



*IAS PCS Pathshala*

# **ENVIRONMENT & ECOLOGY One Liner**



## 1. ECOSYSTEM & ECOLOGY

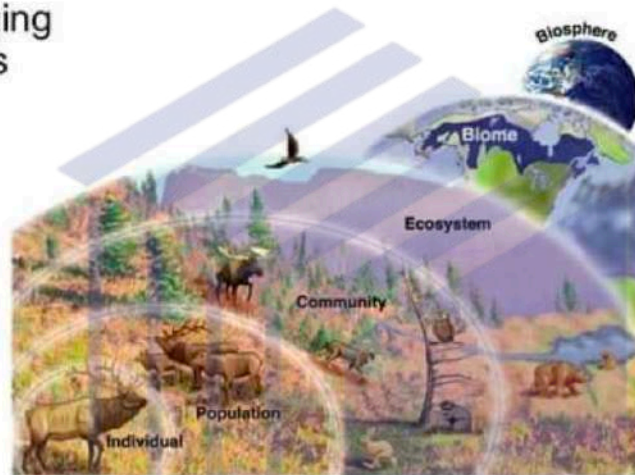
1. Ecology is the study of interactions among organisms & their environment. Ernst Haeckel coined the word 'Ecology'.

- Levels of Organizations in Ecology - Correct order of biological organization ranging from organism to biosphere is: Population → Community → Ecosystem → Landscape

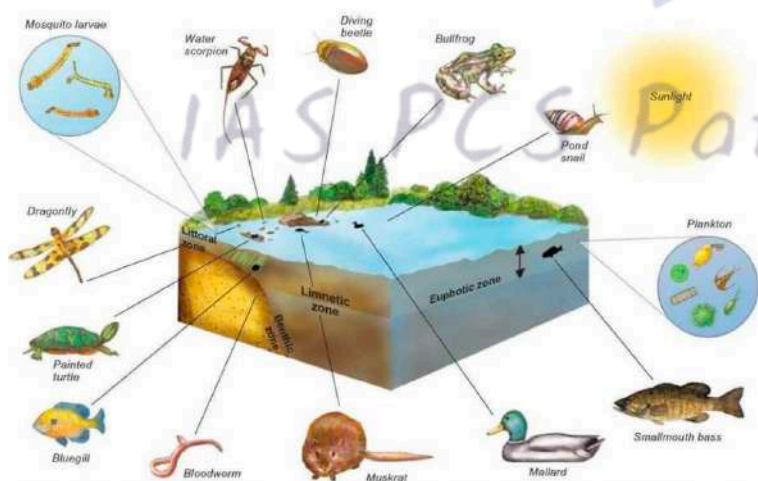
### Levels of Organization

Ecologists study organisms ranging from the various levels of organization:

- Species
- Population
- Community
- Ecosystem
- Biome
- Biosphere



2. A.G. Tansley first used the term Ecosystem. An Ecosystem is a community of living organism (plants, animals & microbes) along with non-living components (air, water, soil etc.) interacting as a system. These biotic & abiotic components are linked together through nutrient cycle & energy flows.



Aquatic Ecosystem ([Source](#))

3. Important features of ecology/ecosystem are:

- It is an open system.
- It represents all living organisms & the physical environment.
- It is a functional unit.
- It has own productivity.
- It consists of biotic & abiotic components.

**Environment → Can be almost everything or a small region.**

**Habitat → Area where an organism lives.**

**Biosphere → The region on earth that supports life.**

**Ecosystem → Producers, Consumers, Decomposers and their relationships (tiny environment). It is the functional unit of the environment.**

#### 4. Classification of Ecosystems:

- There are mainly two kinds of ecosystems → Aquatic & Terrestrial. Marine (Aquatic) ecosystems are biggest cover 71% of earth surface & contain 97% of our planet's water (e.g.: Ocean)
- Forest, grassland and desert are some examples of terrestrial ecosystems; pond, lake, wetland, river and estuary are some examples of aquatic ecosystems.
- Artificial ecosystem: fields, gardens, orchards, human made reservoirs.
- Natural ecosystem: forests, ponds, lakes, rivers, oceans.

5. Carrying capacity is the number of organisms that can be supported by the environment in a given area.

6. The concept of 'Ecological Transition' was given by John Bennett in 1976. It studies the relationships between humans and the physical environment.

7. Ecological niche describes the physical space occupied by an organism & its functional role in the community of organisms.

## Habitat vs Niche

### Habitat

- The habitat is the place where an organism lives out its life.
  - It is where the organism finds food, shelter and mates.



### Niche

- A niche is its role in the community and how it interacts with the environment.
  - How it obtains food, mates and protection from predators.



8. Main cause of ecological imbalance is Deforestation. Secondary causes are - desertification, Lumbering, floods, famines & rainfall variations.

9. Decomposer (fungi & bacteria), are mainly nature recyclers as they break down organic matter of dead bodies.

10. Transfer of food energy from green plants (producers) through a series of organisms with repeated eating and being eaten link is called a food chain. E.g., Grasses → Grasshopper → Frog → Snake → Hawk/Eagle.

- Each step in the food chain is called trophic level.
- Types of Food Chains: 1) Grazing food chain and 2) Detritus food chain
- In food chain, Man is primary as well as Secondary consumer who feeds on both plant products & meat.
- Food Chain e.g.: Diatom → Crustaceans → Herring

11. In Ecosystem, due to the availability of maximum energy, the primary producers are always maximum in number.

12. Deer is herbivores (primary consumers). Ants are both decomposers & primary consumers. Green plants are primary producers/autotrophs/1<sup>st</sup> trophic level as they are self-feeding through photosynthesis.

Trophic levels	
Autotrophs	Green plants (Producers)
Heterotrophs	Herbivore (Primary consumers)
Heterotrophs	Carnivores (Secondary consumers)
Heterotrophs	Carnivore (Tertiary consumers)
Heterotrophs	Top carnivores (Quaternary consumers)

13. A trophic level is the representation of energy flow in an ecosystem.



14. Raymond Lindeman in 1942 gave ten percent law of energy transfer from one trophic level to the next. It means, only ten percent of the energy is stored as flesh during transfer of energy from organic matter from one trophic level to the another. Thus, the amount of energy decreases during the transfer from one trophic level to another in an ecosystem. The primary source of energy for almost every ecosystem on Earth is the sun.

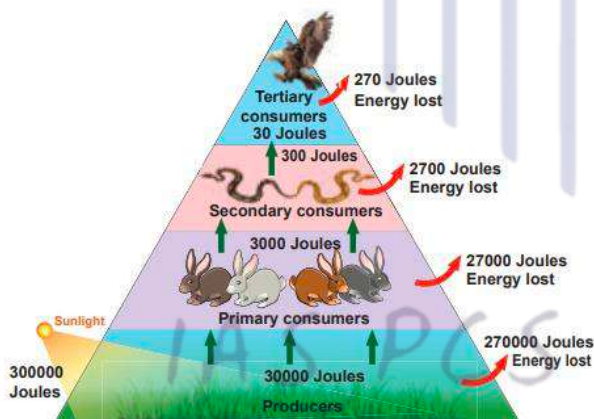


Figure 15: Ten percent law

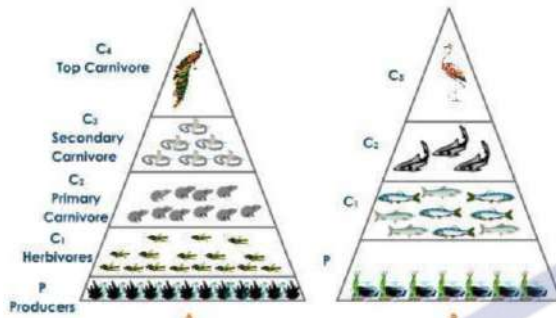
15. Phytoplankton's (microalgae) are the main primary producers in marine environment. They contain chlorophyll & require sunlight to live and grow. Phytoplankton requires inorganic nutrients- nitrates, phosphates and Sulphur.

16. Ecological Pyramids - The pyramidal representation of trophic levels of different organisms based on their ecological position. The ecological pyramids are of three categories:

- 1) Pyramid of numbers,
- 2) Pyramid of biomass, and
- 3) Pyramid of energy or productivity

17. Pyramid of Numbers - represents the total number of individuals of different species (population) at each trophic level. They may not always be upright, and may even be completely inverted.

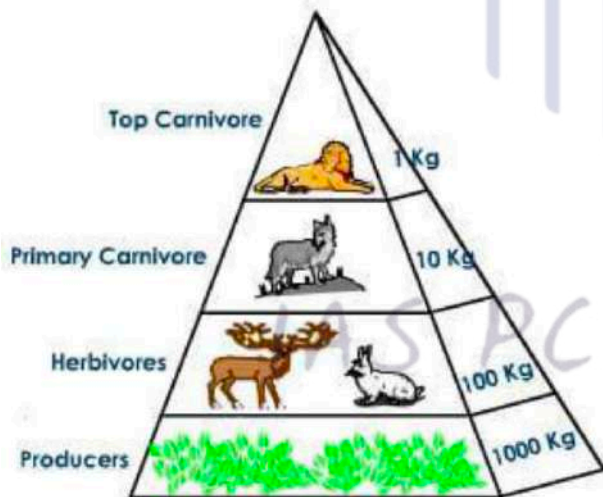
- Pyramid of numbers – upright ----- > This type of pyramid can be seen in the grassland ecosystem and pond ecosystem.



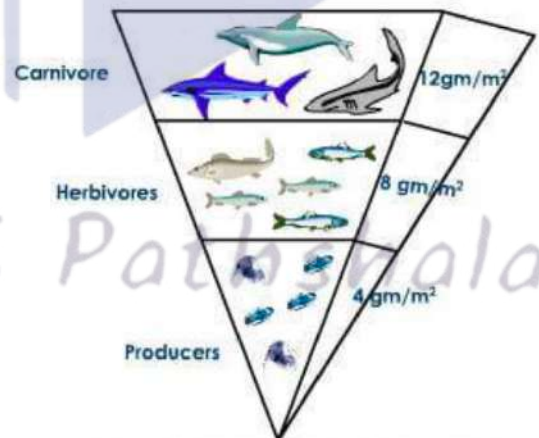
Upright Pyramids of Numbers. (A) In a Grass Land (B) In a Pond

- Pyramid of numbers – inverted ----- > number of individuals is increased from lower level to higher trophic level. E.g., Tree ecosystem.

18. Pyramid of Biomass - depicts the extent of biomass per unit area within different trophic levels. In grasslands & forests, there is a gradual decrease in the biomass at successive levels from producers to top carnivores. Thus, pyramids are upright. However, in pond, as the producers are small organisms, their biomass is least making the inverted pyramid.

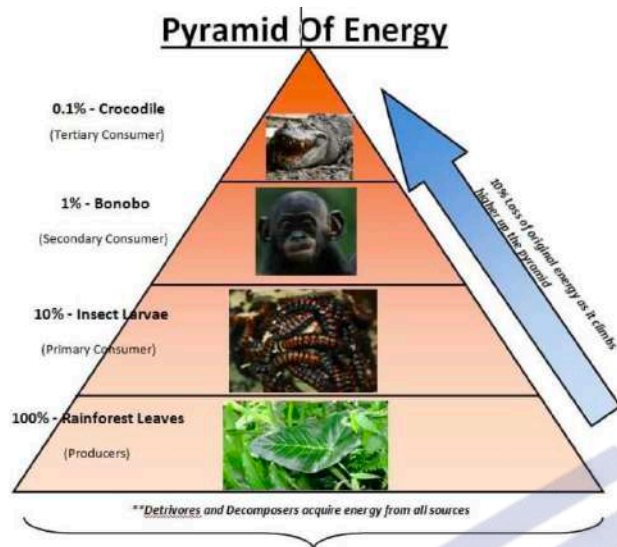


Upright Pyramid of biomass in a Terrestrial Ecosystem



Inverted Pyramid in an Aquatic Ecosystem

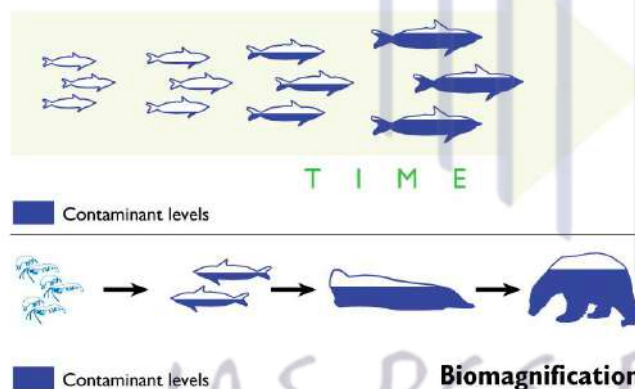
19. Pyramid of Energy - represents the amount of energy at each trophic level and loss of energy at each transfer to another trophic level. Hence the pyramid is always upward.



20. Bioaccumulation is the gradual accumulation of pollutants, chemicals (chronic poisoning) or other substances in an organism.

21. Biomagnification refers to progressive bioaccumulation (increase in concentration) at each trophic level with the passage of time.

#### Bioaccumulation



22. DDT is a non-biodegradable, biomagnifying pollutant which increases in concentration from primary producers to tertiary consumers.

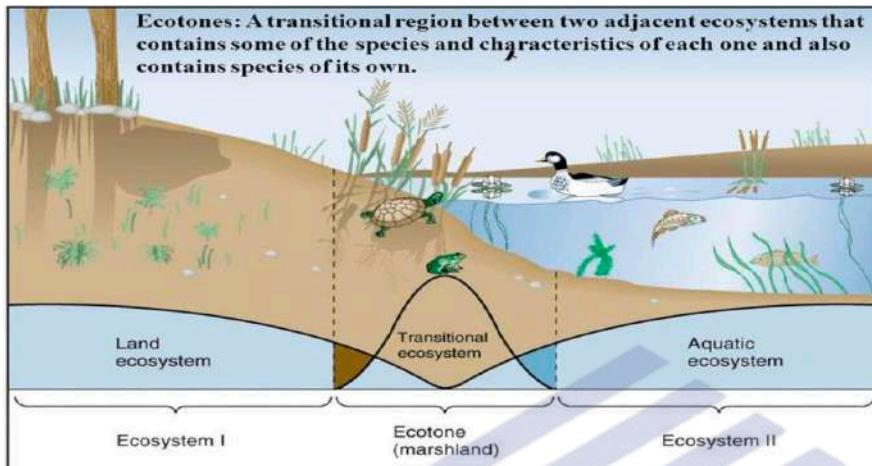
23. The amount of energy during transfer from one trophic level to another decreases. This flow of energy is unidirectional.

24. Some Invasive fauna in India are - Eucalyptus in Southern India, Gold Fish, House Gecko

25. Eucalyptus consumes more water than other trees, so also called as 'enemy of the environment'. These are mostly found in Australia. Eucalyptus is called as the environmental enemy

26. Lentic ecosystem refers to static water habitats like ponds, lakes, swamps, marshes. Lotic ecosystem refers to dynamic water habitats like rivers.

27. Ecotone is a region of transition between two distinct biological communities. For e.g., the mangrove forests represent an ecotone between marine and terrestrial ecosystem.



28. Sometimes the number of species and the population density of some of the species in the ecotone is much greater than either community. This is called edge effect. For example, the density of birds is greater in the ecotone between the forest and the desert.

29. Ocean (coral reef) is the most stable ecosystem.

30. A biome is a large naturally occurring community of flora and fauna occupying a major habitat. E.g., Rainforest biome or tundra biome

- Natural Biome → freshwater, Grassland, Rainforest.
- Anthropogenic Biome → cropland

31. Coral Reefs: (A) Most of the world's coral reefs are in tropical waters. (B) More than one-third of the world's coral reefs are located in territories of Australia (Great Barrier Reef), Indonesia & Philippines. (C) Coral reefs host far greater number of animals phyla than those hosted by tropical rainforests.

