LECTURE NOTE

PNS SCHOOL OF ENGINEERING AND TECHNOLOGY

ENVIRONMENTAL STUDIES

ELECTRICAL ENGINEERING DEPT.SEM-3RD

PREPARED BY- ER. SASWATI SOUMYA SHARMA

CH-1

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

INTRODUCTION:-

- The word environment is derived from the French word 'environner' which means to 'encircle or surround'.

- Thus our environment can be defined as "the Social, Cultural and Physical conditions that surround, affect and influence the survival, growth and development of people, animals and plants"

- This broad definition includes the natural world and the technological environment as well as the cultural and social contexts that shape human lives.

- It includes all factors (living and nonliving) that affect an individual organism or population at any point in the life cycle; set of circumstances surrounding a particular occurrence and all the things that surrounds us.

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES :-

- The Environment studies is a multi-disciplinary science because it comprises various branches of studies like chemistry, physics, medical science, life science, agriculture, public health, sanitary engineering etc.

- It is the science of physical phenomena in the environment. It studies about the sources, reactions, transport, effect and fate of physical and biological species in the air, water, soil and the effect of from human activity upon these.

- As the environment is complex and actually made up of many different environments like natural, constructed and cultural environments, environmental studies is inter disciplinary in nature including the study of biology, geology, politics, policy studies, law, religion engineering, chemistry and economics to understand the humanity's effects on the natural world.

- This subject educates the students to appreciate the complexity of environmental issues and citizens and experts in many fields.

- By studying environmental science, students may develop a breadth of the interdisciplinary and methodological knowledge in the environmental fields that enables them to facilitate the definition and solution of environmental problems. 1.1.4 SCOPE OF ENVIRONMENTAL STUDIES Environmental studies as a subject has a wide scope. It includes a large number of areas and aspects, which may be summarized as follows:

- Natural resources- their conservation and management

- Ecology and Biodiversity

- Environmental pollution and control

- Human population and environment

Green marketing:-

While ensuring the quality of products with ISO mark, now there is an increasing emphasis on marketing goods that are environment friendly. Such products have ecomark or ISO 14000 certification. Environmental auditors and environmental managers would be in great demand in the coming years.

Green media: -

Environmental awareness can be spread amongst masses through mass media like television, radio, newspaper, magazine, hoardings, advertisements etc., for which environmentally educated persons are required.

IMPORTANCE OF ENVIRONMENTAL STUDIES :-

• The importance of environmental studies is that, the current trend of environmental degradation can be reversed if people of educated communities are organized, empowered and experts are involved in sustainable development

. • Environmental factors greatly influence every organism and their activities. Environmental Science 4 AITT & H&S

• At present a great number of environmental issues, have grown in size and complexity day by day, threatening the survival of mankind on earth. These issues are studied besides giving effective suggestions in the environment studies.

• The environment studies enlighten us, about the importance of protection and conservation of our natural resources, indiscriminate release of pollution into the environment etc. Environment studies have become significant for the following reasons:

1.Environment Issues being of International Importance:-

It has been well recognized that environment issues like global warming, ozone depletion, acid rain, marine pollution and loss of biodiversity are not merely national issues but are global issues and hence must be tackled with international efforts and cooperation.

2.Explosively Increase in Pollution:-

World census reflects that one in every seven persons in this plant lives in India. Evidently with 16 per cent of the world's population and only 2.4 per cent of its land area, there is a heavy pressure on the natural resources including land.

Agricultural experts have recognized soils health problems like deficiency of micronutrients and organic matter, soil salinity and damage of soil structure. 4. Need for An Alternative Solution: It is essential, specially for developing countries to find alternative paths to an alternative goal. We need a goal as under:

(a) A goal, which ultimately is the true goal of development an environmentally sound and sustainable development.

(b) A goal common to all citizens of our earth.

(c) A goal distant from the developing world in the manner it is from the overconsuming wasteful societies of the "developed" world.

5. Need To Save Humanity From Extinction:-

It is incumbent upon us to save the humanity from extinction. Consequences to our activities cause destructing the environment and depleting the biosphere, in the name of development.

6. Need For Wise Planning of Development:-

Our survival and sustenance depend. Resources withdraw, processing and use of the product have all to be synchronized with the ecological cycles in any plan of development. Our actions should be planned ecologically for the sustenance of the environment and development.

NEED FOR PUBLIC AWARENESS:-

1. Growing Population: -
   - ⇨ A population of over thousands of millions is growing at 2.11 per cent every year. Over 17 million people are added each year. It puts considerable pressure on its natural resources and reduces the gains of development. Hence, the greatest challenge before us is to limit the population growth.
   - ⇨ Although population control does automatically lead to development, yet the development leads to a decrease in population growth rates.
2. Poverty:-
   - ⇨ India has often been described a rich land with poor people. The poverty and environmental degradation are mixed with one another. The vast majority of our people are directly dependent on the nature resources of the country for their basic needs of food, fuel shelter and fodder. About 40% of our people are still below the poverty line.
3. Environment degradation:-
   - ⇨ It has adversely affected the poor who depend upon the resources of their immediate surroundings. Thus, the challenge of poverty and the challenge of environment degradation are two facets of the same challenge.
4. Agricultural Growth:-
   - ⇨ The people must be made familiar with the methods to sustain and increase agricultural growth without damaging the environment. High yielding varieties have caused soil salinity and damage to physical structure of soil.
5. Need to Increase Ground water:-
   - ⇨ It is essential of rationalizing the use of groundwater. Factors like community wastes, industrial effluents, chemical Environmental Science 6 AITT & H&S fertilizers and pesticides have polluted our surface water and affected quality of the groundwater.

- ⇨ It is essential to restore the water quality of our rivers and other water bodies. Suitable strategies for conservation of water, provision of safe drinking water and keeping water bodies clean should be developed.

6. Development and Forests:-
   - ⇨ Forests serve catchments for the rivers. With increasing demand of water, plan to harness the mighty river through large irrigation projects were made. Certainly, these would submerge forests; displace local people, damage flora and fauna.
   - ⇨ As such, the dams on the river Narmada, Bhagirathi and elsewhere have become areas of political and scientific debate. Forests in India have been shrinking for several centuries owing to pressures of agriculture and other uses. Vast areas that were once green, stand today as waste lands. These areas are to be brought back under vegetative cover.
   - ⇨ The tribal communities inhabiting forests, respects the trees, birds and animals give them sustenance. We must recognize the role of these people in restoring and conserving forests. The modern knowledge and skills of the forest department should be integrated with the traditional knowledge and experience of the local communities. The strategies for the joint management of forests should be evolved in a well planned way.
7. Degradation of Land:-
   - ⇨ At present out of the total 329 mha of land, only 266 mha possess any potential for production. Of this, 143 mha is agricultural land nearly and 85 suffers from varying degrees of soil degradation. Of the remaining 123 mha, 40 are completely unproductive. The remaining 83 mha is classified as forest land, of which over half is denuded to various degrees.
   - ⇨ Nearly 406 million head of livestock have to be supported on 13 mha, or less than 4 per cent of the land classified as pasture land, most of which is overgrazed. Thus, out of 226 mha, about 175 mha or 66 per cent is degraded to varying degrees. Water and wind erosion causes further degradation of almost 150 mha This degradation is to be avoided.
8. Evil Consequences of Urbanization:-
   - ⇨ Nearly 27% of Indians live in urban areas. Urbanization and industrialization has given birth to a great number of environmental problems. Over 30 percent of urban Indians live in slums. Out ofIndia's 3,245 towns and cities, only 21 have partial or full sewerage and treatment facilities. Hence, coping with rapid urbanization is a major challenge.
9. Air and water Pollution:-
   - ⇨ Majority of our industrial plants are using outdated and pollution causing technologies and makeshift facilities devoid of any provision of treating their wastes.
   - ⇨ A great number of cities and industrial areas have been identified as the worst in terms of air and water pollution. Acts are enforced in the country, but their implement is not so easy. The reason is their implementation needs great resources, technical expertise, political and social will. Again the people are to be made aware of these rules. Their support is indispensable to implement these rules.

