

Ecological Succession.

Ecological succession is a gradual and orderly process of replacement of community in an Ecosystem

Ecological

- 1) Population = organisms which belongs to same group of species.
- 2) Community = In this different group of species or organisms are included.
- 3) species = It is that group of individual which have interbreed tendency.

* Ecological succession are of 2 types:

- a) Primary succession = The development or existence of any species or community in any bare area. It is called Primary succession.

For eg: Volcanic erupted land; landslides; flooded.

Pioneer = The organism that first enters to bare area is called Pioneer community or species.

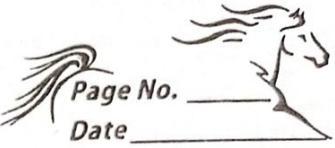
For eg: lichens or mosses.

- b) Secondary successions = The place where already any life forms existed and is replaced by any other community or species.

→ The development of any community or species in an area where already a life form existed before.

Eg = conversion of forest area to farm land any flooded land or Earthquake.

on the b



On the basis of replacement Ecological succession is divided into :-

- a) Autogenic = Self replacement of any species or community in an ecosystem is called Autogenic Succession • when any community fail to adapt in any unfavourable or undergiven environmental condition.
- b) Allogenic = The replacement of community or species in an ecosystem by external factors like High temp., predators, competitor and unfavourable factors.

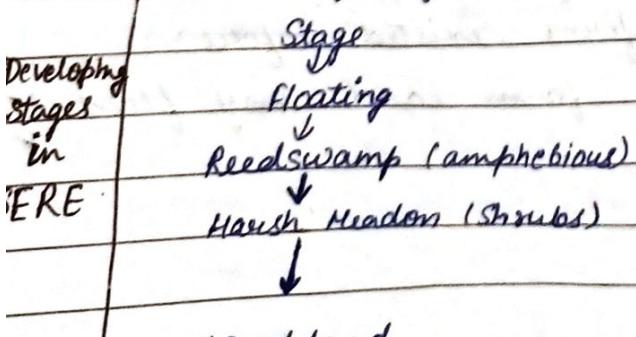
Ques What are the two important physical or climatic factors that determine the nature of community?

Ans: 1) Temperature
2) amount of rainfall or precipitation.

On the basis of Habitat there are 5 types of Ecological succession.

- 1) Hydrosere (water)
- 2) Lithosere (rock)
- 3) Xerdsere (desert)
- 4) Psammsere (sand)
- 5) Halosere (saline)

Submerge (Hydrosphere)



* Climax stage or stable further development or changes will not take place

Lithosphere:

ROCK
↓

LICHENS
↓

BRYOPHYTES. (amphibious plants like mosses)
↓

HERBS
↓

SHRUBS
↓

WOODLAND (climax stage) Fresh condition (where moisture exist)

Mechanism of SUCCESSION

Step 1: NUDATION

Step 2: INVASION

Step 3: MIGRATION

Step 4: COMPETITION

Step 5: REACTION

Step 6: CLIMAX

Step 1: It is a lifeless stage where no life form existed earlier.

Step 2: It can be defined as the entry of any foreign species to native land.

Step 3: The species that migrate from one place to another.
Eg: Seed dispersal.

t

ESTABLISHMENT OR ECCSIS

The place where the number of organisms or individual increase in number of population.

Step 4: Interspecific: In this type the competition is between two different species.

Intra specific: The competition is ~~between~~ within same species

Step 5: It states the survival of fittest or dominant species.

Step 6: It states the stabilization i.e. finner stable community is called climax.

* Significance of Ecological Succession:

- (a) It gives opportunity to organism to survive in favourable condition.
- (b) Ecological Succession is a very important form of growth and development of an ecosystem as whole.
- (c) It is the process by which communities of an ecosystem changes in a definite and directional way over time.
- (d) Through this process a relatively unlivable land is slowly converted into thriving and vibrant ecosystem.
- (e) It allows new area to be colonised and damage ecosystem to be recolonised. So organisms can adopt the changes in the environment and continue to survive.

- f) It helps to maintain Material cycle and Ecological balance.

NATURAL RESOURCES.

Life on Planet Earth depends on resources.

Resources: Large number of services provided by nature for the sustenance of life.

Types of Resources.

1) Renewable or inexhaustable: The resources which can be regenerated or reused. These resources can be regenerate in a given time.

For eg: Water, wind energy, forest or wildlife, tidal energy, hydropower or biomass energy.

2) Non-renewable or exhaustable: These are the resources which can not be regenerated once they are exhausted.

For eg: coal, petrol, oil, minerals.

(Forest Resources)

They are one of the most important natural resources. $\frac{1}{3}$ rd of the world's land area is covered with forest land.

Uses of forests.

a) Commercial uses.

Commercial uses of forests includes the following products: Timber and Firewood, Pulp wood, food items, gum and resin, non-edible oils, rubber and fiber, lac (used for sealing), bamboo cane, fodder, medicines, dung.

* $\frac{1}{3}$ rd wood is harvested from forests used for construction of building material such as plywood and hardwood.

* 1/6th of wood is harvested for paper and pulp industry.

b) Ecological Services:

- Forests are the major producer of oxygen. These are also called lungs of Earth.
- It helps in reducing global warming by absorbing CO₂.
- The main greenhouse gas (CO₂) is absorbed by forest as raw material for photosynthesis.
- Thus, forest canopy act as sink of CO₂.

c) Wildlife Habitat:

- Forests are also providing shelter to wildlife.
- Forest are home of million of wildlife species.
- About 7 million of species are found in tropical forest alone.

d) Regulation of water cycle or Hydrological cycle:

- Forest watershed act like giant sponge absorbing the rainfall and slowing down the run off.

e) Soil conservation:

- It prevents soil erosion.

f) Pollution Moderator:

- Forests can absorb many toxic gases and have also been reported to absorb noise.

Two major threats to forest resources:

- Over exploitation of forest resources.
- Deforestation.

Major causes:

- Shifting cultivation or (slash and burn farming): It reduces soil fertility.

Eg: North East region, Madhya Pradesh, Bihar, Andhra Pradesh.

- Fuel requirement due to high population:

Increasing demand of fuel wood by growing population of India.

- Raw material for Industrial uses:

wood for making furniture, railway sleepers, fly wood, matchboxes, pulp for paper.

- Developmental project

Construction of hydroelectric dam, roads and mining.

- overgrazing.

Due to this the top most layer of soil is removed.

Case studies: (a) Silent Valley movement

(b) Chipko movement

(c) Teesta Dam conflict

(d) Narmada Dam Conflict

Water Resources:

It can be found in the form of Ground water, ponds, lakes, oceans, Icebergs.

Aquifers = A layer of sediment or rock that contains water is called aquifers.

a) Aquifers are of two types : a) Unconfined aquifers
b) Confined aquifers.

a) Unconfined aquifers : The aquifers which are overlaid by permeable Earth material. They are recharged by water seeping or water seepage.

b) Confined aquifers : The aquifers which are a sandwich of two impermeable rock.

Aquifers are a part of ground water.