32. Largest ecosystem of the earth is Biosphere.

33. Type of Biotic Interaction in a Food Web -



	Interaction type	Combination		Effects	Examples
<b>1. Positive interaction</b>					
1	Mutualism	(+)	(+)	Both species benefitted	Lichen, <i>Mycorrhiza</i> etc.
2	Commensalism	(+)	(0)	One species is benefitted and the other species is neither benefitted nor harmed	orchids, Lianas etc.
<b>2. Negative interaction</b>					
4	Predation	(+)	(-)	One species benefitted, the other species are harmed	<i>Drosera, Nepenthes</i> etc.
5	Parasitism	(+)	(-)	One species benefitted, the other species are harmed	<i>Cuscuta, Duranta, Viscum</i> etc.
6	Competition	(-)	(-)	Harmful for both	Grassland species
7	Amensalism	(-)	(0)	Harmful for one, but the other species are unaffected	<i>Penicillium</i> and <i>Staphylo coccus</i>

(+) Benefitted, (-) Harmed (0) Unaffected

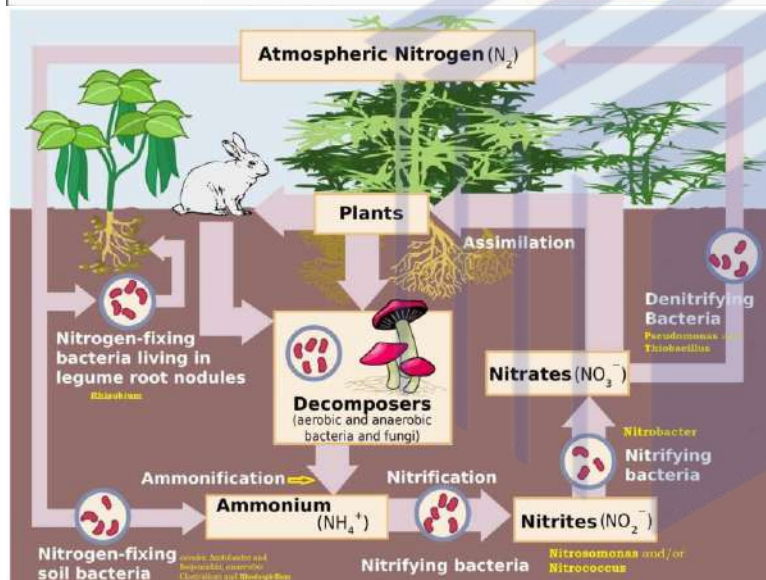
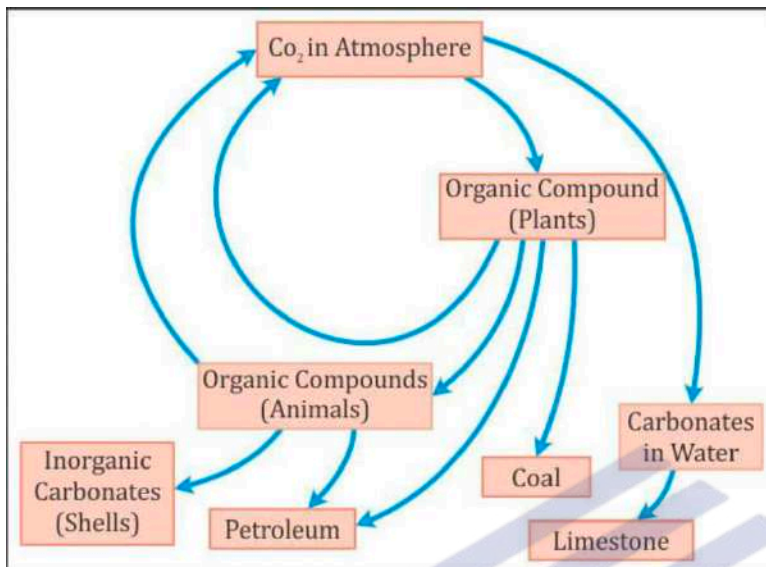
Table 6.4: Different interactions of plant

### 34. Biogeochemical cycle - cycling of elements in an ecosystem.

#### Types of Biogeochemical cycles:

- **Gaseous Cycle:** the reservoir is the atmosphere or the hydrosphere — water cycle, carbon cycle, nitrogen cycle.
- **Sedimentary Cycle:** the reservoir is the earth's crust (soluble elements mostly found in earth's crust) — phosphorous cycle, Sulphur cycle, calcium cycle, magnesium cycle

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35. Nitrogen fixation on earth is accomplished in three different ways:

- By microorganisms (bacteria and blue-green algae),
- By man using industrial processes (fertilizer factories) and
- To a limited extent by atmospheric phenomena such as thunder and lightning.

36. 'Narmada Bacho Andolan' was started in 1985 against construction of dam on Narmada River. The proposed Sardar Sarovar Dam and Narmada Sagar will displace more than 250,000 people.

37. "Ecology is permanent economy" is the slogan of Chipko movement. It was started on 26 March, 1974 in Garhwal Himalayas by Gaura Devi. It was a non-violent struggle. Chandi Prasad Bhatt & Sundarlal Bahuguna were also the leaders. Chandi Prasad Bhatt also received Ramon Magsaysay award in 1982.

24. Gaura Devi launched the movement against deforestation in Raini village of Chamoli, Uttarakhand.

38. Apiko Movement' was started in Karnataka in 1983.

39. The Mitti Bachao Andolan was started in the year 1977 against water logging and salinity caused by the Tawa Dam in Hoshangabad, Madhya Pradesh.

40. Decomposers convert inorganic into organic matter. Organic into Inorganic matter

41. Sequence of ecosystem in order of decreasing productivity:

- Mangroves → Grasslands → Lakes → Oceans

42. Arne Naess coined the term "deep ecology".

43. Grinnell enunciated the concept of ecological niche. He referred to the "ecological or environmental niche" as the ultimate distributional unit of "species & subspecies".

44. Global hectares is the measurement unit of the ecological footprint.

45. Ecological footprint is the measure of human demand on Earth's ecosystem. It is the minimum area of land required to completely sustain the life of the person. It is the biologically productive area which is required to include fruits, vegetables, wood, fibers, fossil fuels use & also the release of CO<sub>2</sub>.

46. National Environmental Legislation List -

- Wild Life (Protection) Act of 1972
- The Water (Prevention and Control of Pollution) Act of 1974
- Water Cess Act (Prevention and Control of Pollution), 1977
- Forest (Conservation) Act of 1980
- The Air (Prevention and Control of Pollution) Act of 1981
- Environment (Protection) Act of 1986
- Biodiversity Act 2000
- Forest Rights Act, 2006 Or The Scheduled Tribes & other Traditional Dwellers (Recognition of forest Rights) Act, 2006
- National Green Tribunal Act, 2010
- Wetlands (Conservation and Management) Rules 2010
- Project Tiger, 1973.
- Project Elephant, 1992
- Project Snow Leopard, 2009

47. Bionomics is study of an organism & its relation to its environment. It is synonymous with ecology. It stresses on value of natural systems that influence human systems.

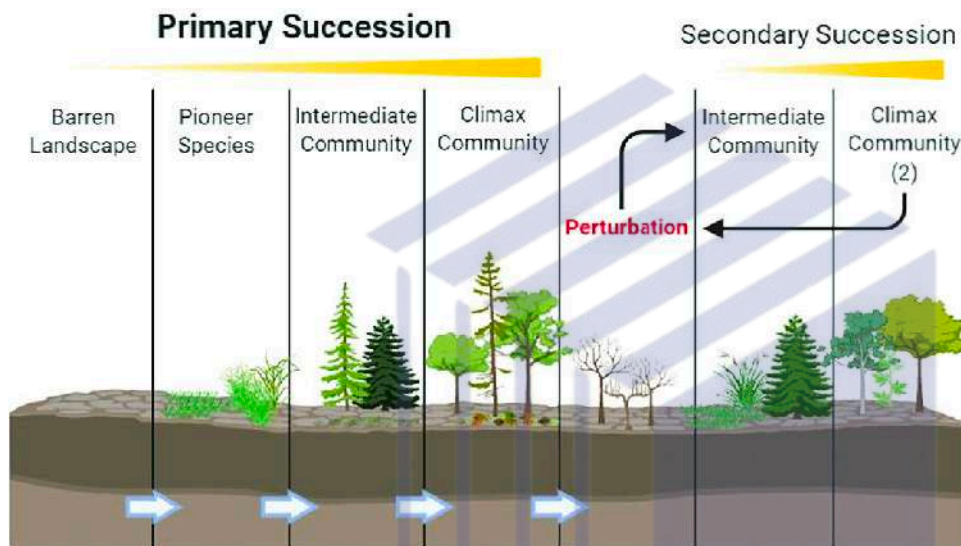
48. Pycnocline indicates a density gradient. Halocline shows salinity gradient. Thermocline shows change in temperature.

49. Marine upwelling is process of replacement of hot water of the surface of sea with cold nutrient rich water. It increases the marine productivity. Downwelling is where surface water is forced downwards, where it may deliver oxygen to deeper water. Downwelling leads to reduced productivity.

50. Eco sensitive zones are mentioned under the Environment Protection Act, 1986. Its purpose is to regulate all kinds of human activities in those zones except agriculture.

51. MoEFCC stipulated that state governments should declare land falling within 10 km of the boundaries of national parks and wildlife sanctuaries as eco-fragile zones or ESZs under the Environmental (Protection) Act, 1986.

52. Ecological succession is the gradual process by which ecosystems change & develop over time. The process involves a progressive series of changes with one community replacing another until a stable, mature, climax community develops.



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- First plant to colonize an area is called the pioneer Community.
- The final stage of succession is called the climax community.
- Each transitional community that is formed and replaced during succession is called a stage in succession or a seral community.
- The entire sequence of communities that successively change in a given area is called Sere. The individual transitional communities are termed seral stages or seral communities.
- Primary Succession - takes place on over where no community has existed previously. New site is first colonized by a few hardy pioneer species that are often microbes, lichens and mosses.
- Secondary Succession - after the complete or partial destruction of the existing community.
- Unlike in the primary succession, the secondary succession starts on a well-developed soil already formed at the site. Thus, secondary succession is relatively faster.

53. Correct order of biotic succession:

- Nudation → Migration → Ecesis → Reaction → Stabilization

## 2. BIODIVERSITY & BIODIVERSITY CONSERVATION

1. Biodiversity is range of different species (plants & animals) in an environment (ecosystem). The most significant aspect of biodiversity is maintenance of the ecosystem.

- **Biodiversity is measured by two major components:** species richness (measure of the number of species found in a community), and species evenness (measure of the relative abundance of the different species making up the richness of an area)
- It is denoted with Alfa (diversity within a particular area or ecosystem), Beta (comparison of diversity between ecosystems) & Gamma (overall diversity for the different ecosystems within a region) indicating different categories. This classification was advanced by Whittaker in 1972.

2. Threats to biodiversity are:

- Pollution
- Climate change
- Overexploitation of resources
- Alteration a loss of habitats/habitat change
- Introduction of exotic species & genetically modified organism.
- Global warming
- Nutrient loading Human activities
- Deforestation
- Desertification
- Increasing wildlife trade
- Shifting cultivation/Jhum cultivation

3. Keystone species is a species whose addition to or loss from an ecosystem leads to major changes in the occurrence of at least one other species. Ex. Lion, Tiger etc.

4. **Biodiversity Conservation** -

- Ex-situ(off-site) conservation: seed bank, botanical garden, horticulture recreational garden, zoo, aquarium.
- In Situ (on site) conservation: National Parks, Sanctuaries, Biosphere reserves, Reserved Forest, Protected Forest, Nature reserves.

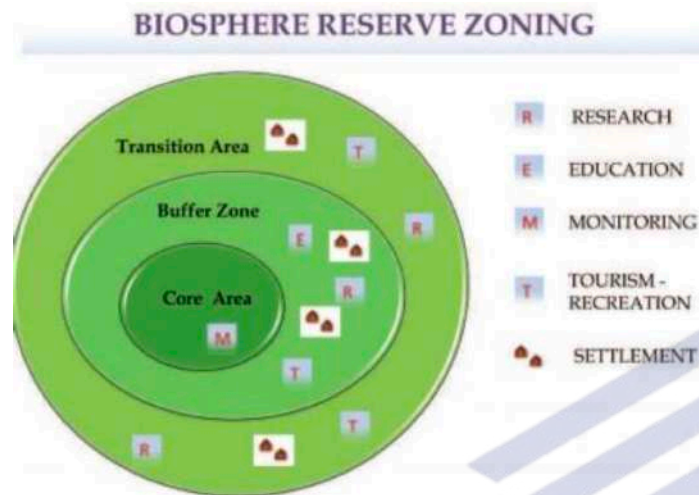
5. Rights to all activities like hunting, grazing, etc. in reserved forests are banned unless specific orders are issued otherwise. In protected areas, rights to activities like hunting and grazing are sometimes given to communities living on the fringes of the forest

6. India now has 18 biosphere reserves, 106 national parks and 553 wildlife sanctuaries.

7. In terms of protection, National Parks > Wildlife Sanctuary > Reserved forests > Protected forests

8. Unlike a Sanctuary, where certain rights can be allowed, in a National Park, no rights are allowed. No grazing of any livestock shall also be permitted inside a National Park while in a Sanctuary, the Chief Wildlife Warden may regulate, control or prohibit it.

9. Biosphere Reserve - Large areas of protected land for conservation of wildlife, plant and animal resources and traditional life of the tribals living in the area. In core or natural zone human activity is not allowed.



10. Natural habitat destruction & loss of vegetation is the main reason for the decrease in biodiversity.

11. Biosphere Reserve In India

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### Biosphere Reserves in India

Name	State	Type	Key fauna
1. Nilgiri Biosphere Reserve	Tamil Nadu, Kerala and Karnataka	Western Ghats	Nilgiri tahr, lion-tailed macaque
2. Nanda Devi National Park & Biosphere Reserve	Uttarakhand	Western Himalayas	Snow Leopard, Himalayan Black Bear
3. Gulf of Mannar	Tamil Nadu	Coasts	Dugong or sea cow
4. Nokrek	Meghalaya (Part of Garo Hills)	East Himalayas	Red panda
5. Sundarbans	West Bengal	Gangetic Delta	Royal Bengal tiger
6. Manas	Assam (Terai region)	East Himalayas	Golden langur, red panda
7. Simlipal	Odisha	Deccan Peninsula	Gaur, royal Bengal tiger, elephant
8. Dihang-Dibang	Arunachal Pradesh	Eastern Himalaya	
9. Pachmarhi Biosphere Reserve	Madhya Pradesh	Semi-Arid	Giant squirrel, flying squirrel
10. Achanakmar-Amarkantak Biosphere Reserve	Madhya Pradesh, Chhattisgarh	Maikala Hills	Four-horned antelope, Indian wild dog, Sarus crane, White-rumped vulture
11. Great Rann of Kutch	Gujarat	Desert	Indian wild ass
12. Cold Desert	Himachal Pradesh	Western Himalayas	Snow leopard
13. Khangchendzonga	Sikkim	East Himalayas	Snow leopard, red panda
14. Agasthyamalai Biosphere Reserve	Kerala, Tamil Nadu	Western Ghats	Nilgiri Tahr, elephants
15. Great Nicobar Biosphere Reserve	Andaman and Nicobar Islands	Islands	Saltwater crocodile
16. Dibru-Saikhowa	Assam	East Himalayas	Golden langur
17. Seshachalam Hills	Andhra Pradesh	Eastern Ghats	
18. Panna	Madhya Pradesh	Catchment Area of the Ken River	Tiger, chital, chinkara, sambar and sloth bear

**12. Man and Biosphere Programme (MAB programme) - started by UNESCO in 1971; introduced in India in 1986.**

Twelve of the eighteen biosphere reserves are a part of the [World Network of Biosphere Reserves](#), based on the [UNESCO Man and the Biosphere \(MAB\) Programme](#)

#	Name	States/ UT	Year
1	Nilgiri Biosphere Reserve	Tamil Nadu, Kerala and Karnataka	2000
2	Gulf of Mannar Biosphere Reserve	Tamil Nadu	2001
3	Sundarbans Biosphere Reserve	West Bengal	2001
4	Nanda Devi Biosphere Reserve	Uttarakhand	2004
5	Nokrek Biosphere Reserve	Meghalaya	2009
6	Pachmarhi Biosphere Reserve	Madhya Pradesh	2009
7	Simlipal Biosphere Reserve	Odisha	2009
8	Great Nicobar Biosphere Reserve	Andaman & Nicobar Islands	2013
9	Achanakmar-Amarkantak Biosphere Reserve	Chhattisgarh, Madhya Pradesh	2012 <sup>[2]</sup>
10	Agasthyamalai Biosphere Reserve	Kerala and Tamil Nadu	2016 <sup>[4]</sup>
11	Khangchendzonga National Park	Sikkim	2018 <sup>[5]</sup>
12	Panna Biosphere Reserve	Madhya Pradesh	2020 <sup>[6]</sup>

**13. Govt. of India in collaboration with Norwegian Govt. has made a "Centre for Biodiversity Policy & Law (CEBPOL)" in the National Biodiversity Authority (NBA), Chennai.**

**14. International Day for Biological Diversity proclaimed on May 22 by United Nations. On 29 Dec, 1993 the convention of biological diversity came into force.**

**15. India Represents -**

- **Two 'Realms** - They are: 1) the Himalayan region represented by Palearctic Realm and 2) the rest of the sub-continent represented by Malayan Realm
- **Five Biomes** – given below
- **Ten Bio-geographic Zones** - 1) Trans-Himalayas 2) Himalayas 3) Desert 4) Semi-arid 5) Western Ghats 6) Deccan Peninsula 7) Gangetic plain 8) North-east India 9) Islands 10) Coasts
- **Twenty-five Bio-geographic provinces**

**16. Norman Myers coined the term "biodiversity hotspot" in 1988.**

**17. India has four biodiversity hotspots →**

- Western Ghat
- Eastern Himalaya
- Indo-Myanmar border
- Sundaland. Andaman & Nicobar Island is regarded as a part of the Sundaland biodiversity area.

**18. 'Conservation International' has released an updated list of 36 biodiversity hotspots worldwide.**

**19. Hotspots are not only located in tropical regions but also in temperate regions.**



20. India inhabitants 7.6% of all mammals, 12.6% birds, 6.2% reptiles, 4.4% amphibians found in 18 mega-diverse countries. Western Ghat is a biodiversity saturated area and richest in biodiversity in whole of India.

21. In terms of species richness, India ranks seventh in mammals, ninth in birds and fifth in reptiles.

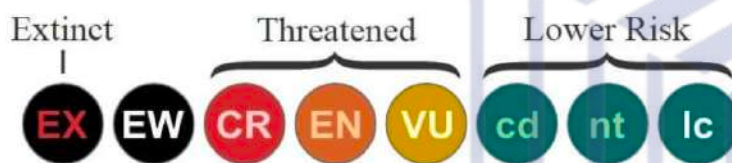
22. The tallest known tree (379 feet/115.5mm) is Redwood (sequoia) found in California (USA).

23. According to International Union for Conservation of nature, a species not located for last 50 years is considered to be Extinct.

24. Large body size, Narrow niche, lack of genetic variability is responsible for extinction whereas Broad niche is not responsible.