SHORT QUESTIONS

1. What is the meaning of environmental studies ?
   - The word environment is derived from the French word 'environner' which means to 'encircle or surround'.
   - Thus our environment can be defined as "the Social, Cultural and Physical conditions that surround, affect and influence the survival, growth and development of people, animals and plants"
   - This broad definition includes the natural world and the technological environment as well as the cultural and social contexts that shape human lives.
   - It includes all factors (living and nonliving) that affect an individual organism or population at any point in the life cycle; set of circumstances surrounding a particular occurrence and all the things that surrounds us.
2. What is green marketing ?
   While ensuring the quality of products with ISO mark, now there is an increasing emphasis on marketing goods that are environment friendly. Such products have ecomark or ISO 14000 certification. Environmental auditors and environmental managers would be in great demand in the coming years.
3. What is green media ?
   Environmental awareness can be spread amongst masses through mass media like television, radio, newspaper, magazine, hoardings, advertisements etc., for which environmentally educated persons are required.

LONG QUESTIONS

1. What are the importance of environmental studies ?
2. Describe the need of public awareness for environmental studies.

CH-2

NATURAL RESOURCES

INTRODUCTION:-

- 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 (living or biotic part), Air, water, soil, minerals, climate and solar energy (non- living or abiotic part).

- They are essential for the fulfillment of physiological, social, economical and cultural needs at the individual and community levels.

TYPES OF NATURAL RESOURCES:-

They are of two types of resources namely Renewable and Non-Renewable Resources.

1. Renewable resources:- The resources that can be replenished through rapid natural cycles are known as renewable resource. These resources are able to increase their abundance through reproduction and utilization of simple substances. Ex: Plants, (crops and forests) and animals.

- Some examples of renewable resources though they do not have life cycle but can be recycled. Ex: Wood and wood-products, pulp products, natural rubber, fibers (e.g. Cotton, jute, animal wool, silk and synthetic fibers) and leather.

- In addition to these resources, water and soil are also classified as renewable resources.

- Solar energy although having a finite life, as a special case, is considered as a renewable resource in as much as solar stocks is inexhaustible on the human scale.

2. Non renewable resources:- The resources that cannot be replenished through natural processes are known as non-renewable resources. These are available in limited amounts, which cannot be increased. These resources include fossil fuels (petrol, coal etc.), metals (iron, copper, gold, silver, lead, zinc etc.), minerals and salts (carbonates, phosphates, nitrates etc.).Once a non-renewable resource is consumed, it is gone forever.

- Non-renewable resources can further be divided into two categories, viz. A) Recyclable and B) Non-recyclable A) Recyclable: These are non-renewable resources, which can be collected after they are used and can be recycled. These are mainly the non-energy mineral resources, which occur in the earth's crust (Ex: Ores of aluminum, copper, mercury etc.) and deposits of fertilizer nutrients (e.g. Phosphate sock and potassium and minerals used in their natural state (asbestos, clay, mica etc.) B) Non-recyclable: These are non-renewable resources, which cannot be recycled in any way. Ex: Fossil fuels and uranium, which provide 90 per cent of our energy requirements

NATURAL RESOURCES AND ASSOCIATED PROBLEMS:-

- The main problem associated with natural resources is unequal consumption.

- A major part of natural resources are consumed in the 'developed' world. The 'developing nations' also over use many resources because of their greater human population. However, the consumption of resources per capita (per individual) of the developed countries is up to 50 times greater than in most developing countries.

- Advanced countries produce over 75% of global industrial waste and greenhouse gases.

- Energy from fossil fuels consumed in relatively much greater quantities in developed countries. Their per capita consumption of food too is much greater as well as their waste.

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. It is derived from latin word 'foris' means 'outside'. India's Forest Cover is 6,76,000 sq.km (20.55% of geographic area). Scientists estimate that India should ideally have 33% of its land under forests. Today we only have about 12% thus we need not only to protect our existing forests but also to increase our forest cover.

FUNCTIONS OF FOREST:-

1. It performs very important function both to human and to nature.

2. They are habitats to millions of plants, animals and wild life.

3. They recycle rain water.

4. They remove pollutant from air.

5. They control water quality.

6. They moderate temperature and weather.

7. They influence soil condition and prevent soil erosion.

USES OF FOREST:-

1. Commercial uses

2. Ecological uses

1. Commercial uses:-

i. Wood – used as a fuel

ii. Supply wood for various industries – Raw materials as pulp, paper, furniture timber etc.

iii. Minor forest products – gum, dyes, resins

iv. Many plants – Medicines

v. Supply variety of animal products – honey. Ivory, horns etc.

vi. Many forest lands are used for - Mining, grazing, for dams and recreation.

2. Ecological uses: Forest provides number of environmental services.

i. Production of oxygen: Photosynthesis produces large amount of oxygen which is essential for life.

ii. Reducing global warming: Carbon dioxide is one of the main green house gas. It is absorbed by plants for photosynthesis. Therefore the problem of global warming caused by CO2 is reduced.

iii. Soil conservation: Roots of trees bind the soil tightly and prevent soil erosion. They also act as wind breaks.

iv. Regulation of hydrological cycle: Watershed in forest act like giant sponges and slowly release the water for recharge of spring Pollution

v.moderators: Forest can absorb many toxic gases and noises and help in preventing air and noise pollution.

vi. Wild life habitat: Forest is the home of millions of wild animals and plants

REASON FOR DEFICIENCY OF FOREST:-

In India the minimum area of forest required to maintain good ecological balance is about 33% of total area. But at present it is only about 12%. So over exploitation of forest material occurs

OVER EXPLOITATION OF FOREST: Due to over population, there is an increased demand for medicine, shelter, wood and fuel. Hence exploitation of forest materials is going on increasing.

Cause of over exploitation:-

1. Increasing agricultural production.

2. Increasing agricultural activities.

3. Increase in demand of wood resources.

DEFORESTATION: It is process of removal of forest resources due to natural or manmade activities (i.e.) destruction of forests.

Causes of deforestation:-

1. Developmental projects: Developmental projects causes deforestation through two ways.
   - Through submergence of forest area.
   - Destruction of forest area. Ex: big dams, hydro electric projects, road construction etc.

2. Mining operations: It reduces forest areas. Ex: Mica, coal, Manganese and lime stone.

3. Raw materials for industries: Wood is an important raw material for various purposes. Ex: Making boxes, furniture and paper etc.

4. Fuel requirement: Wood is the important fuel for rural and tribal population. Shifting cultivation: Replacement of natural forest ecosystem for mono specific tree plantation. Ex: Teak

6. Forest fires: Forest fire destructs thousands of acres of forest.

7. Over grazing: Over grazing by cattle reduces the cultivation land Consequences of deforestation (or) impacts of deforestation: 1. Economic loss 2. Loss of biodiversity 3. Destructs the habitats of various species 4. Reduction in stream flow 5. Increases the rate of global warming 6. Disruption of weather patterns and global climate 7. Degradation of soil and acceleration of the rate of soil erosion. 8. Induces and accelerates mass movement / land slides. 9. Increases flood frequency, magnitude / severity. 10.Breaks the water cycle 11.Breaks the nutrient cycle

PREVENTIVE MEASURES (OR) AVOID OF DEFORESTATION (OR) METHODS OF CONSERVATION OF FORESTS:-

1. New plants of more or less of the same variety should be planted to replace the trees cut down for timber

2. Use of wood for fuel should be discouraged.

3. Forest pests can be controlled by spraying pesticides by using aero planes

4. Forest fire must be controlled by modern techniques.

5. Over grazing by cattle must be controlled.

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

7. Education and awareness programmes must be conducted.

8. Strict implementation of law of Forest conservation Act.

WATER RESOURCES:-

Water claims to be an important resource. An important use of water in our country is for irrigation. Besides, water is also required in large amounts for industrial and domestic consumption.

USES:-

- Is essential for all forms of life.

- Many uses of water include agricultural, industrial, household, recreational and environmental activities. Virtually, all of these human uses, require fresh water.

- No plant or animal species can survive without water. If water in our body drops by 1% we feel thirst, if it drops by 10% we face death

HYDROLOGICAL CYCLE: Water from various water bodies Evaporated by solar energy Enters in to the atmosphere as clouds Falls again on earth as rain or snow Ultimately returns to the ocean.

