

consumption and waste products.

* Environment protection Act:

Air act, water act, wildlife protection act, forest conservation act, issues involved in enforcement of environmental legislation, public awareness.

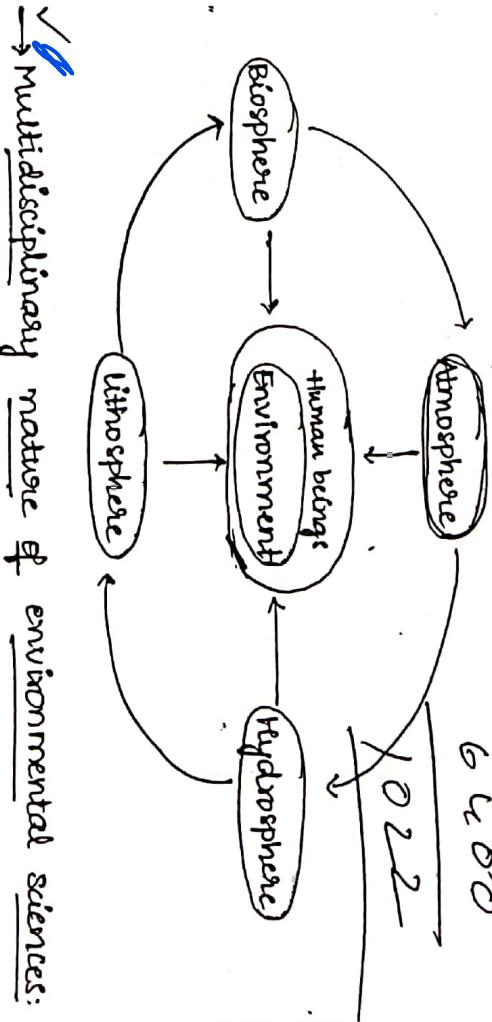
* human population and the environment:

population growth, variation among nations, population explosion - family welfare programme, environment and human health, human rights, value education - HIV/ AIDS, women and child welfare, role of information - Technology in environment and human health.

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✓ Multidisciplinary nature of environmental sciences:

- * Es is not a unique subject
- * It is framed by the combination of diff concepts from various subjects and various streams like life sciences, physical sciences, engineering, accounts and computer science.

5/12/13

→ Environment:

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UNIT-1:

* It displays various subjects like

→ physical sciences:

* It consists of subjects like physics, chemistry.

geology and earth sciences



physical sciences

→ accounts & computer science:

* It consists of maths, statistics and computer

science

* E.S imports Analysis from this

→ Engineering:

* It consists of subjects like civil, mechanical,

electrical and chemical engineering

* E.S imports technology from engineering

→ MBA, education and law are subjects that

imports management aspects from environmental sciences.

→ life sciences:

It consists of subjects like Botany, zoology, micro-biology, bio-technology

Imports basics from environmental sciences

→ Scope of Environmental sciences:

- * Research & development
- * Industrial sector
- * Consultancy
- * Environmental journalism
- * Environmental lawyers & judges

Ex: Mr. Nathan

The study of the environment is no longer limited to issues of health and sanitation but, is now concerned with pollution control, biodiversity conservation, waste management and conservation of depleting natural resources. These measures require expertise and hence are increasingly creating job opportunities.

(i) Industrial sector:

- * Environmental scientists work towards maintaining ecological balance, conservation of biodiversity and preservation of natural resources.
- * Most industries have a separate environmental research and development section which governs the impact that their industry has on the environment.

(ii) Consultancy:

With an increase in public awareness regarding environmental issues, there is tremendous scope

for research in this field. Various universities

and governmental organisations offer avenues for such research in this field.

- * They conduct research studies in order to develop theories or methods of monitoring and controlling environmental pollution.

(iv) Environmental Journalism

- * there is an increasing demand for people who can report on environmental issues to generate awareness among people.
- * environmental journalism is an emerging field which helps in bringing environmental problems to public notice.

(v) Environmental lawyers and judges:

Ex: Mr. Mehta is a famous environmental lawyer from supreme court. He introduced

ENS course into graduation. He declared ENS

is mandatory for all graduate courses.

Importance of Environmental Sciences:

- * social processes that form the basis of these processes
 - * environmental studies helps in maintaining the ecological balance by providing basic operating knowledge of environmental systems and processes.
 - * the concepts from E.S. can be applied to the study of agriculture and the design of sustainable production systems.
 - * environmental studies applies economic methods and concepts to issues of the environment, environmental policy analysis and also management.
- Need for public awareness:
- * since, human beings cannot isolate themselves from the environment, the imbalance that they have created is interfering with their survival and sustenance on the planet.
 - * Many of environmental problems are global in nature

- * To understand current environmental problems, we need to study the physical, biological, chemical and

more, every citizen of the world needs to be aware & actively participate in protecting global environment. Hence, Public awareness is essential

→ How to create awareness among people?

school - Baries

- * education
 - ↳ college / graduation - present problems & post graduation - innovative sol'n for prevent problems

media

- ↳ print - newspapers, magazines
- ↳ electronic - radio, TV, movies etc.

* Seminars & conferences } to create awareness among

* folk songs & skits } diff categories of people

→ Natural Resources:

the resources provided by nature for the sustaiability of life of organisms

e.g.: forest resources, water resources, land resources, mineral resources, energy resources, food resources

→ Forest Resources

1/3 of world geographical land space is occupied

by forests.

* forests are one of the backbone for each and every country annual income.

- * Now a days the part of eco-tourism develops and plays an important role in development aspects
- * 50-60% of forest resources are already depleted because of population and human needs

→ uses of forests:

Direct uses:

- * food
- * wood & timber
- * medicinal plants
- * Rubber & gum
- * raw materials for industries
- * paper & pulp
- * natural habitat for wild life

Indirect uses:

- * regulates hydrological cycle
- * produce O₂
- * reduces CO₂
- * reduce soil erosion
- * reduce air pollution
- * reduce noise pollution
- * reduce radioactive pollution
- * protects fertility and moisture of soil.

Causes:

of deforestation:

- causes:
of deforestation:
 - i) Natural forest fires
 - ii) Natural disasters like Tsunamis etc
 - iii) Manmade causes:
 - i) shifting cultivation
 - ii) utilization of forest land to agriculture.
 - iii) urbanization.
 - iv) Industrialization
 - v) construction of dams
 - vi) Mining
 - vii) demand for firewood

Deforestation:

- * decrease forest cover by cutting of trees.
- * 40-60% of world's forest lands are deforested because

of various reasons

over exploitation of forests:

- * over exploitation of forests: rapid deforestation because utilisation is more & available sources are very less i.e., 16% of world population pressure 19% of world cattle population present, but

Effects of deforestation:

- * effects wildlife
- * increases endangered & extinct organisms

- * effects annual income

India consists only 1% of world's forest cover. India known as over exploitation of forests.

* area increased
increased
increased
increased

increases rainfall percentage [hydrological cycle]

- * increases intensity of floods

- * increases siltation of rivers

- * increase soil erosion

- * effects climatic conditions.

→ Control measures of deforestation:

- * create awareness among tribal people and it reduces shifting cultivation
- * reduce urbanization by increasing facilities in rural areas
- * Re-use remote sensing, GIS and GPS to identify exact position of mine by reducing unnecessary mining activities
- * use LPG & natural gas instead of fire for cooking.
- * increase forest cover by massive plantation
- * increase forest cover for agriculture
- * Don't encourage forest lands for agriculture

Afforestation: increasing forest cover by massive plantation.

Afforestation is classified into:

i) Recreation forestry:

It is most successful because we can convert the deforested land into a complete forest

ii) Agroforestry:

→ no rain & moisture, fertility identifies barren agricultural lands and converts to forest lands to increase the forest cover

iii) Social forestry:

It is most difficult among the three. It is done by increasing water resources and providing them to the barren lands. Then the barren lands are converted to forest cover by the increase of forest cover & water resources, fertility

→ Chipko movement:

under the leadership of the famous environmentalist Sunderlal Bahuguna, in 1975, women in the Rupla

15/12/17:

~~Water resources:~~

region of Tehri Garhwal launched a chipko-like movement to save trees on the hills, above an altitude of 1000m. The women tied a sacred thread around 1000 trees, marked for cutting.

- * In the chipko movement, women by hugging trees that were marked for felling, offered themselves to the axe instead.
- * they said, "Axe us, not the trees". They felt the heartbeats of the trees.

- * It took 800 days, but the message was taken even to remote villages.

- * The chipko movement brought unprecedented energy and direction to the issue of environment.

- * It spawned similar movements in a number of places such as the appiko movement in Karnataka, Narmada Bachao Andolan, Gujarat, and the chikka lake agitation in Orissa.

Advantages & disadvantages of dams:

- * Dams construction has equal advantages and disadvantages

- * advantages are long term uses
- * disadvantages are immediate effects.

→ Advantages:

- i) Irrigation purpose:
we can use dam water throughout the year without any suffocation.

ii) domestic purpose:

- dam water can be used for domestic purpose like drinking, washing clothes & utensils, bathing.

iii) Hydroelectrical power project:

- every dam is a hydroelectrical power project and generates electricity and it is a second place in India for electricity generation.

increases
dam const
navigation

→ increases navigation facilities:

dam construction increases depth and the navigational facilities increases gradually.

→ increases eco-tourism:

dams can attract tourists that increases annual income of the country

, increases fishing activities

Disadvantages:

Deforestation:

most of dams are constructed in forest region.

it occupies more space & causes deforestation

effects tribal people by rehabilitation:

reduces agricultural lands :

construction of dams occupy more agricultural land.

ex: polavaram project

increases siltation of rivers.

increases aquatic weeds & decreases quality of water

(vi) increases the intensity of earth plants quakes by applying more pressure because of more weight

(vii) impacts earth rotation.

