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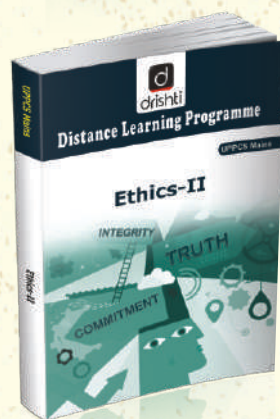
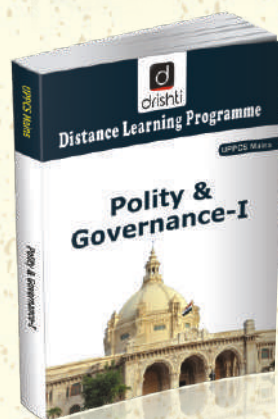
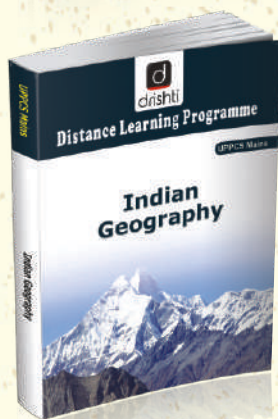
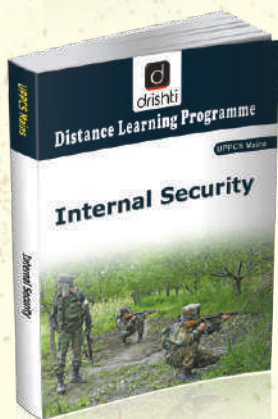
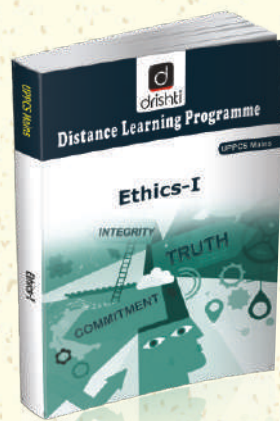
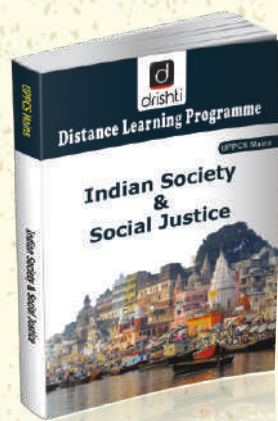
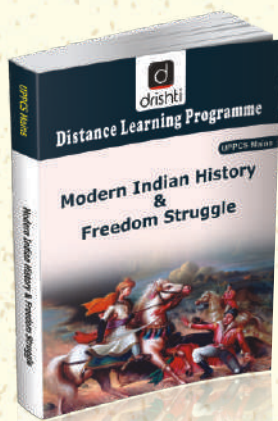
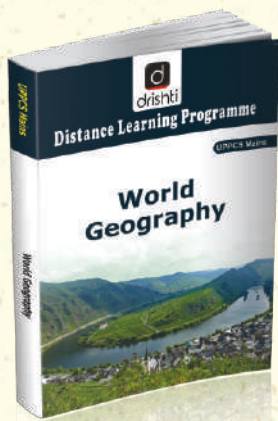
ENVIRONMENT AND ECOLOGY



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www.drishtipublications.com

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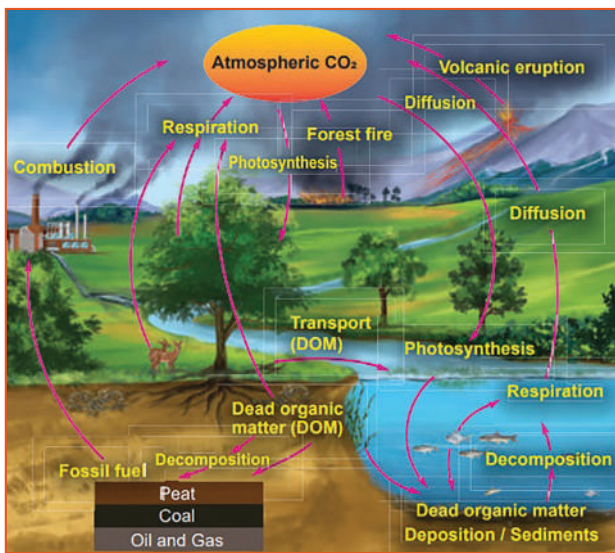
Biogeochemical Cycles

Biogeochemical Cycles

- Biogeochemical cycle is a pathway by which a chemical substance moves through both biotic and abiotic components of Earth.
- Biogeochemical cycles are of two types:
 - **Gaseous Nutrient Cycle:** In this case, the reservoir is the air or the oceans (via evaporation), and it includes Oxygen, Carbon and Nitrogen cycles.
 - **Sedimentary Nutrient Cycle:** In this case, the reservoir is Earth's crust and it includes the cycles of Phosphorus, Sulphur and Calcium, which are present as sediments of Earth.

Carbon Cycle

- Carbon cycle is the continuous exchange of carbon between the atmosphere and Earth through different processes such as photosynthesis, respiration, burning of fossil fuels, decomposition, etc.
- Cycling of carbon between organisms and atmosphere is a consequence of two reciprocal processes of photosynthesis and respiration.



- Carbon in the atmosphere increases due to burning of fossil fuels, deforestation, forest fires,

volcanic eruptions and decomposition of dead organic matters.

- Some carbon also enters into long term cycle due to accumulation as undecomposed organic matter or as insoluble carbonates in the aquatic system.
- It also gets dissolved in the ocean and remains there for a long time.

Nitrogen Cycle

- Nitrogen cycle refers to circulation of nitrogen in various chemical forms through the atmospheric, terrestrial and marine ecosystems.
- Our atmosphere contains nearly 78% of nitrogen, but it cannot be used directly by the majority of living organisms.
- There are five main processes which are essential for nitrogen cycle, viz., Nitrogen Fixation, Nitrification, Assimilation, Ammonification, and Denitrification.

- **Nitrogen Fixation:** It is the conversion of gaseous nitrogen into ammonia, a form in which it can be used by plants.

❖ **Atmospheric Fixation:** Lightning, combustion and volcanic activities help in the fixation of nitrogen.

❖ **Industrial Fixation:** At high temperature and high pressure, molecular nitrogen is broken into atomic nitrogen which then combines with hydrogen to form ammonia.

❖ **Bacterial Fixation:** There are two types of bacteria which helps to fix Nitrogen:

- (i) Symbiotic bacteria, e.g., Rhizobium in the root nodules of leguminous plants.
- (ii) Free living or Non-symbiotic, e.g., Nostoc, Azobacter, and Cyanobacteria can combine atmospheric or dissolved Nitrogen with hydrogen to form ammonia.

