consumerism and waste products.

22

* 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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5/12/17:

UNIT - I:

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→ Environment:

literally surroundings. the combination of atmosphere, Hydrosphere, lithosphere and bio-sphere and inter linking pattern of them and with the human beings is environment

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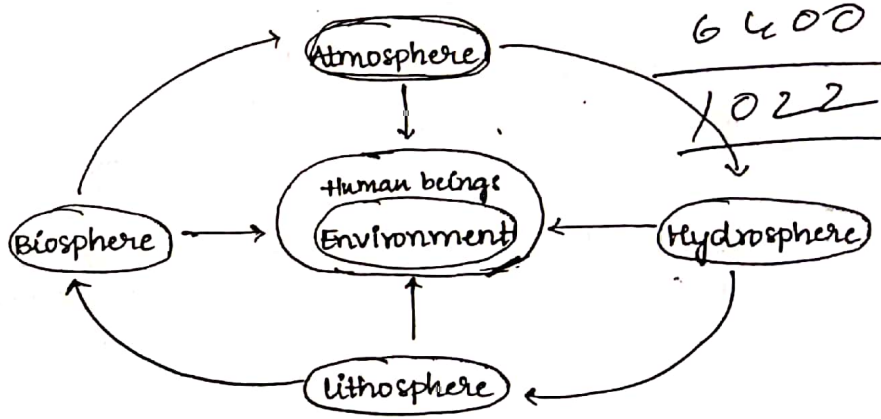

→ Multidisciplinary nature of environmental sciences:

* E.S 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.

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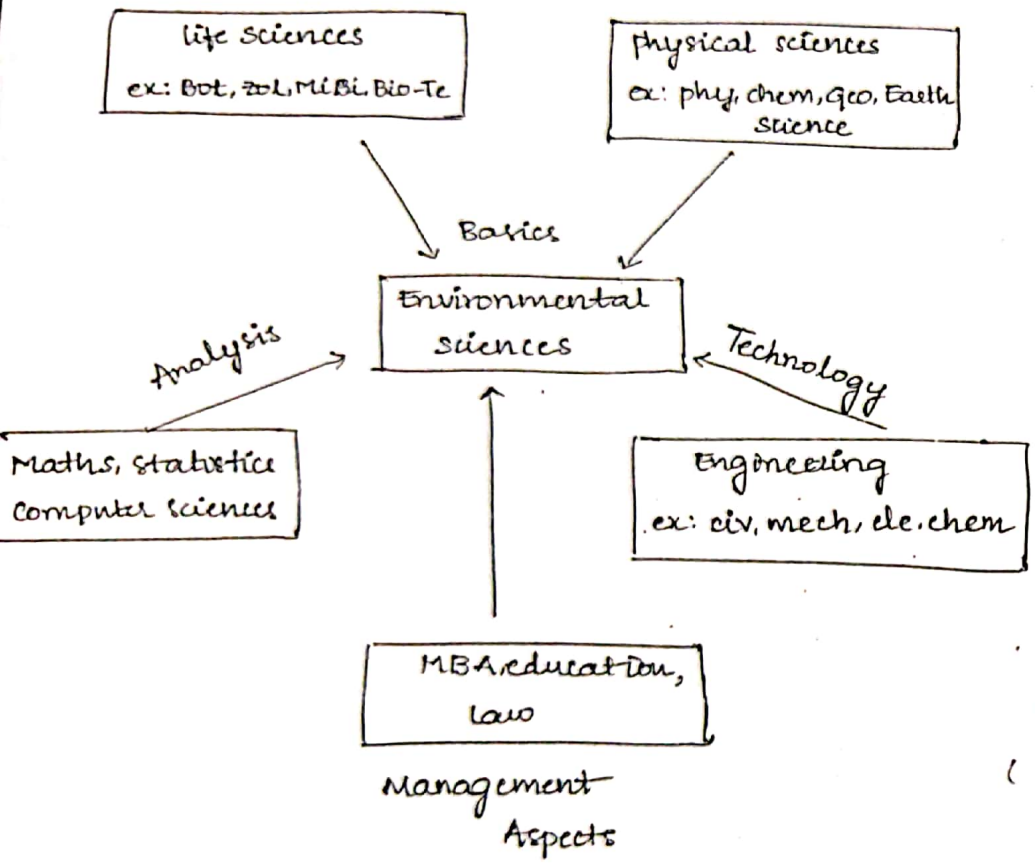
* It displays various subjects like



→ life sciences:

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

Imports basics from environmental sciences

→ physical sciences:

* It consists of subjects like physics, chemistry, geology and earth sciences
* Environmental sciences imports basics from 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.

* Research → Scope of

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→ Scope of Environmental Sciences:

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

ex: Mc. Mehathar

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) Research and development:

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.

(ii) 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.

(iii) Consultancy: skillful persons can establish consultancy and can employ others.

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(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: M.C Mehatha is a famous environmental lawyer from supreme court. He introduced ENS course into graduation. He declared ENS is mandatory for all graduate courses.

11/12/17:

→ Importance of Environmental Sciences:

* To understand current environmental problems, we need to study the physical, biological, chemical and social processes that form the basics of these pro

* 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 natur

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Therefore, 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?

* Education
  - school - Basics
  - college/graduation - present problms & ~~awareness~~ sol^{n}s available
  - post graduation - innovative sol^n for present problems

* Media
  - print - newspapers, magazines
  - electronic - radio, TV, movies etc.

* seminars & conferences
* folk songs & skits

} to create awareness among diff categories of people

→ Natural Resources:

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

ex: forest resources, water resources, land resources, mineral resources, energy resources, food resources

→ Forest Resources:

1/3rd of world's 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 decreted because of population and human greeds

→ uses of forests:

Direct uses:

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

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Indirect uses:

* Regulates hydrological cycle
* produce O_2
* reduces CO_2
* reduce soil erosion
* reduce air pollution
* reduce noise pollution
* reduce radioactive pollution
* protects fertility and moisture of soil.