(viii) changes micro-climate of the region:

It increases water droplets & humidity depending on the region, it can have positive as well as negative impacts on the climate.

→ water conflicts:

* Krishna conflict

* Kaveri conflict

→ sources of water:

* surface water (rivers, lakes, canals)

* ground water (wells, bore)

* rain water

→ effects associated with surface water:

(i) floods: the presence of huge amount of water

for the particular period of time that what cannot be handled by drainage facilities of the region.

floods are classified into three types:

- i) fluvial floods
- ii) river floods
- iii) coastal floods

fluvial floods: these floods occur due to sudden & heavy rainfall and also due to dam failures

river floods: these floods are occurred due to heavy flow and weak embankment areas of the river.

coastal floods: these floods occur in coastal regions because of cyclones, hurricanes and tsunamis.

(iii) droughts:

It is a condition where the region is suffered from severe deficiency of water resources.

Droughts are classified into three types:

- i) meteorological droughts
- ii) hydrological droughts
- iii) agricultural droughts

Meteorological droughts:

These occur due to lack of rainfall where the regions are vastly depends on rainfall percentage.

hydrological droughts:

These droughts occur due to lack of surface water flow where the regions vastly depends on

agricultural droughts:

These occur due to lack of moisture content in the agricultural lands. It effects food production

→ Effects of over-utilization of ground water:

* effects water table of the region by affecting

surface water

* causes land subsidence.

land subsidence: due to over-pumping / over-utilization of oil & water, gaps are formed below rock layers. To fulfill that gap, the earth will

fact this phenomenon is land subsidence. It affects pipe lines and causes cracks to the building.

- * Increases power consumption

- * Increases the salts concentration of the remaining water.

* effects surface water flow

lowering of water table: Excessive water extraction causes a sharp decline in water table resulting in loss of vegetation and wildlife habitat.

Increased power costs:

due to increase in depth of the available groundwater, the water must be lifted higher to reach the land surface. As the lift distance increases, the energy required to drive the pump also increases. Thus, power costs increase as ground water levels decline.

Increased salt content:

extraction due to increase in depth of the available groundwater increases the concentration of salts in it, making the water unsuitable for drinking.

reduced surface water flow: Groundwater pumping alters the flow between underground water and a stream, lake or, wetland by intercepting groundwater flow that discharges into the surface-water body.

→ food resources:

Sources of food:

- * Agricultural products
- * forest products
- * aquatic organisms
- * livestock & fish

→ Food problems:

- * undernutrition & malnutrition
- * effects of chemical pesticides & fertilizers
- * poor irrigation facilities
- * blackmarketing
- * insufficient production

→ undernutrition & malnutrition: Both of them are global problems. People become less productive but may not die because of these.

→ insufficient production: Today, many countries are

facing acute problems of food shortage and starvation.

→ Lack of irrigation facility: scarcity of water in some area and improper irrigation techniques impede production of food grains.

→ Hoarding & black marketing: Malpractices such as hoarding and black marketing create artificial scarcity of food and cause world food problems.

→ Effects of chemical fertilizers & pesticides:

excessive use of chemical fertilizers leads to loss of soil fertility and degrades soil quality.

→ Green Revolution: (M.S. Swaminathan)

Increase in population increases food demand, but we have limited agricultural lands. To meet the food demand with those limited agricultural lands, some of the modifications brought into agriculture

(i) genetically modified seeds

(ii) mixed crops

(iii) decrease the life span of crop

(iv) increase in chemical pesticides & fertilizers.

this total phenomenon is called Green Revolution.

→ Limitation of Green Revolution:

chemical pesticides and fertilizers effects the human beings and spreads diseases.

→ Biomagnification / Bioaccumulation:

Increase in concentration of chemicals when it transfers from one trophic level to another trophic level through a food chain is called as Biomagnification. It is one of the property of chemicals.

Agricultural land → rain → rivers → small fish →

large fish → Birds / human beings.

→ Biomagnification of DDT (Dichloro Diphenyl Trichloro ethane):

* DDT is once thought to be harmless, but eventually people found out it has the potential to be quite harmful.

→ Effects of chemical pesticides and fertilizers:

- * excessive utilization of chemical pesticides causes biomagnification
 - * excessive utilization of chemical fertilizers causes eutrophication.
- Eutrophication: excessive fertilizers from agricultural fields & disposal of garbage into water bodies leads to eutrophication. excess fertilizers and waste products increases bacterial content in water. especially green algae cause green colour & forms green colour patches that increases aquatic weeds & floating plants. this phenomenon is known as eutrophication.
- Effects of eutrophication:
- * decrease dissolved O₂ %
 - * reduces photosynthetic rate.
 - * increases water born diseases

* effects aquatic organisms

- excessive pesticides and fertilizers remains in soil & causes soil pollution.
- * excessive pesticides & fertilizers enters into food products, decrease the quality of food and affects human beings.

- * they effect non-targeted organisms like earth worms, frogs, birds, flies, snakes etc.
- * they decrease life span of human beings and also causes throat diseases and leads to cancer.

→ factors causing world food problems:

(i) Geographical condition:

impacts agricultural production like cyclones, floods, land slides, volcanic eruption & insufficient rain etc

(ii) Population growth:

Increase in world population gradually increases food problems.

* In India we have:
i) iron, aluminium, ga

* Non-Metallic:

(iii) improper distribution system.

(iv) inadequate rainfall

(v) poor quality of soil

→ improper distribution system: starvation and malnutrition occur because the available food is not equally distributed.

→ poor quality of soil:

Infertile soil is not productive and hence causes a decline in food production.

→ Inadequate rainfall: sometimes, crop failure takes place due to failure of monsoons and other vagaries of weather and climate.

→ organic farming:

- * It discourages use of chemical pesticides & fertilizers
- * It consists of natural methods instead of chemicals
- * It is difficult so that the reason why they are costly and are also produced in less amount.

→ water logging & salinity:

* water absorbing & holding capacity of soil is known as water logging.

* sandy soils have poor water logging capacity.
* excessive water-logging leads to infertility of soil because, presence of more water in soil surface for long period of time and it evaporates along with nutrients in the soil, it forms a slight white colour layer on the top of the soil which leads to infertility of soil. This total phenomenon is known as salinity of soil.

11/12/17:

Minerals

→ Renewable Resources:

→ Types of Minerals: Minerals are classified into three types

(i) Metallic minerals

(ii) Non-Metallic minerals

(iii) fuel minerals

→ Metallic minerals:

* These are associated with their ores and are obtained through chemical process

portunity
capacity
value

We are unable to use these in their natural occurring state.

ex: iron, aluminium, gold etc.

* In India we have 11 metallic mineral ores

→ Non-Metallic minerals:

* these minerals are used in their natural occurring state with some modification in sizes & states.

ex: diamond, marble, limestone, graphite etc

* world wide 53 non-metallic mineral resources are there.

→ Fuel Minerals:

* These are used as fuel

ex: petroleum and coal

→ Effects of over-extraction of mines: / Mining effects:

* deforestation: Most of mineral resources are present under forest cover & causes deforestation.

* ground water contamination:

Mining activities disturbs the inner layers of earthcrust and causes ground water pollution.

* increases intensity of earthquakes:

Mining activities disturbs the inner layers of earthcrust and causes intensity of earthquakes.

* causes air pollution:

Mining releases suspended particulate matter (SPM) metal particles, toxic gases, ash to the atmosphere and causes air pollution.

* causes noise pollution:

Mining activities produce more noise 100-150 decibels especially from the blasts, explosions which are used for mining.

* causes surface water pollution:

Mining activities produce waste water and the dust particles mixed into nearby water bodies and pollutes the water.

* Effects would be:

mining activities in forest regions affects the birds and animals and also effects tribal people by rehabilitation.

* Mineral resources are all non-renewable

resources. over-utilization impacts the future generations

→ Energy Resources: They are two types:

(i) Renewable Resources

(ii) Non-Renewable Resources

Renewable Resources: These resources are vastly

available in nature. whatever the % we use,

they will be regenerated.

ex: solar energy, wind energy, tidal energy.

geo-thermal energy, biomass - based energy, hydro

thermal energy

→ solar energy: The heat energy generated from

solar radiation by using solar cell/ panel.

→ solar cell:

An electronic device which converts heat energy from solar-radiation into electrical energy.

→ Applications of solar energy:

* solar water heaters

* solar calculators

→ hydro-thermal energy:
* every dam is an hydro-

* solar watches

electrical power project that produces electricity by

* solar inverters.

utilising turbines.

* solar vehicles

* solar motors

* In India hydro thermal energy is 2nd source in

* solar rice cookers

production of electricity after thermal power plants & produces upto 90% of electric

* solar panels

→ Advantages of solar energy:

* It is renewable energy resource

* availability percentage is more

→ disadvantages of solar energy:

* initial cost of the devices are very high.

* storage capabilities are very low.

* does not work properly on rainy & cloudy days

wind energy:

- * the energy generated from wind flow by constructing wind mills is known as wind energy.
- * the avg wind speed required to construct wind mill is 10-15 Kmph.
- * the avg cost of one unit electricity by wind mill is 4-5 Rs/- and it is only 1-1.5 Rs/- by thermal power plant.
- * Australia and Germany are the top countries in the utilisation of wind energy and in India Tamilnadu is the top most state.

Tidal energy:

- * the energy generated from tides by constructing tidal paths or by arranging turbines in b/w high and low tides.
- * the availability of tidal energy is more but the efficiency is low.

* turbines are frequently damaged because of salt water.