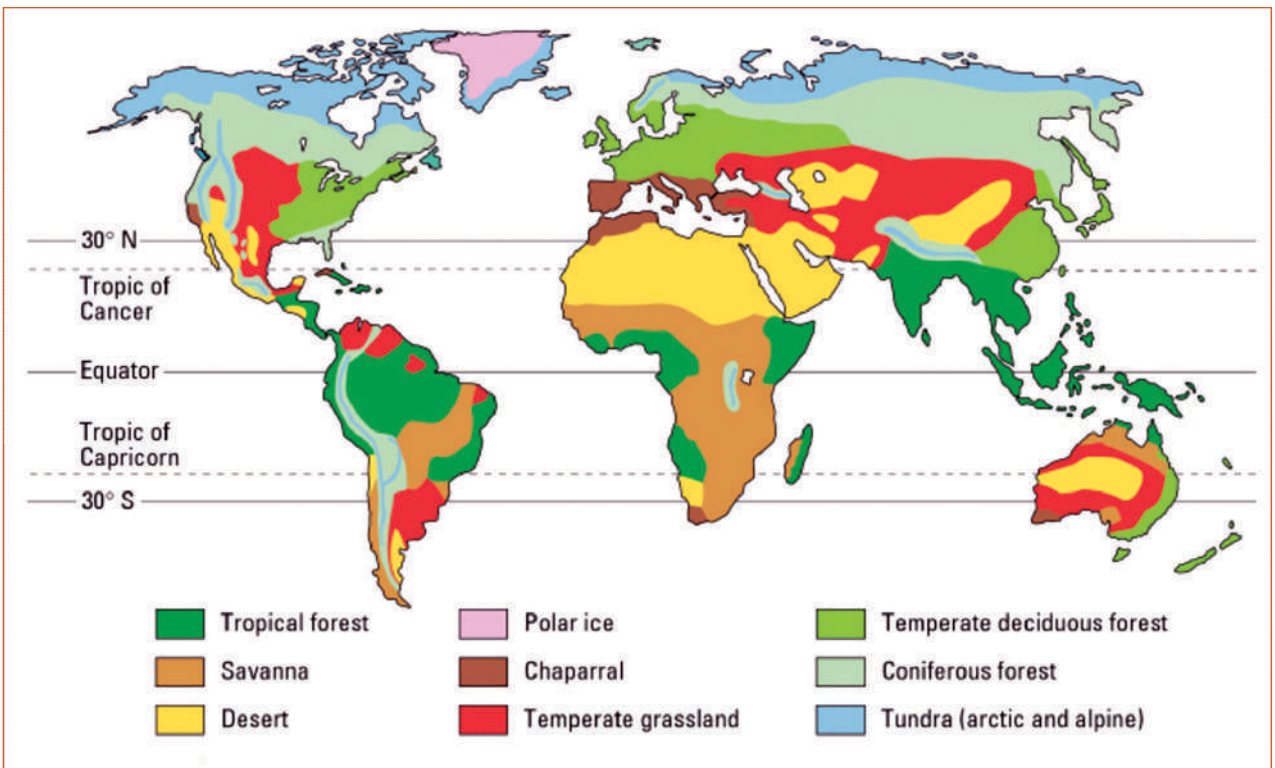
- **Nitrification:** It is a process in which ammonia is converted into nitrates and nitrites by bacteria, e.g., Nitrosomonas and Nitrosococcus convert



- Occur mostly in northwest, central and eastern Europe, eastern North America, northern China, Korea, Japan, far eastern Russia and Australia.
- **Temperature:** Ranging between 10-20°C with a 6-month long winter.
- **Rainfall:** Annual rainfall of about 75 to 150 cm.
- **Soil:** Brown soils which are rich in nutrients.
- **Vegetation**
 - Trees of these forests shed their leaves in autumn and new foliage grows in the spring.
 - They utilize their broad and flat leaves to collect sunlight spreading out as they grow.
 - They generally have a thick bark to protect them during the cold winter months.
 - Common trees are oak, heath, chestnut, birch, pine, etc.
- **Fauna**
 - Prominent grazers include deer, bison, etc.
 - Because of the relatively harsh winters and scarce food supplies, many animals migrate to warmer climates or animals, like bears and mice, dig out a den or burrow and sleep during the cold months.

Boreal or North Coniferous Forests

- **Distribution**
 - **Latitude:** 50-60° North
 - It does not occur in the southern hemisphere as there is no land at this latitude.
 - These are also known as ‘Taiga’ and extend as a continuous belt across North America and North Eurasia below the Arctic tundra.
- **Temperature:** The climate is cold with long, harsh winter, with a mean annual temperature below 0°C.
- **Precipitation:** Primarily in the form of snow, 40-100 cm annually.
- **Vegetation**
 - Coniferous forests are characterized by evergreen, drought resistant and woody conifers, e.g., spruce, fir and pine trees.
 - The trees here have distinctive features such as spire shape to promote shedding of snow, narrow shaped leaves to protect moisture loss and waxy coating to protect from dry winds.
 - Fire is crucial to a healthy boreal forest. Fires open the forest canopy to sunlight, which stimulates new growth.



Desertification in India (2003-05 to 2011-13)			
State	Area under Desertification	Percentage Change	Cause
Erstwhile state of Jammu & Kashmir	35.86%	1.94	Forest shattering
Himachal Pradesh	43.01%	4.55	Vegetation degradation, frost shattering
Uttarakhand	12.12%	1.25	Vegetation degradation
Punjab	2.87%	1.02	Settlement, vegetation degradation
Haryana	7.67%	0.55	Wind erosion, settlement
Delhi	60.6%	11.03	Settlement, vegetation degradation
Rajasthan	62.9%	-0.29	Wind erosion, vegetation degradation
Uttar Pradesh	6.35%	-1.27	Water erosion, vegetation degradation
Bihar	7.38%	0.38	Water erosion, vegetation degradation
Jharkhand	68.98%	1.01	Water erosion, vegetation degradation
West Bengal	19.54%	0.59	Water erosion, vegetation degradation
Odisha	34.06%	-0.12	Water erosion, vegetation degradation
Chhattisgarh	16.36%	0.26	Vegetation degradation, water erosion
Madhya Pradesh	12.34%	0.1	Vegetation degradation, water erosion

Gujarat	52.29%	0.94	Water erosion, salinity
Maharashtra	44.93%	1.55	Water erosion, vegetation degradation
Goa	52.13%	1.76	Vegetation degradation, water erosion
Telangana	31.34%	-0.52	Water erosion, vegetation degradation
Karnataka	36.24%	0.05	Water erosion, vegetation degradation
Andhra Pradesh	14.35%	0.19	Vegetation degradation, water erosion
Kerala	9.77%	0.63	Vegetation degradation, settlement
Tamil Nadu	11.87%	0.21	Vegetation degradation, settlement
Sikkim	11.1%	0.04	Vegetation degradation
Assam	9.14%	1.84	Vegetation degradation, water logging
Meghalaya	22.06%	0.71	Vegetation degradation, water logging
Manipur	26.96%	0.4	Vegetation degradation
Tripura	41.69%	10.48	Vegetation degradation, water logging
Mizoram	8.89%	4.34	Vegetation degradation, water logging

Combating Desertification in India

- The concern for combating and reversing land degradation and desertification gets reflected in many of our national Acts/policies.

- The Ramsar Convention works closely with five other organisations known as International Organization Partners (IOPs). These are Birdlife International, the International Union for Conservation of Nature (IUCN), the International Water Management Institute (IWMI), Wetlands International and World Wildlife Fund (WWF) International.
- World Wetlands Day is celebrated every year on 2nd February. It marks the date of the adoption of the Convention on Wetlands on 2nd February 1971.

Montreux Record

- Montreux Record, under the Ramsar Convention, is a register of wetland sites of international importance

where changes in ecological character have occurred, are occurring, or are likely to occur as a result of technological developments, pollution or other human interference.