25. (IUCN) is an international organization (NGO) working in the field of nature conservation and sustainable use of natural resources. Its headquarters are in Gland, Switzerland.

26. Red Data Book enlists the endangered species (plants and animals). It is published by the International Union for Conservation of Nature & Natural Resources (IUCN).



27. Bird population is shrinking because of large scale reduction in habitats, excessive pesticides (DDT), chemical fertilizers & mosquito repellants.

28. 36th Constitutional Amendment Act, 1975 has made Sikkim full-fledged state of the Union of India. It is botanist paradise because it lies under hotspots of northern Himalaya. Population here are mainly Lepchas Bhotias & Nepalis.

29. Nitrogen is commonly used in Cryo-Bank for ex-situ conservation.

30. Maximum biodiversity is found in the tropical rainforest. They extend from 10° North to 10° South Longitudes. It has heavy rains & high temperature throughout the year.

31. Most biologically diverse ecosystems on Earth are Tropical rainforest on land & coral reefs in marine.

32. Maximum plant diversity is found in tropical evergreen forests. It receives more than 200 cm of rainfall & have temperature of 15-30°C.

33. Tropical rainforest has maximum plant biomass.

34. Biodiversity Increases/Decreases :

- Species diversity decreases from the equator towards the poles.
- Tropics harbor more species than temperate areas.

- Species diversity decreases from temperate areas towards poles.
- Biodiversity is normally greater in the lower latitudes as compared to the higher latitudes.
- Tropical rainforest has the largest biodiversity and is found in lower latitudes.

35. The richest biodiversity is found in Silent Valley in Kerala. In 1986, it was declared a national park. It is located in Palakkad District, Kerala. It is part of the Western Ghats.

36. 'Valley of flowers' is situated in Chamoli District of Uttarakhand.

37. The Ramsar Convention is associated with conservation & sustainable use of wetlands. It was signed on 2 Feb, 1971 at Ramsar in Iran. 2 February is celebrated as World Wetlands Day. India is a party to Ramsar convention and has declared many areas as Ramsar sites to conserve all the sites through an ecosystem approach.

38. Sambhar Lake (Rajasthan) is the largest inland wetland of India.

39. Warmer water temperatures (due to global warming) can cause coral bleaching i.e. when water is too warm, corals will expel the algae (zooxanthellae).

40. Total coral reef area in India is 5,790 km sq., distributed between Lakshadweep, Gulf of Mannar, Gulf of Kutch & Andaman and Nicobar Islands. Fringing reefs are common. They occur around Gulf of Mannar, Gulf of Kutch, Andaman & Nicobar Islands. Atoll reefs are found in Lakshadweep. Sundarbans is known for mangrove forests.

41. 'Biodiversity' term was first used by Walter G. Rosen.

42. Biodiversity forms the basis for human existence in form of soil formation, prevention of soil erosion, recycling of waste & pollination of crops.

43. UN General Assembly declared 2011-20 as Decade on Biodiversity.

44. Decrease in trophic level indicates abundance of a particular type of organism, causing decrease in biodiversity.

45. Due to the confluence of different bio-geographical zones, Himalayan range is very rich in species diversity.

46. National Biodiversity Authority (NBA) established in 2003 to implement Bio-Diversity Act (2002). Headquarter of NBA is in Chennai, Tamil Nadu. NBA checks biopiracy & protects indigenous & traditional genetic resources. Application for Intellectual Property Rights related to genetic/biological resources cannot be made without the approval of NBA. NBA provides a framework for access to biological resources and sharing the benefits arising out of such access and use.

47. Sea buckthorn is a medicinal plant found in Himalayan region. It grows in the cold deserts of Ladakh, Lahaul-Spiti in Himachal Pradesh & some parts of Arunachal Pradesh. The fruit of this plant is a source of nutritious juice.

48. Biosphere is an open system. There can be reinvestment of new substances in the biosphere.

49. Diclofenac Sodium is responsible for vulture death. It is an anti-inflammatory painkilling drug. It is also given to cattle as medication.

50. Dodo (extinct bird of Indian Ocean islands of Mauritius) was helpful in pollinating and propagating the seed of the species called Tambalacoque.

51. Butterflies population decline will cause adverse effect on pollination of plants. It will also affect the food chain as their meal of the spider, bird, snake etc.

52. Indian flying fox(Pteropus Gigantes) also called greater Indian fruit bat, is species of bats in family Pteropodidae.

53. Dugong (sea cow) is an herbivorous marine mammal which is vulnerable to extinction. It is found in Eastern Africa, South Asia & Australia. It has been given legal protection under Schedule I of Wildlife Protection Act, 1972.

54. Three criteria's that has contributed to the recognition of Western Ghats, Sri Lanka and Indo-Burma region as hotspots of biodiversity are species richness, endemism and threat perception.

55. Indian wild ass has no predator in the region Rann of Kutch but its existence is threatened due to its destruction.

56. The Economics of Ecosystems and Biodiversity (TEEB) is global initiative of "making values visible". Its principal is to draw the attention to the economic benefits of biodiversity. It presents an approach that can help decision makers to recognize, demonstrate and capture the value of ecosystems and biodiversity.

57. Lion tailed macaque (an endangered species) found mostly in Western Ghats of India, Kerala, Karnataka and border region of Tamil Nadu.

58. Bird life International is a global partnership to conserve birds, their habitats & global biodiversity. Concept of biodiversity hotspots was propounded by British environmentalist Norman Myres.

59. UN-REDD is an international programme under the aegis of UNFCCC member countries. This programme was started in 2008. It contributes to protection of biodiversity, resilience of forest ecosystems, poverty reduction.

60. Brahmani & Vaitarni rivers merge at Bhitarkanika before emptying into sea. Brahmani river is known as South Koel in Jharkhand.

61. Cheetah was declared extinct in India in 1952. Recently, govt. planned to rehabilitate cheetah in in wildlife sanctuary in Madhya Pradesh from Namibia. Uttarakhand & Himachal Pradesh shows presence of Snow leopards in India. Black-necked crane is state bird of Jammu & Kashmir. flying squirrels are found in India, Russia, Japan, China, Europe.

62. Bats, Bears & Rodents shows hibernation.

63. Andaman and Nicobar Islands are rich in marine biodiversity which includes marine mammals such as whales, dolphins, dugong, marine turtles, estuarine or saltwater crocodile, fish, prawns and lobsters. Shrew and Tapi are found in large Himalayan ranges.

64. Red panda lives in temperate climates, in deciduous and coniferous forests. They are found in Himalayan region, in parts of Nepal, Bhutan, Myanmar and in the Indian states of Sikkim, West Bengal, Meghalaya and Arunachal Pradesh. Majority of the Indian red panda is found in Arunachal

Pradesh. Slow Loris species are found in Bangladesh, Cambodia, China, North-Eastern India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura).

65. Wetlands international, a global organization works to sustain and restore wetlands. It is an independent, not-for-profit, global organization supported by government and NGO membership. Its head office is in the Netherlands. It works at the ground level to develop and mobilize knowledge, and use the practical experience to advocate for better policies.

66. The Montreux record is a register of wetland sites on the list of Wetland of International Importance where changes in ecological character have occurred, or occurring, or are likely to occur as a result of technological developments. It is maintained as part of the Ramsar list.

67. Wetlands are useful for nutrient recovery and cycling, releasing heavy metals through absorption by plants, in reducing the siltation of rivers by retaining sediments.

68. Biomass is produced by green plants converting sunlight into plant material through photosynthesis and includes all land and water-based vegetation as well as all organic wastes.

69. The five biomes of India are:

- Tropical Humid Forests
- Tropical Dry or Deciduous Forests (including Monsoon Forests)
- Warm deserts and semi-deserts
- Coniferous forests
- Alpine meadows.

70. Biomass production for biomes in decreasing order:

- Deciduous Forest (1200 gram) >Taiga(800gram) >Prairie(600gram) >Deep Sea(negligible)

71. "Tomorrow is Biodiversity" is written by Vandana Shiva.

72. The International Treaty on Plant Genetic Resources for Food and Agriculture, the United Nations Convention to Combat Desertification, the World Heritage Convention has bearing on biodiversity.

### **3. UNFCCC & International Environmental Conventions**

1. First Earth summit by UN conference on Sustainable Development held in Rio-de-Janeiro. In 2012, the UN Conference on Sustainable Development was also held in Rio & is called Rio+20 or Rio Earth Summit 2012 (Hosted by Brazil). Primary result of this was non-binding document "The future we want".

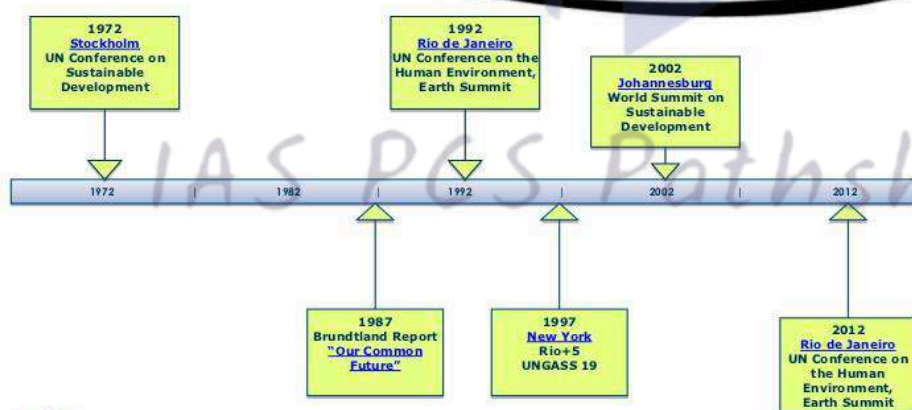
2. UNFCCC: United Nations Framework Convention on Climate Change - UNFCCC is negotiated at the Earth Summit 1992; Signed in 1992, New York City; As of March 2022, UNFCCC has 197 parties.

3. List of Important UNFCCC Summits

- 1995: COP 1, The Berlin Mandate
- 1997: COP 3, The Kyoto Protocol on Climate Change

- 2002: COP 8, New Delhi, India
- 2005: COP 11/CMP 1. Montreal, Canada Montreal, (Kyoto Protocol was ratified in 2005)
- 2006: COP 12/CMP 2, Nairobi. Kenya
- 2007: COP 13/CMP 3, Bali, Indonesia - Bali conference resulted in the adoption of the Adaptation Fund
- 2010: COP 16/CMP 6, Cancun, Mexico - Parties also established a Green Climate Fund (GCF)
- 2013: COP 19/CMP 9, Warsaw, Poland - UNFCCC created a mechanism for Intended Nationally Determined Contributions (INDCs) to be submitted before COP-21 which would take place in Paris in 2015.
- 2014: COP 20/CMP 10. Lima, Peru
- 2015: COP 21/CMP 11, Paris, France - At COP-21, the Paris Agreement was announced as the Kyoto Protocol's successor. The Paris Agreement, with 195 signatories, was to fully replace the Kyoto Protocol and govern climate change reduction measures from 2020. It was 21st yearly session of conference of Parties (COP) to the 1992 UNFCCC and the 11th session of the meeting of the Parties to the 1997 Kyoto Protocol.
- 2016: COP 22/CMP 12, Marrakech, Morocco
- 2017: COP 23/CMP 13, Bonn, Germany.
- 2018: COP 24/CMP 14, Katowice, Poland.
- 2019: COP 25/CMP 15/CMA 2, Madrid, Spain
- 2021: COP 26/CMP 16/CMA 3, Glasgow, United Kingdom
- 2022: COP 27, Sharm El Sheikh, Egypt
- 2023: COP 28, United Arab Emirates

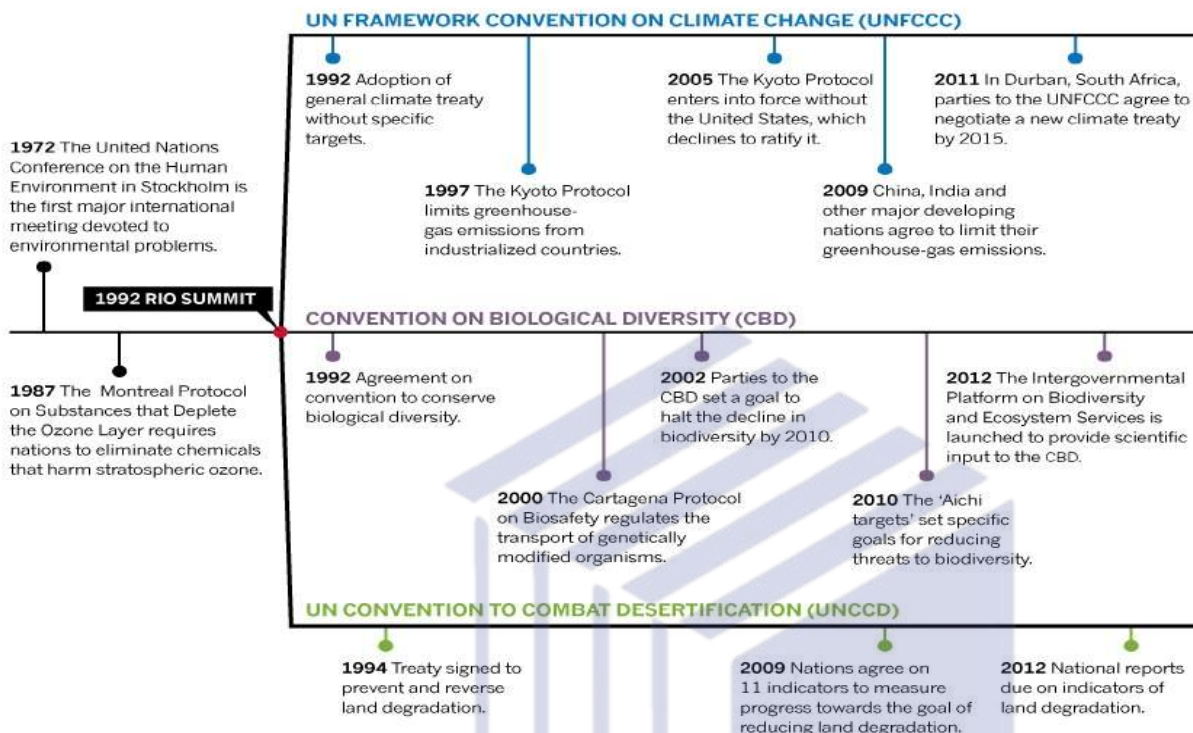
## Background: Timeline 1972-2012



See also: Sustainable Development Timelines, Stakeholder Forum

## GLOBAL AWAKENING

The treaties that emerged from the 1992 Rio summit followed several major environmental agreements and spawned a series of subsequent accords.



IAS PCS Pathshala



## Important Environmental Conventions

### 1. Ramsar Convention

- It is called the Convention on Wetlands
- It was adopted in the city of Iran, Ramsar in 1971, came into force in 1975.

### 2. Stockholm Convention

- It is a convention on Persistent Organic Pollutants (POPs)
- It was adopted in 2001 in Geneva, Switzerland., It came into force in 2004.

### 3. CITES

- It is a convention on International Trade in Endangered Species of Wild Fauna and Flora
- (CITES) is legally binding on the states that have joined it, but this convention does not take the place of national laws.
- It was adopted in 1963, It came into force in 1975.

### 4. Convention on Biological Diversity (CBD)

- It is a convention for the conservation of biological diversity.
- It was adopted in 1992, came into force in 1993.

### 5. Bonn Convention

- It is a convention on the Conservation of Migratory Species of Wild Animals.
- It was adopted in 1979, came into force in 1983.

#### 6. Vienna Convention

- It is a convention for the Protection of Ozone Layer.
- It was adopted in 1985, came into force in 1988.

#### 7. Montreal Protocol

- It is an international environment protocol on substances that deplete the Ozone Layer.
- It was adopted in 1987, came into force in 1989.

#### 8. Kyoto Protocol

- It is an international protocol to reduce greenhouse gas emissions.
- It was adopted in 1997, came into force in 2005.

#### 9. United Nations Framework Convention on Climate Change

- It is an international environmental treaty governing actions to combat climate change through adaptation and mitigation efforts directed at control of emission of GreenHouse Gases (GHGs) that cause global warming.
- It was adopted in 1992, came into force in 1994.

#### 10. Rio Summit

- It is a United Nations Conference on Environment and Development.
- It was held in 1992 at Rio de Janeiro, Brazil.

#### 11. UNCCD

- It is a United Nations Convention to Combat Desertification.
- It was adopted in 1994, came into force in 1996.

#### 12. Basel Convention

- It is a convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.
- It was adopted in 1989, came into force in 1992.

#### 13. Cartagena Protocol

- Cartagena protocol is a supplementary protocol of the convention on Biological Diversity (CBD). It is committed to preserving biodiversity from live modified organism-LMO caused by adoption of biotechnology.
- Ensure safe handling, transport and use of living modified organism (LMO)
- India signed the biosafety protocol on 23rd Jan, 2001. The Ministry of Environment & Forest implements this protocol.
- It was adopted in 2000, came into force in 2003.



#### 14. UN-REDD

- It is a United Nations Programme on Reducing Emissions from Deforestation and Forest Degradation. It was created in 2008.

#### 15. Nagoya Protocol

- It is an international environment protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) to the Convention on Biological Diversity (CBD).
- It is also a supplementary protocol of CBD.
- It was adopted in 2010, came into force in 2014.

#### 16. Minamata Convention

- It is an international environmental treaty intended to protect health and the environment from the adverse effects of mercury.
- It was adopted in 2013, came into force in 2017.

#### 17. Rotterdam Convention

- It is an international environmental convention on Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade.
- It was adopted in 1998, came into force in 2004.