Water table
Unconfined
Confined

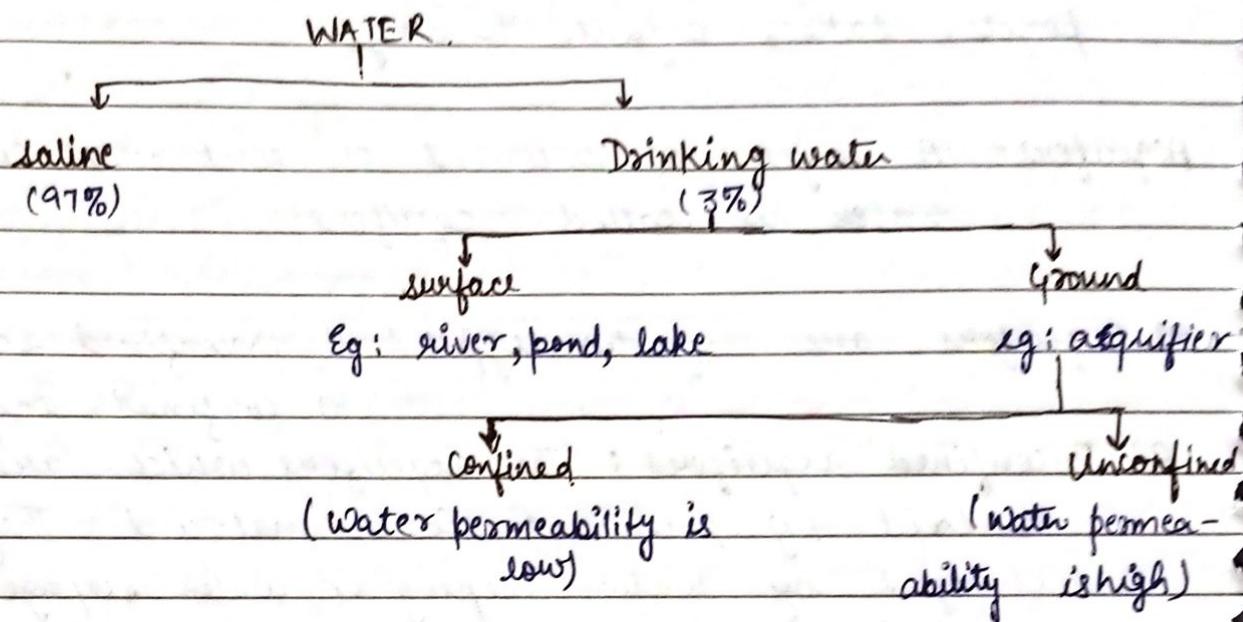


Page No. _____

Date _____

Part -2 (Water Resources)

* 71% of Earth is covered with water



⇒ Points :

- 1.) India has 25 major basin
for eg: Narmada (Arabian Sea) etc.
- 2.) Water percent on Earth's surface is 71%.
- 3.) Drinking water on Earth is less than 1%.

→ River Basin = are shared resources so management and sustainable use is required

CONFLICTS ON WATER RESOURCES.

* Reasons for conflicts :-

- (1.) Political
- (2.) Institutional
- (3.) Historical
- (4.) Climatic change

- (5) Global warming
- (6) water scarcity
- (7) Evolving Political Dynamics.

The nine major disputes in India:-

1) Krishna River Dispute = It is a East flowing river.
It is an inter state dispute between Andhra
Pradesh and Telangana. due to Polavaram Dam.
Its threat is to Telangana.

2) Kaveri River Dispute = It is also known as Ganga
of South. It is between Karnataka and Kerala.

3) Ravi and Beas River Dispute =

- * This is an interstate and international dispute
- * To reduce/resolve this dispute interstate river water
act 1956 was enacted.

* Important :

The river water can be used for irrigation,
ground water recharge, drinking water and industrial
purposes, so, the water quality and amount
could be degraded which affect downstream states

* Nine Major Tribunal Apon Body to resolve
water dispute.

- (1) Kaveri water dispute Tribunal (I)
- (2) Kaveri water dispute Tribunal (II) [1969]
- (3) Krishna water dispute Tribunal
- (4) Mahadayi water dispute Tribunal.

- (5) Narmada Water Dispute Tribunal.
- (6) Ravi and viyas Water Dispute Tribunal.
- (7) Godavari water Dispute Tribunal.
- (8) Banska dhara water dispute Tribunal
- (9) Mahanadi water Dispute Tribunal.

* Some International Rivers Dispute :

1) River Nile

originated in Turkey and passes through middle - east country.

Turkey → Ethiopia → Sudan → Egypt

2) Tigris

originated in Syria

Flow:

Syria → Turkey → Iraq.

3) Euphrates

originated in Iraq

Flow:

Iraq → Turkey → Syria.

* Interstate River water conflict

- i) case study 01: Punjab and Haryana conflict head-to-head regarding the river flow of Sutlej. The conflict resolved and Indus Water Treaty (1956) was made. according to the treaty, water distribution is Punjab (7.2 million acre feet), Rajasthan (8 million acre feet) and Jammu / Kashmir (0.65 million acre feet).

After the separation of Punjab and Haryana in 1966 the dispute arose. In 1976, Punjab decided to give 3.5 million acre feet water to Haryana from Yamuna causing the state of Haryana not to be put in the list of dry states. It was proposed to create link between Sutlej and Yamuna (named Sutlej and Yamuna link canal) which is still incomplete in present.

(2.) Case Study 02: Kaveri river dispute

The dispute was between Karnataka and Tamil Nadu. Initially,

the water sharing was
Madras = 75%.

Presidential Mysore = 25%.

In 1924, Tamil Nadu got the approval for dam construction during British Raj. The share of water was due to a Treaty (1924-27)

Tamil Nadu and Puducherry = 75%.

Karnataka and Kerala = 23% - 2%.

The issue again arose after the completion of the Treaty in 1927.

Also, Tamil Nadu demanded more water to support agricultural activities. Karnataka also claimed more right on water because Kaveri river originated from Karnataka.

A tribunal was again made in 1990 to solve the issue. according to which, Karnataka and Tamil Nadu would share 205 thousand million cubic feet.

In 1995, the water in Kaveri reduced due to low rainfall. The state of Karnataka denied to share the water with Tamil Nadu.

In 2007, the tribunal was again constituted according to which,

$$\text{Karnataka} = 37\%$$

$$\text{Tamil Nadu} = 58\%$$

$$\text{Puducherry} = 4\%$$

$$\text{Kerala} = 1\%$$

⇒ Possible soln to the water disputes

- 1.) Tamil Nadu should grow agricultural crops which consume less water or are less water intensive.
- (2.) Better rain monitoring system should be developed to accurately predict the rainfall pattern of the state.
- 3.) Better legal framework without any bias.

India Bangladesh river conflict over river GANGA.

Ganga river when enters into West Bengal it is known as river Meghna and Ganga and again this tributary merges with Brahmaputra river.

So, the issue is over Farakha Barrage on Calcutta port.

So, West Bengal claimed the two issues.

- During dry season India divert the whole water of the river towards the Calcutta port for the sailing of ships in the dry season.
- During monsoon season the gates of Farakha Barrage are being open which creates flood like condition in West Bengal region.

* FLOOD:-

A flood happens when water overflows or soaks land that is normally dry.

Causes of flood

- a) Geomorphic = It is one of the cause because of large catchment (collection of more and more water) area, poor drainage and slope.
- b) Meteorological (climatic condition) = The climatic factors which are responsible for flood are
 - Rainfall or precipitation
 - Climate change
 - Global warming
 - Deforestation.



