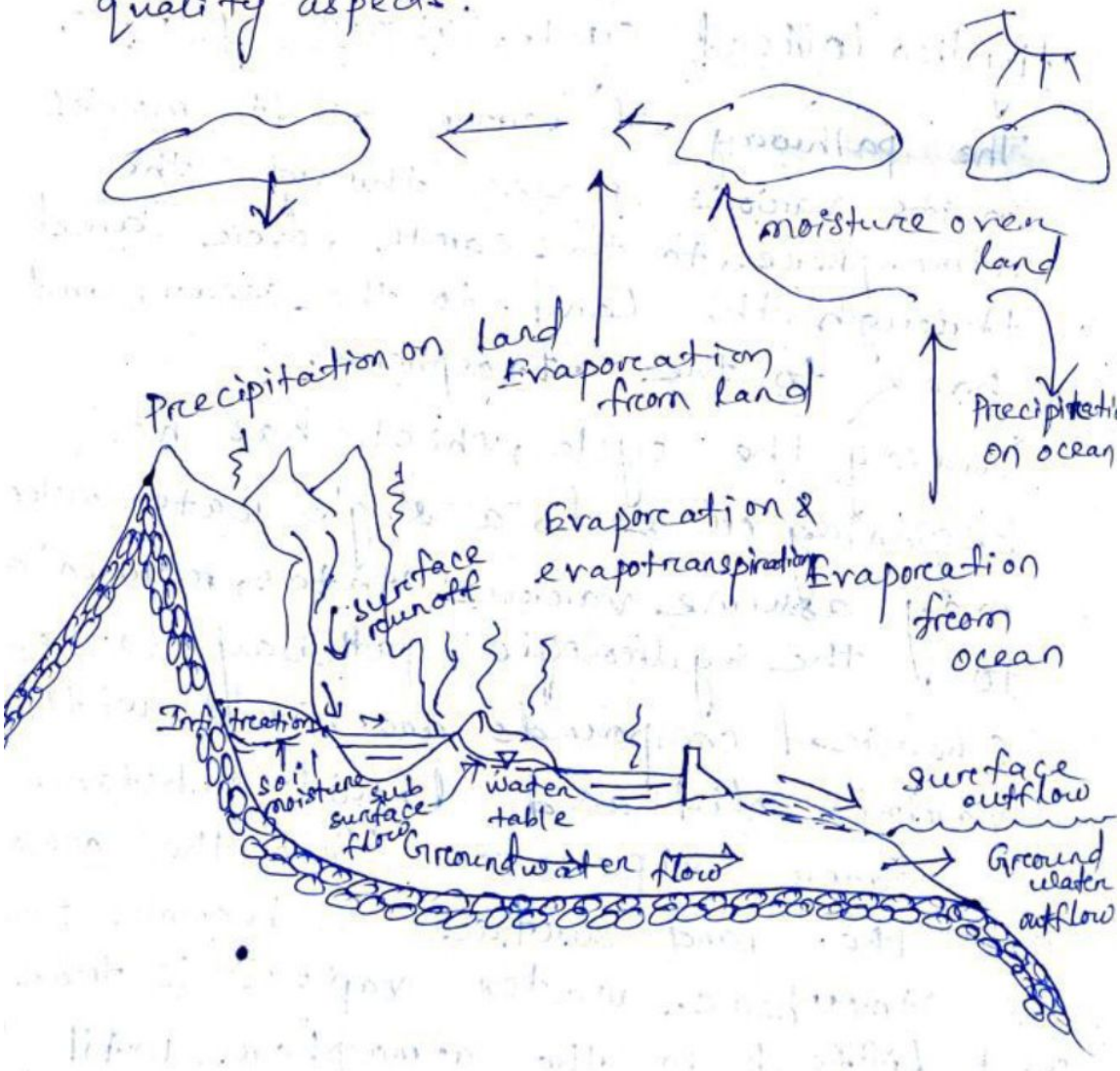
Hydrological cycle (Water cycle) —

The pathway of water as it moves in its various phases through the atmosphere, to the earth, over and through the land, to the ocean, and back to the atmosphere.

During the cycle, which has no beginning or end, a single water molecule may assume various states, returning to the hydrologic pathway as new chemical compounds are mixed with various solid and liquid substances.

Water evaporates from the oceans and the land surface to become part of the atmosphere. water vapor is transported and lifted in the atmosphere until it condenses and precipitates on land or

oceans, precipitated water may be intercepted by vegetation, become overland flow over ground surface infiltrate into the ground, flow through the soil as subsurface flow, and discharge into streams as surface runoff. Large amounts of the intercepted water and surface run-off returns the atmosphere through evaporation. Infiltrated water may percolate deeper to recharge groundwater and later emerge in springs, or seepage into streams, to form surface runoff. Finally, this water flow out to the sea or evaporate into the atmosphere. Throughout this cycle, water may take on many quality aspects.



Over Exploitation of water -

The exploitation of groundwater resources more than its annual replenishment has caused the continuous declining of water levels, declining of well yield, drying of shallow wells, deterioration of ground water quality, sea water intrusion into coastal aquifers and high cost of energy required to lift the water from great depths which becomes uneconomical for poor farmers to continue agriculture.

Even in the high rainfall areas like Meghalaya and Kerala water scarcity is felt in summer months due to over exploitation of water and mismanagement.

Due to over utilization of water, Punjab, Haryana, Tamilnadu and Gujarat and the states where the water tables have declained steeply. In Gujarat more than 90% wells water table dropped by 0.5 m to 9.5 m. In Haryana, the avg. depth of groundwater is fallen by 1 to 33 cm annually in different parts of the state.

Conflicts over water -

Water disputes -

Example -

(1) Urban water demands are concentrated in space, therefore, pose serious problems at local levels. Water demands in mega cities are growing much faster than envisaged and are putting heavy stress on water resources. It is creating difficult problem for the surrounding rural areas, leading to serious conflicts.

(c) Since the urban water supply are met from surface (river) flows, there will be conf with upstream users, specially farmers, over the quantum of withdrawals, while the downs stream users will be affected by the pollut waste waters released by urban areas. Su conflicts already exists between Delhi and Haryana, and between Chennai and the farmers i

Drought - drought prone districts of Andhrapra

Due to deficient rainfall 150 districts are drought prone in India. Out of above 7 districts - Punjab, Haryana, Rajasthan, Gujarat, Tamilnadu, Uttar Pradesh, Maharashtra, Karnataka and Andhrapradesh are provided with irrigation. Among states West bengal, Madhya Pradesh, Andhra pradesh, Bihar, Jharkhand, Orissa are suffering from high frequency of drought.

Food production in India being marginal drought poses many problem. Irrigation available in this country are also limited and, therefore, when drought occurs, they cause partial complete crop failure. If failures occurs in consecutive years, it becomes a national calamity, putting great strain on the economy of the country.

Green house effect -

→ The built-up of carbon dioxide (CO_2) in the atmosphere known as the "green house effect".
→ This has led to current global warming
→ The growing in no. of Auto-mobiles which all run on fussil fuel (petrol and diesel) is a major cause of air pollution.