## 4. ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

### 1. Environment refers to

- Natural world of land, water, air, plants & animals that exist around it.
- Sum total of conditions which surround human beings at a given point of time.
- The interacting interlinked system of physical, biological & cultural elements.

### 2. The environment divided into

- BIOTIC → all living things in environment.
- ABIOTIC → Physical environment e.g.: Temp, Light intensity etc.

3. United Nations Conference on Environment & Development (UNCED) emphasizes on concept of sustainable development defined as 'Development that meets the need of present generation without compromising the ability of future generations to meet their needs.'

4. Brundtland Report, also called Our Common Future, publication released in 1987 by the World Commission on Environment and Development (WCED) that introduced the concept of sustainable development. Sponsored by the United Nations (UN) and chaired by Norwegian Prime Minister Gro Harlem Brundtland, the WCED explored the causes of environmental degradation.

5. United Nations identified 17 sustainable development goals which have to be realised by 2030.

6. The Decade of Sustainable Energy (2014-2024) for all is initiative of United Nations.

7. 5th June → World Environment Day

8. Natural capital includes air, water, land, minerals, forests (all renewable & nonrenewable environmental resources created by nature without human interference)

9. Solar radiations major role is water cycle which drives by evaporating water from oceans, lakes, rivers & soil.

10. The National Environmental Engineering Research Institute (NEERI), Nagpur, established in 1958 is pioneering lab in the field of environmental science & part of Council of Scientific & Industrial Research (CSIR). NEERI falls under Ministry of Science & Technology.

11. Prevention & control of pollution, conservation of biological diversity, decreasing poverty are important for Sustainable Development.

12. Core elements of Smart City Mission are:

- Adequate water supply
- Sanitation & solid waste management
- Affordable housing, especially for poor
- Assured electricity supply
- Efficient urban mobility & public transport.
- Good governance, especially e- Governance & people's participation
- Robust IT connectivity & digitalization.
- Sustainable environment.
- Health & Education
- Safety & security of citizens.

13. Atmosphere → Thin layer of gases surrounding earth. It consists of high amount of nitrogen, small amount of Oxygen & CO<sub>2</sub>.

14. Air is mixture of gases. 78% is Nitrogen, 21% is oxygen. CO<sub>2</sub>, argon, methane, ozone & water vapour are present in very small amount.

15. During photosynthesis plants take in Carbon Dioxide & release oxygen in atmosphere. If all plants die, oxygen in atmosphere will decrease.

16. Trees provide oxygen, improve air quality, climate amelioration, conserving water, preserving soil & support wildlife.

17. Respiration, Decay of organic matter, volcanic action adds carbon dioxide to carbon cycle. Plants do not add Carbon dioxide to carbon cycle.

18. Weathering → mechanical disintegration & chemical decomposition of rocks through actions of various elements of weather & climate.

20. Specialized agency of UN

- Food and Agriculture Organization (HQ – Rome, Italy)

- International Civil Aviation Organization (HQ – Montreal, Canada)
- International Fund for Agricultural Development (HQ –Rome, Italy)
- International Labour Organization (HQ – Geneva, Switzerland)
- International Maritime Organization (HQ – London, UK)
- International Monetary Fund (HQ - Washington, D.C., USA)
- International Telecommunication Union (HQ - Geneva, Switzerland)
- UNESCO (HQ – Paris, France)
- United Nations Industrial Development Organization (HQ – Vienna, Austria)
- Universal Postal Union (HQ – Bern, Switzerland)
- World Bank Group (HQ - Washington, D.C., USA)
- WHO (HQ - Geneva, Switzerland)
- World Intellectual Property Organization (HQ - Geneva, Switzerland)
- World Meteorological Organization (HQ - Geneva, Switzerland)
- World Tourism Organization (HQ – Madrid, Spain)

21. Headquarter of UNEP (United Nations Environment Programme) → Nairobi (Kenya), established in 1972.

22. EPA (Environment Protection Agency) of United States was created for protecting human health & environment.

23. Environmental Information System's (ENVIS) Centre on Population & Environment is located in International Institute for Population sciences (IIPS) Mumbai.

24. National Environment Appellate Authority (NEAA) or NEA was set up by ministry of environment & forest to address cases in which environment clearances were required in certain restricted areas. NEAA stands dissolved on the establishment of National Green Tribunal on 18th oct, 2010, under National Green Tribunal Act, 2010.

25. Greenpeace is non-governmental environmental organization with headquarters in Amsterdam, Netherlands. Its goal is to "ensure the ability of the Earth to nurture life in all its diversity".

26. Eco-mark issued by Bureau of Indian standards to products conforming ensuring they having the least impact on ecosystem. This scheme was started in 1991.

27. Sustainable agriculture means to utilize land so that its quality remains intact.

28. Natural vegetation is the true index of climate & an increase in the quantity of CO<sub>2</sub> in atmosphere also affects natural vegetation. Water loving/Aquatic plants found mostly in muddy land & near the ponds.

29. Extreme urbanization & industrialization are harmful to balanced development, environment & ecology & biodiversity conservation.

30. National Green Tribunal (NGT):

- Established on 18th October 2010 under the NGT Act of 2010.
- India has become the third country in the world after Australia and New Zealand, for setting up a specialized environmental tribunal.

- comprises of the Chairperson, the Judicial Members and Expert Members. They shall hold office for term of five years and are not eligible for reappointment.
- Tribunal is not bound by the procedure laid down under the Code of Civil Procedure 1908, but shall be guided by principles of 'natural justice'.

31. William M. Adams in author of 'Green development'.

32. World Environment Conference was organized in Kyoto, Japan in year 1997. Kyoto Protocol to the United Nations framework convention on Climate change was adopted which came into existence on 16 feb, 2005.

33. The Earth Summit +5 was held in 1997.

34. Rio+10 summit was held in Johannesburg in 2002 & Rio+ 20 in Rio de Janeiro in 2012.

35. Sustainable Development Goals were proposed in 2012 at Rio+20. Sustainable Development Goals are officially known as "Transforming our world: the 2030 Agenda for sustainable Development'. These are 17 Goals & 169 targets among them.

36. FAO in 2010 developed concept of Climate Smart Agriculture (CSA).

37. Partnership for Action on Green Economy (PAGE), a UN mechanism to assist countries transition towards a greener & more inclusive economies, emerged at UN conference on sustainable Development 2012, Rio de Janeiro.

38. Agenda 21 is a non-binding, voluntarily implemented action plan of UN on Sustainable Development. It is a product of the Earth Summit (UN Conference on Environment & Development) held in Rio de Janeiro, Brazil in 1992.

39. Many transplanted seeds do not grow because most of root hairs are lost during transplantation. function of root hairs is to collect water & mineral nutrients present in the soil.

40. Environmental degradation is deterioration of environment through depletion of resources such as air, water & soil.

41. Forest Policy, Environment Protection Act, Industrial Policy, Educational Policy are related to Protection of Ecological Balance.

42. Global Environment facility (GEF) established on 1992 Rio Earth Summit to help tackle environmental problems. It is financial mechanism for five major international conventions:

- Minamata convention on Mercury
- Stockholm convention on Persistent Organic Pollutants
- United Nations Convention on Biological Diversity
- United Nations Convention Combat Desertification
- United Nations framework Convention on Climate Change.

43. Sustainable Development Goals



## SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD



44. NITI Aayog is the nodal agency for coordinating and monitoring the Sustainable Development Goals.

45. Plachimada is a small village in Palakkad district of Kerala. In 2000, the Panchayat gave license to Coca-Cola Beverage which soon contaminated groundwater in that locality.

46. Environment Protection Act, 1986 also known as Umbrella legislation. Due to Bhopal Tragedy, Govt. of India Environment Protection set of 1986 under Article 253 of constitution.

47. Genetic Engineering Appraisal Committee is constituted under the Environment Protection Act, 1986. It is the apex body constituted in Ministry of Environment & forest under 'Rule of manufacture, use, import, export & storage of hazardous microorganism/genetically engineered organism 1989'.

48. Conservation agriculture means adopting minimum tillage, using crop residues to cover the soil surface, adopting spatial & temporal crop sequencing/crop rotations.

49. Mixed cropping, organic manures, nitrogen fixing plants and pest resistant crop varieties are best strategy for environment-friendly sustainable development in Indian agriculture.

50. India is not over urbanized country. Here most of the large cities do not have adequate infrastructure.

51. According to census 2011, approx. 121 crore (68.9 %) people still live in rural areas.

52. Masanobu Fukuoka is famous for his natural farming & revegetation of desertified lands.

53. Australia introduced Green Army for Environmental conservation.

## 5. VEGETATION AND WILDLIFE

1. Equatorial forests tall, closely set trees with crowns forming a continuous canopy. Here, various varieties of epiphytes are there & large number of species co-exist. The tropical evergreen forests are found in areas receiving more than 200 cm rainfall & temperature of 15-30°C. They are found mostly near equator. In India, evergreen forests are found on western slope of Western Ghats in states like Kerala & Karnataka. They are also found in hills of Jaintia & Khasi (Arunachal Pradesh & Mizoram) in north-east and Andaman & Nicobar Islands.

2. As per the National Forest Policy, 1988, the national goal should be to have a minimum of one-third (33%) of the total land area of the country under forest

3. According to National Forest Policy (1952), forests have been classified in India as follows → (a) Protected forests (b) National forests (c) Village forests (d) Tree lands.

4. Percentage of forest area in the total geographical area of India is 24.62%. [Add latest ISFR 2021]

5. The new forest inventory design implemented in 2016 has reduced the revisit time of forest inventory from 20 years to 5 years.

6. One of the 8 missions outlined under the National Action Plan on climate Change (NAPCC), National Mission for Green India (GIMI) acknowledges the influence of forests on environment through climate change mitigation, water security, food security. Annual plan for the possible schemes & operations proposed by four states Mizoram, Manipur, Kerala & Jharkhand was approved in October, 2015.

7. Urbanization is not the effect for deforestation rather it is one of the reasons of deforestation (The impact of deforestation in India are loss of biodiversity, soil erosion, drying of water sources in Himalaya).

#### **8. INDIA STATE OF FOREST REPORT 2021 IMPORTANT FINDING -**

- The total forest and tree cover of the country is 80.9 million hectare which is 24.62 percent of the geographical area of the country. As compared to the assessment of 2019, there is an increase of 2,261 sq km in the total forest and tree cover of the country. Out of this, the increase in the forest cover has been observed as 1,540 sq km and that in tree cover is 721 sq km.
- Increase in forest cover has been observed in open forest followed by very dense forest. Top three states showing increase in forest cover are Andhra Pradesh (647 sq km) followed by Telangana (632 sq km) and Odisha (537 sq km).
- Area-wise Madhya Pradesh has the largest forest cover in the country followed by Arunachal Pradesh, Chhattisgarh, Odisha and Maharashtra. In terms of forest cover as percentage of total geographical area, the top five States are Mizoram (84.53%), Arunachal Pradesh (79.33%), Meghalaya (76.00%), Manipur (74.34%) and Nagaland (73.90%).
- 17 states/UT's have above 33 percent of the geographical area under forest cover. Out of these states and UT's, five states/UTs namely Lakshadweep, Mizoram, Andaman & Nicobar Islands, Arunachal Pradesh and Meghalaya have more than 75 percent forest cover while 12 states/UTs namely Manipur, Nagaland, Tripura, Goa, Kerala, Sikkim, Uttarakhand, Chhattisgarh, Dadra & Nagar Haveli and Daman & Diu, Assam, Odisha, have forest cover between 33 percent to 75 percent.
- Total mangrove cover in the country is 4,992 sq km. An increase of 17 sq km in mangrove cover has been observed as compared to the previous assessment of 2019. Top three states showing

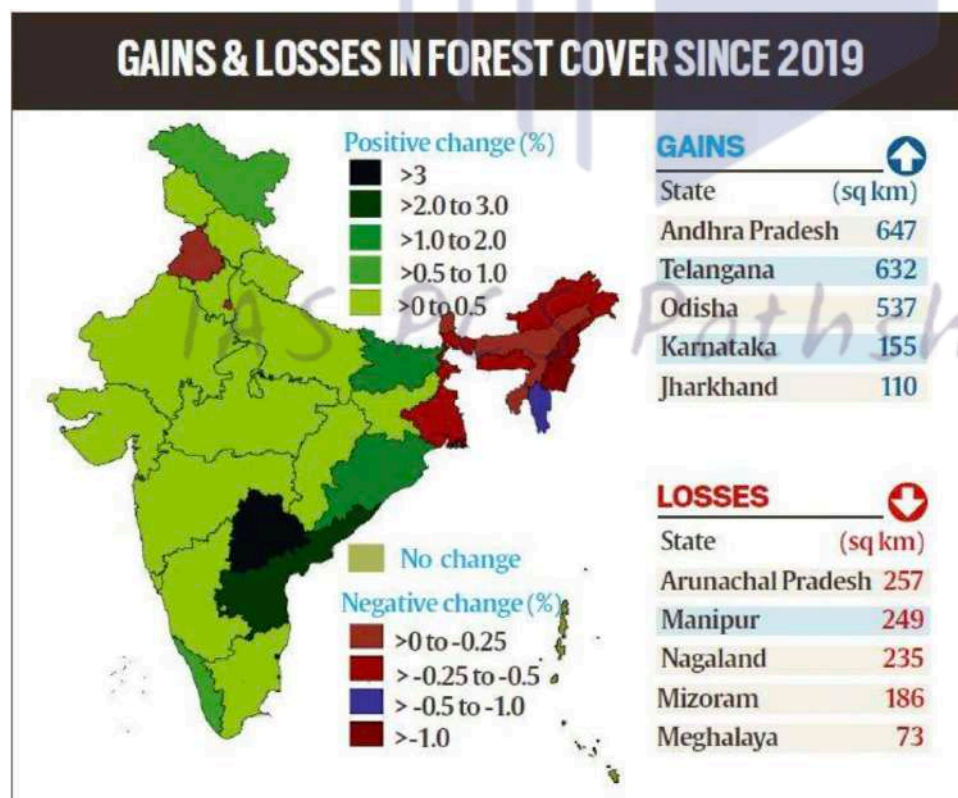
mangrove cover increase are Odisha (8 sq km) followed by Maharashtra (4 sq km) and Karnataka (3 sq km).

- Total carbon stock in country's forest is estimated to be 7,204 million tonnes and there an increase of 79.4 million tonnes in the carbon stock of country as compared to the last assessment of 2019. The annual increase in the carbon stock is 39.7 million tonnes.

### India's Forests vis-à-vis Forest Resources in the World:<sup>iv</sup>

**Table 1.3(a) Top ten countries for forest area (2020)**

Sl. No.	Country	Forest area (000 ha)	% of world forest area	% of country area
1.	Russian Federation	8,15,312	20	49.8
2.	Brazil	4,96,620	12	59.4
3.	Canada	3,46,928	9	38.7
4.	USA	3,09,795	8	33.9
5.	China	2,19,978	5	23.3
6.	Australia	1,34,005	3	17.4
7.	Democratic Republic of the Congo	1,26,155	3	55.6
8.	Indonesia	92,133	2	49.1
9.	Peru	72,330	2	56.5
10.	India	72,160	2	24.3
	<b>Total</b>	<b>4,85,438</b>	<b>66</b>	



9. Forest can be reused after its sustainable exploitation, so it is a renewable resource. Forests enhance the quality of environment as it absorbs carbon dioxide & produces oxygen.

10. Natural resources are those that exist in a region & can also be used in future. On the basis of development stage, natural resources are categorized as: (a) Potential Resources (b) Actual Resources (c) Reserve Resources (d) Stock Resources.

- Development of an actual resource depends upon technology & cost of production.

11. Forest Survey of India (FSI) is based in Dehradun.

12. Most of the region of Mangrove plants are found in Sundarbans delta. Sundari plant are present in these forest.

13. Due to shifting cultivation, Nagaland mountains are becoming barren mountains.

14. 'Apna Van Apna Dhan' scheme has been started by Himachal Pradesh govt. to promote afforestation.

15. According to Wildlife (Protection) Act, 1972 Gharial, Indian wild ass & wild buffalo cannot be hunted by any person except under some provisions provided by law.

16. Project Tiger launched on 1st April, 1973. MP has highest (526) tigers.

17. Forest Research Institute is located at Dehradun in Uttarakhand.

18. Institutions related to the environment are: Centre for Science & Environment, Botanical Survey of India, Indian wildlife Institute.

19. India constitutes only 2.4% of the world's total land area. 8% of the world's total known biodiversity is found in India. 7.28% of the world's animal species are found in India.

20. Whale Shark is the largest fish of the world (50m long).

21. World Wildlife fund incepted in 1961 has Giant Panda as symbol.

22. Gavialis crocodilia are found plenty in Ganga. It is also known as gavial & belong to fish eating crocodile family. These are native to the Indian Subcontinent. They are found in Bangladesh, India & Nepal.

23. Important Dates

- World Wildlife Day (America) → 4 December
- World Wildlife Week (India) → 2-8 October
- World Environment Day → 5 June
- World Forest Day → 21 March

24. The pugmark technique is used for the estimation of population of various wild animals.

25. Demographic factors including population growth, density, distribution, migration & urbanization are important reason for deforestation.

26. Industrialization is the main cause for forest loss.



27. Rajiv Gandhi Wildlife Conservation Award is given to Educational & Research Institutions, Forest & Wildlife officers, Wildlife conservationists.

28. The greatest diversity of plants & animals are found in tropical moist forests.

29. Tropical moist deciduous forests found in areas of moderate rainfall of 100-200 cm per annum. Here, Teak trees are the most dominant species of trees. Bamboos, Sal, Shisham, Sandalwood, Mulberry are some other commercially important species found here.

