Multidisciplinary Nature of Environmental Studies (UNIT – I)

* **Environment:** It is sum total of all biotic and abiotic factors that surround and potentially influence on organisms is called environment.

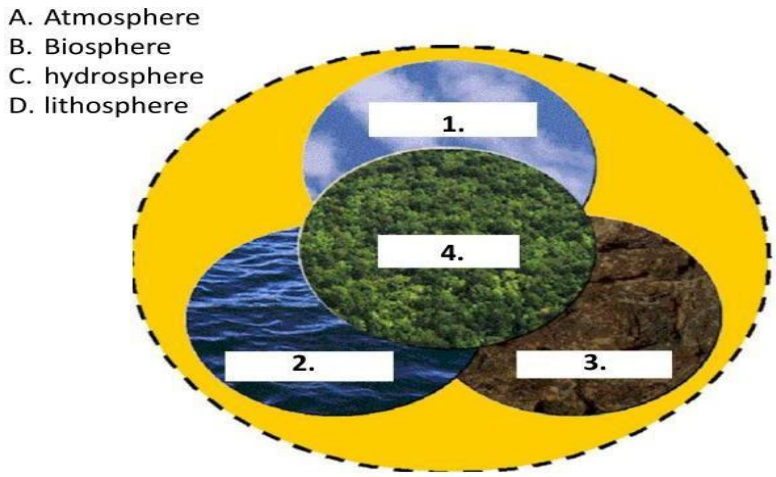
* **Environmental studies:** The study of the basic components of our surroundings and their interactions is called environmental studies.

* Basic Components of the Environment/Segments/parts of the environment

Environment consists of all living (Biotic) and non-living things (abiotic) which surround us. Therefore, the basic components of the environment are:

1. Atmosphere or the air 2. Hydrosphere or the water

3. Lithosphere or the rocks and soil 4. The living component of the environment or the biosphere



1) Atmosphere

The gaseous envelope of the earth is called atmosphere. It is present around the earth. It consists of gases, some solid and liquid particles suspended in it.

The important function of the atmosphere is, it maintains the heat balance of the earth and energy budget of the earth.

2) Hydrosphere:

The combined mass of water on, above and below the surface of the earth is called hydrosphere.

The important function of the hydrosphere is, it is a part of the living organisms, act as a habitat, regulates climate and usable to humans in a number of ways.

3) Lithosphere:

The solid component of the earth is called lithosphere.

The important function of the lithosphere is, it acts as a substratum for living organisms, store house of wealth in its own, regulates water flow, stores water flow, provide minerals, nutrients to plants, regulates nutrient cycles etc.,

4) Biosphere:

The biological environment where living organisms can live and interact with physical environment (air, water and soil) is called biosphere.

Biosphere**,** relatively thin life-supporting stratum of Earth's surface, extending from a few kilometres into the atmosphere to the deep-sea of the ocean. The biosphere is a global ecosystem composed of living organisms (biota) and the abiotic (nonliving) factors from which they derive energy and nutrients.

* Structure of the atmosphere

Atmosphere consists of a complex mixture of a number of gases, water vapour and a variety of fine particulate material. The gaseous mantle which surrounds the globe is constituted by about 5.15×10^{15} metric tons of gas which exerts a pressure of about 1 kg per sq.cm. on earth's crust. Most of these gases are compressed in the lowermost layer. Pressure decreases as we move upward.

The atmosphere is divided into the following five layers on the basis of vertical distribution of temperature.

1. Trophoshere
2. Stratoshere
3. Mesosphere
4. Thermoshere
5. Exosphere

1. Troposhere:

The lowest layer of the atmosphere, in which the temperature decreases with increasing altitudes is called trophoshere. Clouds are formed and carried by winds in this layer. It extends from 6 to 8 km at the poles and to about 17 km at the equator. It contains 90% of the air of the atmosphere. Seasonal variations are so common.

2. Stratosphere:

The layer of atmosphere above the troposphere, in which the temperature increases with increasing altitudes is called stratosphere. It extends to a height of 50 km. Here the air is much thinner. Long distance air crafts fly in the lower part of the stratosphere. The top of this layer contains ozone.

3. Mesosphere:

Mesosphere lies above 50 km upto 100 km It is characterized by decrease of temperature.

4. Thermosphere:

It lies beyond the mesosphere. Here the temperature rises sharply attaining 1000^0 C. It extends to a height of 400 km.

5. Exosphere:

It lies above thermosphere beyond 400 Km. The increase in temperature ceases at this layer. The density of the atmosphere is very low here.

* Scope and Importance of environmental studies

* Scope of environmental studies:

The scope of environmental studies is so wide that it is related to every science and scientific aspects in general and biology in particular.

The scope of environmental studies in numerous fields is given below.

1) Conservation and management of natural resources (like forest resources, water resources etc.,)

2) Conservation of biodiversity

3) Control of environmental pollution

4) Control of human population

5) Control of environmental problems

6) Control of social issues related to environment

7) Replacement of development (like green revolution, urbanisation), economic growth, (industrialisation, etc.,) with sustainable development.

* Importance of environmental studies:

The importance of environmental studies are the following.