Mineral resource

Types of minerals -

1. Metallic minerals
2. Non-metallic minerals
3. Mineral fuels

1. Metallic minerals -

We can't extract metal directly from minerals. There is difference bet' minerals and ores. Therefore, for extracting metals, 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

a) Ferrous alloys - Most common metal is iron.

Other than iron are aluminium, lead, zinc, copper etc. All are found in rich quantities found in native as well as in combined state. Iron pyrite, Lynonite, Haematite, Magnetite are examples of ferro alloys. Certain other metals, non-metals are contaminated with these as impurities.

b) Non ferrous alloys -

The minerals / alloys of this type contain the metals like titanium, antimony, arsenic beryllium, copper, zirconium, cerium, lithium etc. These metals are costlier than preceeding metals. Here the iron found as impurities.

© The minerals/alloys containing very least quantity of metals (for ease of extraction is costlier. These metals are generally used in jewellary eg. gold, platinum, silver, iridium etc.

② Non-metallic minerals -
Minerals, whose yield products are other than metals comes in this head. They are called the non-metals. They are further divided on the basis of physical and chemical properties. Graphite, pyrolusite, dolomite quartz, kaoline, fire clay, felspar, mica, asbestos & limestone, borax etc are the example of non-metallic minerals.

③ Mineral fuels -
These include the materials used to provide energy, for example coal, Natural gas, fossil fuels and petroleum etc. These are the important source of energy, hence they have tremendous importance for mankind.

→ Coal is the most commonly available fuel which is used as domestic & industrial fuel.
→ It is of different types i.e. Anthracite, Bituminous, Lignite etc.
→ It is used in the following industries - cement, glass, railway, textile, sugar, paper, steel
→ USA, China, Britain, Germany, South Africa, Australia are richest coal containing countries.

→ Petroleum is used in the manufactur of large no. of petro-chemicals.
It is drilled out from the sources as crude oil.
Crude oil is refined before use as petrol, diesel, kerosine etc.

Minerals in India Resources -

Iron, aluminium, titanium, copper, lead, zinc ores.

5th rank among the Aluminium rich countries.

zinc, lead ore reserves about 390 million tons in India.

Iron - Odisha, Bihar.

Bituminous coal - Jharia & Bokaro (Bihar) & Raniganj (West Bengal)

Lignite coals - Neyreli (Tamilnadu).

Manganese - Madhya Pradesh, Maharastra, Bihar, odisha.

Chromite - Bihar, Cuttack (Odisha), Krishna (Andhra Pradesh), Mysore & Hassan (Karnataka).

Bauxite - western Bihar, southwest kashmir, Central Tamilnadu. & part of Kerala.
UP, Maharastra & Karnataka.

→ India produces third quarters of the worlds mica.

mica - Bihar, Andhra, Rajasthan.

Gypsum – Tamilnadu & Rajasthan.

Nickel – Cuttack, Bihar, Mayurbanj (Odisha)

Ilmenite – kerala and along the east and the west coastal beaches.

Silimanite – Sonapahar (Meghalaya), Pipra (MP)

Copper – Agnigundala (Andhra)
Singhbhum (Bihar)
Khetri & Daretiba (Rajasthan)
parts of Sikkim & Karnataka.

Gold – Ramagiri field (Andhra)
Kolar & Hutti (Karnataka)

Diamond – Panna (only belt in India)
Panna, Chhatarpur & Satna (MP)
some parts of Banda (U.P)

petroleum – Assam & Gujarat.

Fresh reserves were located off Bombay.

potential oil – Assam, Tripura, Manipur, West Bengal, Punjab, Himachal, kutch. and the Andamans.

Chhatisgarh is rich in minerals and forest products.

Environmental effects of extracting and using mineral resources —

There are following environmental effect of mining —

(1) Land degradation due to lowering of the surface levels levels at some places and creation of large mounds at other places.

(2) Deforestation in the mining areas, i.e. the loss of valuable soil cover, resulting in the possibility of enhancement of soil erosion.

(3) The loss of top and sub-soil.

(4) Due to increased discharge of rain water passing through the terrains, disturbed by surface mining, the local drainage system is polluted, which on joining the main drainage feature affects it also.

(5) The frequency of land slides increases substantially as a combined result of factores as stated above.

(6) The ercosion of soil in enhanced.

(7) The disturbance caused adversely affects the well-balanced pH and diminishes the regenerative qualities of soil.

(8) The disturbance caused to the floral & faunal population is immense.

(9) The heavy earth-moving machinery and blasting cause problems of noise, vibration and the release of noxious gases in the atmosphere.

(10) The aesthetic damage caused to the landscape reduces its recreational value.

(11) Mine drainage has polluted streams, rivers, lakes even seas.

(12) Fumes from smelters damage forests and spread pollution over large area.

Food Resources –

World food problem –

① Population growth : Food production in 64 of the 105 developing countries is lagging behind their population growth levels.

② Poor agricultural practices :
Poor environmental agricultural practices such as slash and burn, shifting cultivation or 'rab' (wood ash) cultivation degrade forests.

③ Degradation of agricultural lands :
Globally 5 to 7 million hectares of farmland is degraded each year. Loss of nutrients and overuse of agricultural chemicals are major factors in land degradation. Water scarcity is an important aspect of poor agricultural outputs. Salinization and water logging has affected a large amount of agricultural land worldwide.

④ Our fertile soils are being exploited faster than they can recuperate.

⑤ Forests, grasslands and wetlands have been converted to agricultural use, which has led to serious ecological questions.

⑥ Use of genetically modified seed variety without minding the conducive environment for such experimentation, will serious ly affect the land ecosystem.

⑦ Our fish resources, both marine and inland show evidence of exhaustion.

(8) There are great disparities in the availability of nutritious food, some communities such as tribal people still face serious food problems leading to malnutrition especially among women and children.

(9) Loss of Genetic Diversity:
Modern agricultural practices have resulted in a serious loss of genetic variability of crops, India's distinctive ~~have resulted in a serious loss of geo~~ traditional varieties of rice alone are said to have numbered between 30 & 50 thousand. Most of these have been lost to the farmer during the last few decades as multinational seed companies push a few commercial type.
This creates a risk to our food security as farmers can loose all their produce due to a rapidly spreading disease.
A cereal that has multiple varieties growing in different locations doesn't permit the rapid spread of a disease.

Food security –

It is the ability of all people at all times to access enough food for an active and healthy life. It is estimated that 18 million people worldwide, most of whom are children, die each year due to starvation or malnutrition and many others suffer a variety of dietary deficiencies. The earth can only supply a limited amount of food. If the world's carrying capacity to produce food can't meet the needs of a growing population, anarchy and conflict will follow.

The following 3 conditions must be fulfilled to ensure food security.

→ food must be available
→ Each person must have access to it.
→ The food utilized must fulfill nutritional requirements.

Changes caused by agriculture —

→ The agricultural methods in most parts of the world were primitive. fields were dug by oxen pulling wooden plows, seeds were broadcast by hands and grains were harvested with the scythes.

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

→ A vigorous market soon developed for soil amendments such as guano, manure, crushed bone and lime.