O Anthropogenic = (human activities or interferences)

The human activities which causes flood are :

- Pollution
- Industrial activities.
- Improper management of land use.

* Types of flood

- Flash flood
- Urban flood = Eg. chennai flood
- Coastal flood.

→ flood prone zone =

- Ganga Brahmaputra
- Coastal region

(Case Study)

a) Uttarakhand flood 2013.

- uttarakhand has a total area of 53,484 km² of which 93% is mountainous and 84% is covered by forest
 - It is well known as the "Land of the Gods"
- This monsoon destroyed uttarakhand

Natural Reason :

- From 14 to 17 June 2013, Indian state of uttarakhand and near by have received heavy rainfall.
- The rainfall was above benchmark which is above 375 percent.
- The multi-day cloudburst, centered on the state uttarakhand caused devastating floods and landslides
- Due to continuous Rain the chorabari glacier melted and this triggered the flooding of the Mandakini river.

- Which led to heavy floods near Gobindghat, Kedar Deme, Rudraprayag district, Uttarakhand.

Human Reason:

- The Uttarakhand Disaster have been officially termed a natural calamity caused by cloudbursts and unprecedented heavy monsoon rainfall.
- However, the true causes of the epic tragedy is growth of tourism, unchecked rapid increase of roads, hotels, shops, and multistory housing in ecologically fragile areas and unplanned construction are the reason for landslide.
- Also, rapid growth of hydroelectricity dams that disrupt water balances and this also triggered the action of disaster.
- Deforestation is also one of the most important factor of uttarakhand disaster, which cause frequently landslide.

Reasons for uttarakhand flood.

cloud burst, change in regular monsoon pattern, heavy rainfall, deforestation, construction development, tourism, landslides, development activities.

b) Kerala flood 2018

The main reasons for Kerala flood are:

- Excessive rainfall
- climatic changes
- Negligence of Gadgil report on western Ghats
- Madhav Gadgil is an Indian ecologist. He gave a report over the protection of Western Ghats.
- Western Ghat area includes Gujarat, Goa, Maharashtra, Tamil Nadu
- Western Ghat is a very sensitive eco zone as it can be harm to rare species found only in India all over the world.
- According to Gadgil report development in this area can be a major harm to the unique flora and fauna and rare species of amphibians, birds, reptiles, animals etc.
- Whereas Kasturirangan report stated that only 37% area of western Ghat is sensitive the other area can be used for development and construction.

DROUGHT

When annual rainfall is below normal and less than evaporation this condition creates drought.

Causes of Drought

- a) Natural causes = climatic changes irregular monsoon pattern.

b) Anthropogenic = over grazing, Deforestation, mining.

Regi States in India effected by drought are:

- Madhya Pradesh and Maharashtra
- Effected areas in Maharashtra were Latur, Jalgaon, and Solapur.

Reasons for Maharashtra drought:

- Intensive cropping pattern in Maharashtra
- Increase exploitation of scarce water resources to get high productivity.

Imp.

Prolonged period of drought in an area is converted into desert and this process is called Desertification.

Remedies of drought -

- * Agroforestry
- * Alley cropping
- * mixed cropping
- * Crop rotation
- * use of animal manure as fertilizer which may increase the nutrient content in the soil as well as the water holding capacity of the soil.

Agroforestry = Agroforestry refers to the cultivation of trees and shrubs are grown around or among crops and pastureland.

Aim of agroforestry is to increase biodiversity.

Social forestry = Social forestry refers to the management and protection of forests and afforestation on barren lands.

Kolar district of Karnataka is one of the leaders in social forestry. Its funding is provided from World Bank.

11 talukas in this district are drought affected. It is because the tree used for plantation was Eucalyptus which is known to lower the water table and because of its very high transpiration rate.

Eucalyptus is planted in the area where water is logged or the area with damage drainage.

Minerals Resources.

Date _____

Minerals = Minerals are naturally occurring in organic crystalline solids.

every mineral have its own definite chemical composition and physical properties.

minerals = Mining = Mining is the process of extracting minerals and these are extracted from crust and mantle.

Uses of minerals are

- Minerals are used in Industrial plants and machinery.
- Minerals like coal, uranium oil are used for Energy generation.
- Weapons and armaments used in defence are made up of minerals.
- Minerals are used for Transportation means.
- communication - telephone wires, cables, electronic devices.
- agriculture - as fertilizers, seed dressings and fungicides.
- for ornamental purpose.

Based on their properties, minerals are basically of two types:

- (i) Non-metallic minerals = e.g. Graphite, diamond, quartz
- (ii) Metallic minerals = e.g. Bauxite, laterite, haematite etc.

Minerals are sometimes classified as Critical and Strategic :

Critical minerals = The minerals which are essential for the economy of a nation.

Eg. Aluminium, Iron, copper, Gold etc.

Strategic = Minerals which are required for the defence of a country.

Eg. Manganese, cobalt, platinum, chromium etc.

ENVIRONMENTAL IMPACTS OF MINERALS EXTRACTION AND USE

India is the producer of 84 minerals the annual value of which is about Rs 50,000 crore.

There are six major mines need a mention for causing sever problems.

- (i) Jaduguda Uranium Mine, Jharkhand = Exposing local people to radioactive hazards.
- (ii) Jharia coal mines, Jharkhand = underground fire leading to land subsidence and forced displacement of people.
- (iii) Sukinda chromite mines, Orissa = seeping of hexavalent chromium into river posing serious health hazard, Cr^{6+} being highly toxic and carcinogenic.
- (iv) Kudremukh iron ore mine, Karnataka = causing river pollution and threat to biodiversity.
- (v) East - coast Bauxite mine, Orissa = land encroachment and issue of rehabilitation unsettled.
- (vi) North - Eastern Coal Fields, Assam = very high sulphur contamination of ground water.

IMPACTS OF MINING

Mining is done to extract minerals from deep deposits in soil by using sub-surface mining or from shallow deposits by surface mining. The former method is more destructive and dangerous including risk of occupational hazards and accidents.

Surface mining can make use of any of the following three types:

- a) Open-pit mining in which machines dig holes and remove the overburden (e.g. copper, iron, gravel etc.)
- b) Dredging in which chained buckets and draglines are used which scoop up the minerals from under-water minerals deposits
- c) Strip mining = in which the overburden is stripped off by using bulldozers, power shovels and stripping wheels (e.g. phosphate rocks)

The environmental dangers caused by mining activities are as follows:

- 1) Devegetation and defacing of landscape.
- 2) Subsidence (tilting or slopy areas): It is mainly associated with under ground mining. Subsidence of mining areas often result in tilting of buildings, cracks in houses, bending of rail tracks, leaking of gas from the cracked pipes leading to serious disasters.
- 3) Ground water contamination: Mining disturb the natural hydrological process.

Sulphur, chromium or some heavy metals can be converted into acids by microbial activities.

Some heavy metals also get leached into ground water

4) Surface water contamination: Surface water contamination due to acid mine drainage sometime radioactive substances like uranium also contaminate the water and creating serious health hazards.

5) Air pollution :- During the purification of the metals, due to extraction, transportation

Pollutants are suspended particulate matter oxides of sulphur soot (arsenic, cadmium, lead). People near smelter plants are from serious & occupational health hazards.

→ Silicosis → silica dust.

→ Asbestosis → mineral of silica which is highly fibrous can cause serious respiratory disease.