→ Geothermal Energy:

- * the energy generated from hot gases present in the earth crust is geothermal energy
- * It is vastly used in industrial activities especially for heating

→ Biomass-based energy:

- * the energy generated by burning biomass (dry waste) is biomass-based energy
- * In India, in Durgapur, ministry of Mechanical engineering established a biomass based electricity generation plant. It generates 5kW of electricity by burning 500kg of completely dry waste.

→ Non-Renewable Resources:

- These resources are limited in the earth crust. Once we use, they are exhausted and cannot be regenerated

ex: coal, petroleum, all mineral and metal ores

→ Coal: It is also called as black gold.

- * generally used as essential raw material in thermal power plants

- * It is rich content of carbon and sulphur

- * It produces instant amount of energy in a very less span of time

- * It is non-renewable energy resource

- * vast utilization of coal effects future generations

- * burning of coal releases oxide of carbon and

- oxide of sulphur and causes pollution to the environment

→ Petroleum:

- * The best efficient fuel

- * The byproducts of petroleum are petrol, diesel, kerosene, crude oil etc.

- * petroleum is non-renewable energy resource.

- * It causes air, water and land pollution.

* burning of petroleum releases CO, CO₂, SO_x, NO_x etc.

* vast utilisation of petroleum affects future generation.

→ Mineral Resources: They are of three categories

(i) Metalllic minerals: These minerals are associated with their ores. The ores are mined and pure metals are obtained through chemical process.

ex: iron ore, lead, zinc, copper, manganese etc

(ii) Non-metalllic minerals: These minerals are moulded after mining and given different shapes and sizes. These are used in their naturally occurring state

ex: diamond, marble, granite, salt & mica.

(iii) Fuel minerals: The minerals that are utilized as fuel are known as fuel minerals.

ex: coal, petroleum, natural gas etc.

→ Effects of over-exploitation of mineral Resources:

- * It leads to soil erosion and reduces soil fertility.

- * It leads to deforestation and damages features of earth's surface.

- * It causes air, water and land pollution.

Sustainable
Proper utilisation
of resources in

Sustainable Development:

- * Proper utilisation of non-renewable energy resources in present days and make it available for future generations is known as sustainable development.
- * we can achieve sustainable development through 5R-technology. They are Recycle, Reduce, Reuse, Repair and Refuse.
- * encourage recycling of resources and reuse paper.
- * use alternative energy sources such as solar energy for domestic heating.
- * should reduce deforestation as it leads to severe environmental impacts.
- * ensure better use and maintenance of non-renewable resource.
- * prefer usage of renewable and non-conventional energy sources.

→ Land Resources:

- * Land used patterns: Land is useful in various ways, they are forest lands, grasslands, mountain lands, desert lands, manure lands.
- Based on rainfall, geographical zones are classified into three types:
 - i) arid zones: receives more than 100 cms rainfall annually.
 - ii) semi-Arid zones: receives 50-100 cms annual rainfall.
 - iii) dry zones: receives less than 50 cms annual rainfall.

→ Soil Erosion:

- Run off top soil along with flood water or heavy rains and winds is known as soil erosion.
- Land degradation:
decrease in fertility of land due to various natural or human activities is known as land degradation.

→ Desertification:

Expansion of deserts that is conversion of fertile lands into infertile lands is known as desertification.

→ causes:

* Natural causes :

- i) Natural forest fires.
- ii) floods
- iii) Natural disasters like cyclones, earthquakes, land slides etc

* Man made causes:

i) over irrigation - It converts agricultural lands into barren lands by decreasing the fertility of land

ii) disposal of garbage - the toxic chemicals deplete from soil from garbage, especially in rainy season decreases the quality of soil.

iii) overgrazing - one of the causes of desertification.

- iv) Deforestation:
It increases desertification and reduces fertility
- v) Mining:
Mining effects the texture of the soil and increases soil erosion.
- vi) Industrialisation & urbanisation:
they decreases rainwater depletion capability
- vii) overgrazing by cattle:

Overgrazing effects the soil because of the presence of a group of animals in the same area for a long period of time which effects the

length of soil, productivity of soil
→ effects:
* reduces agricultural

55

strength of soil, increase soil erosion and decrease productivity of plant.

→ Effects:

- * reduces agricultural lands, causes world food problems
- * increase the demand of chemical fertilizers, decreases the quality of food and effects human beings and reduces forest cover
- * effects wild animals
- * soil erosion causes siltation of water, decreases the water quality.

→ Control Methods:

- * plantation of more and more trees
- * increases afforestation activities
- * construction of small check dams
- * increase rain-water harvesting system
- * watering to agricultural lands at early mornings and evening hours
- * use of drip irrigation and sprinklers.

* Reduce mining activities
* use land fill or incineration instead of open burning

* increase municipal - solid waste management facilities and don't encourage open dumping

→ Water conflicts: - Indispensability of water and its unequal distribution in different regions has often lead to inter-

i) Kaveri conflict
ii) Krishna conflict. State vs. International disputes.

→ Kaveri conflict:

water have been largely affecting our frames and also shocking our

* the Kaveri river content b/w Tamilnadu and Karnataka and the problem is almost hundred years old.

* the consumption is more in Tamil nadu than Karnataka where the catchment area is more rocky.

* on june 2 1990, the Kaveri water dispute tribunal was set up which through an interim award directed Karnataka to ensure that 205 TMCF of

Water was made available in Tamil nadus Mettur

dam every year till a settlement is reached.

* proper selection of crop varieties, optimum use of water, better rationing, national sharing patterns, and pricing of water are suggested as some measures to solve the problems.

→ Krishna conflict:

* This dispute was there since the colonial times and the states are sharing the water resources based on some agreements

* The 1872 agreement between the Mysore princely state and the Madras presidency and the 1933 agreement between the Hyderabad princely state and the Madras presidency.

* Before the establishment of KNDT (Krishna water dispute tribunal) the above agreements

were in practice.

* After the establishment of KNDT, the members didn't say that agreements are not valid, instead they changed them in order to give protection to already existing irrigation and multipurpose projects in Karnataka and Andhra Pradesh.

* These modifications to the agreements are accepted by the parties in the state and central

Ecology: A
with the life

* Father of ecology

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Unit-II: Ecology & Biodiversity:

members

→ **Ecology:** A relatively new science which deals with the life of organisms is called ecology.

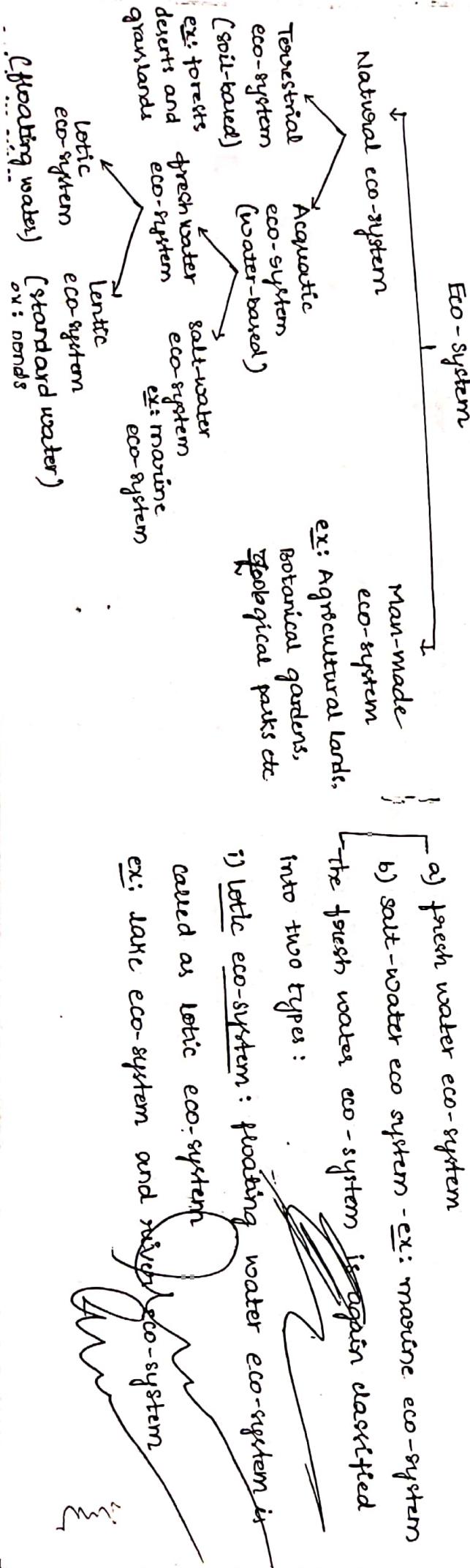
* Father of ecology: Odum

→ **Eco-system:** A system resulting from the integration of living & non-living components of the environment ex: forests, grasslands, deserts, ponds, lakes and ocean eco-system.

ocean eco-system.