- It is maintained as part of the Ramsar List.
- Sites may be added to and removed from the Record only with the approval of the Contracting Parties in which they lie.
- Currently, two wetlands of India are in Montreux record viz. Keoladeo National Park, Rajasthan and Loktak Lake, Manipur. Further, Chilka Lake, Odisha was placed in the record but was later removed from it.

Criteria for Identification of Wetlands

Group A. Sites Containing Representative, Rare or Unique Wetland Types

Criterion 1: A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.

Group B. Sites of International Importance for Conserving Biological Diversity

Criteria based on species and ecological communities

Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

Criterion 3: A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

Criterion 4: A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

Specific criteria based on waterbirds

Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.

Criterion 6: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.

Specific criteria based on fish

Criterion 7: A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.

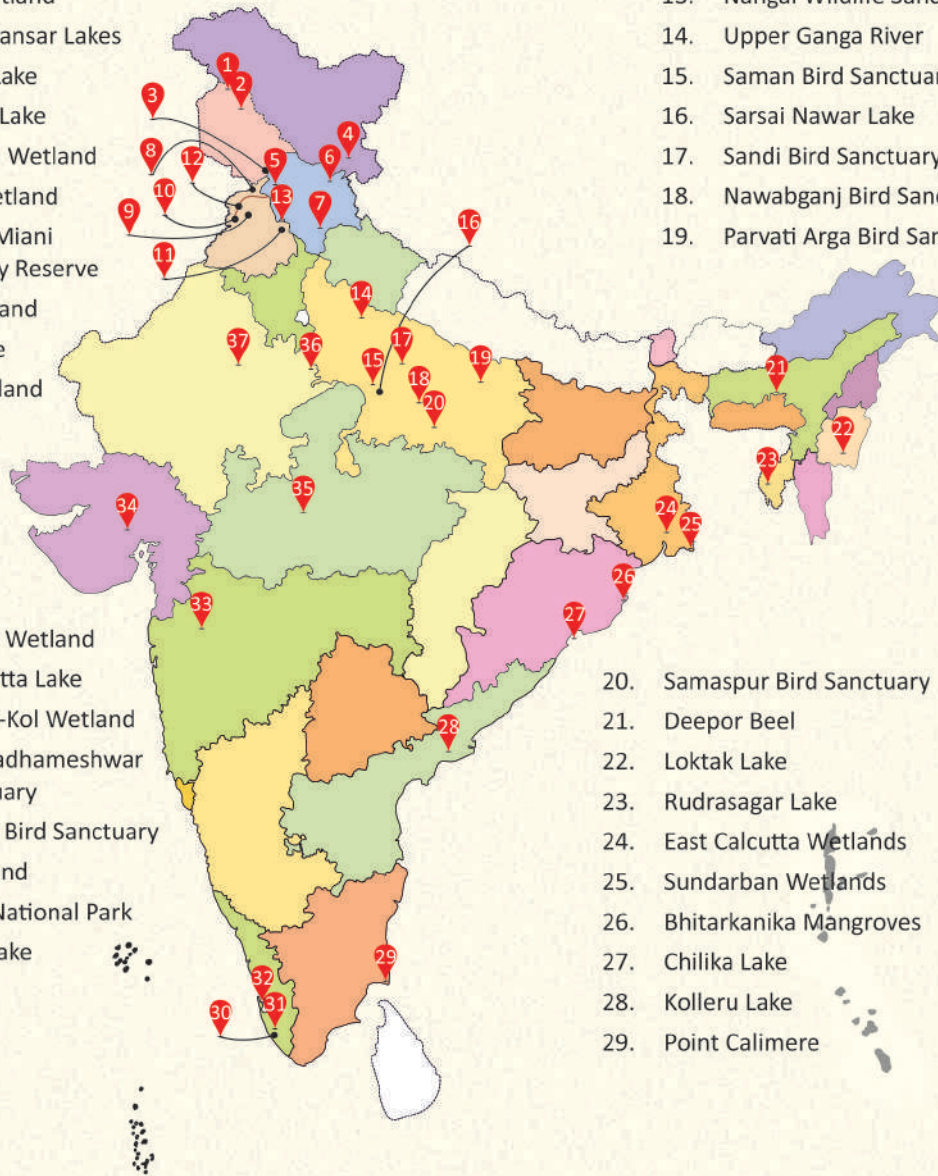
Criterion 8: A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.

Specific criteria based on other taxa

Criterion 9: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species.

Ramsar Sites

- | | |
|-------------------------------------|---------------------------------|
| 1. Wular Lake | 12. Beas Conservation Reserve |
| 2. Hokera Wetland | 13. Nangal Wildlife Sanctuary |
| 3. Surinsar Mansar Lakes | 14. Upper Ganga River |
| 4. Tsomoriri Lake | 15. Saman Bird Sanctuary |
| 5. Pong Dam Lake | 16. Sarsai Nawar Lake |
| 6. Chandertal Wetland | 17. Sandi Bird Sanctuary |
| 7. Renuka Wetland | 18. Nawabganj Bird Sanctuary |
| 8. Keshopur-Miani Community Reserve | 19. Parvati Arga Bird Sanctuary |
| 9. Kanjli Wetland | |
| 10. Harike Lake | |
| 11. Ropar Wetland | |



- | | |
|--|-----------------------------|
| 30. Ashtamudi Wetland | 20. Samaspur Bird Sanctuary |
| 31. Sasthamkotta Lake | 21. Deepor Beel |
| 32. Vembanad-Kol Wetland | 22. Loktak Lake |
| 33. Nandur Madhameshwar Bird Sanctuary | 23. Rudrasagar Lake |
| 34. Nalsarovar Bird Sanctuary | 24. East Calcutta Wetlands |
| 35. Bhoj Wetland | 25. Sundarban Wetlands |
| 36. Keoladeo National Park | 26. Bhitarkanika Mangroves |
| 37. Sambhar Lake | 27. Chilika Lake |
| | 28. Kolleru Lake |
| | 29. Point Calimere |

Wetlands International

- It is a global organisation that works to sustain and restore wetlands and their resources for people and biodiversity.
- It is an independent, not-for-profit, global organisation, supported by government and NGO membership from around the world. It is based mostly in the developing world. It has 20 regional,

national or project offices in all continents. Its head office is in Ede, Netherlands.

BirdLife International

- It is a global partnership of conservation organisations that strives to conserve birds, their habitats and global biodiversity, working with people towards sustainability in the use of natural resources.