→ Black lung disease → people who work in coal mining are highly effected because by absorbing dust of carbon reducing oxygen.

26/5/22.

* Remedial measures for the hazards caused by mining.

→ Personal protective equipments of protection covering for eg:- helmets & masks.

- Spreading awareness among the workers.
- Better machineries
- Ecofriendly techniques could be used.

Eg:- Microbial leaching = This is done to obtain the low grade ores by microbial leaching. one of such bacteria is *Thiobacillus Ferrooxidans*. This is successfully and economically used for extracting Gold embedded in iron sulphide ore.

- Restoration of mine areas by plantation of agroforestry or social forestry.

* Phytoremediation = The process by which soil pollutants could be detoxified.

- also strengthening the extraction regulation system. One should follow the standard of air emissions which are essential for minimising environmental impacts of mining -

Case Studies:

Case Study 01: Mining and Quarrying (surface mining) in Udaipur.

There are about 200 open cast mining sites. About 150 tonnes of explosive are used per month in blasting.

Ahar river which is badly polluted with mining activity. Hilly region in Udaipur are devoided of vegetation.

Due to water scarcity, people are forced / compelled or compelled to use polluted water on farming. These pollutants are non-biodegradable and getting accumulated in food chain.

Case study 02: Mining in Sariska Tiger Reserve (Rajasthan).

* Impact of Modern Agriculture:

- Impact related to high yielding variety.
- Hightech equipments
- Lots of energy subsidies in the form of fertilizers, pesticides and irrigation etc. water.

⇒ This particular yielding helps in monoculture.

In this the same genotype is grown over the vast area in case an attack by some pathogen there is a total devastation of crop.

Fertilizer Related problem:

even at farmers usually use the fertilizer in excess which can cause imbalance in soil.

for eg: Excessive use of fertilizer in Punjab & Haryana has caused the deficiency of (zinc) micronutrient in soil which affect the productivity of soil.

Nitrate pollution:

Nitrogenous fertilizers can leach down into the soil and contaminate ground water.

- ⇒ If an increase of nitrate more than 10 mg than it can cause blue baby syndrome.
- * In countries like Denmark, England, France, Germany this problem is quite prevalent.
- In India it is also common and exist in many area.

Eutrophication: - Accessive use of nitrogen and phosphorous more nutrients fertilizers.

Pesticides related Problems.

First Generation pesticides: In this the chemicals which are used are sulphur, Arsenic, Lead, Mercury to kill the pest.

Second Generation pesticides: It includes DDT (Dichloro Diphenyl Trichloroethane).

These pesticides have gone a long way in protecting our crop from huge losses occurring due to pest. Yet they have a number of side effect.

Super-pest: creating resistant in pest and creating new-pest.

There are about 20 species of pest are now known which have become immune to all type of pesticides are known as super-pest.

For e.g. Diamond Back moth target crop brassica.

Disadvantages:

- Death of non-targeted organism.
- Biological magnification: Many of these pesticides are non-biodegradable and keep on accumulating in the food chain. This process is called biological magnification.

DDT is banned because it had adverse impact on humans.

* Over irrigation:- (~~waterlogging~~)

- water logging: Soil air get depleted due to overlogging.
So when the water table rises while the roots of plants do not get adequate air.
- Mechanical strength of soil declines.

Excessive irrigation can be controlled by the following ways:-

- Manually sub surface drainage technology.
- Bio drainage: the process of removing the excess soil water through transpiration using bio energy of the plant and radiation energy of the sun.

* Salinity Problem.

When the amount of salt increases in soil.

conditions in which salinity inc.

(i) Excess irrigation / rainfall: In this the top nutrient of soil run off.

(ii) Dry climatic condition: In this process water evaporates and leaving behind the salt in upper soil profile.

Salt: NaCl , Na_2SO_4 , CaCl_2 , MgCl_2 . These salts are present in saline soil or sodic soil.

NOTE: The pH of Sodic soil is above 8.

Remedial measures:

- The most common method is to use lime.
- We should use good quality of water for irrigation.
- We can also use network of perforated drainage pipes for flushing out of excessive salt.

TBS: (Tarun Bharat Sangh)

It is an NGO. It is located in Bhikampur, Alwar, Rajasthan.

Dr. Rajendra Singh is founder of this NGO.
He is also known as water man of India.

- Pole:
- (i) Mobilising community for water conservation and management
 - (ii) Traditional water management for eg- use of johad.
 - (iii) Anicut : a dam made in a stream for maintaining and regulating irrigation.
 - (iv) Rejuvenation of rivers
for eg: Arvari, Sarsa, "
 - (v) He worked to prevent poaching.

GDP of any country depends on energy consumption of that particular country.

Page No. _____

Date _____

ENERY RPSOURCES

Developed countries use = 300 Giga Joule of energy

Developing countries use = less than 1 Giga Joule of energy.

* Conventional (non-renewable) (Exhaustable) energy resources.

- It the resources which cannot be regenerated over a long span of time.
- These accumulate in nature over a long span of time and they cannot be quickly replenished (regenerate) exhaustable.

Eg:- Coal, petroleum, oil.

Blurred rock system: It include coal, petroleum, uranium, thorium. It is oldest metamorphic rock.

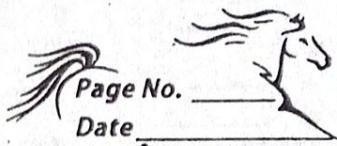
found in Aravali's, chota Nagpur, Tamilnadu

Coal:

Coal is formed 255 - 350 millions years ago. coal was formed in carboniferous age.

These are mainly of 3 types

- 1) Anthracite (hard coal): It contains the maximum carbon content i.e 90% (8700 kg calorie (Kcal)/kg)
- 2) Bituminous (Soft coal): It contains 80% carbon content.
- 3) Lignite (Brown coal): Carbon content is 70%.
- 4) peat : It is found in wetland and marshy areas. It contains 60% carbon content.



Major coal field in India

Jharkhand, Raniganj, Jharia, Bokaro, Chhattisgarh, Singareni (AP), Godavari valley.

The coal state of India : Jharkhand, Odisha, West Bengal, Madhya Pradesh, Andhra Pradesh, Maharashtra

* Hard coal occurs only in JK (Jammu & Kashmir)

* Disadvantages:

- Burning of coal produces major green house gas.
- Oxide of Sulphur, oxide of Nitrogen are responsible for Global warming.

Petroleum

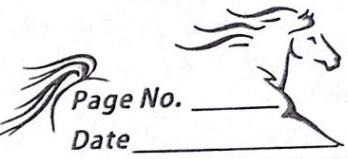
4th of Petroleum reserves are present in South Africa.
Crude petroleum is mixture of alkane hydrocarbon (2 methyl carbon) a) long chain of hydro carbon.

Purification of Petroleum

Fractional distillation = Fractional distillation is a type of distillation which involves the separation of miscible liquids. The process involves the separation repeated distillations and condensations and the mixture is usually separated into components parts.

Petroleum refinery industries gives us the following materials:-

Plastic, wax, Petroleum Gas, Kerosin, petrol, diesel, fuel oil, lubricating oil, Parafin wax, asphalt (wood preservative), Plastic.



* Petroleum is a cleaner fuel as compared to fire coal.

LPG (liquefied Petroleum gas).

It is mainly consists of Butane. Others are propane & butane.