* A.G.Tansley introduced the term eco-system in 1935

→ Classification of Eco-system:



the eco-system is classified into two - types:

- Natural eco-system
- Man-made eco-system

→ Natural eco-system:
the natural eco-system is classified into two types

i) Terrestrial eco-system:
soil-based eco system is called as terrestrial eco-system.

ex: forests, deserts and grasslands

ii) Aquatic eco-system:

water based eco-system is called as aquatic eco-system and it is divided into two types. they are

a) fresh water eco-system

b) salt-water eco system - ex: marine eco-system
- the fresh water eco-system is again classified into two types:

i) Lotic eco-system: floating water eco-system is called as lotic eco-system
ex: lake eco-system and river eco-system

N-HC
N-LC

ii) lentic eco-system:

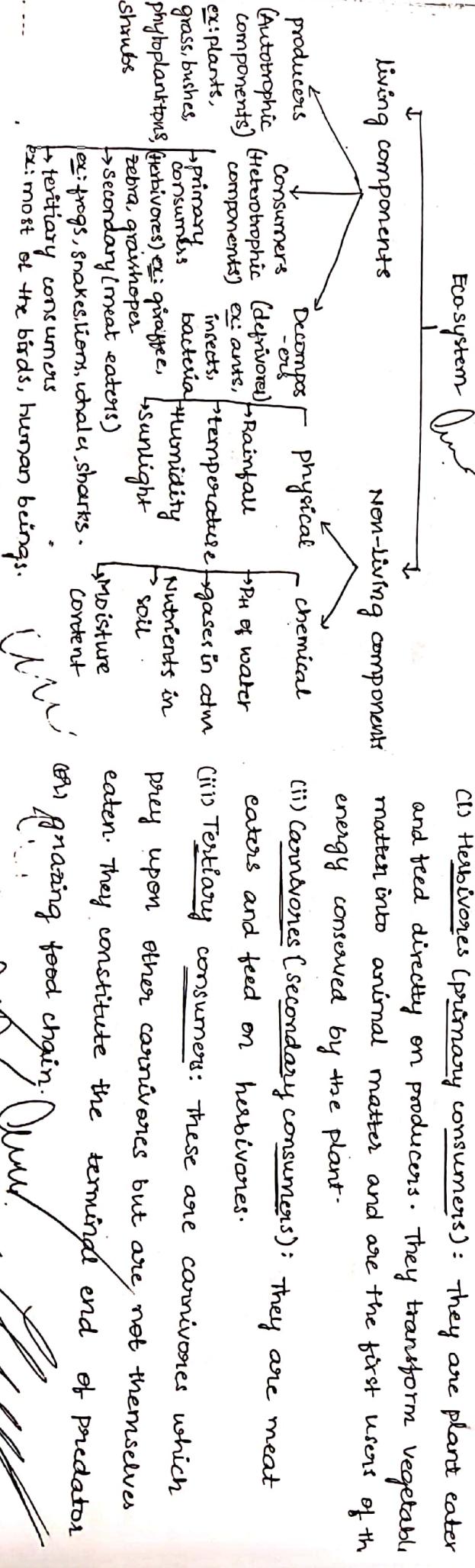
The standard water eco-system is called as the lentic eco-system.

ex: pond eco-system.

→ man-made ecosystem:

The human made (or) artificial (or) human engineered eco-systems are called as man-made ecosystems.
ex: Agricultural lands, Botanical gardens and zoological parks etc.

→ structure of ecosystem: The structure of ecosystem is as follows:



the Eco-system is classified into two types:

(i) living (or) Biotic components

$\frac{1}{2} \frac{1}{3} \frac{1}{5} \frac{1}{8}$

$\frac{1}{5} \frac{1}{$

Decomposers: organisms that feed on dead and decaying matter and convert the organic materials into inorganic materials are called decomposers. They are the recycling agents of nature.

→ Abiotic or Non-living components are classified into physical factors and chemical factors.

Physical factors

- * sunlight
- * temperature
- * Precipitation
- * nature of soil
- * fire
- * water currents

Chemical factors

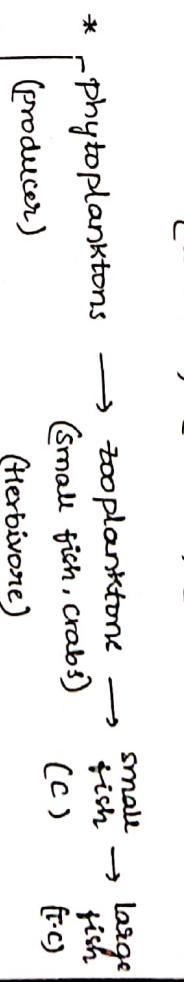
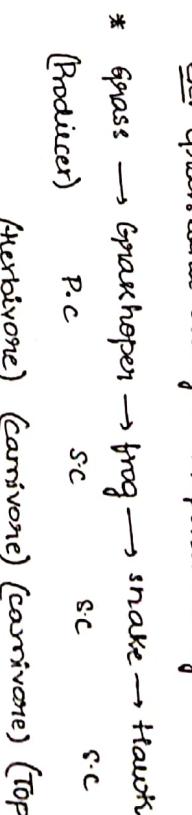
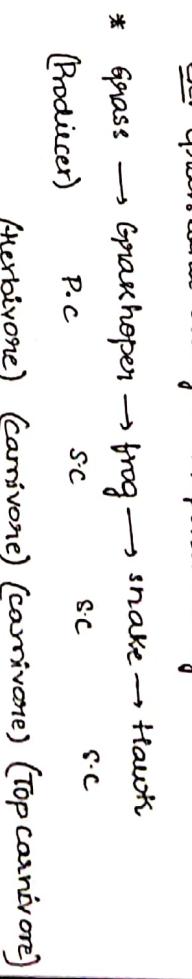
- * percentage of water & air in soil
- * salinity of water
- * oxygen dissolved in water
- * Nutrients present in soil

hillig:

Functions of eco-system:

→ Food chain: the transfer of food energy from one trophic level to another trophic level through a series of organisms by repeated eating or being eaten up. in an eco-system

ex: Grass land eco-system, pond eco-system



* Physical factors: sunlight and shade, intensity of solar flux, length of day, average temperature, maximum & minimum temperatures, annual rainfall, wind, latitude & altitude, soil type, water availability and water currents are some of the physical features which have a strong influence on an eco-system

* Chemical factors: Availability of major essential nutrients such as carbon, nitrogen, phosphorous, potassium, hydrogen, oxygen, sulphur, levels of toxic substances, salts causing salinity are largely influencing the functions of an ecosystem.

the interlinking food chains in this food web are:

* Grass → G.H → frog → snake → hawk

* Grass → mouse → snake → hawk

* Grass → caterpillar → frog → hawk

* Grass → rabbit → snake → hawk

* Grass → mouse → hawk

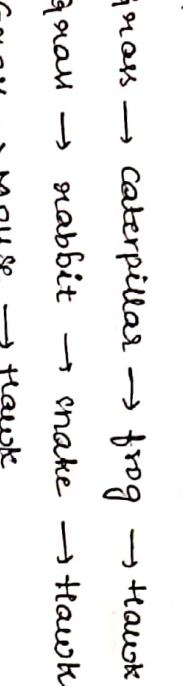
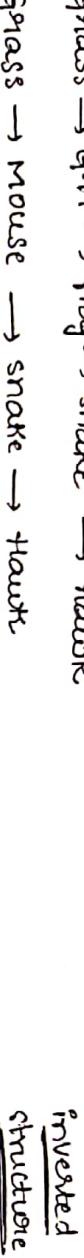
* Grass → caterpillar → snake → hawk

* Grass → rabbit → hawk

* Grass → G.H → snake → hawk

→ Ecological pyramids:

the graphical representation of different trophic levels that is, producers are at the base of the pyramid and ~~go on~~ ^{go on} grazing through herbivores, carnivores and top carnivores is known as ecological pyramid.



upright structure:

producers occupies huge space and gradually decreases to the top is known as upright structure.

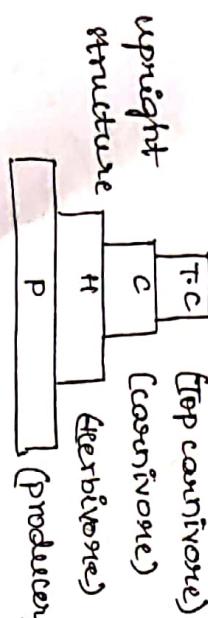
Inverted structure:

producers occupies less space and gradually increases to the top is known as inverted structure

Spindle structure:

neither upright nor inverted is known as spindle structure. It is not a standard structure like the inverted and upright structures.

→ Types of ecological pyramids: classified into three types. They are:



* pyramid of numbers

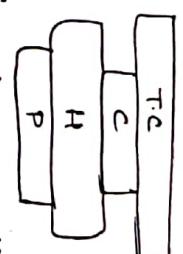
* pyramid of biomass

* pyramid of energy

- * ecological pyramids are in three shapes. they are upright structure, inverted structure and spindle

structure.

spindle structure

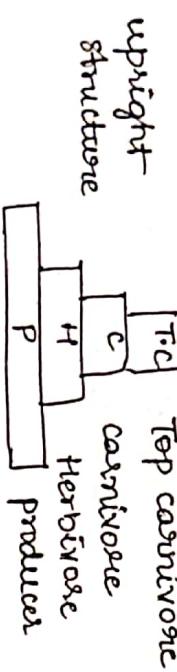


These pyramids total no.

Pyramid of numbers:

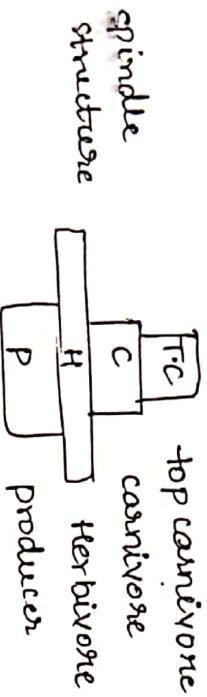
These pyramids are constructed on the basis of total no. of individual organisms at each trophic level

ex-1: grassland eco-system.