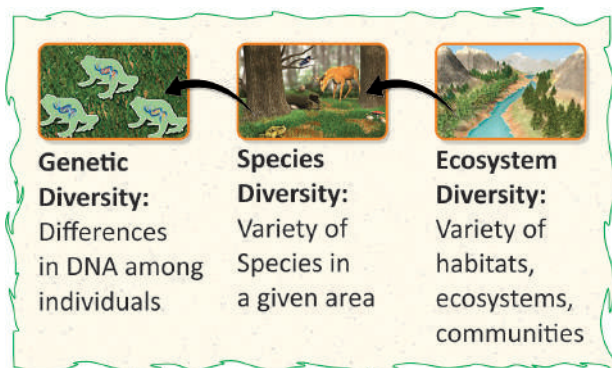
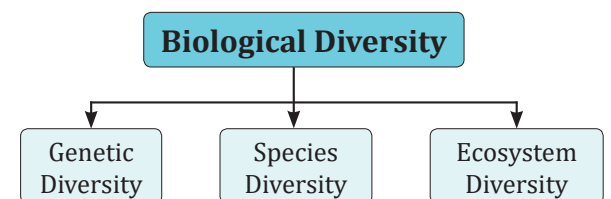


Biodiversity

Biodiversity

- Biodiversity or “biological diversity,” is defined as the variety of life on Earth, in all its forms and all its interactions. The number and variety of plants, animals and other organisms that exist is known as biodiversity.
- According to 1992 United Nations Earth Summit, biological diversity is the variability among living organisms from all sources, including, inter alia, terrestrial, marine, and other aquatic ecosystems, and the ecological complexes of which they are a part. This includes diversity within species, between species and ecosystems.
- The United Nations designated 2011–2020 as the United Nations Decade on Biodiversity. To increase the understanding and awareness of biodiversity issues, May 22 was proclaimed as the International Day for Biological Diversity.

Types of Biodiversity



Genetic Diversity

- Genetic diversity refers to the variety of genes contained within species of plants, animals and microorganisms.
- New genetic variation in individuals occurs by gene and chromosomal mutation. In case of organisms with sexual reproduction, it may be spread across the population by recombination.

Vavilov Center of Diversity

- A Vavilov Center of Diversity is a region of the world first indicated by the Russian agro-botanist Nikolai Vavilov to be an original center for the domestication of plants.
- Vavilov centers are regions where a high diversity of crop's wild relatives can be found, representing the natural relatives of domesticated crop plants.
- Vavilov identified eight such centers of origin of cultivated plants around the world in 1935.
- India has a high genetic diversity and is regarded as a Vavilov's center of high crop genetic diversity.
- Vavilov proposed eight centers of origin of cultivated plants, fundamental and ancient centers of agriculture in the world.

The Eight centers are as following: 1. China; 2. India; 2a. Indo-Malayan region; 3. Central Asia, including Pakistan, Punjab, Kashmir, Afghanistan and Turkestan; 4. Near East; 5. Mediterranean; 6. Ethiopia; 7. Southern Mexico and Central America; 8. South America (8. Ecuador, Peru, Bolivia, 8a. Chile, 8b. Brazil-Paraguay).



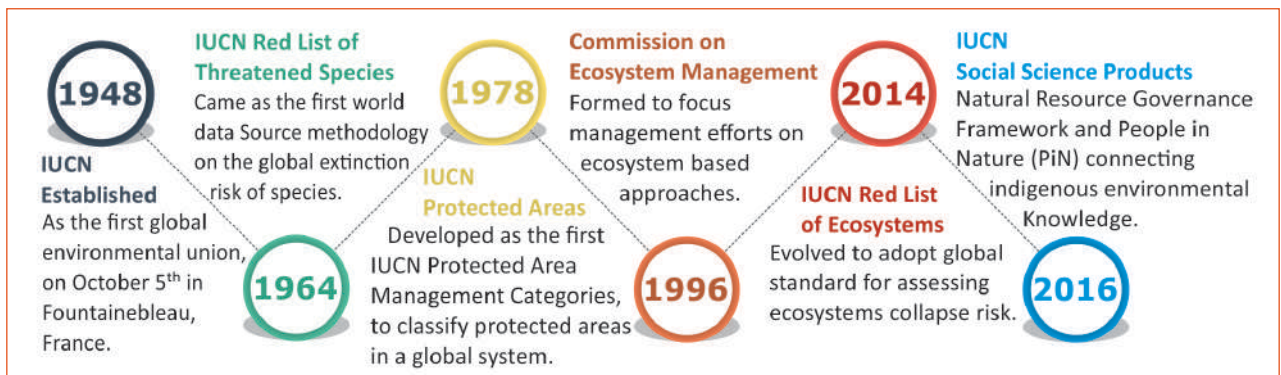


International Union for Conservation of Nature

The International Union for Conservation of Nature (IUCN)

- IUCN is an organization working in the field of nature conservation and sustainable use of natural resources. It is located in Gland, Switzerland and is also known as the World Conservation Union.
- IUCN was founded in October, 1948 as the International Union for the Protection of Nature (or IUPN) following an international conference in Fontainebleau, France. The organisation changed its name to the IUCN in 1956.

- It is a membership union, composed of both government and civil society organisations.
- It is involved in data gathering and analysis, research, field projects and education on conservation, sustainable development and biodiversity.
- **IUCN Red List:** In 1964, IUCN established the IUCN Red List of Threatened Species, which put forth a comprehensive data source on the global extinction risk of species and their conservation status in the world.



■ IUCN Protected Areas

- In 1978, IUCN developed a preliminary system of Protected Area Management Categories to help make sense of the world's growing protected area network, aiming both to define and record the resources.
- **Protected Areas Categories**
 - ❖ Ia (Strict Nature Reserve)
 - ❖ Ib (Wilderness Area)
 - ❖ II (National Park)
 - ❖ III (Natural Monument or Feature)
 - ❖ IV (Habitat/Species Management Area)
 - ❖ V (Protected Landscape/Seascape)
 - ❖ VI (Protected area with sustainable use of natural resources)

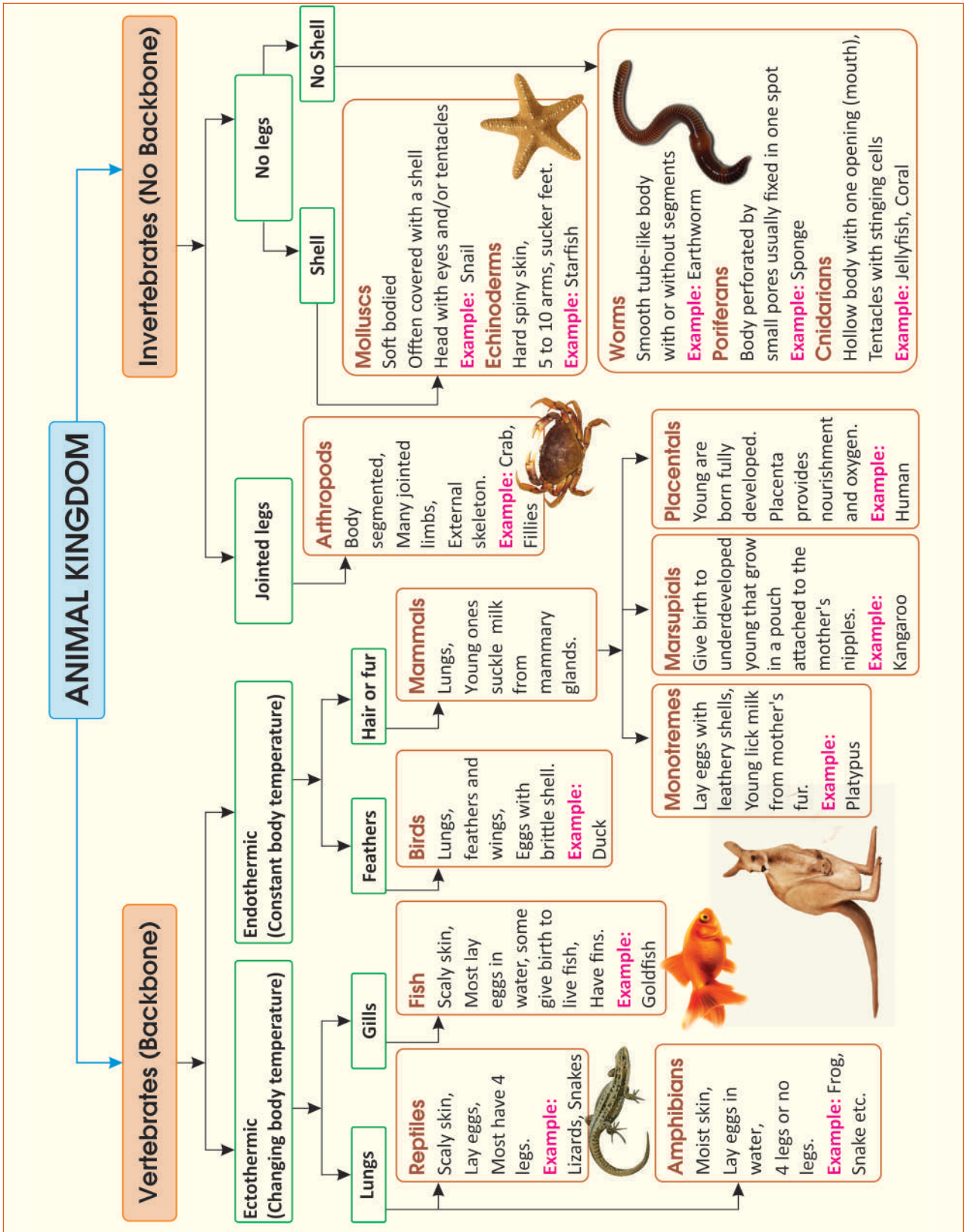
- These categories are recognised by international bodies such as the United Nations and by many national governments as the global standard for defining and recording protected areas and as such are increasingly being incorporated into government legislation.