It is odourless gas. This due to Ethyl Mercaptan a foul smelling gas is added to LPG. So that any leakage of LPG from gas cylinder is detected.

* Oil fields in India:-

Digboi is the first established oil refinery. few of the oil fields are located in;

Gujarat Plains, Bombay high, offshore areas in deltaic coast of Godavari Krishna, Kaveri and Mahanadi.

(NATURAL GAS)

It is mainly composed of methane (95%) with small amount of propane & Ethane.

• Natural Gas is a fossil fuel. It is formed by decomposition and remains of dead plants and animals buried under Earth.

It has a calorific value (50 KJ per gram).

• It burns without any smoke.

• Natural Gas is used in thermo power plant for generating electricity. It is used as a source of hydrogen gas.

• It is also used in fertilizer industry and as a source of carbon in tyre industry.

- Maximum reserves are: Russia (40%), Iran (14%), and USA (7%).

In India the gas fields are Tripura, Jaisalmer, offshore area of Mumbai, and Krishna Godavari delta.

Natural Gas is of two types:

- a) CNG (Compressed Natural Gas)
- b) SNG (Synthetic Natural Gas)

a) CNG

- Its major component is methane
- It is a more cleaner fuel
- It is used to reduce pollution in cities.

b) SNG

- It is a mixture of carbon monoxide (CO) and hydrogen (here CO) It is a colourless, odourless, poisonous gas which is asphyxiating i.e [chocking].
- It is a connected link between fossil fuel and substituted natural gas.
- Low grade coal can be gasified by Gasification into synthetic gas followed by catalytic conversion to methane.

NUCLEAR ENERGY

- It is a highly destructive power.
- Nuclear power plants are located in Maharashtra, Tamil Nadu (Kalpakkam), Uttar Pradesh (Nawada), Rajasthan.

- Nuclear Energy can be generated by Nuclear fission (break down) and Nuclear fusion (combination)
- Generally when U_{235} breakdown gives two nuclei i.e (Kr, Ba) and three neutrons.

Nuclear fission: when two isotopes of light element are forced together at extremely high temperature until they fused to form a heavier nucleus and release plenty of energy.

Nuclear Energy has tremendous potential but any leakage from the reactor may cause devastating nuclear pollution.

Disposal of the nuclear waste is a big problem.

(Case Studies -

- Chernobyl Nuclear Powerplant accident (Ukraine)
- Fukushima Nuclear Power plant disaster (Japan)

In India Nuclear Powerplant ~~disaster~~ are located at

- Tarapur Nuclear Power Plant (Maharashtra)
- Ranaghat Sagar Nuclear Power Plant (Kota, Rajasthan)
- Kalpakkam Power Plant (Tamil Nadu)
- Narora Nuclear Power Plant (Uttar Pradesh)

Nuclear Fission: It is the type of nuclear change in which nucleus of certain isotopes with large mass numbers are split into lighter nuclei on bombardment by neutrons and larger no. of energy is released through several chain rxn.

Renewable Energy Resources, (Inexhaustable energy resources), (non-conventional energy resources).

i) Solar Energy.

- Nuclear fusion ex^n occurs inside the SUN which releases enormous quantity of energy as heat and light.
- Solar constant ($\approx 1.4 \text{ KJ per second per meter square}$) is the amount of solar energy received near Earth surface.
- To harness solar energy solar power plants are made.
- Solar energy can be harnessed by solar panels, solar heat collector, solar cookers etc.

a.) Solar Cells.

They are also known as Photovoltaic cells or PV cells. These are made up of silicon and gallium. Silicon is obtained from silica sand. Solar cells are used for running radio and television and are widely used in calculators, electronic watches, street lighting, traffic signals, water pumps etc.

b.) Solar Panels.

It can harness large amt. of solar energy and produce electricity.

Top 5 states in max. installed solar Energy capacity : i) Karnataka (7100 MW of installed capacity)
largest sol

largest solar Power plant is in Pawagash.

iii) Telangana

→ 5000 (MW) power capacity.

iii) Rajasthan

→ 4400 (MW) power capacity.

iv) Andhra Pradesh

→ 3470 (MW) power capacity

→ maximum is in Kanner.

v) Gujarat

→ 2654 (MW)

→ Power plant is charanka solar power plant

World top installers.

china, United States (US), Australia, Italy.

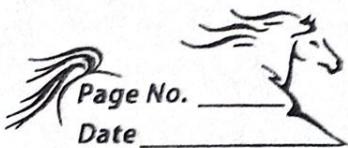
c. Solar Power Plant

It contains large concave reflectors.

The steam turbine drives a generator to produce electricity. A solar power plant has been installed at Gurgaon Haryana with 50 (kW) capacity.

Advantages of solar energy

- It is sustainable source of energy
- It is equally distributed
- It is Ecofriendly and inexpensive.



Drawbacks

- It is a diffuse (not 100% of solar energy can be harnessed and generated to energy) source of energy.
- Initial installation cost of solar plant is high.
- It is weather dependent.
- Large area is required for setting up of panel.

2) WIND ENERGY

- High speed wind have a lot of energy as kinetic energy (the energy which is produced by moving).
- Wind mills are used to harness wind energy.
- A no. of machines like waterpumps, flourmills, electric generator can be runned using wind energy.
- A large number of wind mills are installed in clusters is called wind farm.
- Wind energy can be harnessed at a place i.e open grassland, hilly regions and coastal regions.
- The minimum wind speed required for satisfactory working of wind mills is 15 Km/hr.

The largest wind farm in our country is near Kanyakumari in Tamil Nadu.

used to generate electricity of 380 (MW)

Advantages:-

- Sustainable source of energy.
- Ecofriendly and inexpensive.
- Eg



Disadvantages

- Expensive to setup.
- Creates noise pollution.
- Visual pollution.
- Limited locations are there where it can be setup.
- Threat to biodiversity specially birds.

Imp.

India is 4th in wind Power Generation

China is at 1st, US is at 2nd, and Germany is at 3rd.

Seven wind potential states are:

Gujarat, Maharashtra, Rajasthan, Tamil Nadu, Karnataka, Madhya Pradesh and Andhra Pradesh.

Karnataka is leading state in every renewable resources.

Famous company SUZLON is largest producer of wind mill.

HYDRO POWER.

The water flowing in a river is collected by constructing a big dam where the water is stored and allowed to fall from height which turns in blades of the turbine located at the bottom of the dam to rotate.

The hydropower capacity of India is estimated as $4 \times 10^9 \text{ RW/hr}$.

It is also used for controlling flood, irrigation and navigation.

Bat Bhakda Nagal Dam located in (Himachal Pradesh)

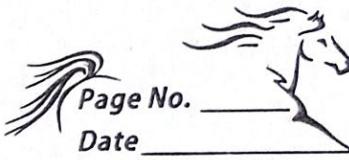
Shree Shalam Dam located in (Andhra Pradesh)

India is the 3rd largest consumer of electricity and it is ranked 5th in the installed capacity of hydropower.

TIDAL ENERGY

Tides are generated by the interaction between sun, moon and Earth.

Ocean tides generated by the interaction b/w sun, moon and Earth contains enormous energy.



A difference of high tide and low tide upto several meters used to spin the turbine by construction of tidal barrage which is used to capture potential energy.

- * Gulf of Kutch.
- * Gulf of Cambay.
- * and Sunderban deltas are potential tidal power sites in India.