30. The Amazon is known as "lungs of the Earth". Amazon rainforest produces more than 20% of world's oxygen.

31. In desert areas leaves are hard & waxy, tiny & sometimes there are thorns instead of leaves to inhibit water loss.

32. Tropical deciduous forests are found in areas with warm, moist summers & mild winters. These forests are mainly found in the Northern Hemisphere, Eastern North America, East Asia, & Europe. Tropical deciduous forests are most extensive in Asia.

33. National Forest Policy 1988 includes:

- Afforestation & Wasteland development.
- Reforestation & replantation in existing forests.
- Encouraging wood substitute & supplying other types of fuel.
- Main Objective of National Forest Policy is forestation of one-third of the total country's land & to promote social forestry.

34. Red sanders (*Pterocarpus Santalinus*) are found in the Southern Eastern Ghats Mountain range of South India. They grow on the Pal Konda & Seshachalam mountain range in Andhra Pradesh.

35. The definition of "Critical Wildlife Habitat "is incorporated in the Forest Rights Act, 2006. For the first time in India, Biogas have been given Habitat Rights.

36. Valparai in in Coimbatore district of Tamil Nadu. This city has specialization in plantation.

37. Bhutan government has made a resolution to maintain forest on 60% land of its total geographical area.

38. Aluminum is eco-friendly & renewable metal, hence known as Green Metal.

39. Vegetation and Region:

- South Western Ghats- Moist forests
- Tarai Duar - Broadleaf forests
- Rann of Kutch- Grasslands
- Eastern Deccan Plateau- Dry mangrove forests

40. Mangroves can serve as a reliable safety hedge against coastal calamities. The mangrove trees do not get uprooted by storms & tides because of their extensive roots.

41. Coastal Odisha is the most affected area due to the cyclones generated in the Bay of Bengal. Mangrove can serve as a reliable safety hedge against coastal calamities.

42. Bhitarkanika Mangrove is located on the deltas of Brahimi, Vaitarni & Mahanadi in the Kendrapada district of Odisha. It is famous for Mangrove forests. It was declared as a Ramsar site in 2002.

43. Taxus tree is naturally found in the Himalayas. The Taxus tree is listed in the Red Data Book. Taxol drug is obtained from Taxus tree, used in breast & lung cancer treatment & also effective against Parkinson's disease.

44. World Wide Fund (WWF) is an international non-governmental organization founded in 1961.

45. Trade Related Analysis of Fauna & Flora in Commerce (TRAFFIC) is a nongovernmental organization to monitor the trade of wild plants & animals. TRAFFIC was established in 1976. It is a strategic alliance of WWF & IUCN.

46. Star Tortoise- India; Monitor Lizard- India; Pygmy hog- India; Spider Monkey-Tropical forests of Central & South America, from Southern Mexico to Brazil.

47. Scientific Names:

- Asiatic wild ass- *Equus hemionus*
- Bara Singha- *Rucervus duvauceli*
- Chinkara- *Gazella Bennetty*
- Nilgai- *Boselaphus tragocamelus*

48. Pakhui is a wildlife sanctuary & a dedicated tiger reserve (also known as the pakke tiger reserves) located in district of east kameng in Arunachal Pradesh.

49. Gharial, Leatherback turtle & Swamp deer all of three come under the endangered category.

50. Kharai Camel or Swimming camels are found only in Gujarat's Bhuj area. It can swim up to 3 km into the sea in search of mangroves, its primary food.

51. Countries with the highest percentage of forest cover of their total area are as follows:

52. Mangroves of tropical & subtropical areas are specialized eco-system bordering at certain sea coasts. Mangroves stabilizes the shoreline & act as a bulwark against encroachments.

53. Amrita Devi Smriti Award is given for protection of wildlife & forests.

54. First World Tiger Summit was held in 2010 between 21 to 24 November at Saint Petersburg (Russia).

55. India & Nepal formed an organization named 'SAVE' in July, 2010, for tiger conservation.

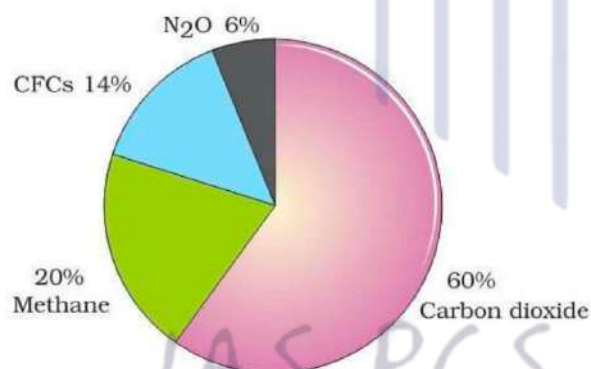
56. Subtropical forests are found in North-West (except Kashmir) Khasi hills, Nagaland & Manipur. Pine, Oak, Rhododendron are found in these areas.

57. Sandalwood is a tropical deciduous tree present in South India.

58. In Uttarakhand, Oak-Rhododendron are characteristics plants of temperate forests.
59. Gond & Koru tribes plants a sapling of fruit-bearing trees every year during a month-long ecological company/festival.
60. Living root bridges are a form of tree shaping common in Northeast Indian State of Meghalaya.
61. The Animal welfare Board of India is statutory advisory body established in 1962 under Prevention of Cruelty to Animals Act, 1960. National Tiger Conservation Authority is statutory Body under the Ministry of Environment, forests & climate Change (Govt. of India). The National Ganga River Basin Authority was set up on 20 Feb, 2009, it is chaired by Prime Minister.

## 6. GREENHOUSE EFFECT AND CLIMATE CHANGE

1. Climate change is caused by Greenhouse gases, depletion of or one layer, pollution.
2. Greenhouse gases includes water vapor, Carbon Dioxide, Methane, Nitrous oxide, ozone & some artificial chemicals such as Chlorofluorocarbons (CFC). Greenhouse effect is the process of heating atmosphere by absorption of infrared radiations by atmospheric carbon dioxide.
3. Oxides of Nitrogen with general formula  $\text{NO}_x$  –  $\text{NO}$ ,  $\text{NO}_2$  – Nitrogen oxide, Nitrogen dioxide etc. are global cooling gasses while Nitrous oxide ( $\text{N}_2\text{O}$ ) is a greenhouse gas.



Relative contribution of various greenhouse gases to total global warming

4. Joseph Fourier gave the concept of Greenhouse Gases in 1824.
5. Greenhouse effect causes increase in humidity & wind speed.
6. Kyoto Protocol is an international agreement linked to United Nations framework Convention on Climate Change by setting internationally binding emission reduction targets.
7. They Kyoto Protocol was adopted in Kyoto on 11 Dec, 1997 & came into force on 16 Feb, 2005. It was adopted as a binding agreement to reduce greenhouse gas emission to the level of 1990.
8. Global Warming Potential (GWP) & Lifetime of Green House Gases

Gas	GWP (100-year)	Lifetime (years)
Carbon di oxide	1	50-200
Methane	21	12
Nitrous oxide	310	120
Hydrofluorocarbons (HFCs)	140 -11,700	1-270
Perfluorocarbons (PFCs)	6,500-9,200	800-50,000
Sulphur hexafluoride (SF <sub>6</sub> )	23,900	3,200

9. Methane is more dangerous & effective as a greenhouse gas than Carbon dioxide, as it has more Global Warming Potential (GWP).

10. Larger CO<sub>2</sub> emitting countries in 2018 →

- China-29%
- European Union-10%
- USA-14 %
- India-7%
- Russia-5%
- Japan-3.5%

11. Among all greenhouse gases, Carbon dioxide is most responsible for global warming as its concentration in the environment is more as compared to other greenhouse gases.

12. Without naturally occurring greenhouse gases, Earth's average temperature would be near 0°F (or -18°C) instead of the much warmer 59°F (15°C).

13. Propane reduces greenhouse gas like carbon dioxide & air pollutants like carbon monoxide & nitrogen oxide.

14. Carbon dioxide is both harmful (as it is greenhouse gas) & useful (involved in photosynthesis).

15. Bhutan is known as world's top 'Carbon negative country'.

16. Oxide of Sulphur & Nitrogen cause acid rain. They do not contribute to global warming.

17. Carbon footprint is the total amount of greenhouse gases produced to support human activities.

18. Greenhouse gases & its Source →

- Carbon dioxide - Thermal Power stations
- Chlorofluorocarbon- Refrigerant & air conditioning devices
- Sulphur dioxide- Brick kilns

19. Global warming causes:

- Melting of glaciers.
- Flowering of mango trees before times
- Adverse impact on health
- Rise in sea level
- Changes in weather conditions

- Rise in global temperature

20. Arctic & Greenland ice sheet are the most fragile ecosystem that will be first affected by global warming.

21. Carbon dioxide absorbs the infrared part of the solar radiation, so it slowly raises the temperature of the atmosphere.

22. Sources of methane emission:

- Human resources of methane emission: Rice fields, coal mines, domestic animals, paddy fields, Industries, waste from home & Businesses.
- Natural resources are: wetlands, sea hydrates, termites, oceans, sediments, volcanoes, wildfires.
- The gas, which is emitted in the paddy fields and increases the earth's temperature is Methane. Methane is one of the most important greenhouse gases.

23. Agriculture is most affected by climate change.

24. Methane (Marsh Gas) source is biogas, bacterial decomposition & cud-chewing animals. This greenhouse gas pollutes air.

25. Earth Hour is organized by World Wide Fund for Nature (WWF) annually by turning off nonessential lights for one hour, from 8:30 to 9:30 p.m. towards the end of March. It was famously started as a lights-off event in Sydney, Australia in 2007. Earth Hour 2022 was on 26th March.

26. United Nations Framework Convention on Climate Change (UNFCCC) was negotiated at Earth summit in Rio de Janeiro from 3rd to 14th June, 1992, & entered into force on 21 March, 1994. It has been ratified by 197 countries.

27. Climate change & extreme weather events can cause serious repercussions on food security & hence leading to increase in social tension in India.

28. Greenhouse Gas Protocol (GHG Protocol) is an international accounting tool for government & business leaders to understand, quantify & manage greenhouse gas emission. It is a partnership between World Resource Institute (WRI) & the World Business Council.

29. Agreement at the UNFCCC meeting in Paris (COP 21) in 2015 was signed by all the member countries of the UN. Its main aim is to keep global temperature rise this century well below 2°C and to drive efforts to limit the temperature increase even further to 1.5°C above pre-industrial levels.

30. Global Atmosphere Watch (GAW) program of World Meteorological Organisation (WMO) has no station in India.

31. Clean Development Mechanism (CDM) is a flexible mechanism defined in Kyoto Protocol that provides for emissions reduction projects. It is a market driven device under UNFCCC that allows developing countries to get funds or incentives from the developed countries to adopt better technologies that reduce greenhouse gas emissions.

32. "Annex I" parties are the countries listed in Annex I of the treaty, the industrialized countries. Non-Annex I parties are developing countries. Thus, projects under the clean Development mechanism are related to "Annex I" and "non-Annex I" countries.

33. The National Adaptation Fund for Climate Change (NAFCC) was established in August 2015 to meet the cost of adaptation for the state and Union Territories of India.

34. Important Match the Column

- First world climate Conference-1979
- First Earth Summit- Agenda 21
- Earth Summit Plus 5- 1997
- Carbon Trading- Kyoto Protocol

35. Annex I countries related to Kyoto protocol. Certified Emission Reductions (CER) are a type of emissions unit (or carbon credits) issued by the Clean Development mechanism (CDM) under the rules of Kyoto Protocol.

36. Nagoya Protocol came into effect on 12 Oct, 2014. It is also a supplementary protocol of CBD. It is concerned with access to genetic resources & fair distribution of benefits from them.

37. Carbon sequestration is process of capturing & storing atmospheric carbon in plants, geologic structures & sea. Abandoned & uneconomical coal seams, depleted oil & gas reservoirs, and subterranean deep saline formations could be potential sites for carbon sequestration.

38. Carbon fertilization effect suggests that the increase of CO<sub>2</sub> in atmosphere increases the rate of photosynthesis in plants, thus increased plant growth.

39. The concept of 'carbon credit' originated in Kyoto Protocol. Carbon credits are traded at a price fixed from time to time by the United Nations Environment Programme.

40. Bio Carbon Fund Initiative for Sustainable Forest Landscapes (ISFL) is managed by the World Bank.

41. The Climate & Clean Air Coalition (CCAC) is a voluntary partnership of governments, intergovernmental organizations to improve air quality through actions to reduce short-lived climate pollutants. CCAC mainly focuses on methane, black carbon & Hydrofluorocarbons (HFC).

42. 'Forest Carbon Partnership facility' is a global partnership of Governments, businesses, civil society & indigenous peoples. It assists the countries in their 'REDD+ (Reducing Emission from Deforestation & forest Degradation+)' efforts by providing them with financial & technical assistance.

43. If the global temperature increases beyond 3% above the pre-industrial level, then terrestrial biosphere tends towards a net carbon source & there will be widespread mortality.

44. The average increase in earth's temperature during last century was 0.8°C.

45. Due to human activities, there is increase concentration of CO<sub>2</sub> but a lot of it does not remain in lower atmosphere because of the photosynthesis by phytoplankton in oceans & plants on lands, where CO<sub>2</sub> is absorbed. So, if phytoplankton got completely destroyed, the ocean as a carbon sink would be adversely affected & it will affect the Ocean's food chain.

46. Astronomical theory of climate change propounded in 1920 by Milutin Milankovic. It states that variation in eccentricity, axial tilt & precession of Earth's orbit determines climatic patterns.

47. Milutin Milankovic suggested that shifting Earth on its axis is responsible for climatic change.

48. Heavy deforestation, excessive burning of fossil fuels, exploding numbers of automobiles driven by oil are primarily responsible for climate change. Carbon concentration increasing in atmosphere is increasing greenhouse effect.

49. Ice case provides the cryogenic indicator of climate change.

50. Global Climate Change Alliance is an initiative of the European Union which provides technical & financial support to targeted developing countries to integrate climate change into their development policies & budgets. It was established to strengthen dialogue & cooperation with developing countries, in particular, least developed countries (LDC) & Small Island Developing States (SIDS).

51. Climate Action Plan was launched on 30 June, 2008 by Govt. of India. Under this action there are Eight National Mission:

- National water mission
- National Solar mission
- National mission for Green India
- National mission on Sustainable habitat
- National mission for Enhanced Energy Efficiency
- National mission for Sustaining the Himalaya Ecosystem
- National mission for Sustainable Agriculture
- National mission on Strategic knowledge for Climate change

52. Global warming causes melting of polar ice caps & rise in sea level submerging all the coral islands in the world. By 2044 A.D., Fiji is likely to be submerged & Netherlands will be in grave danger too by this year due to rise in sea level. Sea level is expected to rise from 0.33m to 0.45m from 1990 to 2100 A.D.

53. Manchester University Scientists have suggested to use sea water for creating bright clouds for maximum reflection of sun rays to control global warming.

54. Contour binding, Relay cropping, zero tillage helps in carbon sequestration/storage in the soil.

55. United Nations Framework Convention on Climate change (UNFCCC or FCCC) is an international environmental treaty adopted at United Nations conference on Environmental & Development (UNCED) informally known as Earth Summit, held in Rio de Janeiro from 3 to 14 June, 1992.

56. U.N. framework convention on climate change conference of parties (COP 21) was held in Paris in December 2015. Under this, countries outlined post-2020 climate actions they intended to take. This was known as Intended Nationally Determined Contributions (INDC).

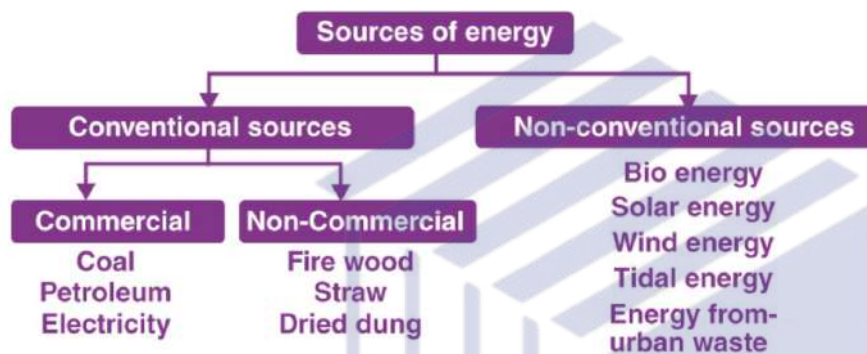
57. Green climate Fund (GCF) was formally established during the 2010 United Nations Climate Change Conference in Cancun, Mexico. The GCF is in South Korea. It is intended to raise climate finance of \$100 billion a year by 2020.

58. Carbon tax is a charge intended to make fossil fuels users pay for climate damage. New Zealand in 2005 introduced it for the first time.

59. Anaerobic conditions involved in rice cultivation causes methane emission. When nitrogen-based fertilizers are used, nitrous oxide is emitted from the cultivated soil.

60. The population of Asia Pacific Partnership countries is 47% of the world's population. They consume 48% of the energy & contribute 48% of the world's greenhouse gases.

## 7. SOURCES OF ENERGY



1. Best source of the production of electricity for sustainable development is hydroelectricity as compared to coal energy, petroleum energy, natural gas and nuclear energy.