■ The IUCN Red List of Ecosystems Categories and Criteria

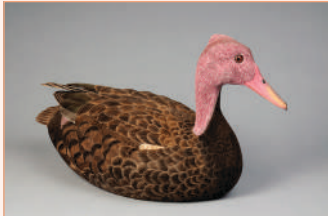



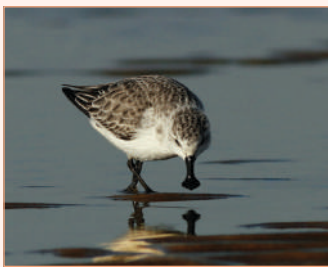
- It is a global standard for assessing the status of ecosystems, applicable at local, national, regional and global levels.
- Assessments determine whether an ecosystem is not facing imminent risk of collapse, or whether it is vulnerable, endangered, or critically endangered.

■ People in Nature (PiN)

- It is an IUCN knowledge basket on the interrelationships between people and nature.



Indian Species: Distribution and IUCN Status		
Species	Habitat and Distribution	IUCN Status
	Sinhagarh Plateau, Maharashtra	EN
	Namdapha National Park, Arunachal Pradesh	CR
	Western Ghat	CR
	Endemic to Andhra Pradesh	CR
	Central deciduous forest region	EN

	Since 1949, it has not been seen in wild in India. Presently found only in Myanmar.	CR
	Grasslands of Cambodia, India and Nepal	CR
	Tall grasslands in Western Himalayas	CR
	Rivers with sand in North Eastern States	CR
	Coastal areas in West Bengal, Odisha, Kerala and Tamil Nadu.	CR



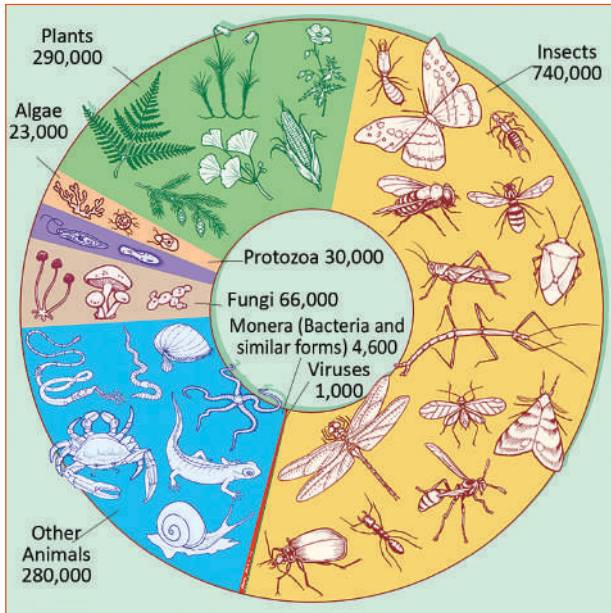
Snow Leopard

High in the mountains of Central Asia, Pamir, Karakoram, Hindu Kush and Himalayan Range. Jammu & Kashmir, Himachal Pradesh, Sikkim, Uttarakhand.

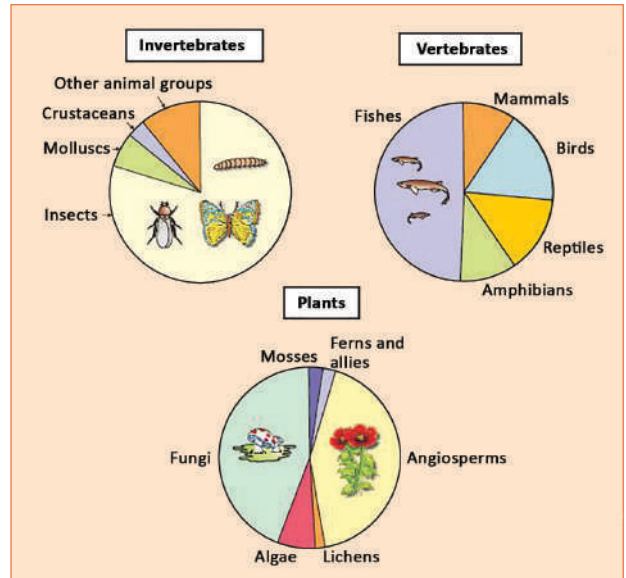
VU

- Species diversity is maximum at tropics than at poles.
- The largely tropical Amazonian rain forest in South America has the greatest biodiversity on earth.

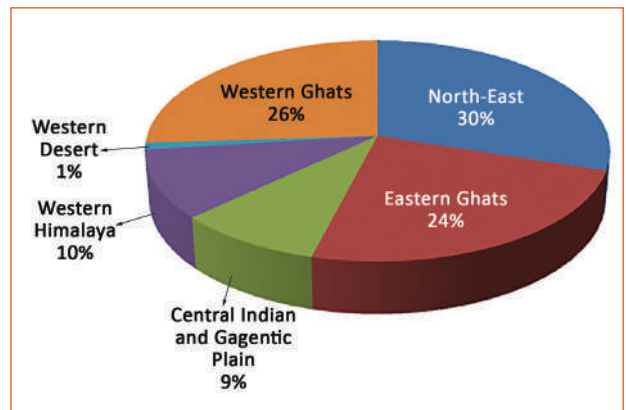
Species Diversity



- More than 70% of all the species recorded are animals, while plants (including algae, fungi, bryophytes, gymnosperms and angiosperms) comprise not more than 22% of the total.
- Among animals, insects are the most species-rich taxonomic group, making up more than 70% of the total.
- The number of fungi species in the world is more than the combined total of the species of fishes, amphibians, reptiles and mammals.