1. To clarify modern environmental concept like how to conserve biodiversity.

2. To know the more sustainable way of living.

3. To use natural resources more efficiently.

4. To know the behaviour of organism under natural conditions.

5. To know the interrelationship between organisms in populations and communities.

6. To aware and educate people regarding environmental issues and problems at local, national and international levels.

7. It helps in the maintenance of healthy life. Through improved health of people, economic productivity gets increased.

*** Need for public awareness about environment:**

To get rid of environmental problems, environmental awareness is necessary. It ensures that everyone knows about consequences of his/her activities on nature.

To protect global environment for sustainable development, we should be aware about environment.

Important aspects related to environment in which public awareness should be developed.

1) They should be taught to grow plants.

2) They should be made aware of the importance of green plants and not to cut the trees.

3) They should be given training in the importance of soil.

4) They should be advised to use minimum quantities of chemicals.

5) They should be made to know about awareness of use of fertilizers and pesticides.

6) They should be made to known about clean surroundings.

7) They should be made to known clearly about sewage disposal.

8) They should be made to know about waste material management.

9) They should be taught about environmental pollution.

10) They should know about the cause of various diseases.

11) They should be made to known about basic principles of personal and environmental hygiene and health.

12) They should be taught about water management.

13) They should be made to known about the need to conserve biodiversity.

Natural resources

* **Natural resources:** Natural resources are the sources which are useful to man or can be transformed in to useful products.

Based on their availability or how human activities affect them, natural resources are classified into two types.

1) Renewable resources

2) Non-renewable resources

1) Renewable resources: These resources are capable of being regenerated by ecological process within a reasonable time period.

Eg: Soil, Water, Air, Wild life, Natural vegetation.

2) Non-renewable resources: These resources are not capable of being regenerated by ecological process.

Eg: Coal, Oil, Natural gas, Minerals.

* Natural resources and associated problems:

Human population is growing day-by-day. Continuous increase in population caused an increasing demand for natural resources. Due to urban expansion, electricity need and industrialization, man started utilising natural resources at a much larger scale. This over utilisation creates many problems. The following are the problems associated with natural resources.

● Forest resources and associated problems

1. Use and over-exploitation.

2. Deforestation.

3. Timber extraction.

4. Mining and its effects on forest.

5. Dams and their effects on forests and tribal people.

● Water resources and associated problems

1. Use and overutilization of water.
2. Floods, droughts etc.
3. Conflicts over water.
4. Dams and problems.

● **Mineral resource and associated problems**

1. Use and exploitation.

2. Environmental effects of extracting and using minerals.

● **Food resources and associated problems**

1. World food problems.

2. Changes caused by agriculture and over grazing.

3. Effects of modern agriculture.

4. Fertilizer-pesticide problems.

5. Water logging and salinity.

● **Energy resources and associated problems**

1. Growing energy needs.

● **Land resources and associated problems**

1. Land degradation.

2. Man-induced landslides.

3. Soil erosion and desertification.

Forest resources

* Forest resources-Uses:

Beneficial functions of forests are the following.

a) Ecological uses (or) Ecosystem services:

1) Influence on climate: The crowns of the trees hold the moisture in because the forest of the wind is broken. It makes the forest cool in the summer and warm in the winter.

2) Control runoff: Leaves and branches of trees break the impact of rain, causing it to drip rather than have a strong force. Rain is absorbed by the ground, reducing surface run-off.

3) Flood control: Forested watersheds help in avoiding extremes of water flow and so help in flood prevention.

4) Wildlife habitat provision: Wildlife uses the products of trees and forests as food and shelter respectively.

5) Prevention of soil erosion: Water moves slowly through forested soils and stays free of sediments.

6) Reduction of wind erosion: Trees are used as windbreaks and slow down the force of wind.

7) Removal of pollutants: The roots of trees absorb soil and water pollutants. Thus forests aid in the cleansing of air, water and soil.

8) Noise abatement: Trees acts as a sound barrier.

9) Recycling of nutrients: Forests help in nutrient recycling.

10) Provisions for healthy survival of local communities and mankind: Forest provide employment and income, aesthetic pleasure and spiritual solace.

b) Commercial uses of forest: Forest provide us a large number of commercial goods such as fuel wood, pulp, board, timber, gums, resins, dyes, medicines, drugs, honey, ivory, hides etc.,

* Over exploitation of forests:

Our forests contribute substantially to the national economy. Excessive use of fuel wood and charcoal, expansion of urban, agricultural and industrial areas and overgrazing have together led to over exploitation of our forests leading to their rapid degradation.

* Deforestation

Definition: Deforestation is the process of removal or elimination of forest resources due to many natural or manmade activities. In general deforestation means destruction of forest.

Causes of deforestation:

The following are the causes of deforestation.

1) Developmental projects: Developmental projects cause deforestation in two ways.

i) Through submergence of forest area underwater.

ii) Destruction of forest area.

Examples: Big dams, hydroelectric projects, road constructions.

Hence, there is a need to discourage the undertaking of any development works in the forest area.

2) Mining operations: Mining have a serious impact on forest areas. Mining operation reduces the forest area.

Examples: Mica, coal, manganese, limestone etc.,

3) Raw materials for industries: Wood is the important raw material for so many purposes.

Examples: For making boxes, furnitures, plywood, match-boxes, pulp etc.,

4) Fuel requirements: Rural and tribal population dependent on the forest for meeting their daily need of fuel wood which leads to the pressure on forest ultimately to deforestation.