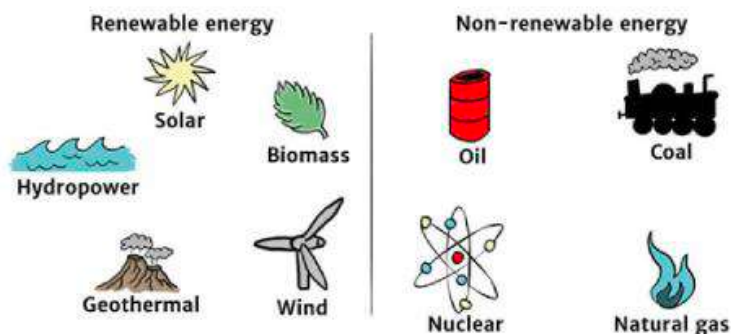
2. Solar energy is the largest storehouse of alternative energy.

3. Among various renewable energy, solar energy is mostly used in organic form.

4. Solar cell is most eco-friendly as it converts the energy of light directly into electricity by the photovoltaic effect.

5. Fossil fuels are the non-renewable sources of energy. Fossil fuels are formed by natural processes through decomposition of buried organism. Examples of fossil fuel include oil, coal and natural gas.

## Renewable and Non-Renewable Energy Sources





6. Diesel, Coal and Kerosene produces carbon dioxide when comes in contact with the atmospheric oxygen. On the other hand, hydrogen, when comes in contact with oxygen, forms water and produces a huge amount of energy. India has set the target to generate 1000 MW of electricity through hydrogen technology.

7. Energy crisis means the danger of the extension of fossil fuels like coal and crude oil.

8. Hydroelectricity is the best source to generate electricity for sustainable development. It uses water to produce electricity without depleting water.

9. The solar power source of renewable energy has the greatest potential in India. Solar panels are the most eco-friendly power generation systems and they are also called as the fuel of the future.

10. Biofuel is eco-friendly, contributes to remedy energy crisis, and also made from corn. But it is not cost-effective. It is quite expensive.

11. Cultivation of Jatropha plant seeds are the main source of biofuel development in India. Jatropha oil can be used after extraction in diesel generators and engines.

12. Ethanol (as known as ethyl alcohol) is used as a green fuel. Ethanol is mainly found from sugar cane, glucose etc.

13. Maize is cultivated for ethanol. Jatropha, Pongamia and sunflower are cultivated for biodiesel.

14. SpiceJet successfully conducted India's first ever biofuel powered flight in 2018 on Dehradun-Delhi route. SpiceJet used its bombardier Q400 aircraft for this flight.

15. Under the Nuclear Power Projects, (a) radioactive contamination of air, water and soil, (b) deforestation and loss of flora & fauna, (c) radioactive waste disposal are studied and resolved.

16. Incineration is the waste treatment process of combustion of organic substances contained in waste material.

17. The Union Territory of Diu became India's first 100% renewable state (solar energy) in March, 2018.

18. International Solar Alliance is a platform for cooperation among sun-rich countries lying fully or partially between the Tropic of Cancer and Capricorn. The initiative was launched at the UN Climate Change Conference in Paris at the end of 2015 by the President of France and the prime minister of India. Its secretariat is based in Gurugram, Haryana, India.

19. Biomass gasification means incomplete combustion of biomass resulting in the production of combustible gases consisting of carbon monoxide, hydrogen and traces of methane. The resulting gas from the gasification process is called producer gas and it can be used in internal combustion engine. Coconut shells, groundnut shells and rice husk can be used in biomass gasification.

20. Earth worms speed up the process of decomposition and they are the part of worm composting. Worm compost is also called vermicompost.

21. Fuel cell is an electrochemical cell that converts the chemical energy from fuel into electricity through an electrochemical reaction of hydrogen with oxygen. In this process, fuel cell produces electricity and water + heat as byproduct. Fuel cells generate direct current (DC).
22. Sulphur dioxide is mainly responsible for acid rain which is produced from Sulphur, present in coal. Oxides of carbon are emitted when coal burns.
23. Microbial Fuel Cell (MFC) is a bio electrochemical device that harnesses the power of respiring microbes to convert organic substrate directly into electrical energy. MFC is used in waste water treatment.
24. Algae-based biofuel production is possible in seas and continents. Production & engineering of these fuels requires high level of expertise.
25. Apart from Jatropha, Pongamia plant is also considered as a resource for fulfilling the growing demand of biodiesel in India. Pongamia pinata grows naturally in most of the arid regions in India. It can be grown in waterlogged, saline and alkaline soil and can withstand harsh agro climates.
26. Earth's natural heat is geothermal energy. It is re-generated continuously by the decay of radioactive elements in rocks. There are seven geothermal provinces in India namely Himalayas, Sohana, West Coast, Cambay, Son-Narmada-Tapi (SONATA), Godavari and Mahanadi.
27. Minerals are exhaustible i.e., if we extract this, one day it will run out. But solar energy is inexhaustible.
28. Biogas typically consists of methane (50–75%), carbon dioxide (25–50%), and smaller amounts of nitrogen (2–8%).
29. Climate Change and Deforestation also affects rainfall.
30. India does not manufacture silicon chip. Every solar panel which is made in India is only assembled here while all the material comes from China, Europe etc. Central Electricity Regulatory Commission (CERC) determines solar power tariffs and regulates the tariffs of generating companies owned or controlled by the central government.
31. Conventional asphalt is petroleum-based and contains toxic and heavy metals. Bio asphalt is a renewable construction material that is manufactured without the use of petroleum. Bio asphalt is used in roofing and street paving.

## **8. OZONE LAYER AND OZONE DEPLETION**

1. Earth's atmosphere is divided into several layers. Stratosphere starts from 10km upto 50km. Ozone layer is found mainly in lower portion of stratosphere from approximately 20-35km above Earth. Thickness varies seasonally & geographically. Ozone layer protects earth from UV rays. 10% of ozone layer is found in troposphere & 90% in stratosphere.
2. The lowest region in the atmosphere is Troposphere. Its thickness is maximum at equator & deepest in tropics up to 18-20km & shallowest near the polar region.

3. Chlorofluorocarbon is an organic compound that contains carbon, chlorine & fluorine. Chlorine has potential to destroy large amount of ozone causing ozone hole. Hence it is one of the major causes of greenhouse effect.
4. Ozone (O<sub>3</sub>) formed by three atoms of Oxygen. It is a deadly poison, but it shields the earth's surface from Ultraviolet radiation of the sun and absorbs it at higher level and provides safety to biotic life on earth. This UV radiation causes skin cancer.
5. Chemical reactions involving solar ultraviolet radiation and oxygen molecules produce Ozone.
6. 16th September declared as the International Day for the Preservation of Ozone layer (World Ozone Day), commemorating the date of the signing of the Montreal Protocol on substances that deplete the Ozone Layer in 1987.
7. ODS include chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), halons, methyl bromide, carbon tetrachloride, hydrobromofluorocarbons, chlorobromomethane, and methyl chloroform.
8. Ozone hole is maximum over Antarctica.
9. The Montreal Protocol was designed to protect the ozone layer by phasing out substances that are responsible for ozone depletion. It is a protocol to the Vienna convention for the protection of ozone layer. It was agreed on 16 September 1987, and entered into force on 1 January 1989.
10. The Vienna Convention for the Protection of the Ozone Layer (Vienna Convention) was agreed in 1985.
11. Kigali amendment to Montreal Protocol 2016 - Kigali is the capital city of Rwanda. In the 28th meeting of the Parties (2016) to the Montreal Protocol, negotiators from 197 nations have signed an agreement to amend the Montreal Protocol in Kigali. It is a legally binding. It came into effect from 1st January 2019.
12. The ozone layer in the stratosphere is naturally regulated by Nitrogen dioxide. The measurement unit of the ozone layer is 'Dobson Unit' (DU). 1 DU equals to 0.01mm thickness of pure ozone at 0°C temperature and 1 atm pressure.
13. Chlorofluorocarbons (CFC) are nontoxic, non-inflammable chemicals containing atoms of carbon, chlorine & fluorine. They are used in the manufacture of aerosol, foams & as refrigerants.
14. Nitric Acid in the Polar stratospheric clouds reacts with CFC. This reaction produces chlorine which destroys ozone layer. Also, presence of prominent polar front & stratospheric clouds & inflow of CFC causes ozone hole.
15. The gases filled in refrigerator are sold as Freon. These are a commonly halonic hydrocarbon.
16. Ozone hole over Antarctica was first discovered by British team in 1985.
17. GW Kent Moore (University of Toronto) discovered ozone hole over Tibetan Plateau in 2005.
18. Phenomenon & Gas responsible:

- Ozone → Chlorofluorocarbon (CFC)
- Acid rain → Sulphur dioxide & oxides of Nitrogen
- Rocket fuel → kerosene oil
- Green House Effect → Carbon dioxide

## 9. ENVIRONMENTAL POLLUTIONS

1. Anthropogenic pollution is caused by humans. It gives rise to non-biodegradable pollutants, so it doesn't get decomposed easily.
2. Biodegradable pollutants can be broken down into simpler, harmless substances in due course of time. Ex: domestic waste, wine, faecal matter, sewage, cattle dung, animal bones, urine, agriculture residues etc.
3. In 2019, the Ministry of Environment, Forest and Climate Change (MoEFCC) launched the National Clean Air Programme (NCAP) with an objective to reduce PM<sub>2.5</sub> pollution by 20–30% by 2024 as compared to 2017.
4. Coal, petrol and diesel burn and produce oxides of carbon and nitrogen and causes air pollution.
5. Solar energy (renewable energy) do not produce any atmospheric pollution.
6. Photochemical smog are formed when nitrogen oxides and volatile organic compound react to sunlight (in summer). It is formed by oxides of nitrogen (NO<sub>x</sub>) and Ozone(O<sub>3</sub>). In the vacuum of automobile hydrocarbon and nitric oxide create Ozone and Peroxyl Acetyl Nitrate (PAN).
7. Sound sources and noise produced in decibels(dB): -



8. A whisper is about 30 dB, normal conversation is about 60 dB, and a motorcycle engine running is about 95 dB. Noise above 70 dB over a prolonged period of time may start to damage your hearing. Loud noise above 120 dB can cause immediate harm to your ears.

9. Carbon monoxide (CO), the MAIN PRIMARY and MOST DANGEROUS air pollutant is odorless, colorless gas formed by incomplete combustion of fuels (vehicle exhaust) and cigarettes. CO displaces the oxygen in body and causes poisoning. It gets dissolved in haemoglobin of blood and form carboxyhemoglobin(CO<sub>h</sub>b).

#### 10. Type of Pollutants -

- Primary pollutants (directly spread in air): Sulphur dioxide, oxide of nitrogen, carbon monoxide.
- Secondary pollutants (formed after reaction of primary pollutants with atmosphere): Peroxyacetyl Nitrate (PAN), Ozone, Smog

11. Petrol combustion in automobiles produces lead (damages kidney and increase blood pressure).

12. Arsenic is a non-biotic pollutant of underground water. Its presence is high in areas adjoining banks of Ganga. Pesticides and insecticides also responsible for this. According to WHO amount of arsenic should be 0.05 mg/litre.

13. Chemical fertilizers causes nitrogen loss leading to soil and land degradation. Nitrogen is produced using large amounts of oil and natural gas generating air pollution.

14. Leather industry effluents causes the highest chemical pollution.

15. Acid rain is caused by Sulphur dioxide and nitrogen oxide. The pH of acid rain is <5-6. Oxides of Sulphur reacts with cloud's water & make it acidic. It increases corrosion and affects nervous system in body.

16. Major source of Sulphur dioxide and nitrogen oxide comes from burning of fossil fuels to generate machinery; vehicles & heavy equipment's; manufacturing oil refineries and other industries. Very small portion comes from natural resources.

17. Eutrophication is an enrichment of water by nutrient salts such as nitrates and phosphates, through fertilizers or sewage, to a freshwater system. Eutrophication leads to algal blooms causing the bacteria population to increase and use up all oxygen by consuming the dead algae.

18. Asbestosis is a disease caused by presence of asbestos in air for a long time.

19. Fly ash is coal combustion product which is driven out of the boiler with the flue gases. Fly ash is a particulate material produced from the combustion of coal in thermal power plants. It has fine particles (SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub> & Cao occasionally). It is used as replacement of Portland cement, to manufacture construction bricks. It is captured by electrostatic precipitator or other particle filtration equipment it causes respiratory diseases.

20. Green muffler is a control measure for noise pollution by planting 4-5 rows of green plants.

21. Bhopal gas tragedy (world's worst industrial disaster) occurred on 3 December, 1984 at Union Carbide India Limited Pesticide plant in Bhopal, MP. The gas involved was Methyl Isocyanate(MiC).
22. Polythene (non-biodegradable product) is made up of polymer of ethylene(C<sub>2</sub>H<sub>4</sub>).
23. Plastic, Iron, Lead can't be destroyed by bacteria (non-biodegradable). Plastic takes maximum time to decay. Rubber can be decomposed and destroyed by bacteria or other living organism(biodegradable).
24. Bio-indicators are living organism that respond to change in the environment. The hardy lichens are bio-indicators for air pollution, especially sulphur dioxide.
25. Biological oxygen demand (BOD) is the amount of dissolved oxygen needed by anaerobic organism to bring down organic material present in water at a certain temperature over a specific period. Increased BOD means high level of organic pollution (Ex: sewage) because oxygen is required to break down pollutant. So, less pollution means more dissolved oxygen and vice versa. BOD is maximum in Ganga River between Kanpur & Allahabad.
26. Bioremediation is a process of detoxification of environment through use of small organism. It is a technique of cleaning up pollution by enhancing the same by biodegradation process that occurs in nature but heavy metal pollutants can't be treated. It is used in cleaning surface and groundwater and soil etc. Genetic engineering can be used to design microorganisms for bioremediation, ex: Pseudomonas putida role in ending oil spill in ocean.
27. Zinc, Copper and Nickel are water pollutant. Sulphur dioxide is air pollutant (in acid rain).
28. Groundwater in Brahmaputra Gangetic plains of India, Padma Meghna plains of Bangladesh, West Bengal, Jharkhand, Bihar, Uttar Pradesh, Assam, Manipur and Chhattisgarh is polluted with arsenic. Permissible range of arsenic in groundwater is 10 microgram/Litre.
29. Chernobyl disaster, a nuclear accident, happened on 26 April, 1986 Ukraine. It caused radioactive pollution by decomposing radioactive nuclides harming the genetic properties.
30. Sewage is a biodegradable pollutant. Asbestos, DDT, Plastic are non-biodegradable.
31. Lead (anti knocking agent in automobiles) are most toxic metal pollutants of automobiles which affects the nervous system, brain and digestive system.
32. La Nina (unusual cold oceanic temperature in equatorial pacific) in 2012, caused intense cold in northern India. El Niño is a climate pattern that describes the unusual warming of surface waters in the eastern tropical Pacific Ocean. It leads to drought in India.
33. Damodar River due to excessive pollutant is called 'biological desert'. It is considered as Sorrow of Bengal & Jharkhand.
34. Argimon seed (found in Mexico) is adulterant for mustard seed. It causes epidemic dropsy.
35. Rain cleans the polluted environment. It better on >10 micron or >2.5-micron particles.
36. Increasing harmful algal blooms (in Indian water) is due to discharge of nutrients from estuaries; run-off from the land during monsoon; upwelling in the sea.

37. Asian Brown Cloud (Clouds with 85% aerosol formed due to air pollution) mainly spread over South Asia during. It contains sulphate, black carbon and other deadly chemicals. It causes uneven temperature & change in rainfall pattern.

38. Cold air is heavy so dirt and pollutants form a layer above the earth's surface responsible for increased pollution during winter in Delhi.

39. Radon (colorless, odorless, radioactive, decay product of radium) is most important indoor air pollutant which causes lung cancer.

40. Cigarette smoke contains carbon monoxide, hydrogen cyanide, arsenic, formaldehyde, benzene, nicotine.

41. Lead pollutant sources: Smelting units, Paints, soil, water, lead containing products, bullets.

42. Air pollutants & Bodypart affected-:

- Lead- Brain and nervous system
- Asbestos- Lung
- Carbon Monoxide- Bloodstream
- Mercury- Stomach

43. Pollutants and effects-:

- Carbon Monoxide- Liver/kidney damage
- Oxides of Nitrogen- Cancer
- Soil particles- breathing ailments
- Lead- Central nervous system

44. In steel furnace: Carbon monoxide, carbon dioxide, oxides of Sulphur and nitrogen are released.

45. International Acid Rain Information Center is in Manchester, England.

46. Carbon dioxide, Oxides of Nitrogen & Sulphur are emitted from coal combustion at thermal power plant.

47. Aflatoxin are cancer-causing chemicals produced from Moulds due to improperly stored staple products like cassava, chili peppers, corn, cottonseed, millet, peanuts, rice, wheat etc.

48. Filter bags are used to filter pollutant particles of <50 micrometer size. Cyclone separator or cyclone collector is used to filter particles of >50 micrometer size. [Cyclone divider is not used for air pollution]

49. Radioactive pollution causes hereditary changes, hinders blood circulation and are carcinogenesis.

50. Extensive Research at the energy & Research Institute (TERI) has developed 'Oil Zapper' which is consortium of crude oil and oil sludge degrading bacteria deriving from bacterial cultures in natural environment.

51. International Maritime Organization (a UN agency) role is to create a regulatory framework for shipping industry that is universally adopted & implemented. Its headquarters is in London.