DISTRIBUTION OF WATER RESOURCES:-

Fresh water resources Surface water Underground water Standing water bodies flowing water bodies

FLOOD

It is an over flow of water. It happens when the magnitude of flow of water exceeds the carrying capacity of the channel within its bank.

CAUSES OF FLOOD

1. Heavy rainfall, melting of snow and sudden release of water from dams. (Flash floods)

2. Reduction in the carrying capacity of the channel.

3. Deforestation, mining and over grazing increase the runoff from rains and the level of flood raises

EFFECT OF FLOOD

1. Water spreads in the surrounding area and submerges them.

2. Cultivated land gets affected.

3. Extinction of civilization.

FLOOD MANAGEMENT

1. Floods can be controlled by dams.

2. Channel management control flood.

3. Flood hazards reduced by forecasting or flood warning.

4. Flood may also be reduced by reduction of run off by increasing infiltration through appropriate afforestation in the catchment area.

DROUGHT

Drought is nothing but scarcity of water, which occurs due to 1. Inadequate rain fall 2. Late arrival of rain fall 3. Excessive withdrawal of ground water Lack of water for the needs of agriculture, livestock, industry or human population may be termed as a drought. Drought causes serious damages to plants, animals and human life.

CAUSES OF DROUGHT

1. When annual rain fall is below normal and less than evaporation, drought is created.

2. High population.

3. Intensive cropping pattern Ex: Maharashtra - There has been no recovery from drought for the last 30 years due to over exploitation of water by sugarcane crop

EFFECTS OF DROUGHT

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

2. Drought causes widespread crop failure leading to acute shortage of food and adversely affects human and live stock population.

3. Worst situation of drought causes desertification.

4. Raw materials of agro based industries are critically affected during drought time, hence industrial and commercial growth decreases.

5. Drought increases the degradation of natural resources. 6. Drought causes large migration of people and urbanization.

DROUGHT MANAGEMENT

1. Indigenous knowledge is essential.

2. Rain water harvesting system.

3. Construction of reservoirs to improve ground water level.

4. Modern irrigation technology (drip irrigation) very useful to conserve water.

5. Afforestration activities also improve the potential of water in the drought area.

6. Crop mixing and dry forming are the suitable methods which minimize the risk of crop failures in dry area.

DAMS

Dams made significant contributions to human development and the benefits derived from them have been considerable. Large dams are designed to control floods and to help the drought prone areas, with supply of water. But large dams have proved cause severe environmental damage. Hence an attempt has been made to construct small dams. 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: They alter river flows, change nature's flood control mechanisms such as wetlands and flood plains, and destroy the lives of local people and the habitats of wild plant and animal species, particularly is the case with mega dams. Some of the problems are mentioned below.

- Dam construction and submersion leads to significant loss of farmland and forest and land submergence
- Siltation of reservoirs, water logging and salination in surrounding lands reduces agricultural productivity

- Serious impacts on ecosystems - 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 and spiritual existence of indigenous and tribal people
- Dislodging animal populations
- Disruption of fish movement and navigational activities
- Emission of green house gases due to rotting of vegetation
- Natural disasters – reservoirs induced seismicity, flash floods etc and biological hazards due to large-scale impounding of water – increase exposure to vectorbrone diseases, such as malaria, schistosomiasis, filariasis.

SUSTAINABLE WATER MANAGEMENT :-

- Building several small reservoirs instead of few mega projects
- Developing small catchment dams and protecting wetlands
- Soil management, micro-catchment development and afforestation permits recharging of underground aquifer, thus reducing the need for large dams
- Treating and recycling municipal waste water for agricultural use.
- Preventing leakages form dams and canals and loss in municipal pipes
- Effective rainwater harvesting in urban environments
- Water conservation measures in agriculture, such as using drip irrigation, control of growing water intensive cash crops ; control of water logging.
- Pricing water at its real value makes people use it more responsibility and efficiently and reduces wastage
- In deforested 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
- Use waste water for activities that does not need fresh water – Recycling
- Adopt mini water harvesting models for domestic usage.
- Protect existing tanks

- Develop systematic water management and adopt strict water auditing
- "Save water Campaigns" for public awareness on water scarcity
- Through rainwater harvesting, community based participatory initiatives and holistic watershed management.
- Responsible water usage can only be achieved by empowering local communities and creating local accountability.
- The government should develop policies that protect water resources, promote sustainable watershed management and invest in technologies that will increase efficiency in irrigation, industrial usage and improve water harvesting techniques.

MINERAL RESOURCES:-

Naturally occurring inorganic crystalline solids with uniform chemical composition are called as minerals.

USES AND EXPLOITATION OF MINERALS:-

1. Development of industrial plants and machinery. - Fe, Al & Cu 2. Construction work – Fe, Al &Ni 3. Generation of energy - coal, lignite, uranium 4. Designing defense equipments like weapons and ornaments 5. Agricultural purposes – fertilizers and fungicides – Zn & Mn 6. Jewellery –Au, Ag & Pt 7. Making alloys for various purposes 8. Communication purposes – telephone, wires, cables and electronic devices 9. Medicinal purposes, particularly in ayurvedic system

ENVIRONMENTAL DAMAGES CAUSED BY MINING ACTIVITIES:-

1. Devegetation:

- Topsoil and vegetation get removed
- Deforestation leads to several ecological losses
- Land scape gets badly affected

2. Ground water contamination: Mining pollutes ground water; sulphur is converted into sulphuric acid which enters into the soil.

3. Surface water pollution: Radioactive wastes and other acidic impurities affect the surface water, which kills many aquatic animals.

4. Air pollution: Smelting and roasting are done to purify the metal which emits air pollutants and damage the nearby vegetation. It causes many health problems.

5. Subsidence of land: Mainly underground mining results in cracks in houses, tilting of buildings and bending of rail tracks

EFFECTS OF OVER EXPLOITATION OF MINERALS:-

1. Rapid depletion of mineral deposits

2. Wastage

3. Environmental pollution

4. Needs heavy energy requirements.

MANAGEMENT OF MINERAL RESOURCES:-

1. The efficient use and protection of mineral resources.

2. Modernization of mining industries

3. Search for new deposit

4. Reuse and recycling of the metals.

5. Environmental impacts can be minimized by adopting eco friendly mining technology.

FOOD RESOURCES:-

Food is an essential requirement for survival of life. Main components are carbohydrates, fats, proteins, minerals and vitamins.

TYPES OF FOOD SUPPLY:-

1. Crop plants: Grains mostly constitute about 76% of the world's food. Ex: Rice, Wheat and Maize
2. Range lands: Produces 17% of world's food from trees and grazing animals. Ex: Fruits, milk and meat
3. Ocean: Fisheries – 7% of world's food

WORLD FOOD PROBLEM:-

1. In the earth's surface, 79% is water out of total area. 21% land (forest, desert, mountain and barren land) . Less % cultivated land, at the same time population explosion is high therefore world food problem arises.

2. Environmental degradation like soil erosion, water logging, water pollution, salinity affects agricultural land.

3. Urbanization affects agricultural land. Hence production of rice, wheat, corn and other vegetable is difficult.

TYPES OF NUTRITION:-

1. Nutritious nutrition: To maintain good health and disease resistance, we need large amount of carbohydrate, proteins, fats and smaller amount of micronutrients such as vitamins and minerals such as Fe, Ca and iodine. Food and agricultural organization (FAO) of United Nations estimated that on an average, the minimum calorie intake on a global state is 2500 calories/day.

2. Under nutrition: People who cannot buy enough food to meet their basic energy needs suffer from under nutrition. They receive less than 90% of this minimum dietary calorie. Effect of under nutrition: Suffer from mental retardation and infectious diseases

. 3. Mal nutrition: Besides minimum calorie intake we also need proteins, minerals, vitamins, iron and iodine. Deficiency leads to malnutrition resulting in several diseases. Effect of mal nutrition: S.No Deficiency of nutrients Effects 1 Protein Growth 2 Iron Anemia 3 Iodine Goiter 4 Vitamin – A Blindness India 3rd largest producer of crops, nearly 300 million Indians are still under nourished. World food summit 1996: The world food summit, 1996 has set the goal to reduce the number of under nourished and mal nourished people to just half by 2015.