12/12/17:

→ Deforestation:

* decrease forest cover by cutting of trees.
* 40-60% of worlds forest lands are deforested because of various reasons
* over exploitation of forests: rapid deforestation because utilisation is more & available sources are very less i.e, 16% of world population presente 19% of world cattle population present but India consists only 1% of worlds forest cover. increases deforestation. Such rapid deforestation known as over exploitation of forests.

→ Causes: of deforestation:

i) Natural forest fires
ii) Natural disasters like Tsunamis etc

→ 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

→ Effects of deforestation:

* effects wildlife
* increases endangered & extinct organisms
* effects annual income

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* increases rainfall percentage (Hydrological cycle)
* increases intencity of floods
* increases siltation of rivers
* increases soil erosion
* effects climatic conditions.

→ Control Measures of deforestations:

* 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 mines by reducing unnecessary mining activities
* use LPG & natural gas instead of fire for cooking.
* increase forest cover by massive plantation
* Dont 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) Agro forestry:

identifies barren (no rain & moisture, fertility) agricultural lands and converts to forests 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 1995, women in the Ryala

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 chilka lake agitation in orissa.

15/12/17:

→ Water Resources:

Advantages & disadvantages of Dams:

* Dams construction has equal advantages and disadvantages
* advantages are longterm uses
* disadvantages are immediate effects.

→ Advantages:

i) Irrigation purpose:

we can use damn water throughout the year without any suffocation.

ii) domestic purpose:

dams 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 second place in India for electricity generation.

Increase
dam con
navigation

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) 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. t occupies more space & causes deforestation

effects tribal people by rehabitation:

reduces agricultural lands:

onstruction of dams occupy more agricultural and. ex: polavaram project

increases siltation of rivers.

creases acquatic 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. dependin 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 (river, lakes, canals)
* ground water and (wells, bores
* 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 drianage facilities of the region.

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floods are classified into three types:

i) flash floods

ii) river floods

iii) coastal floods

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

river floods: these floods are occured due to heavy flow and weak cashment areas of the river.

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

(ii) 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 surface water flow

agricultural droughts:

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

18/12/17:

→ Effects of over-utilization of ground water:

* effects water table of the region by affecting surface water

* causes land subscidence.

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

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act. this phenomenon is land subsidence. It effects 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:

due to increase in ~~depth~~ extraction 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
* acquatic organisms
* Livestocks & fish

→ world food problems:

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

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

→ Insufficient production: today, many countries are

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facing acute problems of food shortage and starvation.

→ lack of irrigation facility: scarcity of water in some areas 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. Swaminadhan)

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 lands → rain water → rivers → smallfish → 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.

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→ 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 acquatic weeds & floating plants. this phenomenon is known as eutrophication.

→ effects of eutrophication:

* decrease dissolved O_2 %
* reduces photosynthetic rate.
* increases water bord diseases
* effects acquatic organisms

→ excessive pesticides and fertilizers retains in soil & causes soil pollution.

* excessive pesticides & fertilizers enters into food products, decrease the quality of food and effects 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.

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(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 thats the reason why they are costly and are also produced in less amounts.

→ water logging & salinity:

* water absorbing & holding capacity of soil is known as water logging.
* sandy soils have poor water logging capac
* excessive water-logging leads to in-fertility 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.

21/12/17:

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

are unable to
occuring state.
ex: iron, aluminium, ga
* In India we have
→ Non-Metallic

Scanned by CamScanner

we are unable to use these in their natural occuring state.

ex: iron, aluminium, gold etc.

* In India we have 11 metallic mineral ores

→ Non-Metallic minerals:

* these minerals are used in their natural occuring 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 produces more noise 100-150 decib 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.

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* effects wildlife:

Mining activities in forest regions effects the birds and animals and also effects tribal people by rehabitation.

* 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
* solar lights
* solar watches
* solar invertors.
* solar vehicles
* solar motors
* solar rice cookers
* solar panels

→ Hydro-thermal Energy:

* every dam is an hydro-electrical power project that produces electricity by utilising turbines.
* In India hydro thermal energy is 2nd source in production of electricity after thermal power plants & produces upto 90% of electric in India.

→ 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
* doesnot work properly on rainy & cloudy days

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→ 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 mills 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.

26/12/17:

→ 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 electricit generation plant. It generates 5KW of electricity by burning 500 Kg of completely dry waste.

→ Non-Renewable Resources:

these resources are limited in the earthcrust. once we use, they are exhausted and cannot be regenerated

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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 utilisation of coal effects future generations
* burning of coal releases oxides of carbon and oxides of sulphur and causes pollution to the environment

→ Petroleum:

* The best efficient fuel
* The biproducts of petroleum are petrol, deisel, Kerosene, crude oil etc.
* petroleum is non-renewable energy resource.
* burning of petroleum releases Co, Co_2, SOX, NOX.
* vast utilisation of petroleum effects future generation.
* one of the major component in air pollution

→ Mineral Resources: They are of three categories

(i) Metallic 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-metallic minerals: These minerals are moulded after mining and given different shapes and sizes. These are used in their naturally occuring 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.
* doesnot work properly or [illegible]

Sustainable

* Proper utilisation of resources in [illegible]

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→ 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 maintainance 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 : recieves more than 100 cms rainfall annually
ii) semi-Arid zones : recieves 50-100 cms annual rainfall
iii) dry zones : recieves less than 50 cms annual rainfall.

28/12/17:

→ Soil Erosion:

Run of 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.