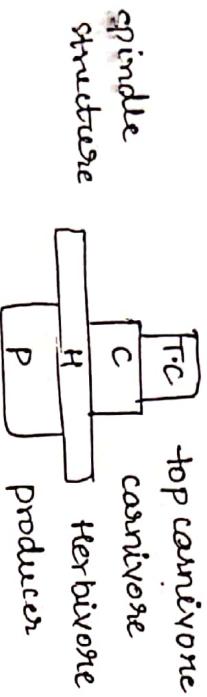
Pyramid of numbers in grassland eco-system is in upright structure.

ex-2: forest eco-system



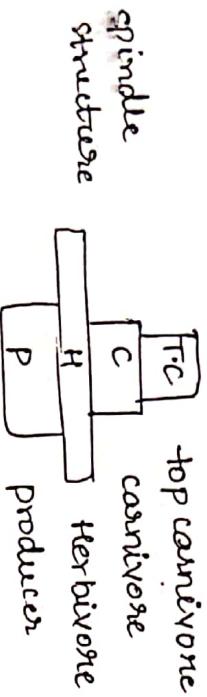
Pyramid of numbers in forest eco-system is in upright structure.

ex-3: forest eco-system



Pyramid of numbers in forest eco-system is in upright structure.

spindle structure

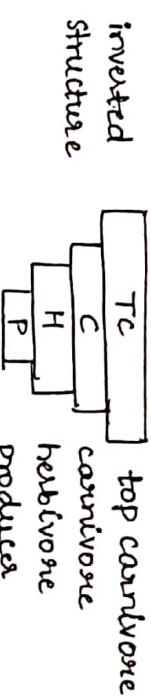


Pyramid of numbers in forest eco-system is in spindle structure.

→ Pyramid of biomass :

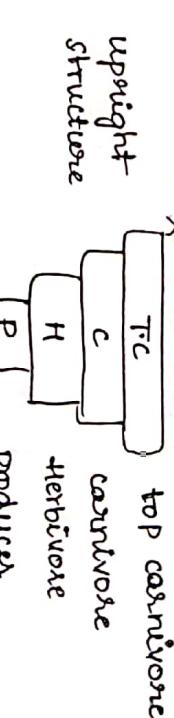
Pyramid of biomass in grassland eco-system is in inverted structure.

ex-1: pond eco-system



Pyramid of biomass in pond eco-system is in inverted structure.

ex-2: forest eco-system



Pyramid of biomass in forest eco-system is in inverted structure.

→ pyramid of energy:

These pyramids are constructed on the basis of total amount of energy present produced at each trophic level

ex-1: desert eco-system, ocean eco-system

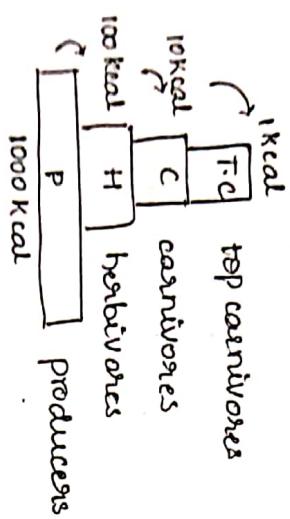


These pyramids are constructed on the basis of total biomass at each trophic level

- * Pyramid of energy in each and every eco-system
- * is in upright structure only.

Losses:

- * The upright structure is because there is an energy loss at each trophic level for respiration, temperature, reproduction, growth and food production. The remaining energy only transfers to the next trophic level.



* secondary succession:

It refers to a succession in which an already existing dominant plant community is replaced by another plant community.

→ process of ecological succession:

- * Nudation
- * Invasion
- * competition
- * Reaction
- * Migration
- * Ecesis (Establishment)
- * Aggregation

- Ecological Succession: The occurrence of relatively different sequence of communities over a period of time in the same area is known as ecological succession. It is of two types - They are

→ Nudation:

The process of creation of a bare area devoid of any plant or animal population is called Nudation. It may be caused by humans for industrial and agricultural purposes, or by climatic as well as biotic disturbances like floods, landslides etc.

- (i) primary ecological succession
- (ii) secondary ecological succession

Empty land → Ecosystem (primary ecological succession)

stabilized → destroyed
eco-system → empty land → Eco-system
(second) in adion, +
ecological species in
succession, species may

Invasion: The process of successful establishment of new species in the bare area is called invasion. The new species may reach the area from another area. Invasion is completed in the following three stages:

* Migration:

In the first stage of invasion, the seeds of the species reach the bare area. This process is known as migration and is generally brought about by agents such as air and water.

* Ecesis (Establishment):

The process of successful establishment of the species in an area as a result of the conditions prevailing there is known as ecisis.

* Aggregation: The members of the species increase in number and come close to each other. This is aggregation.

→ Competition: As the population of species increases, the availability of limited area for growth initiates

competition for food, water, space of the species

→ Stabilization:

After passing through all the stages discussed earlier, after passing through all the stages discussed earlier, the species completely establish themselves in the area and the ecosystem attains stability. This process is known as stabilization.

→ Energy flow in each and every eco-system is unidimensional

Definition: The transfer of food energy from one trophic level to another trophic level through a series of organisms in an eco-system is called energy flow. It is classified into three types:

(i) Unidirectional energy flow

(ii) Single channel energy flow

(iii) Double channel / Y-shaped energy flow

(i) Universal energy flow:

* We can observe these energy flows in the ecosystem commonly.

* In this, the energy transfers from producers to

herbivores, herbivores to carnivores, carnivores to

top carnivores

Producers → Herbivores → Carnivores → Top carnivores

(ii) Single channel energy flow:

* In this, the total energy flow starts from the "producers".

* In producer stage, some part of energy is lost to

heat, temperature, respiration and reproduction.

* Remaining energy transfers to herbivores

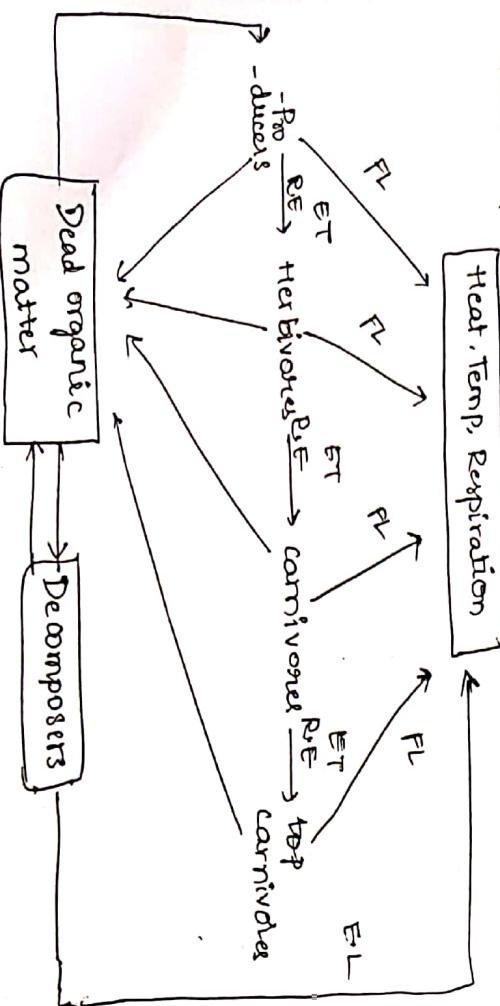
* In herbivores stage, some part of energy lost for heat, temp and respiration. Remaining energy transfer to carnivores

* In carnivore stage, some part of energy is lost for heat, temperature and respiration. Remaining energy transfers to top carnivores.

(iii) double channel energy flow Y-shaped.

* In this, energy starts from producers and as well as dead organic matter with the help of decomposers

* In producers stage, some part of energy is lost for heat, temperature & respiration.



→ 10% Rule:

* It is proposed by Lindman

* According to him 90% of total energy at each trophic level are lost for respiration, heat, temperature and reproduction activities.

* Remaining 10% of energy only transfers to the next trophic level

producers →	heat, temp, resp
herbivores →	10 kcal
carnivores →	10 kcal
top carnivores →	10 kcal

100 kcal 10 kcal 10 kcal 10 kcal

Factors of eco-system:

several types of biochemical processes take place in an ecosystem: the functions of ecosystem can be studied in

following forms.

* food chains and food webs

Energy flows

* mineral nutrient cycles

→ Food chains and food webs: The transfer of food energy from plants to organisms by repeated eating & being eaten up is referred as a food chain. In a food chain, each stage or transfer of food energy is known as

trophic level.

→ types of food chains:

* Grazing food chain

* detritus food chain

→ significance: food chains ~~not~~ are important for regulation of the environment

maintaining and regulating the population...
to maintain ecological balance.

different animals, and \rightarrow innum.
 \rightarrow feed webs: A feed web open several pathways for

the flow of food energy. A food web maintains stability of the ecosystem.

living organisms need food to grow and reproduce. Any food or element required for organisms to live, grow & reproduce is called nutrient. The cyclic movement of minerals from reservoirs to living components and back to reservoirs is called nutrient cycle.

Ecosystem	F	G	D	P	L	O
P	plants	grass	cactus shrub Opuntia		green algae, floating plants phytoplankton	
H	deer elephant	grazing animals, insects	camel	small fish	Molluscs emertacous	
C	snakes lizards	snakes lizards lizard jacket	insects lizards	large fish	sharks octopus	
O	humans, birds tiger	hawk, kites	reptiles	reptiles fish, turtles crabs	dolphins	
D	Arbus bacteria fungi	Nucor Rhizopus	Bacteria	Bacteria	Bacteria	Bacteria

→ Energy flow: the transfer of food energy from one troph.