Species Diversity in Different Zones



Endemism

It is the ecological state of a species being unique to a defined geographic location, such as an island, nation, country or other defined zone, or habitat type. Organisms that are indigenous to a place are not endemic to it if they are also found elsewhere.

Wildlife Diseases

Disease	Agent	Susceptible Animals
Anthrax	Bacteria: Bacillus anthracis	Hoofed animals: Deer, Cattle, Goats, and Sheep.
Black quarter (black-leg)	Bacteria: Clostridium chauvoei	Cattle: Buffaloes, Sheep and Goats.
Foot and mouth disease	Virus: Coxsackie virus	Cloven-footed animals: Gaur, Nilgai, Chetal, Sambar, Yak, Mithun.

Plant Kingdom

Cryptogams (Seedless)

Thallophyta

Undifferentiated body called thallus.
No Vascular System.

Examples: Algae, Fungi and Lichens

Algae

Green, non differentiated plants possessing chlorophyll.

Habitat: Moist condition or in water.
Can manufacture their own food.



Fungi

Non-green, absence of chlorophyll, non-differentiated plants.

Habitat: Grow on dead or decaying organic matter as saphrophytes.

Examples: Moulds and Mushroom
Distribution: Western ghats > Eastern ghats > Western Himalayas



Lichen

Symbiotic relation between algae and fungus.

Habitat: Grow on rocks, tree trunks, dead wool etc.



Bryophyta

No proper root or shoot system.

Vascular system not well developed.

Lack vascular system for movement of substances across plant body.

Habitat: Moist places.
Distribution: Mostly in Eastern Himalaya, North Eastern Himalaya, Western Himalaya and Western ghats.

Examples: Mosses, Liverworts, Hornworts etc.



Pteridophyta

Well differentiated structures, such as stem, root, leaves as well as vascular system.

Habitat: Some are aquatic, some are terrestrial preferring moist and shady places (also known as Amphibians of plant kingdom).

Distribution: North East region followed by South India (including Western ghats and Eastern ghats) and north India.

Examples: Ferns, Horsetail, Marsilea



Gymnosperms (Naked Seeds)

Plants have well differentiated body, vascular system and they bear seeds.

Seed of gymnosperms are naked which means they are not enclosed within a fruit.

Examples: Pines, Redwood etc.

Distribution: Mostly to North Eastern region, Eastern and Western Ghats and Andaman & Nicobar Islands.



Phanerogams (Seed Bearing)

Angiosperms (Hidden Seeds)

Vascular Plants that possess special characteristics such as flower and fruits.

Bear seeds inside fruit.
Examples: Mango, Pomegranate, Avacado



Dicotyledons

Embryo with two cotyledons.

Example: Gram seed



Monocotyledons

Single cotyledon in embryo.

Examples: Rice, Wheat



- They are adapted for capturing and digesting insects and other animals by means of ingenious pitfalls and traps.
- The organic matter obtained from insects and small animals supplements their deficiency of nutrients.
- Drosera or Sundew, Aldrovanda, Nepenthes, Utricularia or Bladderworts are some of the examples of insectivorous plants.



Invasive Alien Species

- These are plants or animals that are introduced by man, accidentally or intentionally, outside of their

natural geographic range into an area where they are not naturally present.

- They are often introduced as a result of the globalisation of economies, for instance by trade via ships, shipment of wood products infested with insects, or the transport of ornamental plants that establish themselves into the wild and spread.
- If these species become problematic, they are termed an invasive alien species.
- An invasive species can be an amphibian like the cane toad, plant, insect, fish, fungus, bacteria, living as competitors, predators, pathogens and parasites.
- Invasive species alter the environment they invade and are difficult and expensive to control after they colonise a landscape, having phenotypic plasticity, i.e., the ability to adapt to environmental stress.
- Invasive plant species transform the soil structure and micro environment to their advantage by producing allelochemicals which cause the destruction of native species and local biodiversity.
- Some of the instances of alien invasive species are needle bush, desho grass (*Pennisetum pedicellatum*), giant salvinia, water hyacinth, prickly poppy, palmyra, and toddy palm.