5) Shifting cultivation: The replacement of natural forest ecosystem for monospecific tree plantation can lead to disappearance of number of plant and animal species.

6) Forest fires: Forest fires are one of the causes for deforestation.

Effects of deforestation:

The ill-effects of deforestation are summarized below.

1) Soil erosion: Soil is exposed to wind, sunlight, and evaporation due to deforestation. Soil fertility goes down due to soil erosion and rapid leaching of essential mineral nutrients.

2) Harm to fisheries: As the soil is eroded, it accelerates siltation in dams, rivers, and the coastal zone. The increased sedimentation harms downstream fisheries.

3) More floods and droughts: Because of deforestation, there is no regulation of the flow into rivers. As a result, floods and droughts alternate in the affected areas.

4) Habitat loss of wildlife: Many birds and animals suffer due to the loss of their habitat.

5) Extinction of some species: Many species are affected and some become extinct.

6) Local and global climate changes: The rain fall pattern is affected as the forest is cut down. Local and global climate changes may result from deforestation.

7) Global warming: If the trees are burned, the carbon is released immediately as carbon dioxide which leads to global warming.

8) Danger for the survival of local communities: Communities loss their source of food, fuel, construction materials and areas for livestock grazing by deforestation.

Preventive measures (or) avoid of deforestation:

The following are the strategies to prevent or avoid deforestation.

1) Steps should be taken by the government to discourage the migration of people into islands from mainland.

2) To counter the depletion of forest areas, tree plantation programmes have been started.

3) Education and awareness programmes must be conducted.

4) Strict implementation of law of forest conservation act.

5) Prevention of fire

6) Protection form fire

7) Involve local communities to protect forest.

* Dams and their effects on forest and tribal people:

Dam is an artificial barrier usually constructed across a river/stream channel to impound water for many beneficial purposes. However, these dams are also responsible for the destruction of vast areas of forest and displacement of local people.

Impacts of dam on forest:

The major effects of dams on forests are summarized below.

1) Loss of forest land: Construction of dam reduces the forest area considerably.

2) Loss of productivity from forest: Dam construction causes inundation of the upstream side and degrades the productivity of trees and vegetations.

3) Loss of economy: It leads to destruction of economic trees.

4) Loss of habitat: Habitat of flora and fauna species in the forests are affected by the construction of dams.

5) Loss of land due to construction activities: The forest land is destroyed not only for the construction of dam, but also for construction of workers quarters and approach roads.

Impacts of dams on tribal people:

Forest submergence would greatly affect the tribal people by the way of submerging their dwellings and agricultural lands. The lifestyle of tribals is webbed with the forests. But when the forests are destroyed, their livelihood is greatly affected.

1) Reduced fuel wood: Wide destruction of forests has reduced the availability and collection of fuel wood to the tribal people.

2) Reduced agricultural activities: Inundation of their land causes reduced agricultural activities and their altered pattern of living.

3) Loss of income and economy: The tribal people depend on forests for each and every thing. Loss of forest leads to loss of income and economy due to destruction of economically important tress and vegetation.

4) Loss of livelihood: Construction of dams affects the tribal people in many ways and it totally affects their livelihood.

Water resources

* Water resources-Uses:

Water resources are sources of water that are useful or potentially useful to humans.

It is important because it is needed for life to exist.

1) Life originated in water (Sea). So water is the mother of life.

2) Plants use water for survival. Without water the plants dry and die.

3) Animal drink water. Without water the animals die.

4) Water is the house for aquatic plants and animals.

5) It is the universal solvent. Many compounds dissolve in it.

6) Water is used for irrigation in agriculture.

7) Water is used in industries.

8) Many uses water for drinking, cooking, bathing, recreational and environmental activities.

* OVER-UTILIZATION OF SURFACE & GROUND WATER:

The rapid increase in population and industrial growth led to severe demand on water resources. After using all available surface water resources to the maximum, human beings began using groundwater to meet their needs.

1. The increased extraction of groundwater far in excess of the natural recharge led to decreased groundwater level. The erratic and inadequate rainfall caused reduction in storage of water in reservoirs. This also led to decrease of groundwater.
2. Building construction activities seal permeable soil zone and reduce the area for percolation of rainwater thereby increasing surface runoff.
3. If groundwater withdrawal rate is higher than recharge rate, sediments in aquifers get compacted resulting in sinking of overlaying land surface. This is called land subsidence which leads to structural damage in buildings, fracture in pipes and reverses the flow of canals leading to tidal flooding.
4. Over-utilization of groundwater in arid and semi-arid regions for agriculture disturbs equilibrium of reservoir in the region causing problems like lowering of water table and decreased pressure in aquifers coupled with changes in speed and direction of water flow.
5. Over utilization of groundwater in coastal areas leads to rapid intrusion of salt water from the sea thereby rendering it unusable for drinking and agriculture.
6. Over-utilization of groundwater lads to decrease in water level thereby causing earthquake, landslides and famine.

7. Over-utilization of groundwater leads to drying-up of dug wells as well as bore wells.
8. Due to excess use of groundwater near agricultural fields, agricultural water that contains nitrogen as a fertilizer percolates rapidly and pollutes the groundwater thereby rendering the water unfit for potable use by infants. (Nitrate concentration exceeding 45 mg/L).