→ By 1860 seven factories had been established in US to manufacture mixed chemical fertilizers. The use of pesticides also began.

→ By 1893 there were 42 patented insecticides offered by several manufactures.

→ In 1840 the benefits of irrigation were discovered. Govt. passes several laws to assist western states in developing extensive and costly irrigation systems.

→ Farm labour requirements diminished with the introduction of mechanised invention of machines for tilling, planting, reaping and threshing vastly increased farm efficiency.

→ In 1892 the first successful gasoline powered tractor was introduced in Iowa. Later on tractors gradually became popular.

→ In 1914 Govt. responded to this need by providing funds for ~~stage~~ state agricultural extension programme assist farmers in adopting improved farming methods.

→ In 1930s national attention was focussed on the need for soil and water conservation measures to maintain farm productivity.

→ The rich soils produced bountiful crops and between 1870 to 1910 the population of plains states increased by a factor of 10.

→ In response to soil and water conservation programmes, the soil conservation service was established in 1935.

→ Use of fertilizers and pesticides including DDT increased by 50% between 1940 - 1944.

Overgrazing -

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

→ Overgrazing 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 ~~capacity~~ activity.

→ Overgrazing reduces plant leaf areas which reduces interception of sunlight and plant growth. Plants become weakened and have reduced root length and pasture sod weakens.
The reduced root length makes the plants more susceptible to death during dry weather.
. The weakened sod allows weed seeds to germinate and grow.

→ One indicator of overgrazing is that the animals run short of pasture. Under continuous grazing overgrazed pastures are predominated by short grass species such as blue grass and will be less than 2-3 inches tall in the grazed areas. Soil may be visible between plants in the stand, allowing erosion to occure. Under rational grazing overgrazed plants do not have enough time to grow to the proper height between grazing events.

→ Overgrazing can increase soil erosion. Reduced soil depth, soil orgenic matter and soil fertility hurts the land's future preductivity.
Soil fertility can be corrected by applying the appropriate lime and fertilizers. However the loss of soil depth and orgenic matter takes years to correct. Their loss is critical in determining the soil's water holding capacity and how well pasture plants do during dry weather.

To prevent onergrazing, match the forage supplement to the herd's requirement. This means that a buffer needs to be in the system to adjust for the last spring growth of cool season forages.
One buffer may state producers use is to harvest hay in May and June and allow the cattle to graze the after math in August & September.

Effects of modern Agriculture -

Between 1950 and 1975 agricultural productivity in American history changed more rapidly. Total farm output increased more than half. This change was due to technological innovations, development of hybrid strains and other genetic improvements and a fourfold increase in the use of pesticides and fertilizers. Not only in America, all over world productivity and means of farming were changed. Thus the agriculture has become more intensive producing higher yields per acre. It also has become more expensive, relying on purchase of machinery and chemicals to replace heavy labour requirements of the past. To remain competitive farmers have been forced to become more efficient.

Fertilizers

Nutrients are lost from agricultural fields through runoff, drainage, or attachment to eroded soil particles. The amounts lost depend on the soil type and organic matter content, the climate, slope of the land, and depth to groundwater, as well as on the amount and type of fertilizer and irrigation used.

→ The 3 major nutrients in fertilizers are Nitrogen, phosphorus and potassium. Of these nitrogen is the most readily lost because of its high solubility in the nitrate form. Leaching of nitrate from agricultural fields can elevate concentrations in underlying groundwater to levels unacceptable for drinking water quality. In the Suffolk Country area of Long Island, for example, almost 10% of private wells tested for nitrate exceed the 10mg/L drinking water standard.

→ Phosphorus doesn't leach as readily as nitrate because it is more tightly bound to soil particles. However, it is carried with eroded soils into surface water bodies where it may cause excessive growth of aquatic plants. If this process proceeds far enough, lakes and reservoirs become choked with decaying mats of algae, which have offensive odours and can cause fish kills from the resulting lack of dissolved oxygen.

→ Potassium, the third major nutrient in fertilizers, doesn't caused water quality problems because it is not hazardous in drinking water and is not a limiting nutrient for growth of aquatic plants. It is tightly held by soil particles and so can be removed from fields by erosion, but generally not by leaching.

Pesticides –

→ The trend toward intensive crop production in modern farming has led to increased potential for damage by pests and diseases. Predators that would be present in a mixed biological community are not supported by large fields of a single crop, so farmers instead, rely on chemical measures for crop protection. ~~Use of pesticides~~

→ One drawback to this is that pesticides generally kill not only the pest of concern, but also a wide range of other organism, including beneficial insects and other pest predators.

→ Once the effect of the pesticide wears off, the pest species is likely to recover more rapidly than its predators because of differences in the available food supply.

→ Another drawback to the increasing pesticide use in the development of resistance in pest species. The individual pests that survive pesticide applications continue to breed, gradually producing a population with greater tolerance to the chemicals control pest populations.

Waterlogging:

Another problem associated with excessive irrigation on poorly demand soils is waterlogging. This occurs in poorly drained soils where water can't penetrate deeply.

For example, there may be an impermeable clay layer below the soil. It also occurs on areas that are poorly drained topographically. What happens is that the irrigation water eventually raises the water table in the ground - the upper level of the ground water - from beneath.

Growers don't generally realize that waterlogging is happening until it is too late - tests for water in soil are apparently very expensive. The raised water table results in the soils becoming waterlogged. When soils are water logged, air spaces in the soil are filled with water, and plant roots essentially suffocate - lack oxygen. Waterlogging also damages soil structure.

→ Both waterlogging and salinization could be reduced if the efficiency of irrigation system could be improved, and more appropriate crops could be grown in arid and semi-arid regions.

Salinity :-

(1) Saline soils -

The soils containing toxic concentrations of soluble salts 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 4.0 mmhos/cm.

→ Exchangeable sodium percentage is less than 15 and the pH is less than 8.5.

→ The soluble salts mainly consist of chlorides and sulphates of sodium, calcium and magnesium. Because of the white encrustation due to salts, the saline soil is also called white alkali.

(2) Non-saline alkali or Sodic soils -

These soils don't contain any large amount of neutral salts, as such, the electrical conductivity is less than 4 mmhos/cm.

→ The detrimental effect of alkali soil on plants is largely due to toxicity of a high amount of exchangeable sodium and the pH. Alkali soils have an exchangeable sodium percentage of more than 15 and a pH greater than 8.5. Such soils have low infiltration rate and the physical condition is unfavourable. Because of high alkalinity, resulting from sodium carbonate, the surface soil is dispersed coloured and black, and, hence the term black alkali is frequently used to designate the non-saline alkali soil.

(3) Saline-alkali soils -

This group of soils is both saline and alkali. They have appreciable amounts of soluble salts, as indicated by the electrical conductivity values of more than 4 mmhos/cm. Also, the exchangeable sodium % is greater than 15. The pH, is to be less than 8.5.

The soil salinity or alkalinity or both have many adverse effects, which are summarized below —

① causing low yields of crops or crop failure in extreme cases.

② The limiting of the choice of crops, because some crops are sensitive to salinity or alkalinity or to both.