OVER GRAZING It is a process of eating the forest vegetation without giving a chance to regenerate.

EFFECTS OF OVER GRAZING

1. Land degradation

- Over grazing removing the cover of vegetation
- Exposed soil gets compacted
- Soil moisture reduces.
- Desertification - OG leads to poor, dry and compacted soil.
- Land cannot be used for further cultivation.

2. Soil erosion: When the grasses are removed the soil becomes loose and gets eroded by the action of wind and rain fall.

3. Loss of useful species: OG affects the plant population and their regenerating capacity. OG replace the plant of high nutritive value with plant of low nutritive value.

AGRICULTURE

Agriculture is an art, science and industry of managing the growth of plants animals for human use. It includes cultivation of the soil, growing and harvesting crops, breeding and raising livestock, dairying and forestry.

TYPES OF AGRICULTURE

1. Traditional agriculture

2. Modern (or) industrialised agriculture

1. Traditional agriculture Small plot, simple tools, surface water, organic fertilizer and a mixture of crops constitute traditional agriculture. They produce enough food to feed their family and to sell it for their income.

2. Modern agriculture Hybrid seeds of single crop variety, high tech equipments, lot of fertilisers, pesticides and water to produce large amount of single crops.

EFFECTS OF MODERN AGRICULTURE

1. Problems in using fertilizers a. Excess of fertilizers causes micronutrient imbalance. (e.g) Punjab and Haryana deficiency of nutrient zinc in the soil affect the productivity of the soil. b. Blue baby syndrome (nitrate pollution): Nitrate present in the fertilizer causes blue baby syndrome, when the amount exceeds the limit leads to death. c. Eutrophication: Nitrogen and phosphorus in the crop fields washed out by runoff water in the water bodies, which increases the nourishment of the lakes called eutrophication. Hence algal species increases rapidly. Life time of the species is less and they decompose easily and pollute the water which affects the aquatic life.

2. Problems in using pesticides 1. Death of non target organism. 2. Producing new pest – super pest 3. Bio magnification – Most of the pesticides are non bio degradable, keep on concentrating in the food chain and it is harmful to human beings. 4. Risk of cancer: a. It directly acts as carcinogen b. It indirectly supports immune system.

3. Water logging: Land where water stand for most of the year.

Causes of water logging: 1. Excessive water supply 2. Heavy rain 3. Poor drainage Remedy: 1. Preventing excessive irrigation 2. Subsurface drainage technology 3. Bio drainage like trees like Eucalyptus

ENERGY RESOURCES:-

ENERGY DISTRIBUTION IN THE WORLD:-

- Developed countries like USA and Canada constitute only 5% of the world's population but consume 25% of the world's available energy.

- Energy consumed by a person in a developed country for a single day is equal to energy consumed by a single person in a poor country for one year.

- Developed country GNP increases and energy consumption increases. In the poor country GNP and energy consumption are less.

TYPES OF ENERGY RESOURCES:-

1. Renewable energy resource (or)Non conventional energy resources 2. Non renewable energy resources (or) Conventional energy resources

RENEWABLE ENERGY SOURCES:

Energy which can be regenerated. Merits of renewable energy resources

1. Unlimited supply

2. Provides energy security.

3. Fits into sustainable development concept.

4. Reliable and the devices are modular in size.

5. Decentralized energy production. Types of renewable energy resources 1. Solar energy: Nuclear fusion reaction of sun produces enormous amount of energy. Several techniques are available for collecting, storing and using solar energy.

a. Solar cell (or) Photovoltaic cell (or) PV cell:

- Solar cell consists of p- type semi conductor (Si doped with B) and n-type semi conductor (Si doped with P). P-type forms top layer and n-type forms bottom layer.

- Solar rays fall on the top layer, the electrons from valence band promoted to the conduction band which crosses the p-n junction into n-type semi conductor. Potential difference between the two layers is created which causes flow of electrons. Uses: It is used in calculators, electronic watches, street light, water pumps etc.

b. Solar battery: Large number of solar cells connected in series is called solar battery. It is used in remote areas where continuous power supply is a problem.

c. Solar water heater: It consists of insulated box painted with black paint with glass lid. Inside the box black painted copper coil is present. Cold water is allowed to flow, it is heated up and flows out into a storage tank from which water is supplied through pipes.

2. Wind energy: Moving air is called wind. The energy recovered from the force of the wind is called wind energy It's speed is high. a. Wind mills: When a blowing wind strikes the blade of the wind mill, it rotates continuously. And rotational motion of the blade drives number of machines like water pump, flour mills and electric generators. b. Wind farms: When a large number of mills are installed and joined together in a definite pattern – it forms wind farm. It produces large amount of electricity. Condition: Minimum speed for wind generator is 15 Km/hr Advantages: 1. It does not cause air pollution 2. Very cheap

3. Ocean energy: Tidal energy (or) Tidal power: Ocean tides are due to gravitational force of sun and moon which produce enormous amount of energy. High tides – rise of water in the ocean. Low tides – fall of water in the ocean. Tidal energy can be used by constructing a tidal barrage. During high tides sea water enters into the reservoirs and rotates the turbine, produce electricity. During low tides water from reservoir enters into the sea rotate the turbine produce electricity. Ocean thermal energy: Temperature difference between surface water and deeper level water in ocean generates electricity. The energy available due to the difference in temperature of water is called ocean thermal energy. Condition: Temperature difference should be 200C. Process: Ammonia is converted into vapours on the surface of warm water, it increases the vapour pressure which rotate the turbine and generates electricity. Deeper level cold water is pumped to cool and condense the vapour in to liquid.

4. Bio mass energy: Bio mass: Organic matter produced by plants or animals used as source of energy Bio gas: Mixture of methane, carbondioxide and hydrogen sulphide. Methane is the major constituent. It is obtained by anerobic fermentation of animal dung (or) plant wastes in the presence of water. Bio fuels: Fuels obtained

by the fermentation of biomass. Ex: Ethanol, methanol Ethanol: Produced from sugar cane. Calorific value is less. Methanol: Obtained from ethanol Calorific value too less. Gasohol: Mixture of ethanol and gasoline India trial is going on to use gasohol in cars and buses. Hydrogen fuel: Hydrogen produced by pyrolysis, photolysis and electrolysis of water. It has high calorific value. Non polluting one because the combustion product is water.

Disadvantages:

1. Hydrogen is highly inflammable and explosive.

2. Safe handling is required.

3. Difficult to store and transport.

SHORT QUESTIONS

1. Define the term deforestation.
   Ans. It is process of removal of forest resources due to natural or manmade activities (i.e.) destruction of forests.
2. Write a short note on mineral resources of India.

Ans. Naturally occurring inorganic crystalline solids with uniform chemical composition are called as minerals.

USES AND EXPLOITATION OF MINERALS:-

1. Development of industrial plants and machinery. - Fe, Al & Cu
2. Construction work – Fe, Al &Ni
3. Generation of energy - coal, lignite, uranium
4. Designing defense equipments like weapons and ornaments
5. Agricultural purposes – fertilizers and fungicides – Zn & Mn
6. Jewellery –Au, Ag & Pt
7. Making alloys for various purposes
8. Communication purposes – telephone, wires, cables and electronic devices
9. Medicinal purposes, particularly in ayurvedic system

LONG QUESTIONS

1. Explain food resources.
2. What are causes of deforestation?
3. What are the advantages and disadvantages of dams?
4. Explain the adverse environmental impacts on modern agriculture.
5. What are the ecological benefits of forest?

CH-3

SYSTEM

INTRODUCTION:-

ECOLOGY:-

- The term was first coined by Hons Reiter and Haekel in 1869.

- The term ecology (Okekologie) is originated from two Greek words Oikos (eco) – means "house" (or) place of living and "ology" means "the science of (or) the study of. Hence, ecology is the branch of science that deals with the study of the pattern of relations between the organism and their environment. (OR)

- Ecology is the study of interactions among organisms (or) group of organisms with their environment. (OR)

- Ecology is the study of ecosystems.

ECO SYSTEM:-

- In 1935, the British ecologist A.G.Tansley coined the term "eco system".