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→ 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, landslides 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 depletes from soil from garbage, especially in rainy season decreases the quality of soil.

iii) open burning (open dumping): one of the used method for throwing municipal dust.

iv) Lechate:

the organic substance ~~which leads to~~ depletes to soil from dumping yards and land fill sites & also from the disposal of garbage.

* Burning of waste in open lands reduces moisture content and fertility of soil.

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

→ effects:

* reduces agricultural productivity of land

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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 donot encourage open dumping

→ Water Conflicts: - Indispensability of water and its unequal distribution in different regions has often lead to inter-state (or) International disputes. Issues related to sharing of river water have been largely affecting our frames and also shocking our governments.

i) Kaveri conflict
ii) Krishna conflict.

→ Kaveri Conflict:

* the Kaveri river water is a bone of 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

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water was made available in tamil Nadus Mettur dam every year till a settlement is reached.

* proper selection of crop varities, optimum use of water, better rationing, rational 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 1892 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 KWDT (Krishna water dispute tribunal) the above agreements were in practice.

* After the establishment of KWDT, the member didn't say that agreements are not valid, instead they changed them inorder to give protection to already existing irrigation and Multipurpose projects in Karnataka and Andrapradesh

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

area for a wing power ...

Unit → Ecology: A s

with the life o

* Father of ecology

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Unit-II: Ecology & Biodiversity:

→ **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.

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

→ classification of Eco-System:

- Eco-system
  - Natural eco-system
    - Terrestrial eco-system (soil-based) ex: forests deserts and grasslands
    - Acquatic eco-system (water-based)
      - fresh water eco-system
        - Lotic eco-system (floating water)
        - Lentic eco-system (standard water) ex: ponds
      - salt-water eco-system ex: marine eco-system
  - Man-made eco-system ex: Agricultural lands, Botanical gardens, Zoological parks etc

the eco-system is classified into two - types:

i) Natural eco-system

ii) 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

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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:

- Eco-system
  - Living components
    - producers (Autotrophic components) ex: plants, grass, bushes, phytoplanktons, shrubs
    - Consumers (Heterotrophic components)
      - primary consumers (Herbivores) ex: giraffe, zebra, grasshoper
      - secondary (meat eaters) ex: frogs, snakes, lions, whales, sharks.
      - teritiary consumers ex: most of the birds, human beings.
    - Decompos-ers (defrivores) ex: ants, insects, bacteria
  - Non-Living components
    - physical
      - Rainfall
      - temperature
      - Humidity
      - Sunlight
    - chemical
      - PH of water
      - gases in atm
      - Nutrients in soil
      - Moisture content

The Eco-system is classified into two types:

(i) Living (or) Biotic components

(ii) Non-living (or) Abiotic components

→ Biotic (or) living components are classified into producers, consumers and decomposers

* producers: Autotrophic organisms, largely green plants, which are able to manufacture food from simple inorgan substances are called producers.

* consumers: Heterotrophic organisms, which cannot manufacture their own food and depend directly (or) indirectly, on producers for their food requirements are called consumers. They are classified into:

(i) Herbivores (primary consumers): They are plant eater and feed directly on producers. They transform vegetable matter into animal matter and are the first users of the energy conserved by the plant.

(ii) Carnivores (secondary consumers): They are meat eaters and feed on herbivores.

(iii) Tertiary consumers: These are carnivores which prey upon other carnivores but are not themselves eaten. They constitute the terminal end of predator (or) grazing food chain.

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	chemical factors
* sunlight	* percentage of water & air in soil
* temperature	* salinity of water
* Precipitation	* oxygen dissolved in water
* nature of soil	* Nutrients present in soil
* fire	
* water currents	

* 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 eco-system.

4/1/18:

→ 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

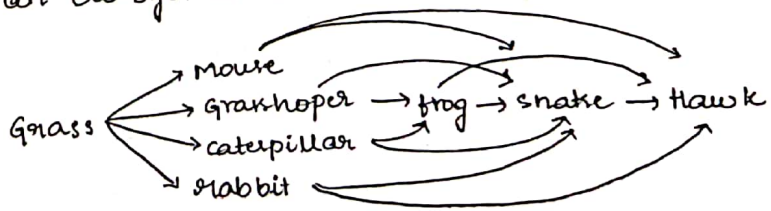
ex: Grassland eco-system, pond eco-system

* Grass → Grasshoper → frog → snake → Hawk
  (Producer) P.C (Herbivore) S.C (Carnivore) S.C (Carnivore) S.C (Top carnivore)

* phytoplanktons → zooplanktons → small fish → large fish
  (producer) (Small fish, crabs) (Herbivore) (C) (T.C)
  ↳ plants in water bodies like green algae, floating plants

Food web: 6301441394 8074137289 8074137279 6301441394 9848083906

The interlinking pattern of different food chains in an eco-system is known as food web



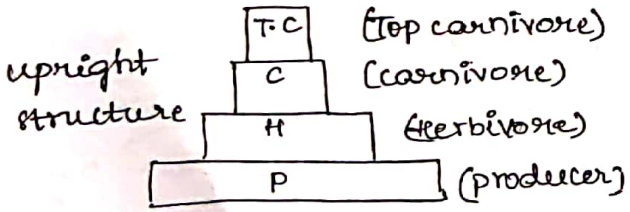
Scanned by CamScanner

The interlinking food chains in this food web are:

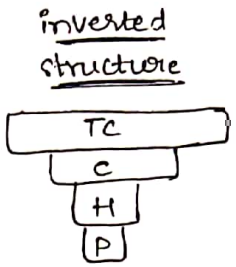
* Grass → G.H → frog → Snake → Hawk
* Grass → Mouse → snake → Hawk
* Grass → caterpillar → frog → Hawk
* Grass → rabbit → snake → Hawk
* Grass → Mouse → Hawk
* Grass → caterpillar → snake → Hawk
* Grass → rabbit → Hawk
* Grass → G.H → Snake → Hawk

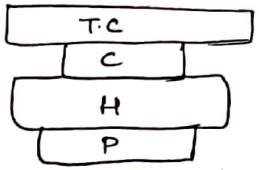
→ Ecological pyramids:

The graphical representation of different trophic levels that is, producers are at the base of the pyramid and ~~those are~~ goes on grazing through herbivores, carnivores and top carnivores is known as ecological pyramid.