Advantages:

- i) No greenhouse gas emission.
- ii) Scope is high as 71% of water is present.
- iii) Maintenance charges is low.

Disadvantages

- i) It may effect the marine life.
- ii) creation of artificial electromagnetic field and it effects prey and predator relationship and also may cause difficulty in finding food by marine organism.

* OTEC (Ocean Thermal Energy conversion):

The energy available due to the difference in temperature of water at surface of tropical oceans and at deeper levels is called ocean thermal energy.

Temperature difference required is about 20°C or more.

The warm surface of ocean water is used to boil liquid ammonia or sea water.

Two types of OTEC technology are used:

- a) close cycle (In this cycle liquid ammonia is used).
- b) open cycle (In this cycle warm sea water is used)

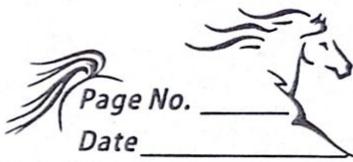
Features

- It is reliable and predictable energy sources for future.
- Global presence.
- unlimited usage area
- Risk factor not been assessed uncertainty of marine environment.
- Environmental impact of OTEC not being explored and assessed.

GEOTHERMAL ENERGY

Energy harnessed from hot rocks present inside the Earth is called geothermal energy. So high temp., high pressure. pressure exists below the Earth surface.

This heat is generated because the heat comes from the fission or decomposition of radioactive material which are mainly naturally present in rocks.



Page No. _____

Date _____

Sohna in Haryana and Manikaran in Kullu are natural geysers.

By putting a pipe in it make the streams or hot water gush out through the pipe at high pressure which turns the turbine of a generator.

Ladakh valley is also a geothermal site.

Advantages:

- No fuel is required to generate electricity
- Pollution level is very much lower.

Disadvantages:

- Location restricted
- It can influence seismic activities like Earthquake
- High cost
- Gases release during drilling also include Green house gases (Methane, butane).

BIO MASS ENERGY

Biomass is the organic matter produced by the plants and animals which contains crop residue, municipal waste etc.

Biomass energy can be generated by energy plantation.

Fast growing trees like cotton woods, poplar, non-woody herbaceous plants like (sugarcane, sugarbeet, sorghum) aquatic weeds like water hyacin, sea weeds)

Energy plantation also include carbohydrates rich plants like potatoes, cereals.
These can be converted into burnable gas or can be converted into fuel by fermentation.

* Petrocrops:

The ~~crops~~ petrocrops are the crops containing plants like Euphorbia and oil plants such as hydrocarbons can yield oil-like substances under high temperature and pressure.

This oily material or oil may be burned directly in diesel engines or may be refined to form Gasoline.

* Agricultural / Sewage waste (urban waste):

Agricultural waste include crop residue, Bagasse (waste generated by sugarcane), coconut shells, peanut shells, cotton stalk, animal dung, fisheries, poultry, even human refuse is also example of biomass.

NOTE: In Brazil 30% of electricity is generated by biomass.

Environment impact

- Greenhouse gas release
- Pathogens release in air

BIOGAS

Biogas is a mixture of methane, carbon dioxide CO_2 , hydrogen and hydrogen sulphide, the major constituent being methane.

Biogas is produced by anaerobic degradation of animal wastes (sometimes plant wastes) in the presence of water. Anaerobic degradation means break down of organic matter by bacteria in the absence of oxygen.

Production of biogas includes 4 processes.

- i) Hydrolysis (breakdown of water molecules)
- ii) Acidification (when waste is completely)
- iii) Acetic acid (scification)
- iv) Methanogenesis (methane is present as major gas).

Biogas is a non-polluting and low cost and clean fuel. i.e. It is an ideal fuel.

Advantages

- There is direct supply of gas from plant and there is no storage problem.
- Non-polluting or low cost.
- The left off sludge is a rich fertilizer which is used in crops.

→ Air tight degradation of animal waste is same as it eliminates health hazards.

There are two type of biogass plant:

- floating gas holder type biogass plant
- fixed dome type biogas plant

One of the important model for rural set up is KVIC (Khadi village Industries commission).

KVIC Type:

- Floating drum type.
- Janta Model (fixed dome type model)
- Deenbandhu model (fixed dome type model)
- Bragati model (floating drum type)
- Ferrocemented digester

BIOFUELS:

Bio fuel is made using microorganisms Spirorella, chlorella (Edible algae and it is protein rich), chlamydomonas, Nestoc.

It can be produced with the help of petro crops.

Biomass can be fermented to alcohol like Ethanol (carbohydrate rich crops), Methanol etc.

Gasohol andor Methanol.

Gasohol :- It is a common fuel used in Brazil and Zimbabwe for running cars and buses. It is a mixture of Ethanol and Gasoline.

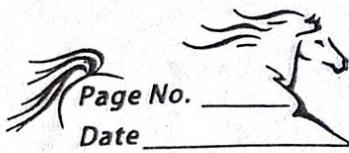
Methanol :- It burns at a lower temperature than Gasoline and diesel. It is a clean and non-polluting fuel.

Transesterification = The process by which algal biomass is converted to biofuel.

Hydrogen as a Fuel.

When hydrogen is burned in air it combines with oxygen to form water and a large amount of energy (150 kJ/g) is released.

BIODIVERSITY



Page No. _____

Date _____

Unit - 4

Biodiversity (the variation among life forms). This term was found by Walter G. Rosen in 1983.

CBD (Convention on Biodiversity 1992) it is a outcome of Resumit or Earthsumit. It is made for the conservation of biodiversity.

Biodiversity is defined as a variability among living organisms from all sources including terrestrial (forest, grassland etc.), aquatic and marine and the ecological complexes of which they are a part.

so million species on Earth

Biodiversity can be understand by 3 different ways

- Genetic diversity
- Species diversity
- Ecosystem diversity

i) Genes are basic hereditary units of which for example transfer information from one generation to another when the genes within the same species show different versions due to new combination. It is called Genetic diversity or Genetic variability.

ii) This is a variability which is found in group of species. It represents species richness and evenness.

Shanon weiner Index / Two index to measure
 Simson Index / richness and evenness

Simson Index : It tells us about the dominance of species in a particular area.

Shanon weiner Index : It tells us about the relative abundance

iii) Ecosystem diversity : It address the biotic and abiotic properties and consider the complexity and biological community.

Different processes are also included.

* On the basis of regional level biodiversity can be measured by :

α diversity, β diversity and γ diversity

a) α diversity : Diversity or richness in a within an ecosystem.

b) β diversity : It is a diversity between the two different ecosystem.

For eg:- Pond and aquatic.

c) γ diversity : Measured overall landscape.

For eg:- Pond, aquatic, river, etc grassland etc.

* Biogeographic zones in India

Biogeography is the distribution, dispersion, evolution and environmental relationship of plants and animals in time and space.

It includes phyogeography and zoogeography.

There are 10 biogeographic zones in India. These are divided on the basis of:

- a) Soil
- b) Topography
- c) Biodiversity
- d) Climate

(10 biogeography zone in India):

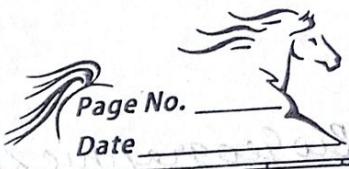
- i) Trans Himalaya
- ii) Himalayan zone
- iii) Desert
- iv) Semi arid
- v) Western Ghats
- vi) Deccan peninsula
- vii) Gangatic Plain
- viii) North East India
- ix) Islands
- x) Coast

Topography is arrangement of physical features on land surface.