- The term "eco system" is made up of two Greek words. "Eco" means ecological sphere (or) house (or) place of living (or) surroundings (or) Environment, where living organism does exist while "system" means "group of organisms joined in regular and interdependent manner. Hence,

- A group of organisms interacting among themselves and with environment is known as ecosystem. (OR)\

- A system of interaction of organisms with their surroundings (i.e., environment) is called as "ecosystem". Examples: Pond, lake, ocean, forest and desert…. Etc are some of the examples of the ecosystems.

FUNDAMENTAL CHARACTERISTICS OF ECOLOGY

STRUCTURE:-

- Living /Biotic

- Non-Living /Abiotitic

PROCESS:-

- Energy flow

- Cycling of matter

CHANGE:-

- Dynamic (Not static)

- Succession etc.

FUNCTION:-

- Food chain
- Food web
- Ecological pyramids
- Energy Flow • Cycling of matter

CHARACTERISTICS OF ECOSYSTEM:-

- Eco system is the basic functional unit of ecology.
- It contains both biotic and abiotic components.
- The function of ecosystem is related to the cycling of matter (materials) and flow of energy.
- The amount of energy needed to maintain an ecosystem depends on its structure.
- Ecosystem passes from a less complex state to more complex state, which is called as "ecological succession".

CLASSIFICATION OF ECOSYSTEM:-

- The ecosystem can be generally classified into two types: 1. Natural Ecosystem 2. Artificial Eco system

1. NATURAL ECOSYSTEM:-

- A natural ecosystem is developed and governed by nature.
- These are capable of operating and maintaining themselves without any major interference by man.
- The following are the two types of natural ecosystem based on their habitat.

1. Terrestrial Ecosystem.

2. Aquatic Ecosystem.

1) Terrestrial Ecosystem:

- This ecosystem is related to land. Examples: Grassland ecosystem. Forest ecosystem, and Desert ecosystem etc.

2) Aquatic Ecosystem:

- This ecosystem is related to water, it is further sub divided into two types based on salt content. i. Fresh Water Ecosystem: a. Running Water Ecosystems Examples: Rivers, streams (small narrow rivers) b. Standing Water Ecosystems Examples: Pond, lake & well, etc ii. Marine Ecosystem: Examples: seas and sea shores

2. MAN MADE (OR) ARTIFICIAL ECOSYSTEM:-

An artificial ecosystem is created and maintained by man for his different needs. Examples: Reservoirs, Artificial lakes and gardens, etc.

STRUCTURE (OR) COMPONENTS OF AN ECOSYSTEM:-

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

- Each and every ecosystem has two major components are: 1. Biotic (living) components. 2. Abiotic (Non-living) components.

Components Of Ecosystem:-

1. Biotic Components:-

The living component of an ecosystem is called "Biotic component". Examples: Plants (Producers) Biotic Components Eco System Abiotic Components Animals (Consumers) and Micro Organisms (Decomposers)

- The biotic components of an ecosystem are classified into three types based on how they get their food. A. Producers (Autotrophs) : Plants B. Consumers (Heterotrophs) : Animals C. Decomposers (Saprotrophs) : Micro organisms. A. Producers (or) Autotrophs (Auto=self, troph=feeder)

- Self food producing organisms are known as autotrophs. Examples: All green plants and trees.

- Producers synthesize their food themselves through photosynthesis. Hence they are also called "Photo autotrophs". (photo = light) B.Consumers (or) Heterotrophs (Hetero = other, troph = feeder:

- Consumers are organisms, which cannot prepare their own food and depend directly (or) indirectly on the producers. Examples: Plant Eating Species: Insects, rabbit, goat, deer, cow, etc. Animals Eating Species: Fish, lions, tigers, etc.

- Depending upon the food habits the consumers are divided into four types. i. Herbivores (or) Primary Consumers (Plant Eaters) ii. Carnivores (or) Secondary Consumers (Meat Eaters) iii. Omnivores (or) Tertiary Consumers (With plant & meat eaters) iv. Detritivores (dead organism eaters) i. Herbivores: (Herbi = the green plant & Vorare = to devour)

- Animals that eat only plants are called Herbivores.

- They directly depend on the plants for their food. So they are called Plant eaters. Examples: Insects, goat, deer, cow, horse, etc. ii. Carnivores: (Carne = flesh meat & Vorare = to devour)

- Animals that eat other animals are called carnivores.

- They directly depend on the herbivores for their food. Examples: Frog, cat, snake & foxes, etc. iii. Omnivores: (Omni = whole comes from "ohm" & Vorare = to devour)

- Animals that eat both plants and animals are called omnivores.

• They depend on both herbivores and carnivores for their food. Examples: humans, tigers, lions, rats and fox etc. iv. Detritivores: (Detritifeeder)

• Animals that eat dead organisms and waste of living are called detritivores. Examples: beetles, termites, ants, crabs, earthworms, etc. C.Decomposers (or) Saptrotrophs: (Sapros = Rotten, trophos = feeder)

• Decomposers attack the dead bodies of producers and consumers and decompose them into simple compounds. During the decomposition inorganic nutrients are released.

• The organisms which break down the complex compounds into simple products are called decomposers (or) reducers. Examples: micro-organisms such as bacteria and fungi, etc.

3. Abiotic Components:-

• The non-living component of an ecosystem is called "abiotic component"

• These non-living components enter the body of living organism, take part in metabolic activities and then return to the environment. The abiotic component of the ecosystems divided into three portions. 1. Climate factors : Solar radiation, temperature, wind, water current, rainfall, etc. 2. Physical factors : light, fire, soil, air, etc. 3. Chemical factors : Organic and Inorganic substances. Chemical Factors Organic Substances Inorganic Substances

FUNCTION OF AN ECOSYSTEM:-

• The function of an ecosystem is related to the cycling of materials (matter) and flow of energy.

Types of functions:

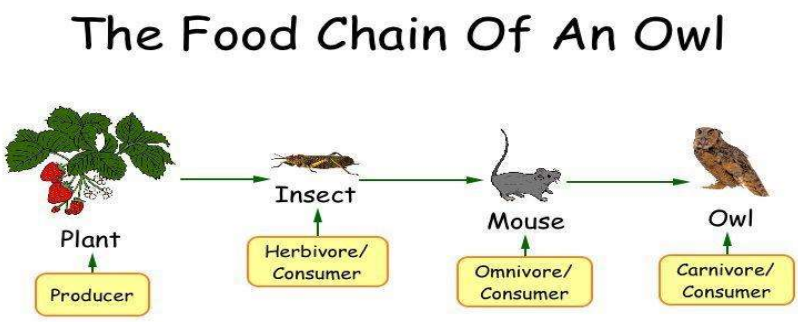
• Functions of an ecosystem are of three types:

1. Primary Function: The producers (plants) can make their food themselves through photosynthesis. This process is called primary function of eco system. Examples: All green plants and trees.

2. Secondary Function: The consumers (animals and humans) cannot make their own food. They are always depending upon the producers for their energy. This is called secondary function of eco system.

3. Tertiary Function: Decomposers attack the dead bodies of consumers and producers and decompose them into simpler compounds. During the decomposition inorganic nutrients are released. Examples: Micro organisms like bacteria and fungi, etc. The functioning of an ecosystem may be understood by studying the following terms: A. Food chains B. Food webs C. Food pyramids (or) Energy pyramids D. Energy and material flow.

A. Food Chain: • Anything which we eat to live is called food. Food contains energy. Food can be transferred from one organism to the other. The process of transfer of food (energy) from one organism to a series of organisms is called as "food chain".



A food chain shows the path of energy from one living thing to another. Decomposers like bacteria, are necessary for all food chains.

- A food chain always starts with a plant life and end with animal life. Thus, a food chain is a picture (or) model that shows the flow of energy from autotrophs (producers) to series of organisms in an environment, as shown in the following figure.

- Infact, all the food chains starts with the sun. The sun provides energy for plants.

- The producers (plants) can make their food themselves with the help of the sunlight, chlorophyll, water and air. The consumers, including animals and humans, cannot make their own food. They are always depending upon the producers for their energy.