③ Rendering the quality of fodder is poor, at times, the fodder grown on alkali soils may contain a high amount of molybdenum and a low amount of zinc, causing nutritional imbalance and diseases among live-stock.

④ Creating difficulties in the construction of buildings and roads and their maintenance.

⑤ Causing excessive run-off and floods owing to low infiltration, resulting in damage to crops in the adjoining areas.

Causes of Salinity-

During the periods of higher-than-average rainfall, the soluble salts are leached from the more permeable high-lying areas to the low-lying areas, where, if the drainage is restricted, salts accumulate on the surface as water evaporates.

The excessive irrigation of the uplands containing salts thus results in the accumulation of salts in the valleys.

In areas having a salt layer at lower depths in the profile, seasonal irrigation may favour the upward movement of the salts.

→ Salinization is also caused owing to the irrigation of soils with saline water.

In all these cases, restricted drainage is usually the main reason.

→ Rise in the water-table within 2 m. of the surface due to irrigation, the obstruction of natural drainage because of developmental activities, e.g. roads and canals, and the siltation of natural drainage may also cause

soil salinity.

→ In the coastal areas, the ingress of sea-water induces salinity in the soil. When sodium ions predominate in the soil solution, and carbonates are present, alkali soils are formed.

Reclamation:

The salinity or alkalinity depend upon their mode of formation and physiographic position. Since the degree of salinity or alkalinity may vary as such methods of reclamation also differ.

(i) If the problem is only of salinity, the salts need to be leached below the root-zone and not allowed to come up. In practice, however, this might be difficult to accomplish, especially in deep and fine-textured soils containing more salts in the lower layers. Under these conditions, a provision of some kind of subsurface drains becomes important. If the soil contains a sandy layer at a lower depth, the leaching of the salts below this layer will check the rise of salts.

(ii) The reclamation of alkali soils needs the addition of a soil amendment, containing soluble calcium salts. The commonly used amendment is gypsum. In the course of reclamation, sodium on the exchange complex is replaced by calcium. The sodium salts, thus formed, are leached down.

(11) The no. and frequency of leaching, the quantity of gypsum to be added and the techniques involved vary from region to region, depending upon the clay mineralogy of the soils, the intensity of the problem, the subsequent use of the soils, the availability and quality of irrigation water and the economics of these operations. Hence, the state authorities engaged in this work should be consulted to draw a schedule of opercations for reclamation.

Energy Resources

Energy is defined as 'the capacity to do work'. Sun is the primary source of energy. Joule is the standard SI unit of energy.

→ All Energy source ultimately come from the Sun, the moon or the earth.

Sources of Energy

(1) The global climate system (wind power)
(2) Wave power
(3) Hydroelectric power
(4) Solar heating and solar lighting
(5) The global ecosystems which give as biomass power such as wood or muscle.
(6) Gravitational energy for hydroelectric power.
(7) Chemical energy for nuclear power, electrochemical reaction and hydrogen fuel cells.
(8) Geothermal power from the heat of lower crust.

Types of Energy

1. Wind power
2. Wave power
3. Ocean Thermal Exchange capacity (OTEC) - based on temp. differences in ocean layers.
4. Solar power
5. Hydro power
6. fuel cells.
7. Bio fuels - also known as biomass fuels such as alcohol form, sugars, methane from organic waste or charcoal from trees and bio diesel.

Growing Energy needs -

Energy is the prime input of a country. It is converted into heat & electricity. For every activity to be performed required energy in the form of heat, light, electricity and even food for our body. Food energy is measured in calories.

The linkages between energy and economic factors, manifested in energy elasticity and energy intensity are broadly related to -

(i) Demographic changes, including a relatively faster growth in urban areas, higher per capita GDP and per capita gross saving.
(ii) Efficient end use devices.
(iii) Technological improvements in ~~conversion~~ / conversion equipments.
(iv) Inter fuel substitution with more efficient alternatives.

Energy sources :

(1) Renewable or non-conventional or inexhaustible energy sources —
These sources are continuously replenished by natural processes.
for example, solar energy, wind energy, bioenergy, hydropower etc.
These energy systems convert such energy into a form which we can use.
Renewable energy sources are essentially flows of energy.

(2) Non-renewable or conventional or exhaustible energy sources —
Example of this are coal, petroleum, natural gas and nuclear power.
All these sources are limited and takes millions of years for formation.

Sustainable energy —

It is a term sometimes applied to nuclear power. The supplies are not exactly renewable but they will last for a very long time because a great of electricity is produced from a small amount of radioactive material.

In general, the 3 types of energy have very different characteristics. This means there is no 'ideal' energy source. The future will most likely to be a mix of sources with increase in emphasis on the renewable.

Advantages and Disadvantages of Energy

Energy type	Advantages	Disadvantages
Renewable	→ Wide availability → Lower running cost → Decentralized power production. → Low pollution → Available for the foreseeable	→ Unreasonable supply → Usually produced in small quantities. → often very difficult to store → Currently per unit cost of energy is more compared to other types.
Non-Renewable	→ Available in highly concentrated form → Easy to store → Reliable supply → Lower cost per unit of energy produced as the technology is matured.	→ Highly polluting → Available only in few places. → High running cost → Limited supply and will one day get exhausted
Sustainible	→ Highly reliable → Produces large amounts of energy with very little CO_2 emissions. → Use small amount of raw material per unit energy production.	→ Risk of radioactivity → High waste disposal costs. → High capital investment and maintenance cost.

Benefits of dams -

1. Water for drinking and industrial use
2. Irrigation
3. Flood control
4. Hydro power generation
5. InLand Navigation
6. Recreation.

Land Resources -

Land is a major resource for, food production, animal husbandry, industry and growing human settlements, forests, wild life and bio diversity.

Land on earth is as finite as any of our other natural resources.

Scientists today believe that at least 10% of land and water bodies of each ecosystem must be kept as wilderness for the long term needs of protecting nature and natural resources.

→ Soil types are red soil, black cotton soil, literate soil, alluvial soil, desert soil etc.

Land degradation -

It is the decline in land quality or reduction in its productivity or production potential caused by human activities.

World wide 5-7m ha farm land is being degraded annually.

Mechanisms that initiate land degradation include -

→ Physical processes - decline in soil structure leading to crusting, compaction, erosion, decertification, fragmentation, environmental pollution and unsustainable use of natural resources.

→ Chemical processes - Acidification, leaching, decrease in cations retention capacity and loss of nutrients.

→ Biological processes - Reduction in total and biomass carbon and decline in bio diversity.

Causes for land degradation —

(I) Intensive irrigation leads to waterlogging and salinisation, on which crop can't grow.

(II) The use of more and more chemical fertilizers poisons the soil so that eventually the Land becomes unproductive

(III) The roots of trees and grasses bind the soil. If forests are depleted, or grasslands overgrazed, the land becomes unproductive and wasteland is formed.

(IV) Land is also converted into a non-renewable resource when highly toxic industrial and nuclear wastes are dumped on it.

(V) As urban centers grow and industrial expansion occurs, the agricultural land and forests shrink. This is a serious loss and has long term ill effects on human civilization.