* Values of Biodiversity.

Consumptive use values: these are the direct use values where the biodiversity product can be harvested and consumed directly.

Eg:- fuel, food (cereals, grains, food), drugs and fibres etc.



- 1) About 90% of present day food crops have been domesticated from wild tropical forest.
- 2) Drugs and medicines 75% of world population depend upon plant or plants extracts. for medicines.
- 3) Penicillin used as an antibiotic is derived from a fungi called penicillium.
Fetta
- 4) Quinine is an antibiotic anti-malarial drug obtained from the bark of Cinchona tree.
- 5) Periwinkle plant is used for making anticancerous Winblastin or Wincaustin.

* **Productive values:** These are the commercially usable values where the products are marketed and sold.

Eg:- silk industry, textile industry, pearl industry

* **Social Values:** These values are associated with social life, customs, religion or cyclo-spiritual aspects.

For eg: Tulsi, lotus, Peepal, banyan, etc.

* **Ethical values:** (live and let others live)

* Ecological services values:

→ Importance of various ecosystem

* Aesthetic value: Ecolotourism for nature lovers.

9/6/2022

There are 17 other countries which are rich in biodiversity



Page No. _____
Date _____

- * India as a major biodiverse Nation.
- i) The degree of Endemism = The species which are restricted to a particular area. There are about 62% of amphibians and 50% of reptiles are endemic to India. Most of these are found in Western Ghats.
- ii) Centre of Origin = A large no. of species are known to have originated from India. Nearly, 500+ species of flowering plants had their origin in India. (Most of the) India has been the centre of origin of 168 species of crop plant and 320 species of wild relatives of cultivated crops.
- iii) Marine diversity = Along, 7500 kms long coastline of our country in the Estuary, Mangroves, coral reefs, backwater etc. The marine diversity is rich in crustaceans, molluscs, polycysts, corals.
- iv) Varied climatic condition in different geographic location.

17 nations

Australia

China

Philippines

Brazil

Indonesia

United States

Ecuador

Mexico

Venezuela

Peru

Malaysia

Colombia

Madagascar

Democratic Republic of Congo

Papua New Guinea

South Africa

* Biodiversity hot spot :

characteristics :-

- Max. species richness
- Endemic species
- threatened ecosystem
- 70% of Flora and fauna is being destroyed

* At Norman Myer introduced the term biodiversity hot spot in 1998.

* Biodiversity hot spot are the area that exhibit high species richness as well as high species endemism.

* Globally, there are 36 biodiversity hotspot in the world.

* These hot spot covering less than 2% of world land area found to have about 50% of terrestrial biodiversity.

* An area is designated as hotspot when it contains atleast 0.5% of plant species as endemic

* 1st highest biodiversity is found in tropical evergreen and forest or moist forest.

* 2nd highest no. of endemic plant species found in Mediterranean.

Mediterranean; Western Amazon forest, Madagascar, north and east bonio, West Africa, Brazilian Atlantic forest

In India, there are 4 biodiversity hotspot regions.

i) Eastern Himalayas.

ii) Western Ghats

iii) Indo Burma

iv) Sunda land. (Nicobar Island)

i) Eastern Himalayas:-

characteristic

- they display ultra varied geographical features that fosters species diversity and endemism.
- There are numerous deep and semi isolated valleys in Sikkim which are extremely rich in endemic plant species.
- There are about 60% of endemic plant species.
- Out of the world record 30% of flora is endemic to India of which 35000 plant species are in Himalayas.

ii) Western Ghats

→ It is 17000 Km sq strip of forest in Maharashtra, Karnataka, Tamil Nadu and Kerala.

→ Most of the hill stations are located in western Ghats regions.

→ Western Ghats are locally known as Sahyadri hills.

→ Generally there are 3 mountain ranges, Aravali, Satpura, Vindyan.

* Aravali :- Rajasthan, Delhi, Haryana.

* Vindyan and Satpura ranges cover central India.

- because of parallel arrangement of aravali range and south west monsoon there is less rain or no rain in rajasthan
- There are two coast in western ghat region!
 - a) Malabar Coast (Kerala and Karnataka).
 - b) Konkan Coast (Goa)
- In 1987 save western ghat movement took place.
- Neilgiri junction is the point where western and eastern ghat meets.
- Land surface in eastern ghat is denuded because most of the river fall in Bay of Bengal pass by these ranges making them rough.
- The major centre for diversity in western ghat are:
 - a) Agasthyamalai hills (Tamil Nadu)
 - b) silent valley (Kerala)
- iii) Indo Burma
- The regions are myanmar and myanmar.
- Here winter are very dry, monsoon comprise heavy rainfall due to south west monsoon.
- Fresh water turtle, olive ridley turtle (extinct)
- 12 new mammal species has been discovered in past 12 years

- Mixed wet evergreen forest or montane forest
- Flood plain zone, mangrove ecosystem and inundated grasslands.
- The threats to this type of ecosystem:
 - a) Shifting cultivation;
 - b) Mangrove ecosystem is utilized for aquaculture.
- iv) Gunta Land
 - It is a part of Andaman and Nicobar Island.
 - Endemic species are orangutan (ape). These are endangered.
 - Sumatran rhino (rhinoceros).
 - Mangroves, peat swamp are responsible for trapping major greenhouse gases and like methane (CH_4) and CO_2 .
 - Coral reefs and beach forest, lichens, mosses and rhododendrons.
 - Threats of this hot spot region is
 - a) deforestation.
 - b) plantation of oil palm trees.
 - c) Illegal wildlife trading for eg:- Sumatran rhinoceros are traded because of their horns as they contain some medicine which are used in China.

* Threats to biodiversity ~~losses to loss in~~ (iii)

i) Deforestation: In India currently forest cover is 21.6%. Approx 7% from this is tropical rainforest which consists of maximum species and is major reservoir of biodiversity.

Almost 1 million hectare per year is deforested for other purposes.

ii) overgrazing: Major consequence of over grazing is soil erosion.

In over grazing

* Degradation of ecosystem due to overexploitation of resources.

iii) Biological invasion or exotic species: If any living organism enters in any non-native place (entry of any non-native species).

Eg:- Pathogens, animals, weeds, insects, virus, bacteria, fungi, etc microorganisms.

* *Prosopis juliflora* (chilcott tree) it is a native of South America and Mexico and is mostly seen in India. It is introduced in India intentionally to fulfil fuel wood requirement in rural areas.

* *Eucalyptus* it is also used intentionally to use its wood for industrial purpose but it is causing negative impact as it is sucking water from ground water table. It is a native of Australia.

iii) Pollutants: liquid, gaseous or solid form.
These Pollutants are causing hazardous impacts on floral and faunal species -
Common example is DDT. its hazardous impact was on crop and microorganisms.
It was banned in 1972.

→ PAN (peroxy acetyl nitrate) :- It is a kind of atmospheric secondary pollutant.
2 Primary

Oxides of nitrogen, ground level ozone in the presence of sunlight it is formed. This is harmful for plants as it effects photosynthesis rate and CO_2 chlorophyll content.