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





(can be more than one)

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

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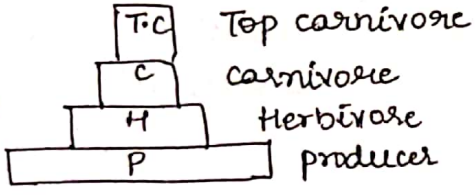
Pyramid of Numbers:

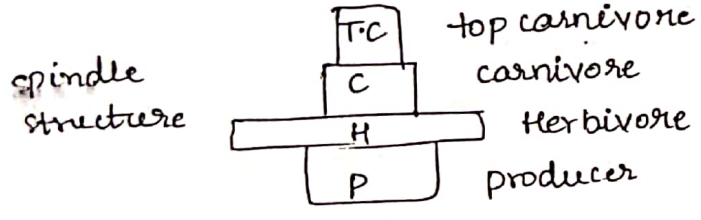
These pyramids are constructed on the basis of total no. of individual organisms at each trophic level

ex:1 grassland eco-system.



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

ex-2: forest eco-system

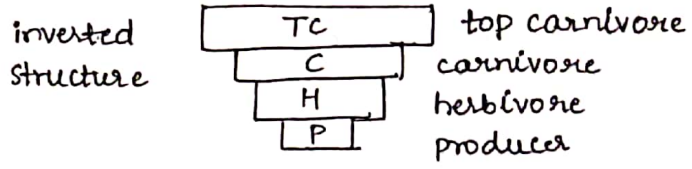


Pyramid of number in forest eco-system is in spindle structure

→ Pyramid of biomass :

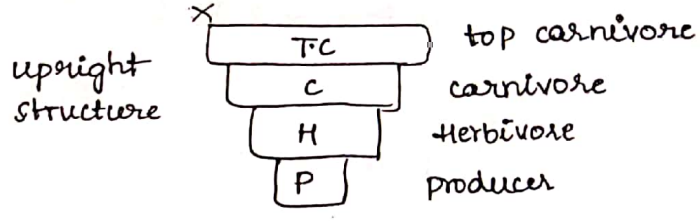
These pyramids are constructed on the basis of total biomass at each trophic level :

ex-1: pond eco-system



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

ex-2: forest eco-system

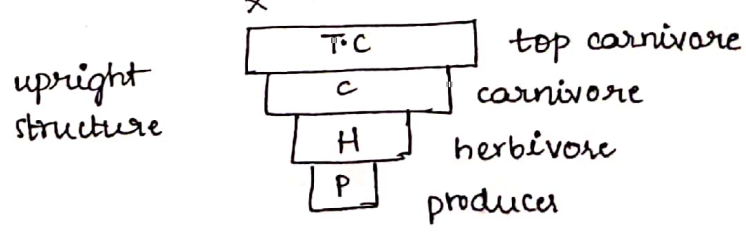


pyramid of biomass in forest eco-system is in upright structure.

IM ** → pyramid of energy:

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

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



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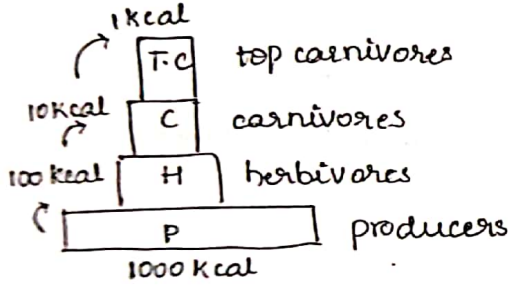
* pyramid of energy in each and every eco-system is in upright structure only.

18/1/18:
** IM
* 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.



→ Ecological Succession: The occurance 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
(i) primary ecological succession
(ii) secondary ecological succession

Empty land → Ecosystem (primary ecological succession)
↓
ecological

stabilized eco-system → destroyed empty land → Eco-system (secondary ecological succession)

* Primary succession: It can start on terrestrial or aquatic environments which were devoid of an vegetation previously.
** IM The organisms that establish there first are called as pioneers or primary colonizers. This initial (or) 'pioneer' community gradually develops through a number of stages or seres to form the final or climax community.

* 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 → Migration, Ecesis (Establishment), ~~competation~~ Aggregation
* competition
* Reaction
* stabilization
* climax

→ 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 floods, landslides etc.

Species may ... in the ... ecological succession.

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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 ecesis.

* 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 ealier, the species completely establish themselves in the area and the ecosystem attains stability. This process is known as stabilization.

22/1/18:

→ Energy flow in each and every eco-system is uni-dimensional

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) universal energy flow

(ii) Single channel energy flow

(iii) double channel / Y shaped energy flow

(i) universal energy flow:

* We can observe these ~~eco~~ 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 am~~ energy flow starts from the producers.