52. Bio-toilets, developed by railways and defense research development Organization (DRDO) has a colony of anaerobic bacteria that converts human waste into water and few gases.
53. Groundwater contains arsenic, fluoride and uranium. Uranium had been found in groundwater in Punjab.
54. Fluorosis: When fluoride in body  $>0.5$  ppm over 5-10 years. It has affinity for calcium and gets accumulated in bones causing knock-knees syndrome.
55. Ocean acidification means decrease in its pH due to carbon dioxide. It would affect the calcareous phytoplankton, coral reefs and some animals that have phytoplankton larvae.
56. Euro Emission standard is pollution regulation applicable to automobiles in Europe. Euro norms place a limit on oxides of nitrogen, carbon monoxide, all hydrocarbons, non-methane hydrocarbon and suspended particulate matter emission. Mashelkar committee for national auto fuel policy suggested implementation of control pollution. BS6 standard was implemented India in 1 April, 2020.
57. To meet Euro-II emission standards, Sulphur content in ultra-low Sulphur diesel should be 0.05% or less than this.
58. India's air-quality index is based on eight major pollutants- (1)  $<10$  micrometer particulate matter/PM<sub>10</sub> (2)  $<2.5$  micrometer particulate matter/PM<sub>2.5</sub> (3) Nitrogen dioxide/NO<sub>2</sub> (4) Ozone/O<sub>3</sub> (5) Carbon monoxide/CO (6) Sulphur dioxide/SO<sub>2</sub> (7) Ammonia/NH<sub>3</sub> (8) Lead/Pb
59. A catalytic converter converts toxic gases and pollutants in exhaust gas to less toxic pollutants by catalyzing redox reaction. Palladium & Platinum are important examples.
60. Soil pollution is more dangerous than industrial pollution as fertilizers and pesticides enters into food cycle.
61. Delhi generates the largest amount of solid waste per capita annually according to FICCI.
62. Nano particles pollute water, soil & air. They can enter food chain after ingestion by bacteria. Nano particles of zinc oxide and titanium dioxide produce free radicals.
63. Brominated flame retardants, as name suggest are organobromine compounds with inhibitory effect on flammability of products containing it. They are bio-accumulative (resistant to degradation) and toxic to humans and environment and cause neurobehavioral and endocrine disruption.

## **10. WATER CONSERVATION**

1. World water conservation Day is an annual event celebrated on March 22.
2. Biotic resources are obtained from living and organic material like forests and animals. Fossil fuels such as coal and petroleum are also included in this category because they are formed from decayed organic matter.
3. The 'Central Ganga Authority' was constituted in February, 1985. In September, 1995 its name was changed to 'National River Conservation Authority'.



4. Union finance minister, 2014-2015 announced Namami Gange programme. The main pillars of Namami Gange Programme are: Sewerage Treatment Infrastructure. River-Front Development. River-Surface Cleaning.

5. Ganga has the status of national river by government of India. Government constituted the National Ganga River Basin Authority (NGRBA) on 20th Feb 2009 under Environment Protection Act, 1986. NGRBA is a planning, financing, monitoring, and coordinating body. The Apex body of NGRBA is headed by Prime Minister for Policy decisions.

6. Rajendra Singh, a well-known water conservationist from Alwar district, Rajasthan also known as 'waterman of India'.

7. Chlorine is used for the purification of drinking of water.

8. Population of Ganges River dolphins is declining because of (a) construction of dams & barrages on rivers, (b) getting trapped in fishing net accidentally, (c) use of synthetic fertilizers and other agricultural chemicals in crop fields.

9. Main objective of the National Water Mission is "conservation of water, minimizing wastage and ensuring its more equitable distribution, both across and within states through integrated water resources development and management".

10. Heavy sand mining in river beds causes pollution of ground water, lowering of the water table.

11. Irrigation causes the deposits of salt build up in the soil and it can reach the level that are harmful for the crops. Hence, salinization is the irrigation's major problem.

12. Water (Prevention and Control of Pollution) Cess act was enforced on 7th December, 1977.

13. In 1984 the Central Water Commission established "Irrigation Research and Management Organization".

14. Arsenic contamination of drinking water is highest in Kolkata, West Bengal.

15. Ultraviolet water purification is the most effective method for disinfecting bacteria from the water.

16. Water filtration can be done through- temperature, radioactive irons, Ultraviolet rays, oxidation of chemicals using a compound of ozone, Iodine and Chlorine. Chloramine ( $\text{NH}_2\text{Cl}$ ) and chlorine dioxide ( $\text{ClO}_2$ ) can also be used for water purification.

17. Greenwash means making false promises of protecting the environment.

18. Yamuna Action Plan (YAP) was launched to clean the dirtiest river in the country in 1993.

19. Wetlands within urban areas are dealt under the National Lake Conservation Plan (launched in June, 2001 as a centrally sponsored scheme) with the aim of Pollution control:

- Bhoj-Madhya Pradesh
- Sukhana-Chandigarh
- Chilka-Orissa

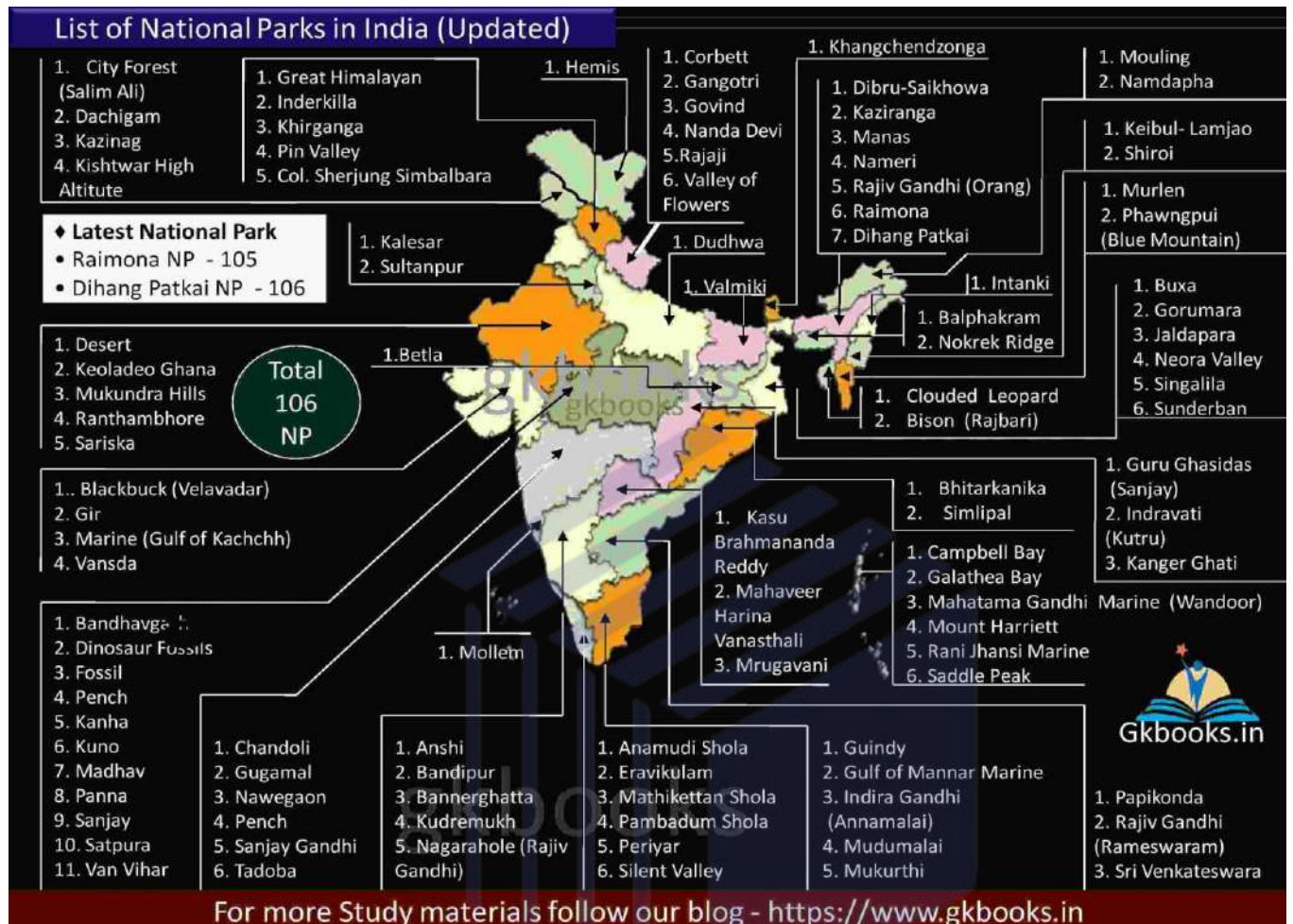
- Pichola- Rajasthan

20. Aral Sea is a saline lake located in central Asia that was once the world 's fourth largest Salt Lake. It is now decreased in size.

### 11. SANCTUARIES, PARK and WILDLIFE

1. International Tiger Day is observed on July 29. It was founded at Saint Petersburg Tiger Summit in 2010.
2. National Board for Wildlife (NBWL), chaired by Prime Minister of India provides a policy framework for conservation in the country. Under it, protected areas comprising National Parks, Wildlife Sanctuaries, Conservation Reserves & Community Reserves has been established. In India, most of the wildlife protected areas are surrounded by dense forests.
3. There are 106 National parks in India.
4. 'Project Tiger' launched in 1973 to save tigers from extinction.
5. 'M-STRIPES' stands for Monitoring System for Tigers-Intensive Protection & Ecological Status.
6. In 1982, Delhi Zoo was officially renamed to National Zoological Park. It is also called National Biological Garden.
7. Jim Corbet national Park (established in 1936 as Hailey National Park) is the first national park of India. It lies in Nainital, Uttarakhand.

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**8. National Park and year of establishment:**

- Corbett, Uttarakhand- 1936
- Kanha, MP- 1955
- Dudhwa, UP- 1977
- Rajaji, Uttarakhand- 1983

9. Nagar hole Forest (also called as Rajiv Gandhi national Park), is located in the districts of Mysore and Coorg, Karnataka.

10. There is only 1 national park located within Uttar Pradesh - Dudhwa National Park.

**11. There are total of 25 wildlife sanctuaries in Uttar Pradesh**

- Sarsai Nawar Wetland - Sarsai Nawar, Etawah district
- Bakhira Sanctuary- Sant Kabir Nagar district
- Chandra Prabha Wildlife Sanctuary - Chandauli district
- Hastinapur Wildlife Sanctuary - Amroha, Bijnor, Ghaziabad, Meerut, and Muzzafarnagar districts
- Kachhua Sanctuary - Varanasi district

- Kaimoor Sanctuary – Mirzapur and Sonbhadra districts
- Katarniaghat Wildlife Sanctuary - Bahraich district
- Kishanpur Wildlife Sanctuary - Lakhimpur Kheri district
- Lakh Bahosi Sanctuary - Kannauj district
- Mahavir Swami Sanctuary - Lalitpur district
- National Chambal Wildlife Sanctuary - Agra and Etawah districts
- Nawabganj Bird Sanctuary - Unnao district
- Okhla Sanctuary - Ghaziabad and Gautam Buddha Nagar districts
- Parvati Arga Bird Sanctuary - Gonda district
- Patna Bird Sanctuary - Etah district
- Ranipur Sanctuary - Banda and Chitrakoot districts
- Saman Sanctuary - Mainpuri district
- Samaspur Sanctuary - Rae Bareilly district
- Sandi Bird Sanctuary - Hardoi district
- Sohagi Barwa Sanctuary - Maharajganj district
- Suhelva Sanctuary - Balrampur, Gonda and Shravasti districts
- Sur Sarovar Sanctuary - Agra district
- Suraha Tal Sanctuary - Ballia district
- Vijai Sagar Sanctuary - Mahoba district

#### **12. Tiger Reserves in UP**

- Dudhwa Tiger Reserve is made up of
  - Dudhwa National Park
  - Kishanpur Wildlife Sanctuary, Lakhimpur Kheri district
  - Katarniaghat Wildlife Sanctuary, Bahraich district
- Pilibhit Tiger Reserve, Pilibhit district
- Amangarh Tiger Reserve, Bijnor district

**13. Periyar game sanctuary (famous for wild elephants) is located in Kerala.**

**14. Betla National Park is located in Chota Nagpur Plateau of the Palamu district of Jharkhand. It was established in 1986.**

**15. Rani Jhansi Maritime National Park, founded in 1996 at Andaman & Nicobar Island.**

**16. Nagarjuna Sagar Shri Sailam Tiger Reserve of Andhra Pradesh is the largest tiger habitat in India. It is in Andhra Pradesh and Telangana.**

**17. Gir National Park is in Junagadh, Gujarat. It is famous for Asiatic lions. Sambhar and Cheetal also found.**

### Natural World Heritage Sites in India (As on December, 2020)

Sl. No.	Name of WH Site	State Location	Year of Notification	Area (sq.km)
1	Great Himalayan National Park Conservation Area	Himachal Pradesh	2014	905.4
2	Western Ghats	Maharashtra, Goa, Karnataka, Tamil Nadu and Kerala	2012	7,953.15
3	Nanda Devi and Valley of Flowers National Parks	Uttarakhand	1988	630.00 87.50
4	Sundarbans National Park	West Bengal	1987	1,330.10
5	Kaziranga National Park	Assam	1985	429.96
6	Keoladeo National Park	Rajasthan	1985	28.73
7	Manas Wildlife Sanctuary	Assam	1985	391.00

18. Sanctuaries and species protected there: (i) Jim Corbett-Tiger (ii) Kaziranga-Rhinoceros (iii) Periyar-Elephants

19. Keoladeo Ghana National Park (earlier known as Bharatpur Bird Sanctuary) is in Bharatpur, Rajasthan. It was established as a national park on 10 March, 1982. In 1985, it was declared a World Heritage Site. It is ideal habitat for Siberian crane.

20. Biosphere reserves are areas comprising terrestrial, marine and coastal ecosystems. It contributes to the conservation of landscapes, ecosystems, species and genetic variation.

21. The Nokrek Biosphere Reserve is in north-east of India on Garo Hills which forms part of Meghalaya Plateau. Agasthya Malai is spread over the Western Ghats, Dehang Debang over Upper Siyang, Debang Valley in Arunachal Pradesh & Nanda Devi are spread in Uttarakhand.

22. Nanda Devi biosphere reserve was inscribed a World Heritage site status by UNESCO in 1988. In 2005, it was extended to the Valley of Flowers as a World Heritage site.

23. The boundaries of a National Park are defined by legislation. No alteration to the boundaries of a National Park shall be made except on a resolution passed by the Legislature of the State.

24. Indian Wild Ass Sanctuary (established in 1972) is also known as the Wild Ass Wildlife Sanctuary is located in Rann of Kutch, Gujarat.

25. Tiger Census Report 2018

- Census is carried out by Wildlife Institute of India (WII – funded by MoEF) and NTCA.
- Tiger Census Report is a four-yearly report.
- India is home to almost 70 % of the world tiger population.
- Nearly 30% India Tiger live outside Tiger Reserve.

- **Top Performers:** Madhya Pradesh saw the highest number of tigers (526) followed by Karnataka (524) and Uttarakhand (442).
- **Worst Performers:** Chhattisgarh and Mizoram saw a decline in tiger population.
- Madhya Pradesh's Pench Sanctuary and Kerala's Periyar sanctuary emerged as the best-managed tiger reserves in the country.
- The Dampa and Rajaji reserves, in Mizoram and Uttarakhand respectively are at the bottom of the list in terms of Tiger count.
- No tiger has been found in the Buxa (West Bengal), Palamau (Jharkhand) and Dampa (Mizoram) reserves.
- Increase in Tiger population: Madhya Pradesh (71%) > Maharashtra (64%) > Karnataka (29%).

26. One-horned Rhinoceros is found in West Bengal and Assam.

27. Kaziranga wildlife sanctuary is a National Park that hosts two-third of the world's Great One-horned rhinoceros. (It is not a tiger reserve)

28. Rhinoceros have been relocated/rehabilitated in Dudhwa national Park, UP from Assam in 1984.

29. In March 2017, the expert committee of the Ministry of Environment gave approval to transfer Asian lions to Kuno Palpur Wildlife Sanctuary from Gir national park, Gujarat.

30. Sanctuary and their location:

- Topichanchi Sanctuary-Dhanbad (Jharkhand)
- Udhwa Bird Sanctuary-Sahebganj (Jharkhand)
- Lavalong Sanctuary-Chatra (Jharkhand)

31. Madhya Pradesh and Andaman and Nicobar Islands have maximum number of national parks.

32. National Park & their State:

- Bandipur-Karnataka
- Rajaji-Uttarakhand
- Simlipal-Odisha
- Pin Valley-Lahaul & Spiti, Himachal Pradesh
- Intanki- Nagaland
- Betla- Jharkhand
- Sirohi- Manipur
- Guindy- Tamil Nadu
- Great Himalayan National Park- Kullu, Himachal Pradesh
- Rajaji National Park- Uttarakhand (Haridwar, Dehradun & Pauri Garhwal district)
- Keoladeo National Park- Bharatpur, Rajasthan
- Van Vihar National Park- Bhopal, MP
- Nokrek National Park is in Garo Hills district of Meghalaya.
- Marine national Park is in the Gulf of Kutch.
- Kaziranga-Golaghat Nawgaon, Assam
- Kudremukh-Chikmagalur, Karnataka

- Silent Valley-Palghat, Kerala
- Pench Valley-Nagpur, MH
- Gir – GJ
- Kanha – MP

**33. National Park & Animals:**

- Bandipur-Tiger reserve
- Kaziranga-One horn rhinoceros' reserve
- Sunderban-Biosphere & Tiger reserve
- Simlipal-Elephant reserve
- Rajaji National Park-Elephant
- Periyar National Park: Tiger
- Manas National Park: Elephant
- Dudhwa National Park: Tiger

34. Sariska and Ranthambore are national parks for protection of tigers.

35. Sariska Tiger reserve is a national Park located in Alwar district of Rajasthan. It was declared Wildlife Century in 1955 in Tiger reserve in 1978.