→ Bio-geochemical cycles (Nutrients cycle):

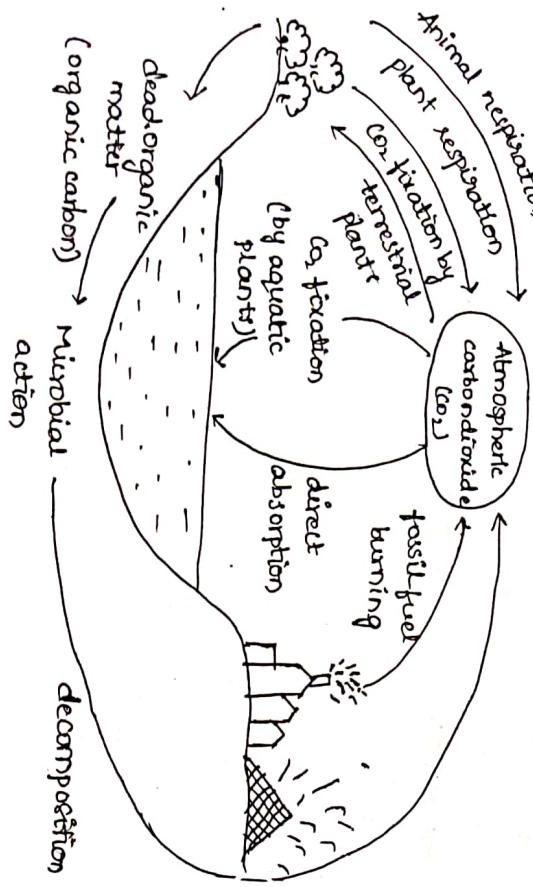
(i) Carbon cycle (water cycle)

(ii) nitrogen cycle

(iii) Sulphur cycle

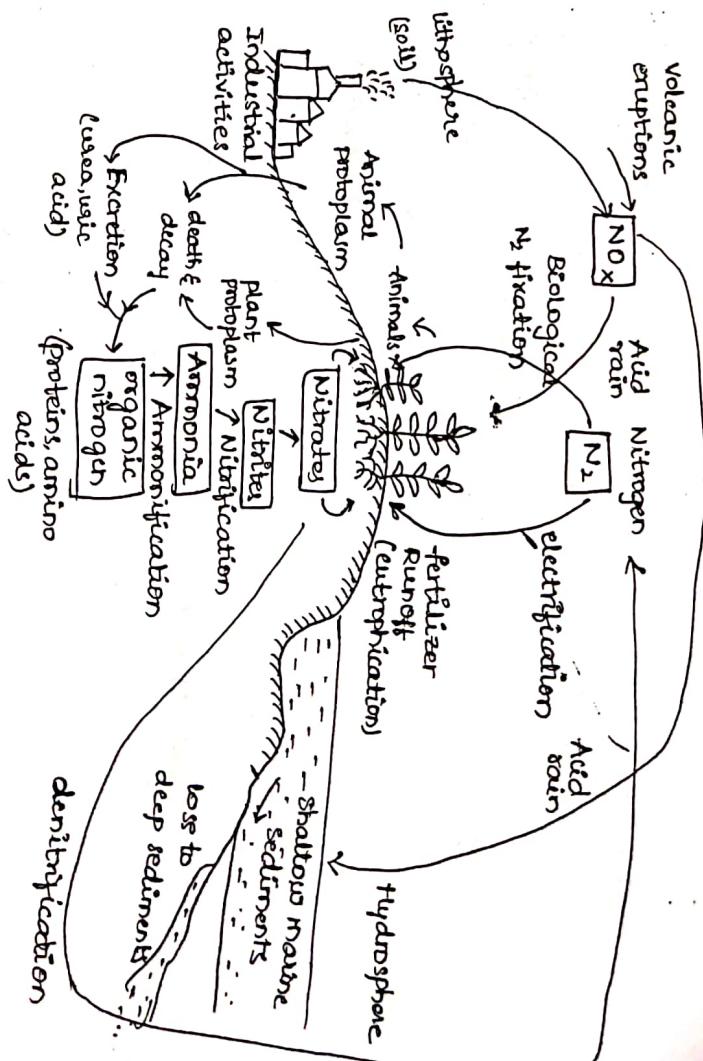
(iv) phosphorous cycle

→ carbon cycle:

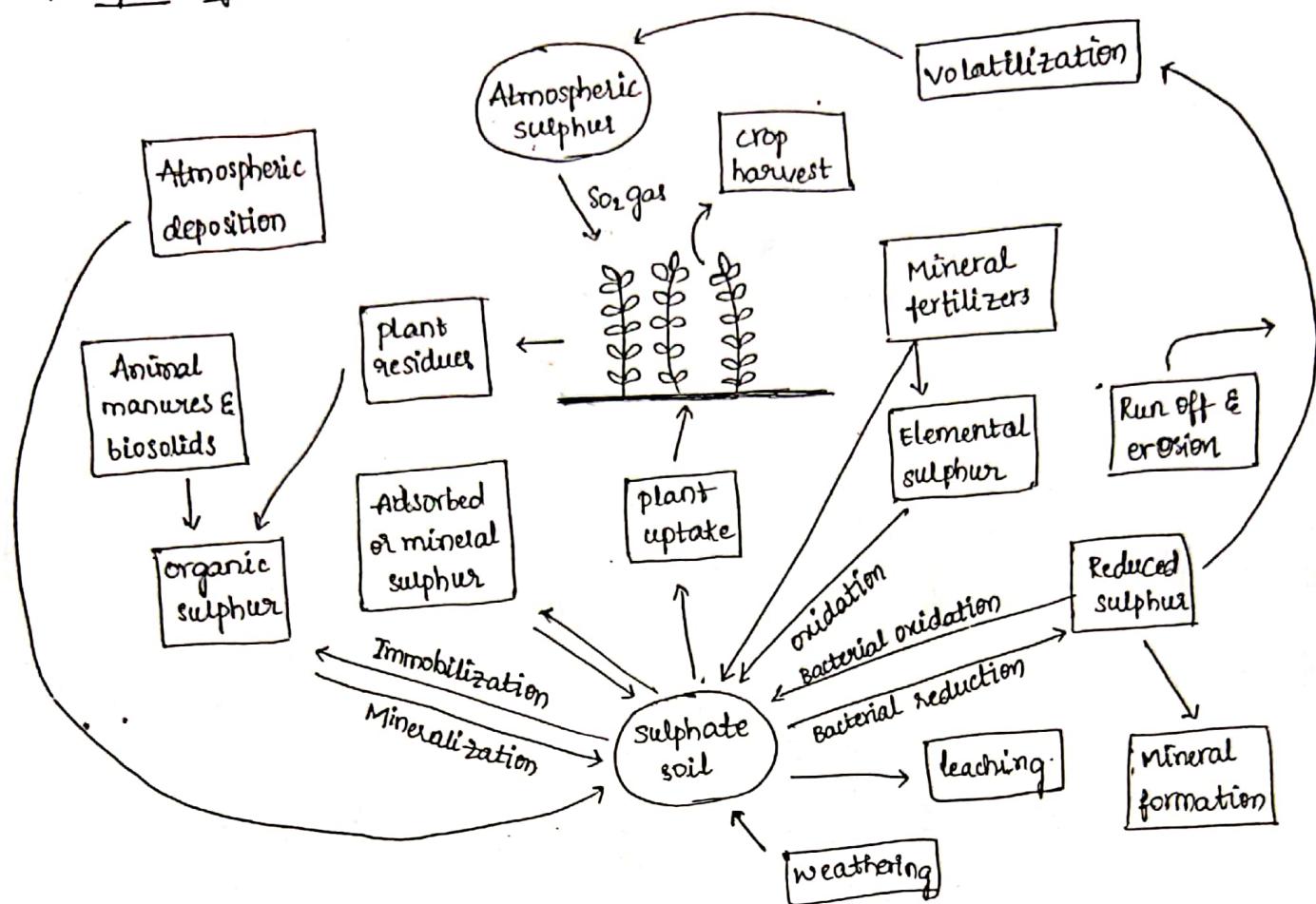


→ Nitrogen cycle:

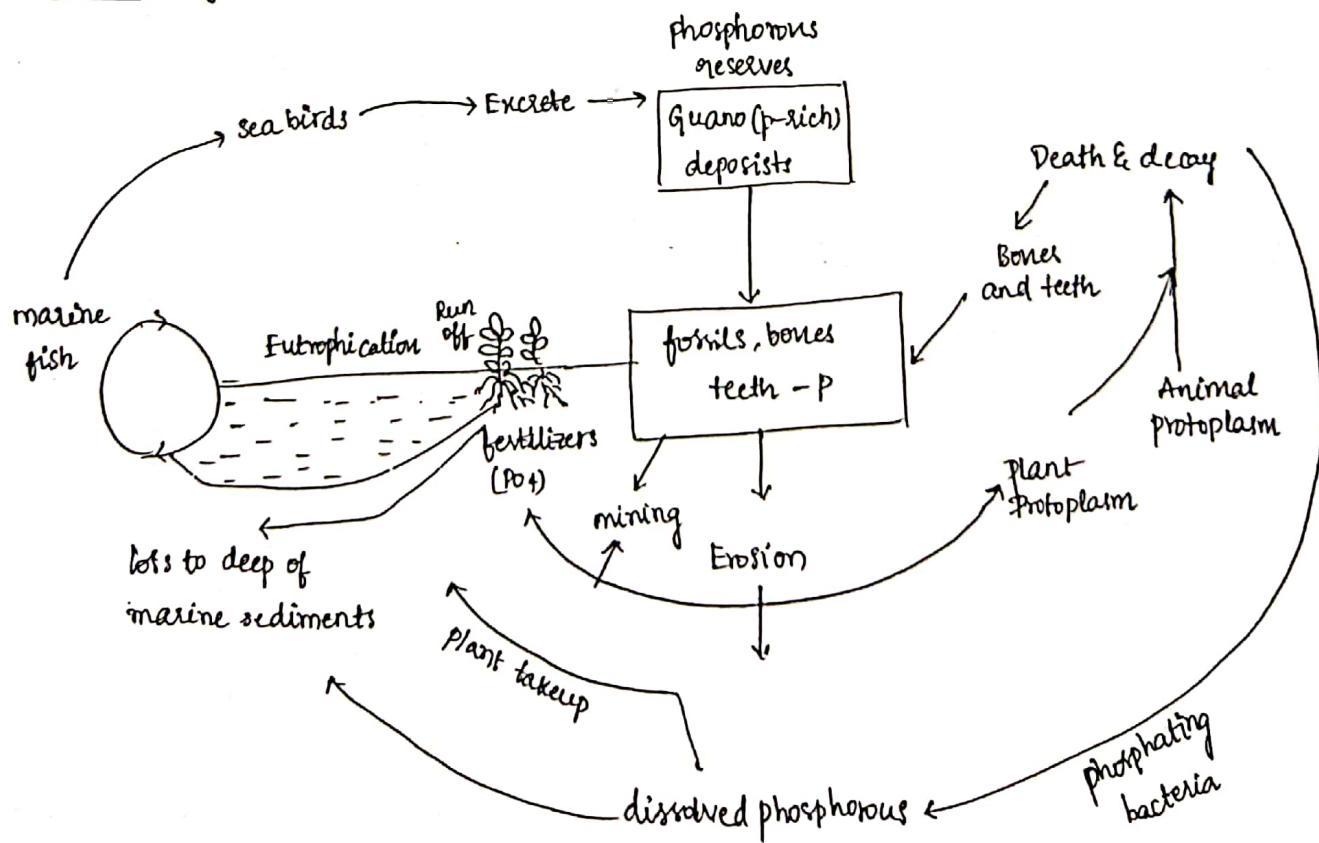
Atmosphere



→ Sulphur cycle:



→ phosphorous cycle:



Explain:

→ Types of forests:

- (i) tropical forest
- (ii) sub-tropical forest
- (iii) deciduous forest
- (iv) temperate forest
- (v) tropical deciduous forests
- (vi) evergreen forests
- (vii) rain forests
- (viii) mangrove forests
- (ix) temperate deciduous forests etc.

→ Types of grasslands:

- (i) tropical grasslands
- (ii) temperate grasslands
- (iii) polar grasslands

→ Types of deserts:

- (i) tropical deserts
- (ii) temperate deserts
- (iii) cold deserts

Types of lakes:

, oligotrophic lakes

Eutrophic lakes

, dystrophic lakes

(i) deserts salt lakes
(ii) Meromictic lakes
(iii) Artificial lakes

→ Explain about following eco-systems?

Introduction - 3 pts

→ types names -
structure of the eco-system with suitable examples
and explanation.

→ Estuaries are the regions where ~~near~~ the fresh water
and salt water meet

Biology:

→ Biodiversity: the word Bio means living organisms.
diversity means "variety & variability". Biodiversity
means the variety and variability among living
organisms ex: forests (\uparrow), deserts (\downarrow), agricultural land
(\downarrow)

→ Types of Biodiversity: It is classified into three types

- (i) Genetic diversity
- (ii) species diversity
- (iii) Eco-system diversity.

→ Genetic diversity: the variety & variability among
genes (or DNA) in a particular species is genetic diversity

numa
Species
the species
ex: plants

human beings, dodo

→ species diversity: the variety & variability among species in an eco-system is known as species diversity

ex: plants, shrubs, caterpillars, snakes, forests, grasslands

* generally we observe the species diversity in nature

→ eco-system diversity: the variety and variability among the eco-systems in a region is known as eco-system diversity

ex: India consists different types of forest, grassland, oceans, pond & desert eco-systems.

→ value of bio-diversity: value of biodiversity consist

productive value, ecological services, natural values and production values. they are further classified

as the following:

- * productive value
- * consumptive value
- * aesthetic value
- * optional value
- * ethical value
- * social value
- * ecological services

→ productive value: there are many products which are used by humans. so productive value increases ex: cinchona plant, penicillin, antidiotes from snake poison

→ consumptive value: there are many varieties to consume so, consumptive value increases in biodive-sity. ex: fuel, food, drugs, fibre etc

→ aesthetic value: biodiversity adds to the aesthetic value of the planet. each species and ecosystem adds to the richness and beauty of life on

ex: ecotourism, bird watching, wildlife, gardening etc of biodiversity that are presently unknown and need to be explored

ex: potential cure for aids or cancer existing within the depths of marine ecosystem (or) tropical rainforest

→ ethical value: each species is unique and has the right to exist while humans do not have the right to eliminate any. it is also known as existence value

ex: because of humans now, the "dodo" and the "passenger pigeon" are extinct.

→ Social values: there are the values associated with the social life, customs, religion and psycho-spiritual aspects of the people.

ex: many of the plants are considered holy and sacred in our country like tulsi, peepal, mango, lotus, Bael etc

→ Ecological services:

The Ecological services refer to the services provided by ecosystems like prevention of soil

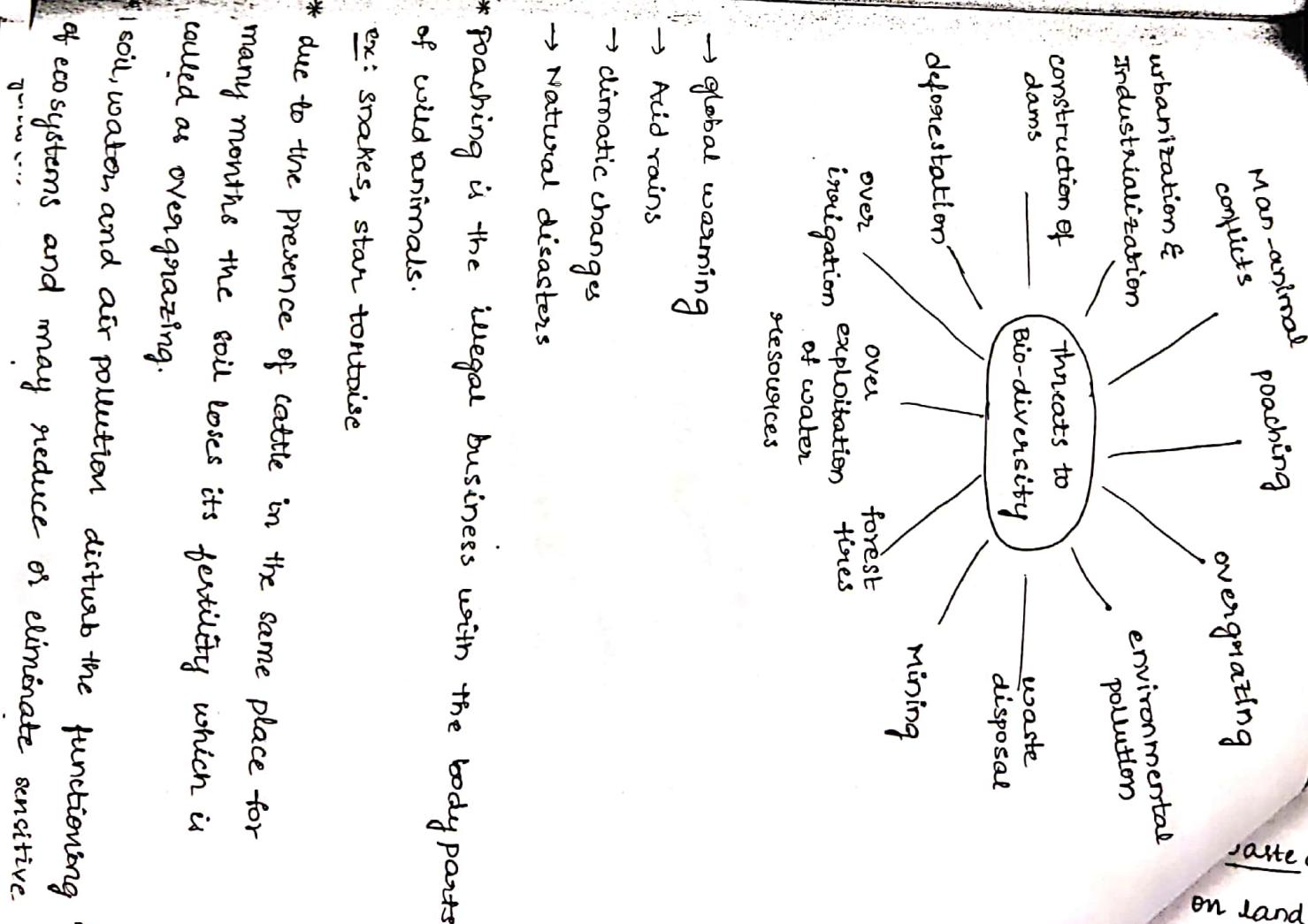
erosion, prevention of floods, maintenance of soil fertility, cycling of nutrients, fixation of nitrogen, cycling of water, their role as carbon sinks, pollutant absorption and reduction of the threat of global warming etc

solving:

→ Threats to biodiversity:

Biodiversity means variety and variability of species the various activities which directly or indirectly affects the organisms are considered as threats to biodiversity. some of the threats are:

(i) Urbanization



- * due to the presence of cattle in the same place for many months the soil loses its fertility which is called as overgrazing.
- * soil, water and air pollution disturb the functioning of ecosystems and may reduce or eliminate sensitive

is referred to as environmental pollution

waste disposal: dumping of nuclear and radioactive wastes on land or water kills plant and animal species and leads to their extinction

* Mining: mining activities results in air & noise pollution, deforestation and soil erosion which also leads to the pollution of water bodies with dangerous chemicals

* forest fires: forest fires due to natural or man-made seasons like lightning, human carelessness, volcanic eruption etc harms the biodiversity by killing various plants and animal species.