(VI) Land degradation/soil erosion due to deforestation is more evident on steep hillslopes in the Himalayas and in the Western Ghats. These areas are called ecologically sensitive areas' or ESAs.

→ To prevent the loss of millions of tons of valuable soil every year, it is essential to preserve what remains of our natural forest cover.

It is equally important to reforest denuded areas. The linkage between the existence of forests and the presence of soil is greater than the forest's physical soil binding function alone. The soil in enriched by the leaf litter of the forest. It is broken down by soil micro-organisms, fungi, worms and insects, which help to recycle nutrients in the system. Further losses of our soil wealth will impoverish our country and reduce its capacity to grow enough food in future.

(VII) The rate of mangrove loss is significantly higher than the loss of any other types of forests. If deforestation of mangroves continues, it can lead to serve losses of biodiversity and livelihoods, in addition to salt intrusion in coastal areas and siltation of coral ~~reefs~~ reefs, ports & shipping lanes.

Land use planning

(1) It should take into account traditional strategies and local environmental knowledge.

(2) Differentiation of state holders and the gender approach are core principles in land use planning.

(3) The ecological, economic technical financial social and cultural dimension of land use makes it necessary to work with inter disciplinary approach.

(4) It should aim at finding solutions for present problems (soil erosion, low yield, and low income in rural house holds) with the planning towards long conservation and sustainable use of land resources.

Landslides

A landslide is a sudden collapse of a large mass of hillside. There are many different types of landslides where not only earth, but rock, mud and debris flow down the side of a slope.

→ Since the beginning of the monsoon season in June. India has been hit by heavy rains and landslides affecting in particular, Arunachal Pradesh, Assam, and Bihar states.

Landslides mostly occur.

① Where landslides have occured before
② On steep slopes.
③ On benches.
④ Where drainage is causing a problem.
⑤ Where certain geologic conditions exists.

Types of Landslides —

① Shallow, disrupted landslide — Example — the Santa Susana Mountains and the maintains north of the Santa Clara River Valley. Here more than 75% of the slope area was denuded by landslides triggered by strong shaking.

② Deep, Coherent Landslides — These triggered by the earthquake were far less numerous than disrupted slides, they contributed significantly to the total volume of landslide material because they tended to be much larger.
Some of these landslides are —
(a) San Martinez Graude Landslide
(b) Rancho Camulos Landslide

Factores causing Landslides —

① Landslides are the sudden downhill movements on earth or other solid materials and are usually caused by rain thaws or forces either increasing the top material layers or making the slope too steep. They can be triggered by earthquakes; saturation with heavy rain or crashing waves.

(2) Excessive rainfall or snow melt, however is also known to saturate and lubricate soil on steep angles. Rapid temperature changes can also cause land to slide by alternatively shrinking and expanding soil formations, or forming ice hares between layers of rock.

(3) Forest fires are indirectly responsible because they take away slope vegetation making erosion easier.

(4) Man can also cause slides by mining the earth, underground excavation, pumping and draining groundwater levels or overdeveloping hillsides. Man induced landslides are generally done for the development purposes i.e. industrial, forming roads, agricultural use, homes etc. They use heavy explosives for that. In this case no serious casualties or damage occur because proper warned earlier to shift in safer places.

Effects

No heavy damage occure in man induced landslides but thousands of people affected and killed due to Landslides. Many houses can be damaged and the loss of public properties is also noticed. Roads & rail communication may remain cut off from rest of the regions. Thunder storm cause debris flows on hill slopes leading to deposits of mud. Heavy rains at the same time may coorsen the situation.

Desertification-

It is land degradation occurring in arid, semiarid and dry subhumid areas of the world. It is a process where ~~the~~ in fertile lands become arid through land mismanagement or climate changes. Many deserts in the world are man-made.

Desertification is taking place much faster worldwide than historically and usually arises from the demands of increased populations that settle on the land in order to grow crops and graze animals.

Cause of desertification —

(1) Overgrazing: By pounding the soil with their hoofes, livestock compact the substrate, increase the propotion of fine material, and reduce the percolation rate of the soil, thus encouraging ~~the preparation~~ erosion by wind and water. Grazing and the collection of firewood reduce or eliminate plants that help to bind the soil.

(2) Increased population: Livestock pressure on marginal lands accelerate desertification.

(3) Deforestation practices: Loss of vegetation results in surface runoff as there are no plants to bind the soil and resulting in soil erosion and depletion of nutrients.

(4) Increased food production from marginal lands in arid and semi-arid areas.
(5) Irrigation projects in areas with no drainage facility.
(6) Shifting of sand dunes by wind storms

Effect -

A major impact of desertification is biodiversity loss and loss of production capacity, such as the transition from grassland dominated by perennial grasses to one dominated by perennial shrubs. In extreme cases, it leads to the destruction of lands ability to support life.

Control of desertification -

(1) Afforestation and planting of soil binding grasses can check soil erosion, floods and water logging.
(2) Crop rotation and mixed cropping improve the fertility of the soil. It would increase production which can sustain large population.
(3) Desertification can be checked by artificial bunds or covering the area with proper type vegetation.
(4) Shifting of sand can be controlled by mulching (use of artificial protective covering).

(5) Salinity of the soil can be checked by improved drainage. Saline soil can be recovered by leaching with more water, particularly where water table of the ground is not very high.

Role of an individual in conservation of Natural Resources —

Barrage

The two most damaging factors leading to the current rapid depletion of all forms of natural resources are increasing 'consumerism' on the part of the affluent sections of society, and 'rapid population growth'. Both factors are the results of choices we make as individuals.

Energy conservation

(1) Turn off lights and fans as soon as you leave the room.

(2) Use tube lights and energy efficient bulbs that save energy rather than bulbs. A 40-watt tube light gives as much light as a 100 watt bulb.

(3) Keep the bulbs and tubes clean. Dust on tubes and bulbs decreases lighting levels by 20 to 30%.

(4) Switch off the television or radio as soon as the program of interest is over.

(5) A pressure cooker can save up to 75% of energy required for cooking. It is also faster.

(6) Keeping the vessel covered with a lid during cooking, helps to cook faster, thus saving energy.

Water conservation —

1. Keep taps closed when brushing teeth and taking a bath.
2. Use drip and sprinkler type of irrigation in agricultural fields.
3. Practice rain water harvesting techniques.
4. Reuse the waste water from kitchen and bath for garden use.

Soil conservation —

1. Don't cut trees and induce soil erosion.
2. Practice contour farming, agro forestry and strip cropping
3. Practice no till farming for less soil disturbance.
4. Avoid over use of fertilizers, pesticides and water logged conditi
5. Use organic fertilizers and vermicompost.
6. Practice integrated pest management practices.

Ecosystem

Ecology - Ecology is a branch of biology that studies the interactions among animals and their biophysical environment.

Ecosystem -

→ An ecosystem is a large community of living organism (plants, animals & microbes) in a particular area.