36. Salim Ali National Park is located in Srinagar, Kashmir.

**37. Wildlife Sanctuary and their location:**

- Chandra Prabha- Chandauli,U.P.
- Karera- Shivpuri,M.P.
- Jaisamand- Udaipur, Rj
- Nahargarh- Bara, Rajasthan
- Garmpuni- Assam
- NamDafa- Arunachal Pradesh
- Pakhal- Telangana
- Sariska- Rajasthan

38. Pench Tiger reserve is spread over two states, Madhya Pradesh and Maharashtra.

39. Manas Wildlife Sanctuary in Assam is one of the first reserves included in the network of tiger reserves under Project Tiger in 1973. In 1985, it was declared as World Heritage Site (Natural). It is famous for Tigers.

**40. National Park & their District-**

- Kanha National Park-Mandla and Balaghat (MP)
- Bandhavgarh National Park- Umaria (MP)
- Madhav National Park-Shivpuri (MP)
- Indravati National Park- Bijapur (Chhattisgarh)
- Mollem National Park – Sanguem Taluk (Goa)
- Kalesar National Park – Yamunanagar (Haryana)

- **Betla National Park – Latehar and Palamu (Jharkhand)**

**41. (i) Gir forest-Gujarat (ii) Bharatpur Bird Sanctuary-Rajasthan (iii) Bandhavgarh Sanctuary-Madhya Pradesh (iv) Kaziranga National Park-Assam (v) Dachigam Wildlife Sanctuary-Jammu & Kashmir (vi) Keoladeo Ghana Bird Sanctuary-Rajasthan (vii) Kanha National Park-Madhya Pradesh (viii) Periyar Wildlife Sanctuary-Kerala**

**42. Dachigam National Park in J&K is famous for Kashmiri stag (Hangul).**

**43. Sathyamangalam Tiger Reserve is located on the meeting of Eastern Ghats and Western Ghats.**

**44. National Park and establishment year-**

- **Silent Valley:1980**
- **Jim Corbett-1936**
- **Kaziranga:1974**
- **Kanha:1955**

**45. Kangaroo rat can leave for longest duration without drinking water.**

**46. Yellowstone National Park (first National Park of USA) is known for Old Faithful Geyser.**

**47. Gulf of Mannar is a marine national park in Tamil Nadu, established in 1986.**

**48. The 40th World Heritage Committee at Istanbul, Turkey on 17th July, 2016 inscribed Khangchendzonga National Park of Sikkim as UNESCO's World Heritage Site on 'Mixed' criteria. This status was also conferred on Nalanda Mahavihar of Bihar & Capital complex of Chandigarh.**

**49. Edward Suess first used the term 'Biosphere'. Ecosystem was first used by A.G Tansley. Reites & Ernst Haeckel first used the term 'Ecology'.**

**50. Small scale photographs are suitable for wildlife management in Jim Corbet national Park in Rajaji national Park.**

**51. Keibul Lamjao National Park is situated in Bishnupur district of Manipur. It is characterized by floating decomposed plant materials called Phasmids.**

**52. Maharashtra has become the first state in the country to have a 'State butterfly' while Karnataka is the second state to declare 'State butterfly'.**

**53. Great Himalayan National Park (GHNP) is in Kullu district of Himachal Pradesh.**

**54. Gulf of Mannar (10500 km sq.) is the largest biosphere reserve in term of the area approved by UNESCO. The largest bioreserve in India is Runn of Kutch.**

**55. Loktak lake is the largest freshwater lake of India, located in Manipur and is famous for floating phundis.**

**56. Namdapha National Park is largest protected area in Eastern Himalaya biodiversity located in Arunachal Pradesh. Its climate varies from tropical to subtropical, temperature and arctic.**



57. Cold Desert Biosphere Reserve of Himachal Pradesh was declared as 16th Biosphere reserve. Seshachalam Hills of Andhra Pradesh was declared as 17th Biosphere Reserve & Panna, Madhya Pradesh as 18th Reserve.
58. Government has set a target of installing 100 GW of solar capacity by 2022 in the country which includes 100 GW from solar, 60 GW from wind, 10 GW from bio power and 5 GW from small hydropower.
59. Garden of five seasons is located near Mehrauli.
60. Total estimated population of tigers in the world is 3000-4000. India has 2967 wild tigers which is highest as compared to other countries.
61. Bandipur Tiger reserve of Karnataka has started using drone for wildlife management.
62. Bhitarkanika National Park has largest population of endangered saltwater crocodiles.
63. The great Indian Bustard is found in Desert National Park. Hoolak Gibbon is found in eastern states of India mainly in Assam.
64. Western Ghat is natural habitat for Great Indian Hornbill. These are also found in Nepal, Bhutan, China and Indonesia.
65. Chambal River is best place to see Gharials in their natural habitat.
66. The biggest national park in India is the Hemis National Park, located in Jammu and Kashmir states.
67. India's first butterfly park is Bannerghatta National Park near Bengaluru, Karnataka. It was founded in 1970 and declared as a national Park in 1974.
68. Askot Wildlife Sanctuary is near Pithoragarh near Askot in Uttarakhand.
69. Corbett National Park gets its water from RamGanga river.
70. Buxar Tiger reserve is situated in Alipur Duar subdivision of Jalpaiguri district, West Bengal.
71. Suklaphanta wildlife sanctuary is located in Kanchanpur district of south-west Nepal.
72. Dampa Tiger Reserve (largest wildlife sanctuary) is in Mizoram. Gumti Wildlife Sanctuary is in Tripura. Saramati is a peak rising above the surrounding peaks at mountainous border of Nagaland State, India & the region of Burma.
73. Ramganga & Kosi River flow through Corbett National Park. Brahmaputra, Diphlu, Mora Diphlu & Mora Dhansiri flows through Kaziranga National Park. Kunthipuzha river flows through Silent Valley National Park.
74. Harike Wetland is located downstream the confluence of Vyas & Satluj rivers. Keoladeo Ghana National Park is at confluence of Gambhir & Banganga. Kolleru lake is largest freshwater lakes in India in Andhra Pradesh between Krishna & Godavari.
75. Rare species Cloud Goats(Nilgiri Tahr) of Nilgiri is found in Eravikulam National Park.

76. Bondla Wildlife Sanctuary is in Goa. Kanger ghati National Park is in Chhattisgarh. Orang Sanctuary (also called Mini Kaziranga) is in Assam. UshKothi Wildlife Sanctuary is in Odisha.

77. Chinar Wildlife Sanctuary is located in Kerala.

78. Sultanpur Bird Sanctuary is situated in Gurgaon, Haryana.

79. Bird Sanctuary of Tamil Nadu is located in Karikili.

80. In Bhutan, National Parks are 33.66% of the total geographical area of the country.

81. World's largest botanical garden- Royal Botanical Garden of Kew, England.

82. Bundala Biosphere Reserve is located on the southeast coast of Sri Lanka.

## 12. MISCELLANEOUS

1. India's first research base station- Dakshin Gangotri, Antarctica, (est. in 1984)-Decommissioned in 1990

- India's second research Centre- Maitri, Antarctica, (est. in 1988-99)-Active
- India's third research base station- Bharati, Antarctica, (est. in 2012)-Active

2. Agenda 21 is a non-binding voluntarily implemented action plan of United Nations with regard to sustainable development. It is a product of Earth Summit (UN Conference on Environment & Development) held in Rio de Janeiro, Brazil on 1992. Agenda 21 has 4 agreements.

3. "Momentum for Change: Climate Neutral Now" is an initiative launched by the UNFCCC Secretariat.

4. (a) Skin Cancer- Ultraviolet light (b) Noise Pollution- Decibel (c) Global Warming- Carbon dioxide (d) Ozone Hole- Chlorofluorocarbon

5. Biotechnology Park in Uttar Pradesh was set up in Lucknow in 2003.

6. Institutes & their location:

- National Institute of Nutrition-Hyderabad
- Wildlife Institute of India- Dehradun
- National Institute of Ayurveda- Jaipur
- National Institute of Naturopathy- Pune
- Centre for Ecological Science (CES)- Bengaluru
- Indian Institute of Forest Management- Bhopal
- G.B. Pant Institute of Himalayan Environment & Development- Almora
- Forest Research Institute- Dehradun
- Indian Grassland and Fodder Research Institute- Jhansi
- Central Arid Zone Research Institute- Jodhpur
- Indian Agriculture Research Institute- New Delhi

7. As of 2022, there are 40 World Heritage Sites located in India. Out of these, 32 are cultural, 7 are natural, and one, the Khangchendzonga National Park, is of mixed type. India has the sixth largest number of sites in the world.

8. Sun Temple of Konark included as World Heritage Site in 1984 while Mahabodhi Temple complex at Bodhgaya Bihar in 2002.

9. Kailash Sacred Landscape Conservation and Development Initiative (KSLCDI) is a collaboration among India, China and Nepal.

10. 'Vegetation is the true index of climate' is associated with Koppen Climate Classification, a system first published in 1900 and revised in 1918 by Vladimir Peter Koppen.

11. Tsunami, is series of large waves generated by abrupt movement on ocean floor can result from earthquake, underwater landslides, volcanic eruption or a large meteorite strike. However, powerful undersea earthquakes are responsible for most tsunami.

12. Ministry of environment and forest, government of India in 1987 instituted Indira Gandhi Paryavaran Puraskar.

13. Movements & their leaders:

- (a) Appico movement- P. Hegde
- Chipko movement- S.L Bahuguna
- Save Narmada movement- Medha Patkar
- Silent Valley movement- Dr. Salim
- Wildlife conservation movement- Baba Amte
- Narmada Bachao Andolan- Baba Amte, Medha Patkar

14. Rally for Valley programme was related to resettlement of displaced persons of Narmada Valley.

15. World Habitat Day (designated by UN and first celebrated in 1986) is observed on first Monday of October.

16. United Nations Human Settlement Program is United Nations agency for human settlements and sustainable urban development. It was established in 1978 at Nairobi, this agency has been mandated by UN General assembly to promote socially and environmentally sustainable towns and cities.

17. Valley of Flowers National Parks lies completely in the temperate alpine zone.

18. After amending Indian Forest Act, 1927, bamboo is no longer a tree. So right to fell bamboo grown on non-forest area.

19. Days & Dates:

- World Environment Day- June 5
- World Forestry Day- March 21
- World Habitat Day- First Monday of October
- World Ozone Day- September 16
- World Earth Day- 22 April

- World Cities Day- 31 October
- World Population Day- 11 July
- World Water Day- 22 March
- World Anti-Tobacco Day - 31st may
- World Toilet Day - 19th November

20. Microbeads are considered harmful to marine ecosystems.

21. Prime Minister Narendra Modi launched Swachh Bharat Abhiyan (Clean India Mission) on 2nd October 2014(Mahatma Gandhi's 145th birth anniversary).

22. Prime Minister Narendra Modi was conferred with United Nations 'Champions of the Earth' award in 2018 by General Antonio Guterres at Delhi ceremony.

23. India's first National Centre for Marine biodiversity (NCMB) is located in Jamnagar, Gujarat.

24. Central Arid Zone Research Institute what is stab list in 1952 in Jodhpur, Rajasthan.

25. Indian Institute of Ecology and Environment, New Delhi was established on World Environment Day i.e., 5th June, 1980.

26. AGMARK (Agriculture Product grading and marking act) came into effect in 1937.

27. The term Domestic Content Requirement (DCR) has been provided for developing solar power production in the country.

28. The Borlaug award is given for outstanding research & contribution in agriculture.

29. Methane is the main component of natural gas (colorless, odorless environment friendly source of energy).

30. Gangetic dolphin (also called Susu) is the national aquatic animal of India. It was notified as national aquatic animal by Environment and Forest Ministry on 18th May, 2010.

31. Helium gas is filled in balloons for weather science dispatch.

32. Prosopis Juliflora is an exotic plant that reduces the biodiversity in the area in which it grows.

33. Benefits of afforestation: Increase greenery, reduce air pollution, minimize global warming, increase oxygen content, reduce soil erosion.

34. If LANDSAT data for an area is received today, the data for adjacent area to its west will be available after certain number of days at the same local time due to revolution of the satellite around the earth.

35. Sita Ashoka tree is useful for prevention of dust pollution.

36. Periyar wildlife sanctuary is in Kerala.

37. Seaweeds, seafood, dairy products are important source of Iodine.

38. Mission of the organization for Prohibition of Chemical Weapons (OPCW) is to implement the provisions of Chemical Weapons Convention (CWC) to achieve the world which is free of chemical

weapons. It monitors the chemical industry to prevent new weapons from emerging and it provides assistance and protection to states(parties) against chemical weapons threats.

39. National Mission for Green India (GIM) is one of the eight missions outlined in National Action Plan on Climate Change (NAPCC). It aims at protecting, restoring and enhancing India's diminishing forest cover and responding to climate change by a combination of adaptation and mitigation measures.

40. The Central Pollution Control Board (CPCB), a statutory organization constituted in September 1974 under the Water (Prevention and Control of Pollution) act 1974. Its principal functions are (i) to promote cleanliness of streams and wells in different areas of the states and (ii) to improve the quality of air and to prevent, control or abate air pollution.

41. Tyler prize is the premier award for environmental science, environmental health and environmental protection.

42. Rajiv Gandhi environment award is given for outstanding contribution to neat technology and development.

43. The Global 500 award was launched in 1987 by the United Nations Environment Programme (UNEP) to recognize and honor environmental achievement.

44. The United Nations General Assembly designated the 1990-99 as the International Decade for Natural Disaster Reduction.

45. District Disaster Management Authority (DDMA), is headed by District Collector or District Magistrate.

46. The National Disaster Management Authority (NDMA), headed by the Prime Minister

47. National Centre for Disaster Management NCDM, New Delhi was founded in 1995. National Disaster Management Institute was established under Disaster Management Act, 2005.

48. Development of Disaster Management Knowledge-cum-Demonstration Centre (SRIJAN) functions are: (a) Creating knowledge-cum-demonstration centers (b) Creating awareness (c) Providing local need-based information.

49. Section 14(I) of the Disaster Management Act, 2005 empowers Governor office state to establish State Disaster Management Authority (SDMA). Governor shall establish the State Disaster Management Authority.

50. Sierra Leone celebrate the National Cleanliness Day on last Saturday of every month.

51. Mega diverse countries(world's top biodiversity rich countries) are Mexico, Colombia, Ecuador, Peru, Venezuela, Brazil, Democratic Republic of Congo, South Africa, Madagascar, India, Malaysia, Indonesia, Philippines, Papua New Guinea, China and Australia.

52. Montana in the USA is called graveyard of dinosaurs.

53. Eco-Mark is scheme launched in 1991 for easy identification of enviro-friendly product. Drugs and antibiotics are not in the list.

54. United Nations Environment Programme(UNEP) has recognized M.S. Swaminathan as Father of Economic Ecology.

55. Loquat is an evergreen fruit plant in Japan.

56. SODAR (Sonic Detection and Ranging), used to measure wind speed and scattering of sound waves by atmospheric turbulence. It is established in Kaiga, Kalpakkam, Tarapur & Trombey.

57. Winterline: In Mussoorie and a part of Switzerland, when sun sets, western horizon turns a myriad combination of yellow, red, orange and mauve.

58. Glaciation of Peninsular India occurred in Pleistocene ice age.

59. Marine national Park (first national Marine Park of India with 42 islands) in the Gulf of Kutch is located in the Jamnagar district of Gujarat.

60. "Bhitarkanika" is situated in district Kendrapara, Odisha in region of Brahmani-Baitarani River.

61. Wildlife Sanctuary and respective states: (a) Namdafa- Arunachal Pradesh (b) Bandipore- Karnataka (c) Periyar-Kerala (d) Lamjao-Manipur

62. Main activities of Bombay Natural History Society (BNHS) India are:

- Natural history collection
- Research on various species and habitats
- Conservation of landscapes and seascapes
- Environmental information system
- Communication and advocacy
- Outreach, camp, exhibition, lectures etc.

63. Every package of food shall carry information of:

- Name of food.
- List of ingredients
- Nutritional information
- Energy value in Kcal
- Amounts of protein, carbohydrate, fat in g or ml.
- Amount of any other nutrient
- Vegetarian or non-vegetarian
- Food additives.

64. Dr. Salim Ali was Indian ornithologist and naturalist. He is sometimes called as 'Birdman of India'.

65. Chilika Lake is the largest saltwater lake in India. The lake spreads across the districts of Puri, Khurda and Ganjam in the state of Odisha

66. Limit to growth concept propounded by Club Of Rome in 1972. The report's authors are Donella H. Meadows, Dennis L. Meadows, Jørgen Randers, and William W. Behrens III,

67. Natural Vegetation and Region

- Epiphytes – Equatorial Region
- Acacia – Savanna
- Baobab – Sahara Region
- Cedars – Mediterranean

68. Rachel Carson's book *Silent Spring*, published in 1962, was a landmark in the development of the modern environmental movement.

69. The main objective of sustainable tourism is to manage tourism and the environment while maintaining cultural integrity and ecological processes.

70. Lake Chilika is the largest brackish water lagoon in Asia and the second largest coastal lagoon in the world. The lagoon is located on the east coast of India, at the mouth of the Daya River, which flows into the Bay of Bengal

71. Mean net primary productivity in increasing order:

- Temperate Grassland < Tropical savanna < Temperate forests < Tropical forests

72. India aim to achieve land degradation neutrality by 2030.

73. The Environmental Kuznets Curve - described the relationship between per capita income and income inequality as an inverted-U.



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