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

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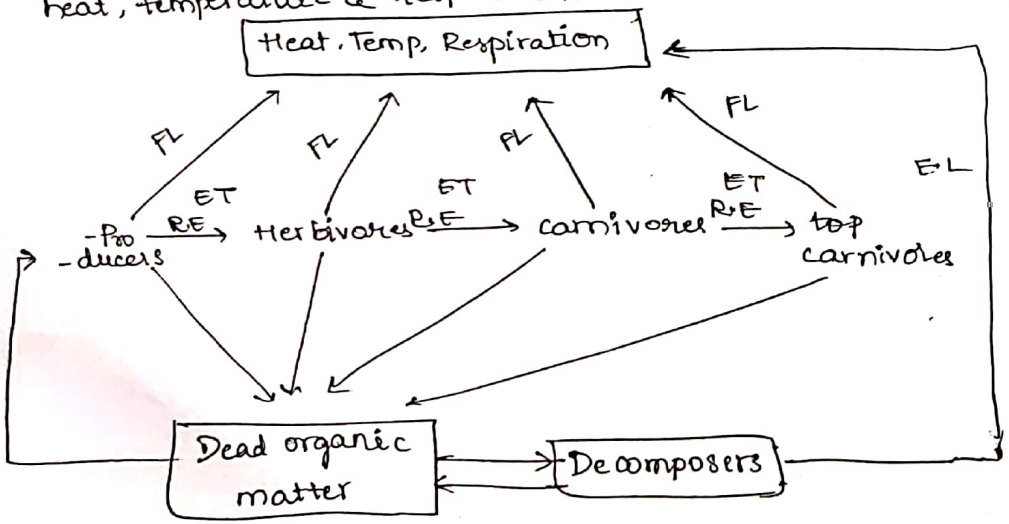
heat, temperature, respiration and reproduction.

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

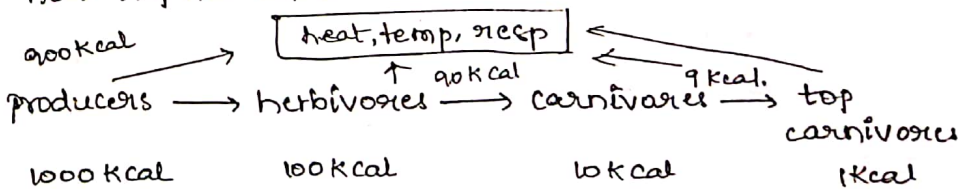
* In this, energy starts from producers and as well as dead organic matter with the help of decomposers
* In producers stage, some part of energy is lost for heat, temperature & respiration.



* some part of energy transfers to herbivores remaining energy present in dead organic
* The energy transfers from dead organic matter to decomposers and as well as decomposers to dead organic matter
* they decompose energy absorbed by the producers and some part of energy lost for decomposers stage to heat, temperature & respiration

→ 10% Rule:

* It is proposed by Lindmen
* 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



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Functions 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 flow
* Mineral nutrient cycles

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

→ **types of food chains:**

* Grazing food chain
* detritus food chain

→ **significance:** food chains ~~may~~ are important for maintaining and regulating the population size of different animals, and to maintain ecological balance.

→ **food webs:** A food web opens several pathways for the flow of food energy. A food web helps in maintaining stability of the ecosystem.

→ **Energy flow:** The transfer of food energy from one trophic level to another trophic level through series of organisms in ecosystem is energy flow. They are of three types

→ **Types of energy flow:**

* universal energy flow
* single channel energy flow
* double channel or y-shaped energy flow

→ **Mineral Nutrient cycles:**

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~~ on reservoirs to living components and back to reservoirs is mineral nutrient cycle

Ecosystem	F	G	D	P	L	O
P	Plants	grass	cactus shrubs oputania	← green algae, floating plants phytoplanktons →		
H	deer elephant	grazing animals, insects	camel	← small fish →		Molluscus crustaceans
C	Snakes lizards	snakes lizards jackel	insects lizards	← large fish →		Sharks octopus
O	Humans, birds ~~Lion, tiger~~	hawks, kites	reptiles	~~reptiles~~ fish, turtles crabs		~~sharks~~ dolphins
D	Ants bacteria fungi	Mucor Rhizopus	Bacteria ←	Bacteria	Bacteria →	Bacteria

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→ Bio-geo chemical cycles (Nutrients cycle) :

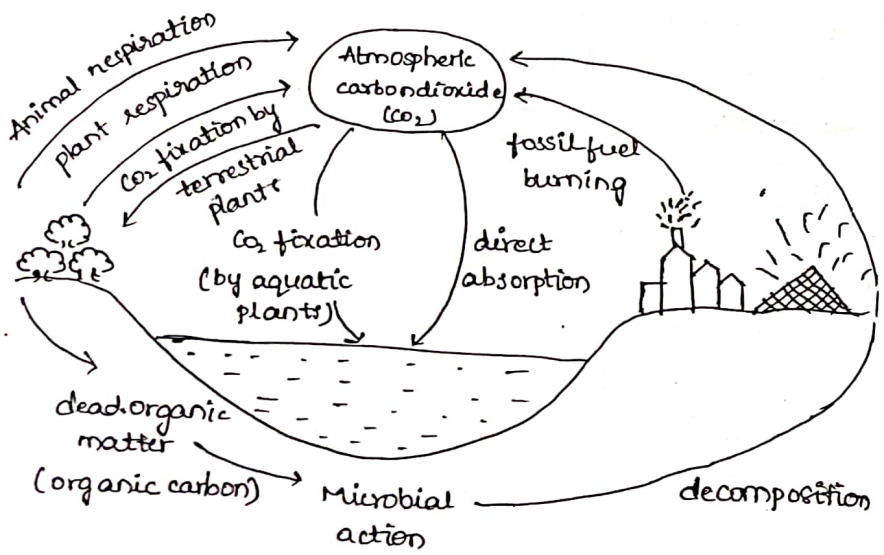
(i) Carbon cycle (water cycle)