* Floods

A flood is an overflow of water, whenever the magnitude of flow of water exceeds the carrying capacity of the channel within its bank.

Causes of floods:

The following are the causes of floods.

1) Heavy rainfall, melting of snow (ice), sudden release of water from dams, often causes floods in the low-lying coastal area.

2) Prolonged downpour can also cause the overflowing of lakes and rivers resulting into floods.

3) Reduction in the carrying capacity of the channel, due to accumulation of sediments or obstructions built on flood ways.

4) Deforestation, overgrazing, mining increases the runoff from rains and hence the level of flood raises.

5) The removal of dense and uniform forest cover over the hilly zones leads to occurrence of floods.

Effects of floods:

The following are the effects of floods.

1) Due to flood, water spreads in the surrounding areas and submerges them.

2) Due to floods the plain surface have become eroded and silted with mud and sand, thus the cultivable land area gets affected.

3) Extinction of civilization in some coastal areas also occurs.

4) Floods can damage any type of structure resulting in physical damage to canals, bridges, sewerage systems, roadways, cars, buildings etc.,

5) Floods can also cause causalities through epidemics and water-borne diseases.

6) The entire harvest can be lost due to floods leading to shortage of food.

7) Clear drinking water becomes scarce because of contamination of water due to floods.

8) Floods can lead to suffocation and death of some non-tolerant tree species.

Flood management:

Floods can be managed by following strategies.

1) Flood can be controlled by constructing dams or reservoirs.

2) Channel management and embankments also control the floods.

3) Encroachment of flood ways should be banned.

4) Flood hazard may also be reduced by forecasting or flood warning.

5) Flood may also be reduced by reduction of runoff by increasing infiltration through appropriate afforestation in the catchment area.

*** Drought:**

The lack water for the normal needs of agriculture, livestock, industry or human population may be termed as a drought.

Types of drought:

Droughts are classified into four types.

1) Meteorological drought

2) Hydrological drought

3) Agricultural drought

4) Socio-economic drought

1) Meteorological drought: It occurs when the total amount of rainfall is less than 75% of the normal rainfall. This drought will be severe if the rainfall is less than 50% of the normal rainfall.

2) Hydrological drought: It occurs when the total amount of rainfall is less than the average rainfall. It is generally associated with reduction of statistical average of water reserves available in source such as aquifers, lakes and reservoirs.

3) Agricultural drought: This occurs due to the shortage as well as the timing of overall rainfall, which inturn reduce the ground water and reservoir levels, soil moisture. Agriculture drought affects cropped plants.

4) Socio-economic Drought: It occurs due to reduction in the availability of food and social security of the people in the affected areas. Socio-economic drought leads to famine.

Causes of drought:

The following are the causes of drought.

1) When rainfall is below normal and less than evaporation, drought is created.

2) High population is also another cause for drought.

3) Intensive cropping pattern and over exploitation of scarce water resources.

4) Deforestation leads to desertification and drought too.

Effects of drought (or) Consequences of drought:

The following are the effects of drought.

1) Drought causes hunger, malnutrition and scarcity of drinking water and also changes the quality of water.

2) Drought causes widespread crop failures leading to acute shortage of food and adversely affects human and livestock populations.

3) The drought indicates the worst situation and initiation of desertification.

4) Drought retards the industrial and commercial growth.

5) It also accelerates degradation of natural resources.

6) Drought leads to large migration of people and urbanization.

Drought management:

Society's vulnerability to drought is minimized through the following actions.

1) An artificial technique of cloud seeding helps in inducing rainfall.

2) For consumption or irrigation, desalination of sea water can be done in times of scarcity.

3) Carefully planned crop rotation can help to minimize soil erosion. This also allow farmers to plant less water dependent crops in drier years.

4) Collection and storage of rain water through rain water harvesting is very useful.

5) Regulating the use of water in irrigation activities.

6) Redirecting rivers for irrigation in drought-prone areas.

7) Treatment and purification of sewage waste water for reuse.

8) Continuous observation of rainfall levels and comparisons with current usage levels can help prevent man-made drought.

* Water conflict:

Water is essential for our existence and is fast becoming a scarce resource. Freshwater is considered to be the most environmental issue of this century. Nearly 1.2 billion people do not have access to safe drinking water.

Thus due to increase in population and decrease in water resources, conflicts over water starts.

Causes for water conflicts:

1) Conflict through use: Unequal distribution of water has been led to interstate or international disputes.

Example:

a) International water conflicts:

- Indian and Pakistan fight over the rights of water from the Indus.
- Mexico and USA fight over the rights of water from the Colorado river.
- Iran and Iraq fight over the rights of water from the Shat-al-Arab water.
- India and Bangladesh are fighting for Bhramaputra river.

b) National water conflicts:

- Sharing of Cauvery water between Karnataka and Tamilnadu.
- Sharing of Siruveni water between Tamilnadu and Kerala.

2) Construction of Dams (or) Power stations:

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

3) Conflict through pollution:

Not only they act as reservoirs for the supply of fresh water but also as a means of disposing of waste water and industrial rubbish With the increasing decline in the quality of the water crossing borders, the problem of cleaning the water takes on an international dimension (conflict).

Management of water conflicts:

1. Concerted efforts are required to enforce laws that check these practices to control water pollution.
2. In order to overcome the problem of sharing river water in a country, the concept of interlinking of rivers has been suggested.