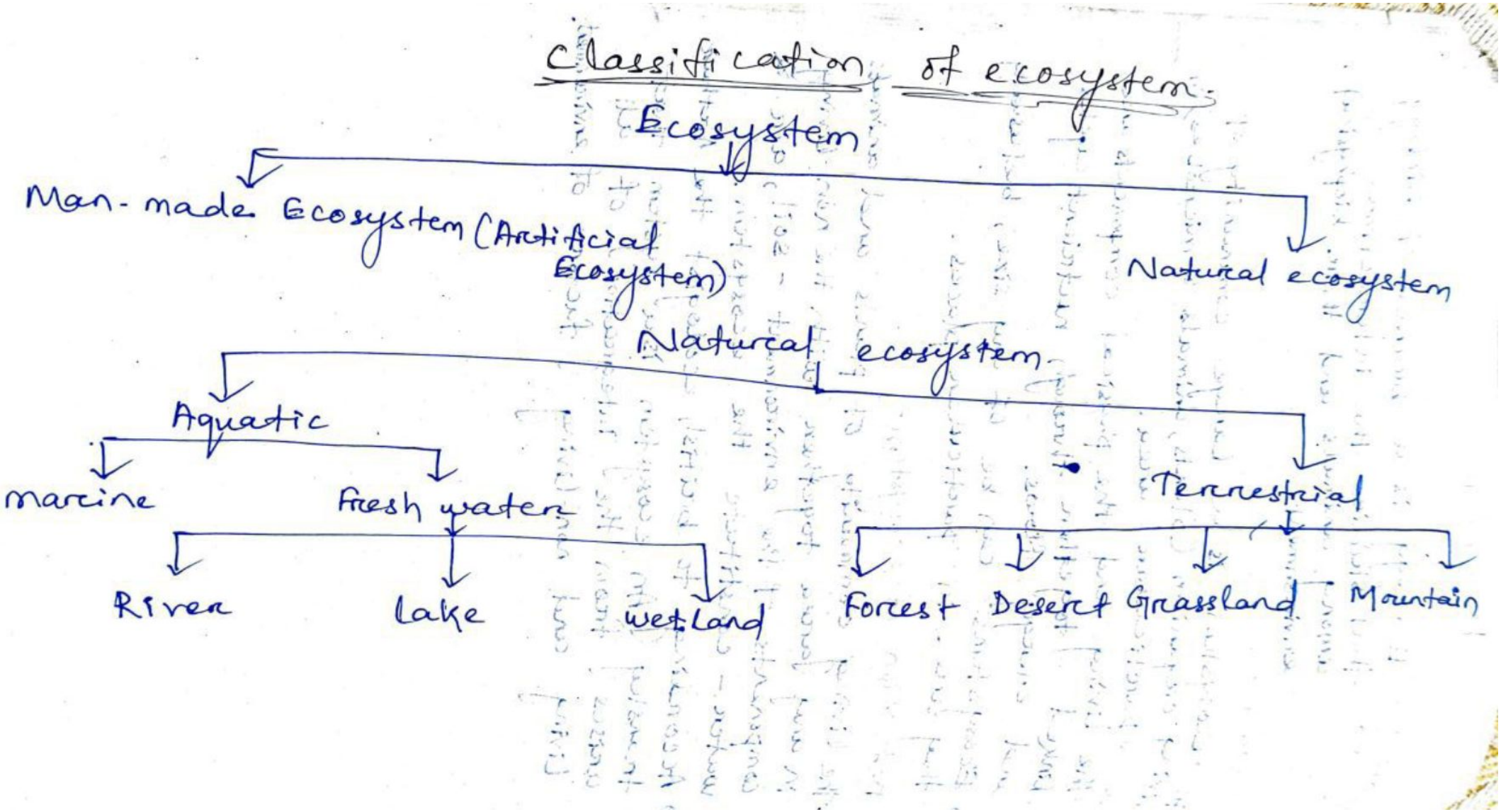
→ The living and the physical components are linked together through nutrient cycles and energy flows.

→ Ecosystems can be of any size, but usually they are in particular places.

Definition of ecosystem -

The living community of plants and animals in any area together with the non-living components of the environment - soil, air & water - constitute the ecosystem.

→ According to british ecologist the Arthur transley An ecosystem is a system that arises from the integration of all living and non-living factors of environment


Classification of ecosystem:
Ecosystem
Man-made Ecosystem (Artificial Ecosystem)
Natural ecosystem
Natural ecosystem.
Aquatic
Terrestrial
marine
Fresh water
River
Lake
Wetland
Forest
Desert
Grassland
Mountain

Functioning and types of Ecosystem —

Functioning of the ecosystem is self-regulating and self-sustaining. This depend upon flow of energy, cycling of materials and perturbations both intrinsic and extrinsic. It is recognised as a dynamic concept with structural heterogeneity based on at least four functional phases.

→ A rapid release phase consisting of tightly bound resources is replaced by a reorganisation phase followed by a exploitative phase, which gradually transformed into conservation phase or climax phase. The control of ecosystem function by nutrient flux and the condition of the physical environment is called Bottom-up-control but function via trophic interactions is called Top-down control.

Ecosystem
- → Permanent & Natural ecosystem
- → Temporary & Natural ecosystem
- → Artificial & Anthropogenic ecosystem

Permanent ecosystem —

These operate under Natural conditions without any interference (even by human beings). These can be further classified into —

(I) Terrestrial ecosystem.

(II) Aquatic ecosystem.

→ Terrestrial ecosystems operate on land hence forest, Desert and grassland and agro-ecosystems included in this type. While Aquatic ecosystem operates in water. It can be devided in two.

(a) Fresh water ecosystem.
(b) Marine ecosystem.

→ Fresh water ecosystems are usually named after the size and nature of the fresh water body such as pond, lake & river.

→ Marine ecosystem is largest ecosystem on earth, which consists of several sub-divisions each having its physical chemical and Biological characteristics. For example, in the deepest ocean producers are absent but in many other organisms survive which dependent for food on the dead organic matter coming from the upper layer of the ocean.

(2) Temporary and Natural ecosystem—
These are short lived but operate under natural conditions.

(3) Artificial ecosystem—
These are man-made like fishery tanks dams, croplands and space ecosystems also. Fish aquarium is also come under this head. These typologies are determined not only by the species composition but also by the physiognomic, characteristics & soil and climatic conditions.

Structure of an ecosystem -

Biotic structure -

→ Producers, consumers and decomposers are components of biotic ecosystem.

→ Living things are made of control and other chemicals with a lot of water added.

Living organisms exchange expel convert, assemble, disassembles, organise and otherwise manipulate the constituents of earth, air and water. Biotic structure includes plants, animals and macro organisms present in an ecosystem

(a) Autrotrophic components - (Self nourishing)
In which the fixation of light, energy, the use of simple inorganic substances and manufacture of complex material predominates. These are also called producers.

(b) Heterotrophic Components - (other nourishing)
These utilizers, rearrange and decomposes the complex material synthesized by the autotrophes. The most intense heterotrophic activity takes place where the organic matter accumulates in the soils and sediments. These are also called consumers.

producers -

All green plants are producers. They are also called "converters" or "transformers". They are living members of the ecosystem that utilize sunlight as their energy source and single inorganic materials from soil, air and water to transform them by photosynthesis in to more complex energy rich chemicals as their own food.