* over exploitation of water resources creates water scarcity and ultimately threatens the survival of aquatic species

* over irrigation ultimately threatens the biodiversity and leads to deforestation.

* industrialization, urbanization, construction of dams, over irrigation, mining and forest fires harm the biodiversity and directly or indirectly causes deforestation.

* man-animal conflicts is also a threat to biodiversity

In a village, the elephants attacked 6 people out of which 4 people are saved and the villagers killed 62 elephants in 2 days which made the elephants decrease in number.

→ Conservation of Biodiversity:

introduction: conservation of effected organisms especially endangered organisms from the external or internal threats with the help of science and technology is known as conservation of biodiversity.

It is classified into two types:

- i) In-situ conservation
- ii) Ex-situ conservation

↳ In-situ conservation: conservation of effected organism within their natural habitat without science and technology by reducing threats is known as in situ conservation.

ex: national parks, biosphere reserves, wild life sanctuaries

* In National parks, human beings are restricted and are only allowed with special permissions.

* hunting and deforestation is strictly prohibited

ex: grand canyon national park, Rajiv Gandhi national park, Jim Corbett national park, Sunderban national park

* In wild life sanctuaries, human beings are restricted but are allowed with special permissions.

* Hunting and deforestation in wild life sanctuaries is strictly prohibited.

ex: Hastinapur wildlife sanctuary, Narmada wildlife sanctuary, Bhairamgarh wildlife sanctuary

* In biosphere reserves, human beings are completely restricted and hunting, deforestation is prohibited

ex: Nilgiri Biosphere Reserve, Nardadevi Biosphere Reserve, Great Nicobar Biosphere Reserve.

In-situ conservation: conservation of affected organisms

outside their natural habitat with the help of

science and technology is known as ex-situ conservation
ex: seed / gene banks, tissue culture technology, Botanical

gardens, zoological parks, DNA technology.

* The seed / genebanks is a kind of ex-situ conservation

In this, the seeds / genes are stored in liquid nitrogen

at -48°C to increase the germination and also the

reproduction capabilities

* Botanical gardens are used for the conservation of rare and endangered plant species for study & research

of specific plant characters to promote sustainable development.

Ex: Tundikhon botanical garden, Hanging gardens, Empress

tissue culture technology refers to a special service used for asexual propagation in plants.

* DNA technology enables the whole DNA of a plant or animal cell or a part of it to be conserved. By the use of recombinant DNA, genes that are important can be isolated and used in other species which may have some form of genetic illness or discrepancy.

* Zoological parks (or) animals parks are those that provide facility in which animals are housed with endosures, displayed to the public and in which they may also breed.

Ex: National zoological park - Delhi, Rajiv Gandhi zoological park - Pune, Nehru zoological park - Hyderabad
→ hotspots of biodiversity:

Def: hotspots are the regions consists of high biodiversity value and maximum number of endemic and endangered organisms.

* World wide all hotspot regions are there.

* In India there are 2 Hotspot regions. They are western Ghats and Eastern Himalayas.

Endemic species: the organisms restricted to the particular zones can only survive in their natural environment are known as endemic species

ex: penguins

* Endangered species: the organisms which are facing threats and gradually decreases their count are known as endangered organisms

ex: elephants, tigers, sparrows etc.

* Extinct organisms: the organisms which are already disappeared from the earth's surface are extinct

ex: dinosaurs, dodo bird, elephant bird, tree man, mylacrines, passenger pigeon etc., sea steer cow

* edge by critically endangered organisms:

These are critically endangered, present in very few numbers which are ready to extinct. These species are in between endangered and extinct

ex: okapi, Amur leopard, red wolf, golden tabby tiger, philippine crocodile, pinta island tortoise

* Red data book:

The red data book consists of endangered, extinct and critically endangered species

1 * vulnerable species:

These species consists maximum value in the market for their body parts

ex: elephants, snakes, tigers

↳ Bio-geo graphical classification of India → 9, 10

↳ India as a megadiversity Nation → 34, 35, 36, 37 Ppt

↳ biodiversity at global level → 28, 29, 33

↳ biodiversity at National level → 29, 30

↳ biodiversity at local level → 32, Rajasthan (from 18)

1218:
↳ Biome: It is an ecological unit defined as various similar eco-systems throughout the world grouped together

ex: forest biome, desert biome etc.

→ India as a mega diversity Nation:

India is one of the 12 mega diversity countries in the world. The 12 mega diversity countries are

* Australia

* Brazil

* China

* Columbia

* Ecuador

* The United States

* India

* Indonesia

* Madagascar

* Mexico

* Peru

* The Democratic Republic of Congo

* The Ministry of Environment and Forests, Govt of India

records 4700 species of plants and 8100 species of animals i.e., 3% and 6.5% of the global flora and fauna.

Distribution of the species in some major groups of flora and fauna in India:

Plants

Number

Bacteria - 850

Fungi - 2300

Algae - 2500

Bryophytes - 2500

ex: Indian Monsoon rainy - - - " "

pteridophytes - 1022

gymnosperms - 64

Angiosperms - 15000

Animals Number

Lower Groups - 9919

Mollusca - 5042

Arthropoda - 54526

Plants - 2546

Amphibia - 428

Serpentes - 1228

Birds - 904

Mammals - 342

* Endemism - species which are restricted to a particular

area or known as endemic.

* about 62% of amphibians and 50% birds are endemic to India

* Western Ghats are the site of maximum endemism

* India is centre of origin: A large number of species are known to have originated in India.
ex: Indian Monsoon rainy - - - " "

nine

rich in "

* More than

nine diversities: 4500 km long Indian coastline is rich in mangroves, coral reefs etc

- * more than 300 species of corals of the world are found here

- * several species of sea grasses are found in India.

→ Biodiversity at global level:

- * roughly 1.8 million species are known till date
- * most of the world's bio-rich nations are in the developing nations
- * the majority of the countries capable of exploiting biodiversity are developed nations
- * international agreements - world heritage convention attempt to protect and support such areas
- * India is a signatory to the convention and has included areas covering manas on the border between Bhutan and India, Kaziranga in Assam, Nandadevi in the himalayas and the sundarbans in the ganges delta in west Bengal.

- * India is one of the 12 mega diversity countries in the world

They are Australia, Brazil, China, Columbia, Ecuador, the United States, India, Indonesia, Madagascar, Mexico, Peru and the Democratic Republic of Congo

→ Biodiversity at national level:

- * Every country is characterized by its own biodiversity depending upon its climate

- * India has rich biological diversity of flora and fauna
- * 6% of the global species are found in India
- * the total number of species found in India is 150,000

- * Out of a total of 25 biodiversity hotspots in the world, India possess 2, one in the eastern Himalaya and one in the western ghats.

→ Biodiversity at local level:

* It is of four types:

- * Point richness: It refers to the number of species that can be found at a single point in a given space.

- * Alpha richness: It refers to the number of species found in a small homogeneous area.

* Beta Richness: It refers to the rate of change in species composition across different habitats.

* Gamma Richness: It refers to the rate of change across large landscape.

Rajasthan: Rajasthan is a bio-diversity-rich state. It is divided into three biogeographical regions. They are:

(i) Desert Region:

- * It is an area of low rainfall & high temperature and is full of sand dunes.
- * the water is saline and sufficient concentration of salts is present in the water
- * this region is unfavorable for plant growth.
- * Jackals, cats, snakes, lizards, etc. are the animals found in this region

(ii) Mountain Region (Hilly Region):

- * this region spreads from north-eastern to south-western side of the Aravali hills.

(iii) The plains:

- * this region covers the eastern and south-eastern side of the Aravali hills
- * salgawaan, bamboo, eucalyptus, mahua etc are the important tree species of this region.
- * panther, wolf, antelope, flying squirrel etc are the important wildlife of this region.
- * small water bodies and reservoirs situated in plains provide shelter for local and migratory birds.

→ Biogeographical classification of India:

- * the Bio-geographic zone
- * the Biotic province
- * the land region
- * the biome

* the annual rainfall ranges b/w 50 cm and ^{to} _{more} 500 cm and ^{to} _{more} variety in ^{to} _{more} rich heri

climate and topography
variety of flora and fauna

- * rich heritage of biological diversity
- * India stands at 10th position among plant-rich nations

of the world

India's Major Biogeographic habitats:

<u>Sn.</u>	<u>Biogeographic zone</u>	<u>Biotic Province</u>	<u>Total area (sq.km)</u>
1.	Trans himalayan	Upper regions	186200
2.	Himalayan	North-west Himalayan	6900
		West-Himalayas	420000
		Central Himalayas	123000
		East Himalayas	83000
3.	Desert	Kutch	45000
		Rajasthan	180000
		Kashmir	NA
4.	Semi Arid	Central India	107600
		Gujarat-Rajwara	400400
		Malabar coasts	59400
5.	Western Ghats	Western Ghats- Mountains	89300

* A biogeographic zone is a large distinctive unit of similar ecology, biome representation, community and species.

* A biotic province is secondary unit within biogeographic zone, giving weight to particular community separated by dispersal barriers or gradual change in the

environmental factors.

ex: North-west and western Himalayas either side of
the Sutlej River.

* A land region is a tertiary set of units within a
province, indicating different land forms.

ex: Aravali mountain and Malwa plateau in Gujarat
—Rajwara province.

* A biome is an ecological unit, not a biogeographical
unit, it can be defined as various similar ecosystems
throughout the world grouped together.

✓
Opal 1/18