3. Rivers should be nationalized, the National Water Authority and River Basin Authority should be given powers to ensure equitable distribution of basin water.

National water conflict:

Example: 1) Sharing of Kaveri water between Karnataka and Tamilnadu:

Kaveri is a south Indian river that originates in western ghats in Karnataka and flow through Karnataka and Tamilnadu where many fields are irrigated. It is said that Karnataka is not releasing enough water necessary for irrigation of fields in the state of Tamilnadu which is a lower state. There was some confrontation between the two states and the central government played an intermediary role to make the government of Karnataka to release some amount of water so as to release the anguish of Tamilnadu ryots.

2) The SYL conflict: The conflict is between states of Punjab and Haryana. Inter linking of Sutlaj river and Yamuna river through a canal. The dispute arose between Punjab and Haryana over the use of water of the inter linking canal.

Mineral resources

* Uses of minerals:

Minerals are used in a large number of ways in everyday us, in domestic, agricultural, industrial and commercial sectors.

The important uses of minerals are as follows.

1. Development of industrial plant and machinery.

Example: Iron, aluminium, copper etc.,

2. Construction, housing and settlements.

Example: Iron, aluminium, copper etc.,

3. Generation of energy.

Example: Coal, crude oil, natural gas, uranium, thorium etc.,

4. Designing defence equipments, weapons, ornaments.

Example: Iron, aluminium, copper etc.,

5 Agricultural purposes, as fertilizers, seed dressings and pesticides.

Example: Zineb – containing zinc, maneb – containing manganese etc.,

6. Jewellery purposes.

Example: Gold, silver, platinum and diamond etc.,

7. Making of alloys for various purposes.

Example: Brass, bronze, steel etc.,

8. Communication and electricity purposes.

Example: Iron, aluminium, copper etc.

9. Medicinal purposes particularly in ayurvedic system.

Example: Sulphur pyrites, iron, calcium, zinc and copper etc.,

* Exploitation of mineral resources:

The exploitation of mineral resources is the use of mineral resources for economic growth, sometimes with a negative connotation of accompanying environmental degradation.

Environmental effects of extracting and using mineral resources:

The environmental effects caused by extracting and using mineral resources are as follows.

1. Deforestation including the loss of flora and fauna.

2. Degradation of land due to excavations.

3. Occupational health hazards such as black lung disease.

4. Pollution of ground and surface water resources due to accidental or periodic discharge of pollutants.

5. Damage to local ecological functions, nutrient cycling and biodiversity due to alterations inwater availability or quality.

6. Problem in rehabilitation of affected population.

7. Pollution of air due to emission of dust and poisonous gases during mining and processing stages. Problems in providing living environment and clean water, air etc., for the survival of large number of workers who have migrated nearby mine sites.

8. Problems in the safe disposal of tremendous amounts of solid waste generated during mining.

9. Rapid depletion of mineral deposit.

10. Extraction of mineral resources causes environmental pollution.

11. Extraction needs energy requirements when energy is used more causes environmental damage.

12. Subsidence of land results in cracks in houses, tilting of buildings, bending of rail tracks etc.,

* Management of mineral resources:

The following steps are very useful for the management (conservation) of mineral resources.

1. The efficient use and protection of mineral resources.

2. Modernization of the mining industry.

3. Search for new deposits.

4. Encourage Re-use and Re-cycling of the metals.

5. The low grade ores can be better utilized by microbial leaching techniques.

6. Encourage use of improved technologies so as to reduce waste generation.

7. Regulate the use of mineral resources.

8. Reduce the purchase of unwanted products made from mineral resources.

9. Encourage research for providing suitable eco-friendly alternatives for fossil fuels, metals etc.,

10. Implementation of strict laws to manage mineral resources.

11. Public awareness regarding mineral resources importance.

Food resources

* Overgrazing:

Overgrazing is a process of eating away the forest vegetation without giving it a chance to regenerate.

Intensive grazing thus causes the plant residual matter to decline and further contributes to numerous negative consequences to both the animals and the land. Consequently, overgrazing signifies a serious environmental challenge in maintaining the natural balance of livestock on grazing lands, which reduces the productivity, usefulness, and biodiversity of the land.

Causes of overgrazing:

The following are the causes of overgrazing

1. Lack of proper animal/wildlife management

2. Drought or decline in precipitation

3. Improper land use

4. Overstocking

5. Poor irrigation methods in arid and semi-arid areas

Effects of overgrazing:

1. Soil erosion: The continued trampling of numerous animals in an average forage land will act to accelerate the death of plants and vegetation cover. This is because the animals will graze even on the slightest shoots of new growth. Without the plants or vegetation cover, the soil is left bare and exposed to harsh weather such as heavy downpour and high temperatures which disintegrates the rocks and carries the top soil away. Animals also prefer gathering at specific areas, like next to water sources, and such areas can get eroded.

2. Land degradation: The acts of compaction and erosion as a result of overgrazing can cause tremendous land degradation.

3. Loss of useful species: The natural composition of plant population and their regeneration capacity is significantly affected by overgrazing. The original pasture crops are composed of high quality pastures and herbs with great nutritional value. When animals intensively graze on such pastures, even the root stocks which contain the reserve food or regeneration capacity get ruined.