→ Producers are largely photosynthetic plants and their kind varies with the kind of ecosystem. In dense forest the trees are the most important producers.

→ In lakes and ponds, the producers are rooted or large floating and microscopic plants (phytoplankton). Usually the algae. They are also known as "photoautotrophs" (photo = light, auto = self, troph = food).

→ Recently, scientists have found ecosystems based on chemical energy at great ocean depth, where there is no light. The producers in these systems are bacteria that are able to gain energy from the oxidation of H_2S that seeps from volcanic vents in the ocean. Since these organisms get their energy from chemical reactions rather than sunlight, they are called "chemotrophs".

Consumers :—

Consumers are heterotrophs, the living organisms which ingest other organism. They derive their food directly or indirectly from the producers. the food is then digested i.e. broken down to simple substances which are metabolized in the consumers body and released the waste product to the environment.

Consumers are of following types —

1) Primary Consumeres —

There are also called "Herbivorces". which feed directly on the producers. They vary with the kind of ecosystem. For example a deer and giraffe is a primary consumer in forest ecosystem, while cow or a goat is in a grassland or crop ecosystem. Protozoans and certain crustaceans which feed floating algae are also primary consumers.

(II) Secondary Consumers —
These are also called 'CARNIVORES' for example insects gamefish in a pond are primary consumers.

(III) Tertiary Consumers —
In most of ecosystem some organism that eat other carnivores like - they are tertiary consumers.

(IV) OMNIVORE —
A person or animal eating plants and animals is called omnivores.

(V) Top Carnivores —
Some ecosystem have animals like lion and vulture, which are not killed or rarely killed and eaten by other animals are called top carnivores.

(VI) Detritivores —
These are the bottom living which sub sist on the rain of organic detritus from auto-trophic layers. eg. beetles, termites, ants crabs etc.

(3) Decomposers —
They are also the living components, mainly bacteria and fungi which breakdown complex compounds of dead protoplasm of producers and consumers to simple organic compounds and ultimately into inorganic nutrients. In all the ecosystems, this biotic structure prevails. Molds and mushrooms of the forest are the largest of the decomposers that are visible. The role of decomposers in ecosystem is very important. They are responsible for the completion of ecosystem mineral cycles.

They are also called microconsumers or saprobes or saprophytes or saprotrophs (Sapros = rotten, trophs = feeders). Other examples are bacteria and fungi.

(2) Abiotic structures or components —
The physical and chemical components of an ecosystem constitute its abiotic structure. It includes two things —

(i) Materials or Chemical Factor —
The materials are like water, minerals, atmospheric gases and other inorganic salts. They also include some organic matter such as amino acids, decay products, lipids, carbohydrates, proteins etc.
The quantity of abiotic materials like the minerals present at any given time in an ecosystem is termed as the 'standing state' or 'standing crop'.

(ii) Energy or physical factor —
This is in the form of light, heat and stored energy in chemical bonds. Annual rainfall, wind, latitude and altitude etc. are also some physical factors, which have a strong influence on ecosystem.
For proper functioning of an ecosystem there must be a continuous 'flow of energy' and 'cycling of minerals' among the organisms of the ecosystem.

Energy flow in the ecosystem —

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 and then transformed into mechanical and heat from during metabolic activities. In the biological world the energy flows from sun to plants and then to all heterotrophic organisms like nitroorganisms, animals and man i.e. from producers to consumers. 1% of the total sunlight falling on the green plants is utilized in photosynthesis. This is sufficient to maintain all life on this earth. There is no 100% flow of energy from producers to consumers. Some is always lost to environment. Because of this, energy can not be recycled in an ecosystem ('it can only flow one way'.

The flow of energy follows the two laws of thermodynamics.

1st Law of thermodynamics —

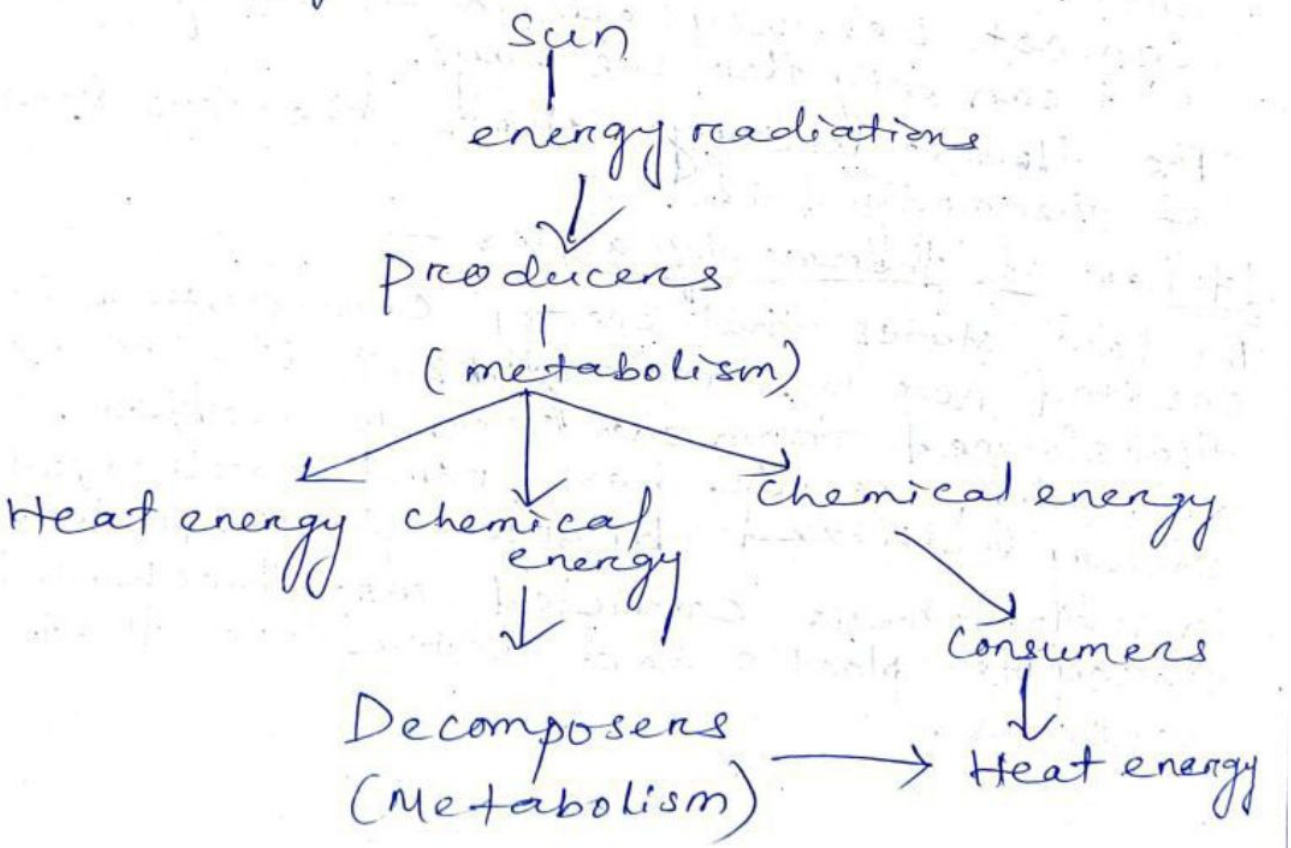
The law states that energy can neither be created nor be destroyed but it can be transformed from one form to another. Similarly, as we have read earlier, solar energy utilized by green plants (producers) in photosynthesis converted into biochemical energy of plants and later into that of consumers.