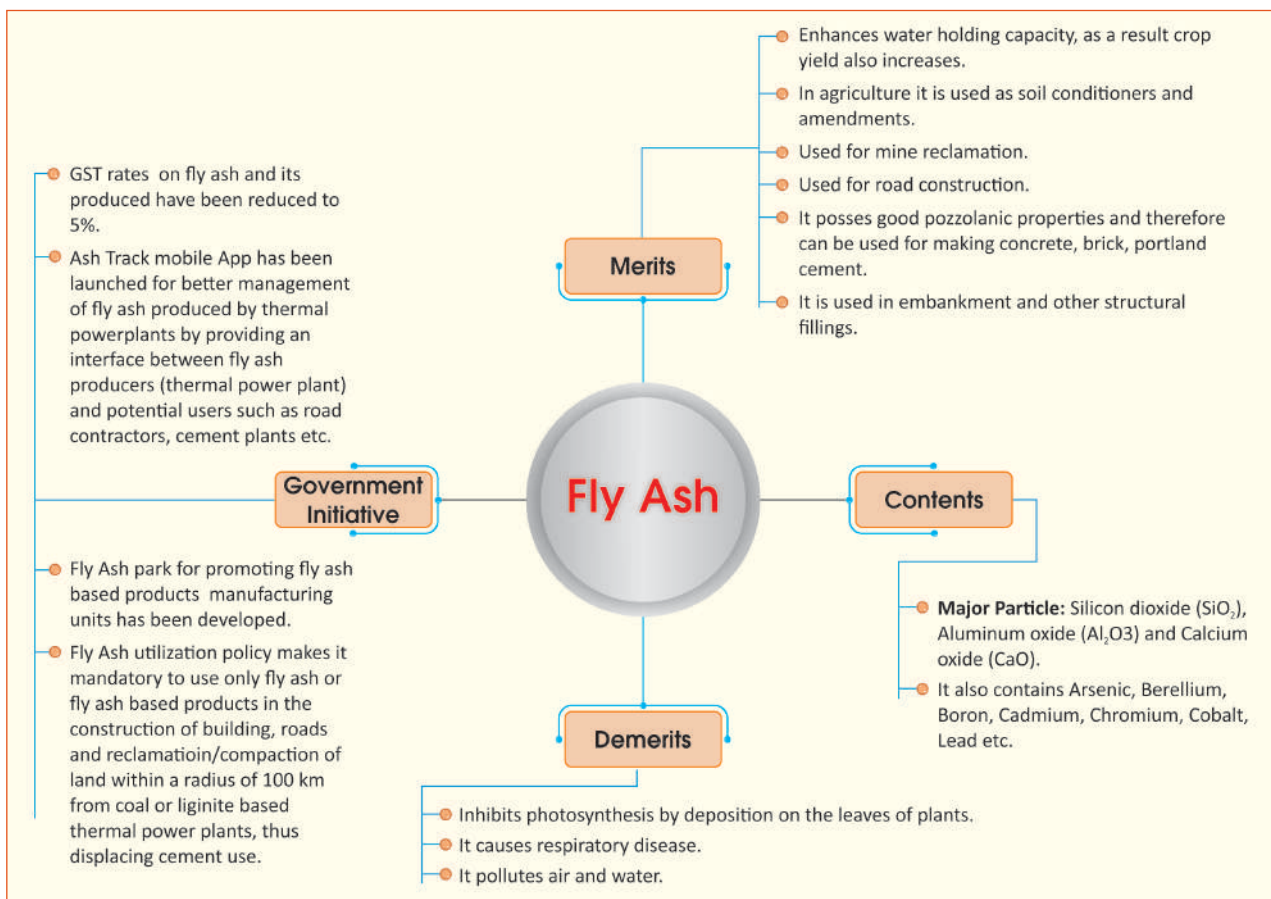
PRACTICE QUESTIONS

- Consider the following statements:
 - In India, Red Panda is naturally found in the western Himalayas only.
 - In India, slow loris lives in the dense forests of the North East.
 Which of the statements given above is/are correct?
 - 1 only
 - 2 only
 - Both 1 and 2
 - Neither 1 nor 2
- Consider the following:
 - Black-necked Crane
 - Cheetah
 - Flying Squirrel
 - Snow Leopard
 Which of the above are naturally found in India?
 - 1, 2 and 3 only
 - 1, 3 and 4 only
 - 2 and 4 only
 - 1, 2, 3 and 4
- In which of the following states is Lion-tailed Macaque found in its natural habitat?
 - Tamil Nadu
 - Kerala
 - Karnataka
 - Andhra Pradesh
 Select the correct answer using the code given below:
 - 1, 2 and 3 only
 - 2 only
 - 1, 3 and 4 only
 - 1, 2, 3 and 4

- A sandy and saline area is the natural Habitat of an Indian animal species. The animal has no predators in that area but its existence is threatened due to the destruction of its habitat. Which one of the following could be that animal?
 - Indian wild buffalo
 - Indian wild ass
 - Indian wild boar
 - Indian gazelle
- Concerning 'Dugong', a mammal found in India, which of the following statements is/are correct?
 - It is a herbivorous marine animal.
 - It is found along the entire coast of India.
 - It is given legal protection under Schedule I of the Wildlife (Protection) Act, 1972.
 Select the correct answer using the code given below:
 - 1 and 2 only
 - 2 only
 - 1 and 3 only
 - 3 only

Answer

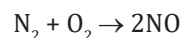
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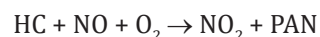
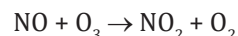
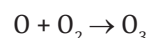
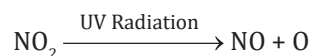
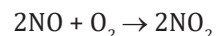
Smog

- Smog in simple terms is the combination of smoke and fog.
- Smog typically exists in urban areas where factories burn fossil fuels such as coal, which creates smoke and Sulfur dioxide that mixes with fog droplets to create a thick blanket of haze close to the ground.
- It is often associated with low temperature, calm wind and heavy traffic.
- Both smog and photochemical smog are forms of air pollution.
- Photochemical Smog**
 - Photochemical smog is a mixture of pollutants that form when nitrogen oxides and volatile organic compounds react to sunlight, creating a haze.
 - It is associated with drier and sunny areas.
 - Ozone is one of the primary components of photochemical smog.

❖ Nitrogen Dioxide + Sunlight + Hydrocarbons = Ozone



(Reactions in the atmosphere)



■ Effects of Smog

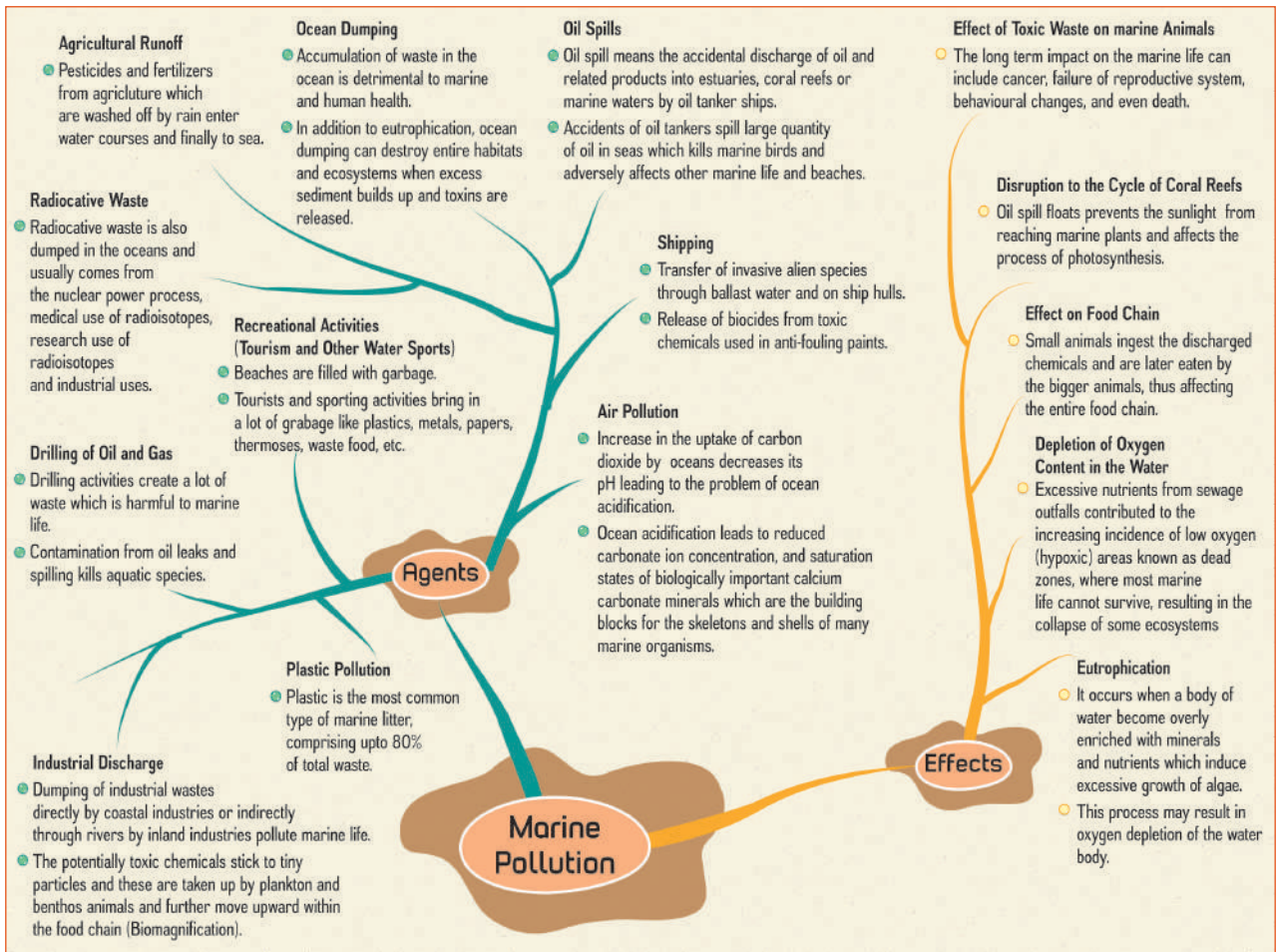
- It causes a light brownish coloration of the atmosphere which reduces visibility.
- It hinders the photosynthetic process in plants.
- It causes irritation to the eyes, respiratory distress, decrease of natural vitamin D leading to rickets.
- Heavy Smog shield earth from harmful ultraviolet radiation.