(ii) nitrogen cycle

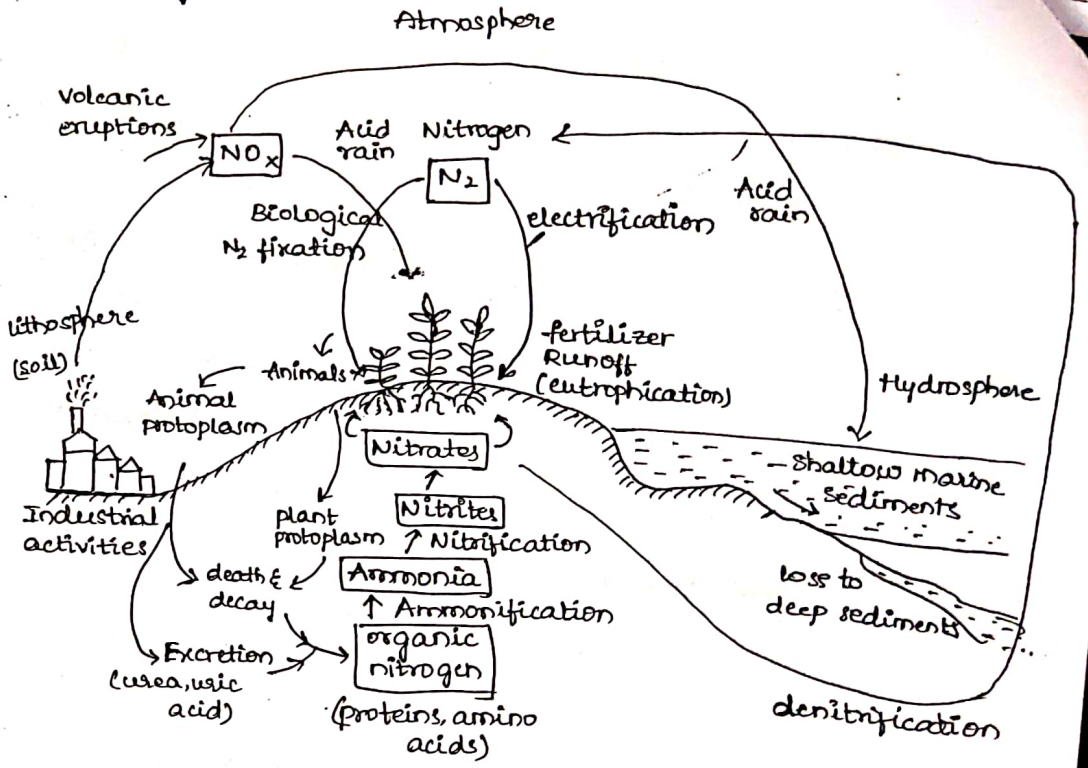
(iii) Sulphur cycle

(iv) phosphorus cycle

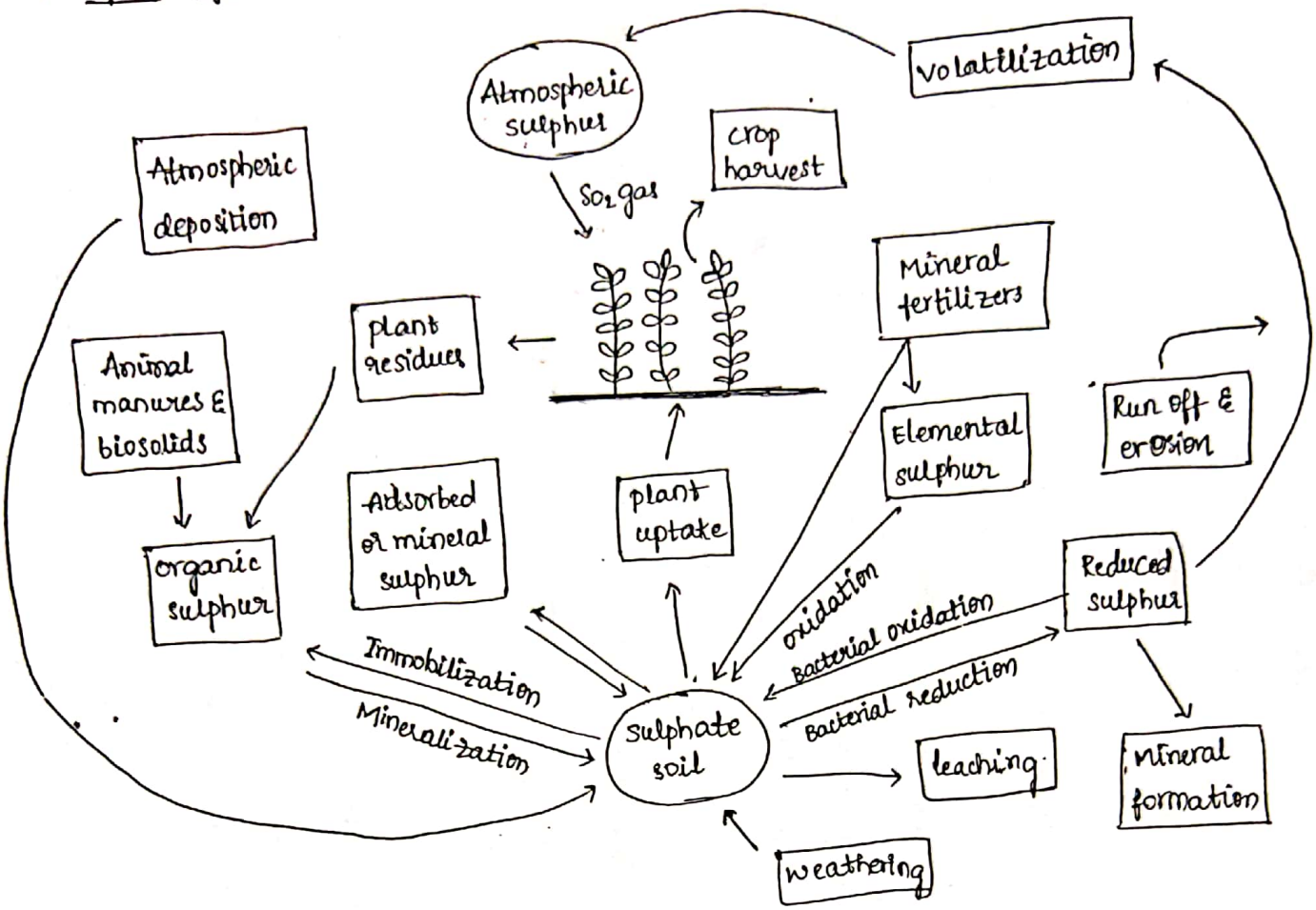
→ carbon cycle:



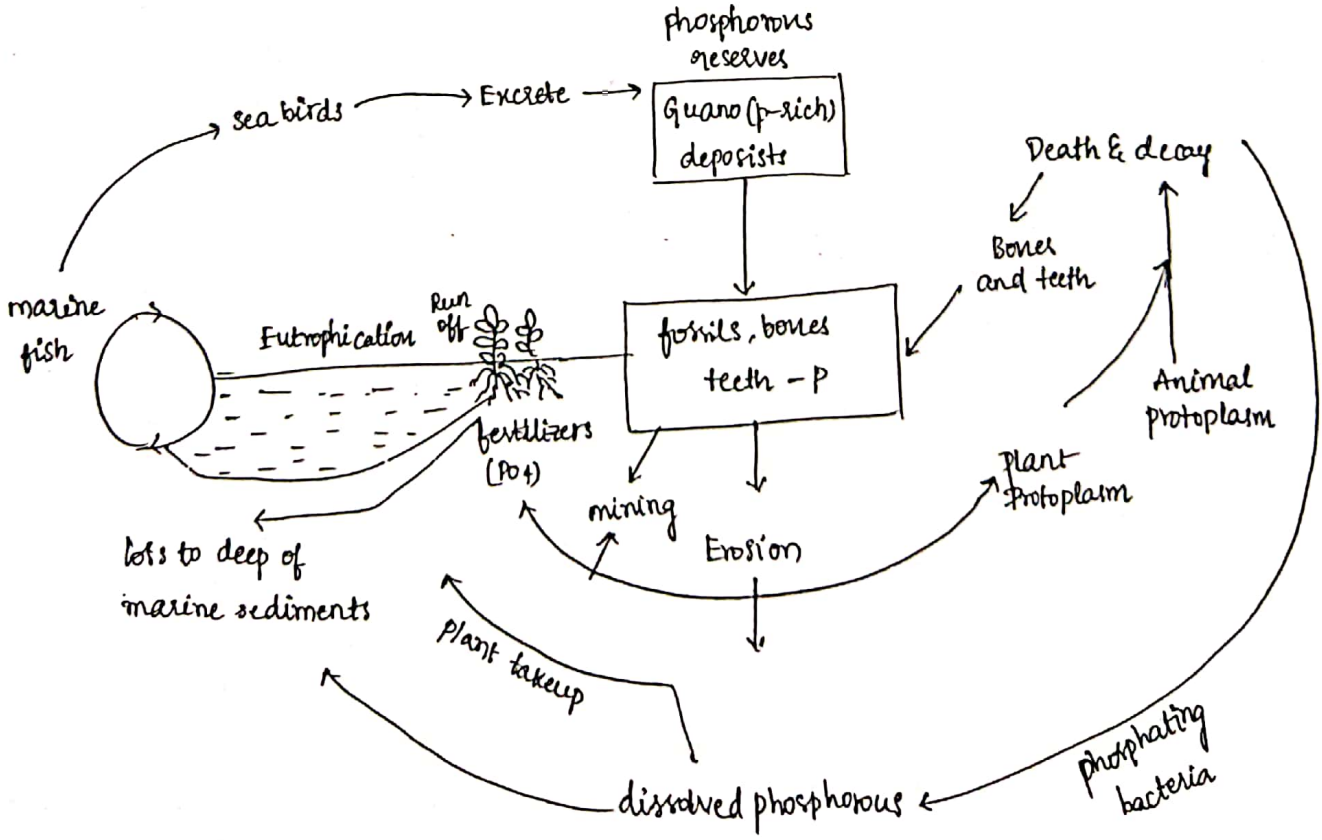
→ Nitrogen cycle:



→ Sulphur cycle:



→ phosphorous cycle:



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23/1/18:

→ 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) Mangroove 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
) dustrophic Lakes
(iv) deserts salt Lakes
(v) Meromictic lakes
(vi) 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 ~~rivers~~ the fresh water and salt water meet

25/1/18:

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

→ 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

→ Species diversity: the species ex: plants

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human beings, dogs

→ Species diversity: The variety & variability among the 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 consists 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, pencilin, antidotes from snake poison

→ consumptive value: There are many varieties to consume. so, consumptive value increases in biodiversity. 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

→ optional value: These values include the potentials 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 existance value

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

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→ **Social values**: these 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 refers to the services provided by ecosystems like prevention of soil erosion, prevention of floods, maintainance 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