4. Food shortage/famine: As earlier stated, overgrazing is a primary contributor to desertification because it converts arable or pasture land into unproductive piece land. The resultant soil is thus not suited for growing food since it loses its essential nutrients.

5. Death of people and livestock: The long term effects of overgrazing are food shortage which can make people and cattle die of starvation.

Control measures to control overgrazing:

1. Avoiding the act of grazing too early, you can have the stockpiled in the rainy season (spring) so that there is enough grass in the dry periods (summer)
2. The use of a grazing chart can assist in planning out how to implement rotational grazing
3. Monitoring rainfall patterns and the growth of pasture
4. Maintaining and managing proper pasture residuals in the grazing area
5. Making sustainable pasture management decisions in dry weather conditions, this can be achieved by leaning more and more about sustainable pasture practices
6. Proper land use management practices

* Traditional agriculture:

Traditional Agriculture can be defined as a primitive style of farming that involves the intensive use of indigenous knowledge, traditional tools, natural resources, organic fertilizer and cultural beliefs of the farmers. It is noteworthy that it is still used by about 50% of the world population.

Characteristics of traditional agriculture:

1. Extensive farming with indigenous knowledge and tools

2. Indigenous tools like axe, hoe, and stick

3. Method: Slash & Burn, and Shifting Cultivation

4. Cattle raisin helps to create fallow land

5. Absence of accountability and responsibility to the Environment

6. Lacked by surplus production

Impact of traditional agriculture on Environment:

The impacts of traditional agriculture on Environment are discussed below:

1. Depletion of Nutrients

The primitive style of framing like slash and burn decreases the organic matter from the soil and within the short period of time the nutrient content of the soil taken up by the crops. This makes the farmers to move to another place for farming.

2. Deforestation

It is the process of the removal of a forest or stand of trees where the land for the conversion of forestland to farms, ranches, or urban use. The most concentrated deforestation occurs in tropical rainforests. The slash & burn, and shifting cultivation required massive cutting down of the forest which leads to the situation of deforestation.

3. Soil Erosion

It is a process of the removal of topsoil by the natural physical forces of water and wind or through forces associated with farming activities such as tillage. The roots of the plant and trees firmly hold the soil, but the deforestation exposed the soil to get eroded by the weathering forces like rain, wind and storms which causes the loss of top fertile soil.

Hence, we can say, it is our duty to deal with the most mundane problems of life where each individual matters, like dealing with safe and clean drinking water, hygienic living conditions, clean and fresh air, fertile land, healthy food and sustainable development.

A few advantages would include:

1. It requires less monetary input, involves a small plot, simple tools, surface water, organic fertilizers and a mix of crops.
2. It requires less skill and technological knowhow,
3. The quality of produce is better and could also reduce risk of cancer,
4. The soil (for arable farming) is more balanced in nutrient distribution and texture, while (in livestock farming) milk, meat and eggs have better quality,
5. Aesthetic benefits,
6. Traditional farming grew many different crops per acre, which replenished the soil, and prevented a reliance on one type of 'staple' crop.

*** Modern agriculture:**

Modern agriculture is an evolving approach to agricultural innovations and farming practices that helps farmers increase efficiency and reduce the amount of natural resources—water, land, and energy—necessary to meet the world's food, fuel, and fiber needs.

Advantages:

- Simpler system for growing one species of crop or one species of animal
- Larger equipment covers more area, therefore should get work done faster
- More advanced technology makes production more efficient and less labour-intensive
- Larger farms create more area to grow more crops to get more money to pay for more machinery (or try to reduce debt in having to get more modernized machinery)
- Less manual labour required because system is more mechanized

- Advances in fertilizers and pesticides generate greater expected yields and reduce weed issues
- Less workers needed.

Disadvantages:

The following are the disadvantages of modern agriculture.

1. Impact of high yielding varieties:

High yielding varieties crops need a lot of fertilisers and pesticides to grow which increases the pollution. It require more reliable source of water for irrigation which inturn create problems.

2. Problem using fertilizers:

The following are the impacts of using fertilizers.

a) Micronutrient imbalance: Most of the chemical fertilizers used in modern agriculture contain nitrogen, phosphorous, and potassium (N, P, K) which are macronutrients. When excess of the fertilizers are used in the fields, it causes micronutrient imbalance.

b) Blue baby syndrome (Nitrite pollution): When the nitrogenous fertilizers are applied in the fields, they leach deep in to the soil and contaminate the ground water. The nitrate concentration in the water gets increased. When the nitrate concentration exceeds 25 mg/lit, they cause serious health problem called ‘’blue baby syndrome’’. This disease affects infants and leads even to death.

c) Eutrophication: A large proportion of N and P fertilizers used in crop fields are washed off by the runoff water and reaches the water bodies causing over nourishment of the lakes. This process is known as eutrophication.

3) Problems in using pesticides:

The following are the problems of using pesticides.

a) Death of non-target species: Many pesticides not only kill the target species but also kill the several non-target species, which are useful to us.

b) Producing new pests: Some pest species usually survive even after the pesticide spray, which generates highly resistant generations They are immune to all type of pesticides and are called superpests.