Nitrates	<ul style="list-style-type: none"> ■ The most common contaminant identified in ground water is dissolved nitrogen in the form of nitrate (NO_3^-). ■ Nearly 80% of the sewage generated in India flows untreated into its rivers, lakes and ponds, turning the water sources too polluted to use. ■ Nitrate pollution is also caused by heavy use of nitrogenous fertilisers, where nitrate seeps into the groundwater. ■ According to WHO, nitrate in drinking water can cause methemoglobinemia or the decreased ability of blood to carry vital Oxygen around the body. 	<ul style="list-style-type: none"> (i) Reverse Osmosis (ii) Ion Exchange (iii) Bio-remediation (iv) Blending
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Marine Pollution

Pollution in the marine ecosystem largely arises out of economic activities on land, in coastal areas and on the high seas.



Controlling Oil Spill

- Floating barriers such as “booms” is used to clean oil from the surface of water and to prevent slicks from spreading.
- Sorbents are sponges that can collect the oil. They are used to absorb the oil in the areas of oil spill.

- Bio-remediation may be used to accelerate the process of bio-degradation of the oil after a spill.
- Oil zapper, a mixture of bacteria, can degrade the pollutants of oil-contaminated sites leaving behind no harmful residues.



Major Environmental Movements in India	
Bishnoi Movement	<ul style="list-style-type: none"> ■ This movement was started by sage Sombaji around 1700 AD against deforestation. After that Amrita Devi forwarded the movement. ■ 363 people from the Bishnoi community were killed in the protest. ■ When the king of this region came to know the protest and killing then he rushed to the village and apologized, and declared the region as protected area.
Chipko Movement	<ul style="list-style-type: none"> ■ It was launched from Gopeshwar in Chamoli district, Uttarakhand in 1973. ■ The movement was to prevent illegal cutting of trees in the Himalayan region (Uttarakhand). ■ The name of the movement comes from the word 'embrace', as the villagers hugged the trees, and prevented it from falling. ■ Sunderlal Bahuguna and Chandi Prasad Bhatt were the leaders of this movement.
Silent Valley Movement	<ul style="list-style-type: none"> ■ Silent Valley is situated in Palghat district in Kundali hills and contains India's last substantial stretch of tropical evergreen forest. ■ The environmentalists and the local people strongly objected to the hydel power project being set up here in 1973. ■ Under pressure, the government had to declare it the national reserve forests in 1985.
Appiko Movement	<ul style="list-style-type: none"> ■ In 1983, on the lines of the Chipko Movement, Pandurang Hegde launched a movement which is come to known as the Appiko Movement in Karnataka. ■ Its main objectives were afforestation as well as development, conservation and proper utilization of forests in the best manner. ■ The meaning of "appiko" is to express one's affection for a tree by embracing it.
Jungle Bachao Andola	<ul style="list-style-type: none"> ■ The tribal community of Singhbhum district of Jharkhand agitated against the forest policy of the Government in 1982. ■ The Government wanted to replace the natural soil, forests with the high-priced teak. ■ Many environmentalists refer to this movement as "Greed Game Political Populism".
Narmada Bachao Movement	<ul style="list-style-type: none"> ■ The environmentalists and the local people started protest against the building of Dams on the Narmada for the production of hydro-electricity since 1985 which was popularly known as Narmada Bachao Aandolan. ■ Medha Patkar has been the leader of this aandolan who got support from the Arundhati Roy, Baba Amte and Aamir Khan.
Tehri Dam Conflict	<ul style="list-style-type: none"> ■ This movement led by Sunderlal Bahuguna, was started by the local people around 1980s and 1990s because the dam project would be constructed in the seismic sensitive region and it causes submergence of forest areas along with Tehri town. ■ Despite the protest, the construction of the dam is being carried out.

International Conventions/Protocols/Commissions	
Convention/Protocols/Commission	Key Points
United Nations Conference On Environment and Development (UNCED) [Earth Summit]	<ul style="list-style-type: none"> ■ Rio de Janeiro, 1992. ■ It consisted of 27 principles intended to guide future sustainable development around the world. <p>Outcome Documents</p> <ul style="list-style-type: none"> ■ Rio Declaration on Environment and Development ■ Agenda 21 ■ Forest Principles <p>Legally Binding Documents</p> <ul style="list-style-type: none"> ■ Convention on Biological Diversity ■ Framework Convention on Climate Change (UNFCCC)



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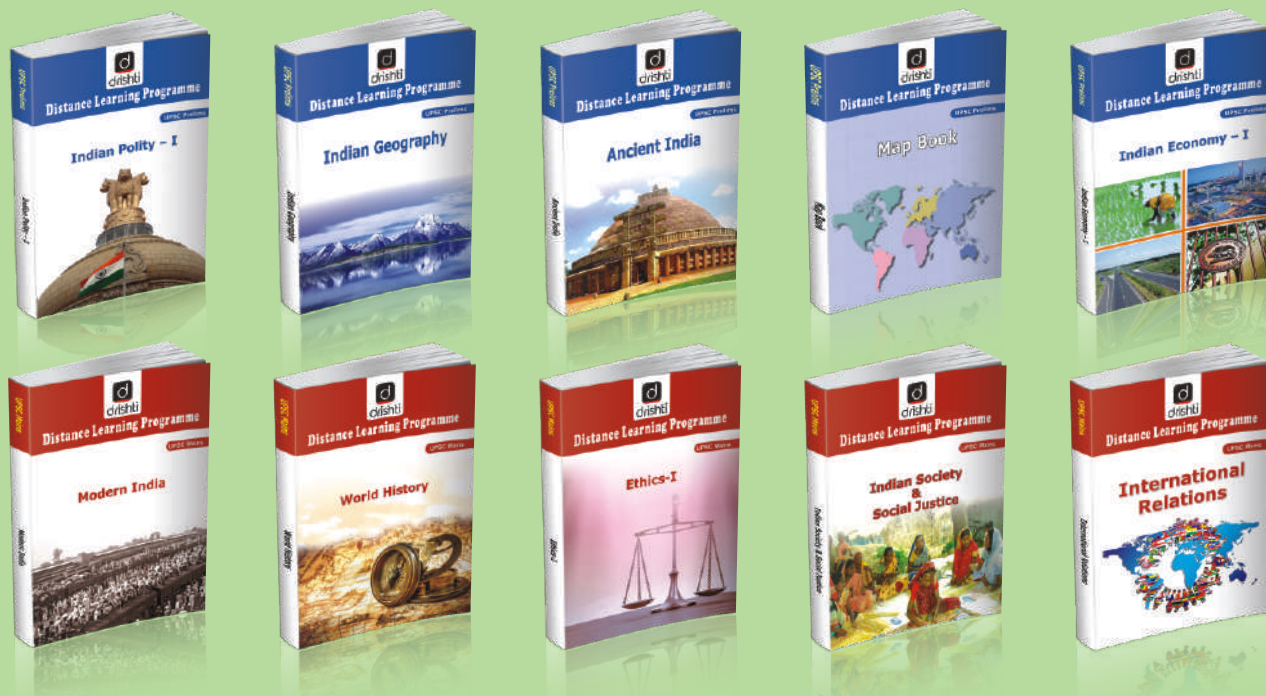
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