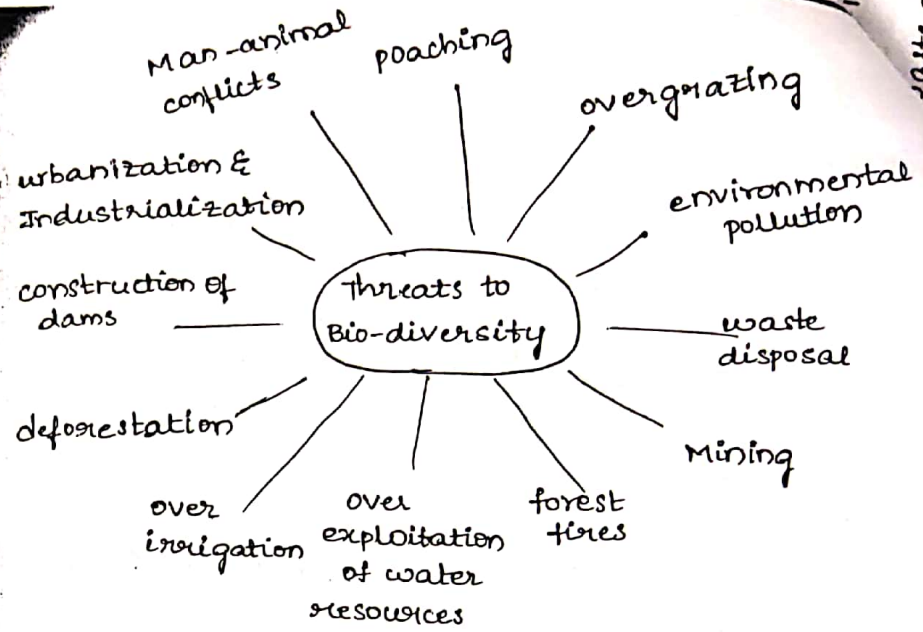
29/1/18:

→ **Threats to Biodiversity**:

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

(ii) [illegible]

(iii) dustrophic Lakes



→ global warming

→ Acid rains

→ climatic changes

→ Natural disasters

* Poaching is the illegal business with the body parts of wild animals.

ex: snakes, star tortoise

* 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

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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 reasons like lightning, human carelessness, volcanic eruption etc harms the biodiversity for 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-made 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 insitu 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 prohibhited

ex: grand canyon national park, Rajiv gandhi national park, jim corbett national park, sundarban national park

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

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* hunting and deforestation in wild life sanctuaries is strictly prohibhited.

ex: Hastinapur wildlife sanctuary, Netravali wildlife sanctuary, Bhairamgarh wildlife sanctuary

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

ex: Nilgiri Biosphere reserve, Nandadevi biosphere reserve, great nicobar biosphere reserve.

Ex-situ conservation: conservation of effected organisms outside their natural habitat with the help of science and technology is known as exsitu conservation

ex: seed / gene banks, tissue culture technology, Botanical gardens, zoological parks, DNA technology.

* The seed / geenebanks 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: Indian Botanical garden, Hanging gardens, Empress (pune)

* tissue culture technology refers to a special technique 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 enclosures, 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

30/1/18:

→ Hotspots of Biodiversity:

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

* world wide 24 hotspot regions are there.

* In India there are 2 Hotspot regions. they are western ghats and Eastern Himalayas

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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 earths surface are extinct organisms.

ex: dinosaurs, dodo bird, elephant bird, flores man, thylacine, passenger pegion etc., sea steller cow

* edge (or) critically endangered organisms:

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

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

* Red data book:

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

* Vulnerable species:

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

ex: elephants, snakes, tigers

- Bio-geographical classification of India → 9,10
- India as a megadiversity Nation → 34,35,36,37
- Biodiversity at global level → 28,29,33
- Biodiversity at National level → 29,30
- Biodiversity at local level → 32, Rajasthan (from TB)

} Ppt topics

1/2/18:

IM → 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

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* 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 81000 species of animals i.e, 7% 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 -	23000
Algae -	2500
Bryophytes -	2564
pteridophytes -	1022
gymnosperms -	64
Angiosperms -	15000

Aimals	Number
lower groups -	9979
Mollusca -	5042
Arthopoda -	57525
pisces -	2546
Amphibia -	428
reptiles -	1228
Birds -	204
Mammals -	372

* Endemism – species which are restricted to a particular areaare known as endemic.
* about 62% of amphibians and 50% lizards 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..

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Marine diversity: 7500 km long indian coastline is rich in mangroves, coral reefs etc

* More than 340 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 sunderbans 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.

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* 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 unfavourable for plant growth
* jackals, cats, snakes, lizards, kites 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 Aravalli hills.
* the annual rainfall ranges b/w 50 cm and [illegible]
* salar, dhak, mahua, karonda, chirongi etc are important plant species.
* Main fauna of this region includes tiger, panther, sambar, neelgai, chettal etc

(iii) The plains:

* this region covers the eastern and south-eastern side of the Aravalli Hills
* sagwaan, 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

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70 cm
it etc are.

mate 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 Biographic Habitats:

Sno	Biogeographic zone	Biotic province	total Area (sq.km)
1.	Trans Himalayan	upper regions	186200
2.	Himalayan	North-west Himalayan	6900
		West Himalayas	720000
		central Himalayas	123000
		East Himalayas	83000
3.	Desert	Kutch	45000
		Thar	180000
		Ladakh	NA
4.	Semi Arid	Central India	107600
		Gujarat-Rajwara	400400
5.	western ghats	Malabar coasts	59400
		western ghat-Mountains	99300
6.	Deccan peninsula	Deccan plateau south	378000
		Central plateau	341000
		Eastern plateau	198000
		chhota nagpur	217000
		central highlands	287000
7.	Gangetic plain	upper gangetic plains	206400
		lower gangetic plains	153000
8.	North-East India	Brahmaputra valley	65200
		North-eastern Hills	106200
9.	Islands	Andaman Islands	6397
		Nicobar Islands	1930
		Lakshadweep Islands	180
10.	coasts	west coast	6500
		East coast	6500

* 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

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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: Aravalli 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 ecosystem throughout the world grouped together.

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