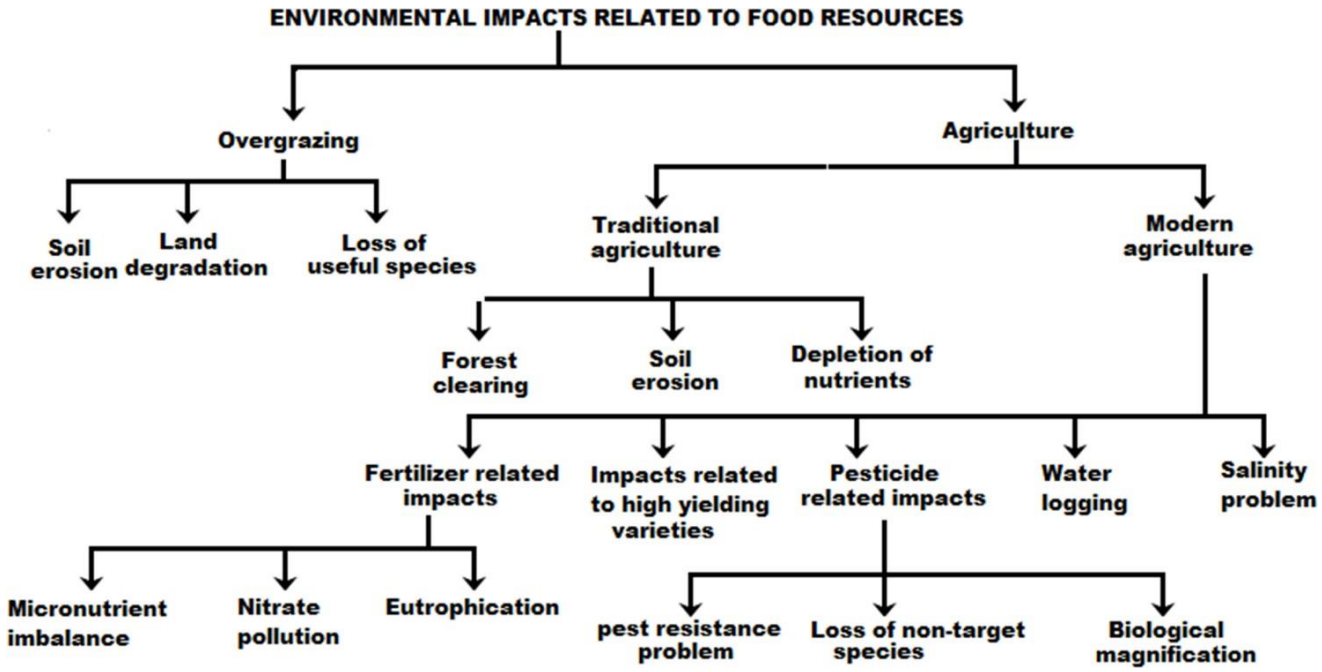
c) Bio-magnification: Many of the pesticides are non-biodegradable and keep on concentrating in the food chain. This process is called bio-magnification. This pesticide in a bio-magnified form is harmful to the human beings.

4) Water logging: Water logging is the land where water stand for most of the year.

Problem in water logging: During water logged conditions, pore-voids in the soil get filled with water and the soil-air gets depleted. In such a condition the roots of the plants do not get adequate air for respiration. So, mechanical strength of the soil decreases and crop yield falls.

5) Salinity: The water not absorbed by the soil, undergo evaporation leaving behind a thin layer of dissolved salts in the top soil. This process of accumulation of salts is called salinity of the soil.

Problems in salinity: Under dry climates, the water gets evaporated leaving behind the salt in the upper portion of the soil. Due to salinity, the soil becomes alkaline and crop yield decreases.



Land resources

Land is regarded as a natural resource because it is essential for the functioning of organisms, populations and ecosystems and constitutes an important entity as a source of all materials essential to man and all other organisms.

* Uses of Land resources:

The following are the uses of land resources.

1) Land provides food, wood, minerals etc., for us.

2) Land nurtures the plants and animals that provide our food and shelter.

3) Land is used as watershed or reservoir.

4) Land acts as a dust bin for most of the wastes, created by the modern society.

5) Land is the physical space for settlements, industry and recreation.

6) Land is store of wealth in its own.

7) Land helps in the production of food, fibre, fuel wood etc.,

8) Land is the biological habitat for many plants, animals and microorganisms.

9) Land regulates flow of surface and stores groundwater.

10) Land enables movement of people and animals between one place to another.

11) Land is buffer, filter or modifier for chemical pollutants.

12) Land is a co-determinant in the global energy balance and global hydrological cycle, which provides both a source and sink for greenhouse gases.

* Land degradation:

Definition: The process of deterioration of soil (or) loss of fertility of the soil is called land degradation.

Causes of land degradation:

The causes of land degradation can be grouped into two types as:

1. Natural causes and

2. Man-made activities

1. Natural causes of land degradation

The following are the natural causes of land degradation.

- Flood
- Drought
- Landslides
- Wind

2. Man-made causes of land degradation

The following are the man-made causes of land degradation.

- Unsustainable agricultural land use,
- Poor soil management practices
- Poor management practices
- Deforestation
- Removal of natural vegetation over the soil

- ❖ Frequent use of heavy machineries
- ❖ Overgrazing of animals
- ❖ Improper crop rotation
- ❖ Poor irrigation practices
- ❖ Disposal of industrial effluents
- ❖ Mining and industrial activities

Harmful effects of land degradation:

The following are the harmful effects of land degradation.