- Decomposers are the micro-organisms that break down the dead animals and plants and release nutrients that become part of the soil, which are re-used by new plants, back to the starting point of the food chain. Types of food chain: Three basic types of food chains are found in a typical eco system. They are: 1. Grazing food chains. 2. Detritus food chains. 3. Parasitic food chains. 1. Grazing food chains:

- Grazing food chain starts with green plants (producers) and goes to decomposer food chain (or) detritus food chain through herbivores and carnivores.

- It has two types : a. Terrestrial food chain and b. Aquatic food chain

a. Terrestrial food chain: Food chain on land is called terrestrial food chain. Example: Grassland food chain Forest land food chain Desert land food chain Grass land food chain Grasses Grasshoppers Frog Snake Eagles Forest food chain SUN Producers Herbivores Carnivores Omnivores Decomposer Green plants Deer Tiger (or) lion

b. Aquatic food chain : This food chain is slightly different from terrestrial food chain. It is seen in aquatic (water) eco system. Food chain in water is called “Aquatic food chain”. Example: Marine food chain Example: Ocean Fresh water food chain Example: Pond, lake, streams, etc. Food chain in a pond Phytoplankton Zoo Plankton Small fish Large fish Man Marine Food chain: Sea Weeds Small fish Large fish Sharks and other animals Figure: Food chain Grazing food chain Detritus food chain Parasite food chain Terrestrial food chain Aquatic food chain Marine food chain Fresh water food chain Standing water food chain Running water food chain 2. Detritus’ food chain: Detritus food chain starts with dead organic matter (plants and animals) and

goes to decomposer through consumers. Detritus food chains, independent of solar energy, but they depend on influx of dead organic matter. Example: Dead Plants Soil mitts Algae Crabs Small fish Large fish 3. Parasitic food chain: Parasitic food chain operates in many ecosystems. In this food chain either consumer (or) producer is parasitized and the food passes to smaller organisms. A parasitic food chain involves host parasite hyper parasites' links. Example: Trees Fruit eating birds Lice & Bugs Bacteria Fungi B. Food Web:

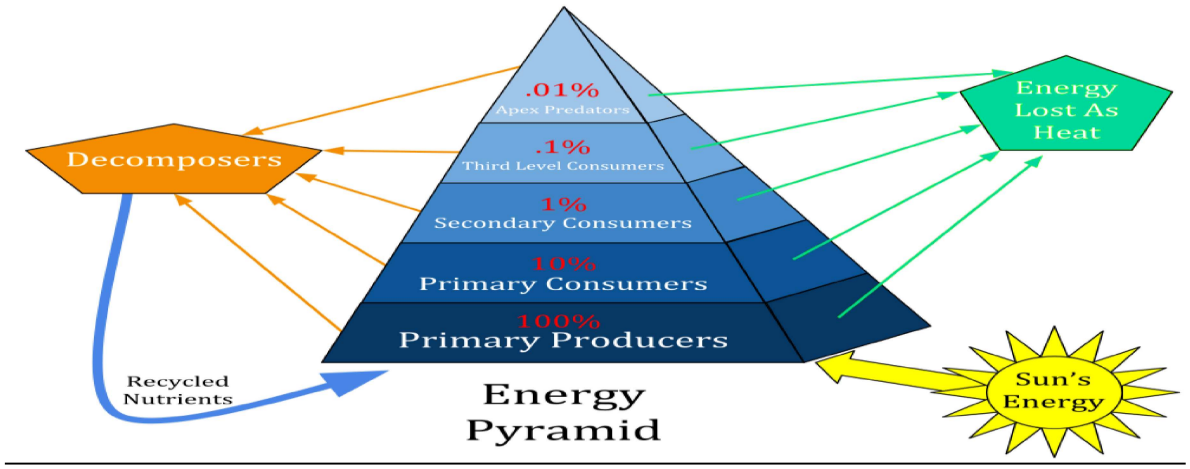
- Web means "network" such as spider's web, World Wide Web (WWW) etc.
- So, food web is a network of food chains.
- In a food web many food chains are inter connected, where different types of organisms are connected at different tropic levels, so that there are a number of options of eating and being eaten at each tropic level. Thus, there is a inter connecting of various food chains are called food webs and as shown in following figure. Bird(Eagle) Snake Frog Grasshopper Grass Fish Insect

The grazing food chains are as follows:

- Grains→ Mouse→ Cat
- Grains→ Mouse→ Hawk
- Grains→ Mouse→ Snake→ Hawk
- Grains→ Insec→t Sparrow→ Hawk
- Grass→ Insect→ Lizard→ Snake→ Hawk
- Grass→ Insect→ Sparrow→ Snake→ Hawk

The above food web is a simple one. Much more complex food webs do exist in nature.

Ecological Pyramids:-



- The concept of ecological pyramids was first developed by British ecologist Charles Elton in 1927.

• Ecological pyramids are the diagrammatic representation of tropic structures in which the tropic levels (i.e., tiers) are depicted in successive stages.

• An ecological pyramid is shown in the following figure. Hawk Sparrow Snake Lizard Insect Grain Grass Mouse Cat

• In ecological pyramids, tropic levels are shown in the following manner: i. The producers represent first tropic level in the ecological pyramid. ii. The herbivores (or) primary consumers represent second tropic level in the ecological pyramid. iii. The carnivores (or) secondary consumers represent third tropic level in the ecological pyramid. iv. The omnivores (or) tertiary consumers represent fourth tropic level in the ecological pyramid

. • On the basis of the number of organisms, the biomass of organisms and energy flow in organist population. Three types of ecological pyramids are:

1. Pyramid of numbers.

2. Pyramid of biomass

3. Pyramid of energy. Tertiary Consumers (Omnivores) Secondary Consumers (Carnivores) Primary Consumers (Herbivores) Producers Decrease in number (or) Biomass (or) Energy Apex Base

1. Pyramid of numbers:

• It shows the number of individual organisms present in each tropic level.

• It is expressed in numbers per unit area.

• Depending upon the type of ecosystem, we have three types of pyramid of numbers. a. Upright pyramid of numbers. b. Partly upright pyramid of numbers. c. Inverted pyramid of numbers.

MAJOR TYPES OF ECOSYSTEMS:-

FOREST ECOSYSTEM

Definition: It is a natural ecosystem consisting of dense growth of trees and wild animals

Types: 1. Tropical – deciduous, evergreen, wet green

2. Littoral and swamps

3. Sub tropical Characteristics: Abiotic: soil, sun light, temperature etc Biotic : forest trees, shrubs and animals Structure: Producer : Trees and shrubs Consumer : Primary – elephants, deer etc. Secondary – snakes, birds, lizards etc Tertiary – lions, tigers etc Decomposers : fungi, bacteria

AQUATIC ECOSYSTEM

Definition: Deals with water bodies and biotic communities present in them-Classified as fresh water and marine ecosystems. Fresh water systems are classified as lentic and lotic ecosystems.

Types:

A. Pond ecosystem: Small fresh water ecosystem – seasonal in nature – organisms: algae, aquatic plants, insects, fishes etc. Ponds are very often exposed to anthropogenic pressure like cloth washing, bathing, cattle bathing, swimming etc.
B. Lake ecosystem: Big fresh water ecosystem – Zonation or stratification, especially during summer is a common one.

SHORT QUESTIONS

1. What is ecology and what is ecosystem?

Ans. ECOLOGY:-

• The term was first coined by Hons Reiter and Haekel in 1869.

• The term ecology (Okekologie) is originated from two Greek words Oikos (eco) – means "house" (or) place of living and "ology" means "the science of (or) the study of. Hence, ecology is the branch of science that deals with the study of the pattern of relations between the organism and their environment. (OR)

• Ecology is the study of interactions among organisms (or) group of organisms with their environment. (OR)

• Ecology is the study of ecosystems.

ECO SYSTEM:-

• In 1935, the British ecologist A.G.Tansley coined the term "eco system".

• The term "eco system" is made up of two Greek words. "Eco" means ecological sphere (or) house (or) place of living (or) surroundings (or) Environment, where living organism does exist while "system" means "group of organisms joined in regular and interdependent manner. Hence,

• A group of organisms interacting among themselves and with environment is known as ecosystem. (OR)\

• A system of interaction of organisms with their surroundings (i.e., environment) is called as "ecosystem". Examples: Pond, lake, ocean, forest and desert…. Etc are some of the examples of the ecosystems.