2nd Law of Thermodynamics –

The law states that energy transformation involves degradation or dissipation of energy from a concentrated to a dispersed form. We have seen dissipation of energy occurs at every trophic level. There is loss of energy; only 10% is transferred from one trophic level to the other.

Sun as the source of energy –

Sun is the source of energy which exists radiations from high frequency to low frequency. Approximately 99% of total energy is in the region between UV and IR. The visible spectrum spreads over 0.38 μ to 0.77 μ involving about 50% of solar radiations. Some autotrophs however utilize energy released from oxidation processes for the synthesis of organic food.



Sun as the source of energy

Ecological Succession:-

Biotic communities are not static, they change with time. This change can be understood on several levels. Changes take place continuously in the community structure, organization, physiognomy, the associated animals and the environment at a place in the course of time, this phenomenon is called ecological succession.

→ The rate of successional changes is rapid initially and gradually it slows until a point of dynamic equilibrium is reached, and the community is more or less stable. A complete succession is called a SERE. A sere is made up of a no. of seral stages.

→ Succession is the "birth" of an ecosystem and subsequent "aging" process of its abiotic and biotic features.

ODUM (1971) has rightly included the following 3 parameters in his definition of ecological succession.

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

(2) It results from [illegible] of the physical environment. by the community, i.e succession is community controlled even through the physical environment determines the pattern, the rate of change and often sets limits as to how far development can go.

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

Two types ⟶

(1) Primary succession.

It is the process of species colonization and replacement in which the environment is initially virtually free of life, i.e. the process starts with base rock or sand deme or river delta or glacial debris and it ends when climax is reached.

→ The sere involved in primary succession is called PRESERE.

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

2) 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 and the surface is completely or largely devoid of vegetation. It may be due to, earthquake, fire or even clearing of forests by man. In each case organism modify the environment in a way that allow one species to replace another.

The sere involved in secondary succession is called SUB SERE.

Depending on the moisture contents the primary & secondary successions may be of the following types —

(A) HYDRACH OR HYDROSERE —

The succession when starts in the aquatic environment such as ponds, lake, streams, swamps, bogs etc.

(B) MESARCH OR MESOSERE —

It is an intermediate type with adequate moisture. The succession when begin in such an area is called mesarch.

(C) XERACH OR XEROSERE —

The succession when starts in Xeric or dry habitat having minimum amounts of moisture, such as rocks, dry deserts etc is called Xerach.

A temporary community in an ecological succession on dry and sterile habitate is called Xerosere.

It may be of 3 types —

① Lithosere — i.e. succession initiating on rocks.

② Psammosere — i.e. " " on sands.

③ Halosere — " " on saline water or soil.

Some times succession is also classified into two types—

(a) Autotrophic succession —

It is characterised by early and continued dominance of autotrophic organisms like green plants. It begins in a predominantly inorganic environment & the energy flow is maintained indefinitely.

(b) Heterotrophic succession —

It is characterised by early dominace of heterotrophs such as bacteria, actinomycetes, fungi and animals. It begins in a organic environment and there is a progressive decline in energy content.

Autogenic succession —

In some cases the replacement of one type of community by another is due to modification of the environment by communities themselves. Such a successional process is called Autogenic.

Allogenic succession —

If replacement is largely due to forces other than the effects of communities on the environment, this is called Allogenic succession.

It occurs in a highly disturbed or eroded area or in ponds nutrients and pollutants enter from outside and modify the environment and in turn the communities.

1) Environmental pollution —

Any undesirable change in the physical, chemical or the biological properties of our surrounding environment that may have harmful effects on plants, animals and human being is called the environmental pollution.

The environmental pollution is principally caused by human activities which release pollutants into the various components of our physical environment, viz air, water and land, in quantities in excess of what can be tolerated by them under their normal self-cleansing capacities and the natural tolerance limits.

2) primarey pollutants —

which are directly emitted into the atmosphere and are found as such. e.g., CO, NO_2, SO_2 and hydrocarbons.

Secondary pollutants -

which are derived from the primary pollutants due to chemical or photo-chemical reactions in the atmosphere, e.g., Ozone, Peroxy-acyl nitrate (PAN), photo-chemical smog, etc.

(3) Red Data Book -

The Red data book is the state document established for documenting rare and endangered species of animals, plants and fungi as well as some local sub species that exist within the territory of the state or country.

(4) Sustainable Development -

It is a process of change in which the exploitation of resources, the direction of investments the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspiration. To build a sustainable world which should last for ever. There should be a fair sharing of global resources among the living beings of the world.

(5) Major threats to bio diversity -

The major threats to the biodiversity is human intervention in the natural ecosystem. Several factors in multiple cause and effect model affect the biodiversity.

Few of them are :-

(1) Alteration or tampering of habitat.

(2) Deforestation, drainage or filling of wetlands, overgrazing, expanding agriculture urban development, construction of highway building of dam, strip mining etc. are

major threats to loss of biodiversity.

(3) other non-deliberate alterations, to loss of biodiversity can happen due to deforestation, forest fire, flood, landslides cyclone, earthquake etc.

(4) Hunting of animals for commercial products, sports items, food etc. also a major threat to biodiversity.

(5) Pet trade, superstitions belief affects biodiversity loss.

(6) Poor agricultural practices, use of chemical fertilizers, pesticides etc. Some extent responsible for loss of biodiversity.

(7) Modern agricultural practice, use of hybrid seeds, change of gene in plants, animals, birds etc. leads to extinction of many species.

(8) Man-wild life conflicts also a major threat to biodiversity.

(9) Pollution also affect biodiversity.

(6) Importance of soil to the Biosphere —

Soil plays a vital role in determining the quality and composition of the biosphere which develops over it. The multiferious functions of soil are as follows:

① Soil provides mechanical support to the plants.

(2) Owing to the porosity and water holding capacity of soil, it serves as reservoir of water and supplies water to the plants through their roots even when the land surfaces is dry.

(3) The ion-exchange capacity of the soil ensures availability and supply of micro- and macro nutrients for the growth of plants, animals and microbes. It also helps in prevention of excessive leaching of nutrient ions, while maintaining proper pH.

(4) The colloidal components of soil, which comprises of clay micelles and humus particles tightly adsorb a no. of nutrient ions and supply them evenly to the plants.

(5) Soil contains organotrophic bacteria, nitrifying bacteria, nitrogen-fixing bacteria, fungi protozoans and other microbes which help in decomposition and mineralization of organic matter and regeneration of nutrients.

Hotspots of biodiversity

- unusually rich in biological species most of which are endemic not found elsewhere and are under a constant threat of being overexploited.

Hazardous waste -

any waste or combination of wastes that poses substantial danger to human beings, plants and animals.