1) The soil texture and soil structure are deteriorated.

2) Loss of soil fertility, due to loss of invaluable nutrients.

3) Increase in water logging, salinity, alkalinity and acidity problems.

4) Loss of economic, social and biodiversity.

5) Land degradation often destroys or reduces the natural beauty of landscapes.

6) Loss of flora and fauna

7) Loss of tree regeneration capacity

8) Vegetation decline and degradation

9) Accelerates soil erosion

10) Loss of its ability to hold water and sediment.

*** Soil erosion:**

The removal of top layer of the soil from its original place by water, wind and glaciers is called soil erosion.

Types of soil erosion:

Based on the rate at which soil loss takes place, there are two types of soil erosion.

1) Normal and geological erosion and

2) Accelerated erosion

1) Normal and geological erosion:

Normal and geological erosion includes soil forming as well as eroding processes, thus maintains soil balance, suitable for the growth of plants. It occurs under normal natural condition by itself, without any interference of man.

2) Accelerated erosion:

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

Causes of Soil erosion:

The following are the causes of soil erosion.

1). Water: Water affects soil erosion in the form of rain, run off, rapid flow, wave action.

2) Wind: Wind is the important climatic agent, which carry away the fine particles of soil and create soil erosion.

3) Biotic agents: Overgrazing, mining and deforestation are the major biotic agents, cause soil erosion.

4) Landslide: It also causes soil erosion.

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

Control of soil erosion (or) soil conservation methods:

In order to control soil erosion and conserve the soil, the following conservation practices are applied.

1) Conservational till farming (or) No-till-farming: In traditional method, the land is ploughed and soil is broken up and levelled to make a planting surface. This disturbs the soil and makes it susceptible to erosion. However, no-till farming causes minimum disturbance to the top soil. Here the tilling machines make slits in the unploughed soil and inject seeds, fertilizers and water in the slit. So the seed germinates and the crop grows.

2) Counter farming: It involves planting crops in rows across the counter of gently sloped land. Each row acts as a small dam to hold soil and to slow water runoff.

3) Terracing: It involves conversion of steep slopes into a series of broad terraces, which run across the counter. This retains water for crops and reduces soil erosion by controlling runoff.

4) Alley cropping (or) Agro forestry: It involves planting crops in strips or alleys between rows of trees or shrubs that can provide fruits and fuel wood. Even when the crop is harvested, the soil will not be eroded because trees and shrubs still remain on the soil and hold the soil particles.

5) Wind breaks or shelter belts: The trees are planted in long rows along the boundary of cultivated lands, which block the wind and reduce soil erosion. Wind breaks help in retaining soil moisture, supply of some wood for fuel and provide habitats for birds.

Energy resources

* Renewable and Non-renewable energy resources:

Based on continual utility, energy resources can be classified into two types.

1) Renewable energy resources

2) Non-renewable energy resources

1) Renewable energy resources:

These are natural resources which can be regenerated continuously and are inexhaustible. They can be used again and again in an endless manner.

Examples: Solar energy, wind energy, biomass energy, biogas, tidal energy, wave energy etc.

2) Non-renewable energy resources:

These are natural resources which cannot be regenerated once they are exhausted. They cannot be used again.

Examples: Coal, crude oil, natural gas, nuclear fuels etc., (thermal energy, nuclear energy)

*** Difference between conventional and nonconventional sources of energy (OR) Difference between renewable and non-renewable energy resources.**

Conventional sources of energy	**Non-conventional sources of energy**
Conventionally non-renewable energy resources are using.	Non-conventionally renewable energy resources are using.
They are fully developed	They are not fully developed
Inexpensive technology	Expensive technology
Require established technology	Require new technologies which are still under research and development
Available in limited quantity	Available in plenty
Emit pollutants from the combustion of coal, crude oil, natural gas, uranium etc., and pollutes environment	Free from pollution problems
Ecologically not safe to use	Ecologically safe to use.
Example: Coal, crude oil, natural gas, uranium etc.,	Example: Solar energy, Wind energy etc.,

*** Use of alternate energy resources (Why alternate (renewable) energy resources are required?)**

The following are represents the alternate energy resources and their need to use togenerate energy.

1) The importance of solar energy can be emphasized in view of the fact that fossil fuels andother conventional sources are not free from pollution problems.

2) Energy sources which have least pollution, safety and security snags and are universallyavailable have to use to get energy.

3) Radioactive pollutants released from nuclear power plants are chronically hazardous.Hence better to use renewable energy resources to get energy.

4) The burning of coal, oil, wood, dung cakes and petroleum products have well debatedenvironmental problems. Thus the renewable energy resources are needed to generate energy.

5) The disposal of ash requires large ash ponds and may pose a severe problem consideringthe limited availability of land. Thus non-conventional energy sources are needed.

6) Petro plants: Hydrocarbons present in plants can be converted into petroleumhydrocarbons.

Examples: Euphorbiaceae. Asclepiodaceae, Apocyanaceae, Sapotaceae, 385 species screenedfor hydrocarbon content and can be used to get energy.

7) Dendrothermal energy (energy plantation): They provide fuel wood, charcoal that canbe used for generating energy.

8) Energy from urban waste: Sewage and waste in cities used for generating gas andelectricity.

9) Bagase-based plants: Sugar mills generate bagase that can be used to generate electricity.