2. What is food chain?

Ans. Anything which we eat to live is called food. Food contains energy. Food can be transferred from one organism to the other. The process of transfer of food (energy) from one organism to a series of organisms is called as "food chain".

LONG QUESTIONS

1.Explain the role of producer, consumer and decomposer in an ecosystem.

2.Explain the functions of forest ecosystem.

3. Describe aquatic ecosystem.

CH-4

BIODIVERSITY AND IT'S CONSERVATION

INTRODUCTION

• Biodiversity is the abbreviated word for —biological diversity (bio-life or living organisms, diversity-variety). Thus biodiversity is the total variety of life on our planet, the total number of races, varieties and species. The sum of total of various types of microbes, plants and animals (producers, consumers and decomposers) in a system.

• Biomes can be considered life zones, environment with similar climatic, topographic and soil conditions and roughly comparable biological communities (Eg. Grassland, forest). The biomes shelter an astounding variety of living organisms (from driest desert to dripping rain forest, from highest mountain to deepest ocean trenches, life occurs in a marvelous spectrum of size, shape, colour and inter relationship). The variety of living organisms, the biodiversity, makes the world beautiful.

• There are 1.4 million species known presently. But based on new discoveries, by research expeditions, mainly in tropics, taxonomists estimate there are between 3-50 million different species may be alive today. Insects make up more than one half of all known species and may comprise more than 90% of all species on earth.

LEVELS OF BIODIVERSITY

• The concept of biodiversity may be analyzed in 3 different levels. They are

1. Ecosystem diversity

2. Species diversity

3. Genetic diversity

1. Community or Ecosystem diversity:-

• A set of biotic components (plants, animals and microorganisms) and abiotic components (soil, air, water, etc) interacting with each other is known as an ecosystem.

• Ecosystem or ecological diversity means the richness and complexity of a biological community, including tropic levels, ecological processes (which capture energy), food webs and material recycling.

• The diversity at an ecological level or habitat level is known as ecosystem diversity. Ex: River ecosystem- Rivers include fish, aquatic insects, mussels and a variety of plants that have adapted.

• Ecosystem diversity is the aggregate of different environmental types in a region.

• It explains the interaction between living organisms and physical environment in an ecosystem.

2. Species diversity: –

- A discrete groups of organisms of the same kind is known as species.
- Species diversity is the diversity between different species.
- The sum of varieties of all living organisms at the species level is known as species diversity.
- Species diversity describes the number of kinds of organisms within individual communities or ecosystems.
- The biotic component is composed of a large number of species of plants, animals and microorganisms which interact with each other and with the abiotic component of the environment. Ex: The total number of species living on earth is approximately more than 2 million. However, only around 1.5 million are found and assigned scientific names. Plant species: Apple, Mango, Wheat, Grapes, Rice etc Animal species: Lion, Tiger, Elephant,Deer etc

3. Genetic diversity: –

- A species with different genetic characteristics is known as a sub-species or "genera".
- Genetic diversity is a measure of the variety of versions of same gene within individual species.
- Within individual species, there are varieties, that are slightly different from one other. These differences are due to differences in the combination of genes.
- Genes are the basic units of hereditary information transmitted from one generation to the other. Ex: (i) Rice varieties - All rice varieties belong to the species "oryzasativa". However there are thousands of rice varieties that show variation at the genetic level in the form of different size, shape, colour and nutrient content. (ii) Teak wood varieties: The various teak wood varieties available are - Indian teak, Burma teak, Malaysian teak etc.

BIO-GEOGRAPHICAL CLASSIFICATION OF INDIA

- India has different climate and topography in different parts and hence is termed as a mega diversity country.
- India occupies 10th place among plant rich countries of the world.
- It is essential to acquire knowledge about the distribution and environmental interaction of flora and fauna of India.
- Bio-geographers have classified India into ten bio-geographic zones with each zone having characteristic climate, soil and biodiversity.
- These zones are described below:

1. Trans-Himalayas: The trans-himalayas is an extension to the Tibetean plateau. This region harbors the high-altitude cold desert in ladakh (Jammu and Kashmir) and Lahaul Spiti (Himachal Pradesh). It accounts for 5.7% of the country's landmass.

2. Himalayas: The Himalayas are the northern boundaries of India. The entire mountain chain is running from Kashmir in the North-west to Assam in the north-east. The Himalayas comprise of a diverse range of biotic provinces and biomes. The himalayas cover 7.2% of the country's landmass

3. Desert: The extremely dry area west of the Aravalli hill range, is comprising both the salty desert of Gujarat and the sandy desert of Rajasthan. Deserts occupy around 6.9% of the country's land mass. The kinds of deserts found in India are: a. The desert of western Rajasthan b. The desert ofGujarat c. The high-altitude cold desert of Jammu & Kashmir and Himachal Pradesh. The Indian deserts have more diversified fauna.

4. Semi-arid: This zone lies between the desert and the Deccan plateau. It includes the Aravalli hill range. It overs approximately 15.6% of the country's landmass.

5. Western Ghats: The western ghats are a mountain range that runs along the western cost of India. They are a range extending north-south from southern tip of Gujarat in the north to Kanyakumari in the south.The mountains cover an area of about 160,000 sq. km. This ghat section covers an extremely diverse range of biotic provinces and biomes. It covers about 5.8% of the country's landmass.

6. Deccan plateau: It is a large triangular plateau south of the Narmada valley. Three sides of the plateau are covered by mountains slopes towards east. Satpura mountains cover the north while western ghats cover the west side and eastern ghats cover the eastern side of the plateau. It is the one of largest zones covering the southern and south-central plateau with mostly deciduous trees. It covers 4.3% of the country's land mass.

7. Gangetic plain: This plain covers the area between the south himalayas to the tropic of cancer. These plains were formed by the Ganges river system and are relatively homogeneous. This region experience 600 mm rainfall annually. Sunderbans forests are located in this region and it covers 11% of the country's land mass.

8. North-east India: These are pains and non-himalayan ranges of northeastern India and have a wide variety of vegetation. It covers around 5.2% of the country's land mass.

9. Islands: The Andaman and Nicobar Islands in the Bay of Bengal has almost 300 big and small islands. Among these, only five islands are inhabited. Only tribes are found in the island of Nicobar. These islands have a highly diverse set of biomes and occupy 0.03% of the country's biomass.

10.Coasts: India has a large coastline distributed both to the east and west with distinct differences between the two. The Lakshwadeep islands are included in this but the area of these islands is negligible.

VALUE OF BIODIVERSITY

Definition and estimation of the value of biodiversity is not easy. The value of biodiversity is classified into:

1. Direct Value and

2. Indirect Value

1. Direct value of biodiversity: It is of two types a. Consumptive use value and b. Productive use value a. Consumptive use value:

• The consumptive use value is the value placed on nature's products that are consumed directly, without passing through a market. Some of them are firewood, food, and game meat.

• When direct consumption requires recreation, as in sport fishing and game viewing, the consumptive value is the whole recreational experience. Consumptive value seldom appears in national income accounts, but could be easily included in measures such as GDP. It is valued from the cost if resource was sold at market value, rather than being consumed.

• High consumptive use values on resources may lead to the following problems:

• Over-exploitation of wildlife in developing countries

• Loss of traditional controls on hunting and

• Loss of wildlife populations at productive levels.

• Consumptive use value benefits the communities closest to the resource if harvested sustainably and managed efficiently. b. Productive use value:

• Productive use value refers to products that are commercially harvested (sold in a market).

• Its value is estimated at the production end rather than retail end by adding an inflated cost to the finished product.

• Productive use value is often the only value of biological resource reflected in national income accounts and may have a major impact on the national economy.

• Timber, fish, honey, construction materials, mushrooms, fruits, medicinal plants and game meat sold in a market have productive use value. 2. Indirect value of biodiversity

• Indirect values provide economic benefits without being harvested and do not appear in GDP. However, they are crucial to other natural products which influence the GDP.

• These values involve functions performed by biodiversity which are not of any use. Ex: Ecological Processes etc.

• Direct values are often derived from indirect values because plants and animals are supported by the services provided by their environments.