→ PCBs (polychlorinated biphenyls) it is carcinogenic.

→ BFR (Brominated flame retardants) :- It is anthropogenic. these are

→ Freon Gas - originated from refrigerators.

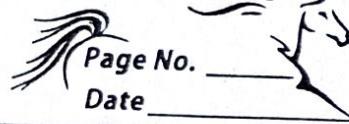
iv) Climate change and Global warming : If no optimum condition is there so it may effect the survival of species.

v) Habitat loss and habitat fragmentation :

Habitat loss: Distortion and loss of natural habitat

for eg: The wetlands are destroyed due to draining, filling pollution thereby.

* There are 18 biosphere reserves in India.



Page No. _____

Date _____

causing huge loss of biodiversity.

Habitat fragmentation: Sometime the loss of habitat is in installments so the habitat is divided into small and scattered patches. A phenomena known as habitat fragmentation.

vii) Poaching: Illegal hunting

viii) Man and Animal conflict: Generally, man and animals have a negative interaction for resources, habitat. For e.g. - A single tiger requires 100 sq feet area and an Elephant requires 1100 sq feet area. Elephant requires 10-20 km² for travelling.

Reasons of man and animal conflicts are:

- i) Habitat fragmentation or shrinking habitat
- ii) Encroachment in the forest land.
- iii) Increased disturbances for fuel, food, fiber, fodder, wood etc.
- iv) Increased area under cultivation
- v) Change in habit (behaviour) (Eg Feeding monkey).
- vi) Increased pollution of animals as well as human being.

Asian lions are mostly in case due to

i) Breeding relation

ii) Loss of their habitat

* An Elephant requires 450 kg of food per day. Not getting this can make them aggressive.

* Impacts of conflicts:

- a) Crop loss
- b) loss of live stocks (Animal husbandry)
- c) Human injury or animal injury
- d) Death
- e) Property damage.

* Control measures:

- a) Control of poaching
- b) prevent monocropping
- c) LPG distribution in rural areas which reduces the use of wood from forest.
- d) Raising awareness: To make them understand about the values of biodiversity
- e) Solar fencing;
- f) Relocation of human to residential area nearby forest
- g) compensation

v) MOWFCC Guidelines

MOWFCC (Ministry of Environment
forest and climate change)

- i) Wild life rescue team should equip with adequate equipments; communication system.
- ii) local volunteers should be trained.
- iii) awareness campaign for encouraging conservations.

- iv) Identifying regular movement corridor of large wildlife.
- v) Compilation of data on conflicts.
- vi) Help locals in constructing barriers.
- vii) Ensureance Insurance program for damage or destruction due to wildlife.

② Natural solutions.

- i) Bees and hot paper can be planted in villages to prevent Elephant entry.
- ii) To prevent tiger attack from back so forest workers begin wearing mask on the back of the head to prevent sudden attack.
- iii) Solar fencing.
- iv) Early warning system : SMS chip trapping tracking collar sensor on animals.

Providing more wildlife sanctuaries and more wild life scouts.

Biological Invasion.

Biological invasion is a threat to biodiversity

Invasive alien species = which are not native to a specific location.

Threats are:

- It can cause damage to environment and economy of a country
- It grows very fast as compared to local species.
- Rapid reproduction.
- Ecological competence : They can survive in any kind of harsh cond'.
- There is no natural enemy

Phenotypic plasticity: adaptation of exotic species physical behaviour to change behaviour under variable environmental ac. to cond'.

It is mentioned in article 8 of CBD convention on Biological diversity (1998) with IUCN.
 IUCN and CBD are working together to address * (International Union for conservation of nature and natural resources)

*this threat.

Useful invasive species

- American crop : Tomato, wheat, rice. are very popular in different countries

Negative Impacts of Invasive Species:

1. African catfish: This was introduced in India accidentally which causes the loss of Indian catfish.
2. Zebra mussels are found in caspian sea. It is a types of molluse. These were translocated to Great lakes of North America by ships attaching to the ship which causes a threat to local species.
 - a) Disturbs the ecological balance by disturbing the food chain.
 - b) They also effects ecological balance
 - c) Soil chemistry
 - d) Also disturbs human health.

Two reasons of translocation of Invasive species are:

- a) accidentally
- b) Intentionally.

Imported ornamental species (*Lantana camara*) It is a weed. These are harmful as they grow very fast over a open land.

b) *Eichornia crassipes*.

These were introduced to control pests and pathogens for Biological control.

Some useful invasive species
 → e.g. Tomato, Rice are very popular in different countries.

Negative impact of Invasive Species
 e.g. African Cat fish ↓.

Causes of loss of Indian Cat fish.

↳ Caspian Sea Zebra Mussels

type of mollusc

they transport to the place of North America which causes the threat to local species

3. it disturbed the food chain led to disturb the ecological balance.

4. effect on soil chemistry, Human Health

This ^{species} imported intentionally also from South America

Imported Ornamental species - Lantana Camara (weeds), Eichornia (water hyacinth) (to control the pathogen & pest) so known as for biological control

Species that Accidental came in India

Panthenium hydropiper (conger grass)

1. Lantana (weed) → which threaten tiger habitat.
↳ ^{Polaron} _{Yield}
2. Longus grass → it is America roadside
3. Eichornia → it absorbs the pollution through their roots. It is an aquatic weed. It is a native of America. It is also known as Terror of Bengal. Because this aquatic weed has choked the canal system of Bhakra Dam. It grows very fast in aquatic system of Bengal.
4. European Rabbits → Introduced in Australia for hunting. Result in successful colonisation. They can thrive in variety of climatic conditions. They reproduce very fast. They were given viruses. They were competitors for pastures. Virus Myxomatosis was introduced to kill them. But 10% to 80% were surviving & became resistance & their no. is up again.
5. Spotted Deer → Introduced in Andaman & Nicobar Island by Britishers, & their large no. is affecting forest regeneration. They do not have any predator except crocodile.

6. Little Fire Ant → Native to South America was accidentally introduced in tropical countries. They are highly invasive & form vast super colony. It can cover the complete territory of entire country.

Control Measures

It can be controlled by introduction of any other species. invasive prickly pear cactus from Australia or introduction of Insect. chemicals also used. But sometimes they become threat to native species so they are

Values of Biodiversity

1. Consumption → which

- ↳ food
- fuel
- fodder
- Drugs
- Medicines

2. Production → wood, timber, leather, fibre/cotton, silk, jute, rubber.

IUCN

Data

Provides Red ~~Rating~~ & Read Data book which consist of Taxonomic Data, Conservation status & Distribution information (geographical Range) on species that are facing high risk of global extinction.

Mission → To influence, encourage & assist societies throughout the world to conserve nature and to ensure that any use of natural Resources is equitable and ecologically sustainable.

IUCN was founded on 5th October, 1948.
headquartered located at gland Switzerland.

Red Data Book → is the State Document established for documenting rare & endangered species of Animals, Plants, microorganisms as well as some ^{sub} local species that exist within the territory of state or country.

There are 3 Objectives of IUCN.

→ provide scientific data on the status of species and subspecies at a global level to address the factors of concern and spread awareness regarding the species & biodiversity extinction.

→ To plan a layout for the conservation

of biodiversity.

Users of IUCN → government Agencies,
wildlife Organisation, Conservation
Related NGOs, Educational Organisation,
Zoo, Media & Business Communities.