• Many classes of plant and animal species are consumed by tribal and non-tribal communities. Ex: 1. Ecological functions 2. Flood and storm protection 3. Waste assimilation 4. Microclimatic functions 5. Nutrient cycles Environmental Science 60 AITT & H&S 6. Photosynthesis 7. Carbon stores 8. Soil protection, etc. Indirect value of biodiversity is of the following types: 1. Non-consumptive use value 2. Optional value 3. Existence or ethical value and 4. Information value 1. Non-consumptive use value:

• This indirect value deals with nature's functions and services.

• It includes photosynthesis of plants which provides support system for other species by maintaining water cycle, regulating climate, production and protection of the soil, absorption and breakdown of pollutants, recreational, aesthetic, socio-cultural, scientific, educational, spiritual and historic values of natural environments.

• Recreational value is important with regard to tourism and helps the national GDP.

2. Optional value: This refers to the potential of biodiversity that is currently known and needs to be explored.

• This refers to the idea that there may be several existing species that may prove to be important in future and their usefulness needs to be studied with reference to a specific problem currently plaguing the society.
Ex: 1. The growing biotechnology field is searching for a the cure for diseases like cancer and AIDS.

2. Medicinal plants and herbs play a very important role in the economic growth of our country.

3. Existence value: This is the value gained from continuous knowledge of existence. Also, this is the value that people are willing to pay to keep a species / community /ecosystem from going extinct. Examples of this are high amounts being spent for animals like pandas, whales, lions etc.

• Our rich heritage teaches us to worship plants, animals, rivers and mountains. Examples being the Ganga river, trees like Banyan and Peepal and plants like the Vambu, Tulsi and Vengai are worshipped.

4. Information value: This relates to the educational, scientific and aesthetic and tourism values of biodiversity in an ecosystem

5. Aesthetic Values: Beautiful plants and animals inspire us to protect biodiversity. The most important aesthetic value of biodiversity is eco-tourism.

Ex: 1. People from distant places spend time and money to visit areas where they can enjoy aesthetic value of biodiversity. This is called eco-tourism.

2. The pleasant music of wild birds, beautifully coloured butterflies, colour of peacocks and colour of flowers are very important for their aesthetic value

THREATS TO BIODIVERSITY

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

• Waste generated due to increase in human population and industrialization spoils the environment and leads to decreased diversity in biological species.

• Any change in the system leads to a major imbalance and threatens the normal ecological cycle.

• Causes for loss of biodiversity are:

1. Habitat loss

2. Poaching of wildlife and

3. Man-wildlife conflicts

1. Habitat loss:-

The loss of populations of interbreeding organisms is caused by habitat loss. Factors influencing habitat loss are:

a. Deforestation: Loss of habitat is mainly caused by deforestation activities. Forests and grasslands are cleared for conversion into agriculture lands or settlement areas or developmental projects. Forests and grasslands are natural home to thousands of species which disintegrate due to loss of their natural habitat.

b. Destruction of wetlands: Wetlands, estuaries and mangroves are destroyed due to farming, filling and pollution that cause loss of biodiversity

c. Habitat fragmentation: When the habitat is divided into small and scattered patches the phenomenon is called habitat fragmentation. This leads to the disappearance of most wildlife

d. Raw material: To produce hybrid seeds, wild plants are used as raw materials leading to extinction of many wild plant species.

e. Production of drugs: Pharmaceutical companies collect wild plants for the production of drugs leading to extinction of several medicinal plant species.

f. Illegal trade: Illegal trade of wildlife reduces biodiversity leading to habitat loss g. Developmental activities: Construction of dams in forest areas coupled with the discharge of industrial effluents kills birds and other aquatic life.

2. Poaching of wildlife:-

Poaching refers to killing animals or commercial hunting. It contributes to loss of biodiversity. Poaching can be of two types listed below:

1. Subsistence poaching: This refers to killing animals for survival.

2. Commercial poaching: This refers to hunting animals in order to sell their products. Factors influencing poaching:

1. Human population: Increased human population in India has led to pressure on forest resources, leading to degradation of wildlife habitats

2. Commercial activities:

Although a ban has been imposed internationally on the trade of products of endangered species, there is a continued smuggling of wildlife products. Since trading of such products is highly profitable, poachers continue to hunt endangered animals and smuggle their fur, skin and tusks to other countries. Wildlife products include furs, horns, tusks, live specimens and herbal products. Richest source of biodiversity lies in developing nations in Asia, Africa and Latin America. Advanced countries like Europe, North America, Japan, Taiwan, Hong Kong are the major importers of wildlife products.

3. Man-Wildlife Conflicts:

Man-wildlife conflicts arise, when wildlife starts causing immense damage and danger to man. Under such conditions it is very difficult for the forest department officials to convince the affected villagers to gain the villagers support for wildlife conservation. Ex: 1. In Sambalpur, Orissa, several people were killed by elephants. In retaliation, the villagers killed and injured several elephants. 2. In Mysore, elephants were killed by farmers in retaliation to the damage done by elephants to their cotton and sugarcane fields. 3. Villagers sometimes hide explosives in their fields to ward-off animals which explode when the elephants enter the fields 4. Several people were killed when leopards attacked them in Sanjay Gandhi National Park, Mumbai

Factors influencing man-animal conflicts:-

1. Shrinking forest cover compels wildlife to move outside the forest

2. Human encroachment into forest area induces a man-wildlife conflict

3. Injured animals have a tendency to attack man

4. Wild animals venture out of the forest area in search of food

5. Villagers set-up electric wiring around their fields. This injures animals (Elephants) who suffer pain and get violent.

6. Cash compensation paid by the government is not enough.

7. Garbage near human settlements or food crops attracts wild animals

SHORT QUESTIONS

1. What is biodiversity?

Ans. • Biodiversity is the abbreviated word for —biological diversity (bio-life or living organisms, diversity-variety). Thus biodiversity is the total variety of life on our planet, the total number of races, varieties and species. The sum of total of various types of microbes, plants and animals (producers, consumers and decomposers) in a system.

• Biomes can be considered life zones, environment with similar climatic, topographic and soil conditions and roughly comparable biological communities (Eg. Grassland, forest). The biomes shelter an astounding variety of living organisms (from driest desert to dripping rain forest, from highest mountain to deepest ocean trenches, life occurs in a marvelous spectrum of size, shape, colour and inter relationship). The variety of living organisms, the biodiversity, makes the world beautiful.

• There are 1.4 million species known presently. But based on new discoveries, by research expeditions, mainly in tropics, taxonomists estimate there are between 3-50 million different species may be alive today. Insects make up more than one half of all known species and may comprise more than 90% of all species on earth.

2. What is poaching of wildlife?

Ans. Poaching refers to killing animals or commercial hunting. It contributes to loss of biodiversity. Poaching can be of two types listed below:

1. Subsistence poaching: This refers to killing animals for survival.

2. Commercial poaching: This refers to hunting animals in order to sell their products. Factors influencing poaching:

1. Human population: Increased human population in India has led to pressure on forest resources, leading to degradation of wildlife habitats

2. Commercial activities:

Although a ban has been imposed internationally on the trade of products of endangered species, there is a continued smuggling of wildlife products. Since trading of such products is highly profitable, poachers continue to hunt endangered animals and smuggle their fur, skin and tusks to other countries. Wildlife products include furs, horns, tusks, live specimens and herbal products. Richest source of biodiversity lies in developing nations in Asia, Africa and Latin America. Advanced countries like Europe, North America, Japan, Taiwan, Hong Kong are the major importers of wildlife products.

3. What are the factors influencing man wildlife conflicts?

Ans. Factors influencing man-animal conflicts:-

1. Shrinking forest cover compels wildlife to move outside the forest

2. Human encroachment into forest area induces a man-wildlife conflict

3. Injured animals have a tendency to attack man

4. Wild animals venture out of the forest area in search of food

5. Villagers set-up electric wiring around their fields. This injures animals (Elephants) who suffer pain and get violent.

6. Cash compensation paid by the government is not enough.

7. Garbage near human settlements or food crops attracts wild animals

LONG QUESTIONS

1.What are the levels of biodiversity?

2.Define value of biodiversity?

3.Explain threats of biodiversity?