



ENVIRONMENT

Syllabus – Prelims

Part A—Preliminary Examination

Paper I - (200 marks)

Duration: Two hours

- Current events of national and international importance.
- History of India and Indian National Movement.
- Indian and World Geography-Physical, Social, Economic Geography of India and the World.
- Indian Polity and Governance-Constitution, Political System, Panchayati Raj, Public Policy, Rights Issues, etc.
- Economic and Social Development-Sustainable Development, Poverty, Inclusion, Demographics, Social Sector Initiatives, etc.
- General issues on Environmental ecology, Bio-diversity and Climate Change - that do not require subject specialization.
- General Science.

Syllabus – GS Paper 3

General Studies-III: Technology, Economic Development, Bio diversity, Environment, Security and Disaster Management

- Conservation, environmental pollution and degradation, environmental impact assessment.

Sections – Environment (Prelims + Mains)

Ecology

Environmental Degradation

Biodiversity

Environmental Conservation

Sustainable Development

EIA & Environmental ethics

27

In case of which one of the following biogeochemical cycles, the weathering of rocks is the main source of release of nutrient to enter the cycle?

- (a) Carbon cycle
- (b) Nitrogen cycle
- (c) Phosphorus cycle
- (d) Sulphur cycle

43

"If rainforests and tropical forests are the lungs of the Earth, then surely wetlands function as its kidneys." Which one of the following functions of wetlands best reflects the above statement?

- (a) The water cycle in wetlands involves surface runoff, subsoil percolation and evaporation.
- (b) Algae form the nutrient base upon which fish, crustaceans, molluscs, birds, reptiles and mammals thrive.
- (c) Wetlands play a vital role in maintaining sedimentation balance and soil stabilization.
- (d) Aquatic plants absorb heavy metals and excess nutrients.

- 21** Among the following crops, which one is the most important anthropogenic source of both methane and nitrous oxide ?
- (a) Cotton
 - (b) Rice
 - (c) Sugarcane
 - (d) Wheat

- 17** Why is there a concern about copper smelting plants?
- 1. They may release lethal quantities of carbon monoxide into environment.
 - 2. The copper slag can cause the leaching of some heavy metals into environment.
 - 3. They may release sulphur dioxide as a pollutant.
- Select the correct answer using the code given below.
- (a) 1 and 2 only
 - (b) 2 and 3 only
 - (c) 1 and 3 only
 - (d) 1, 2 and 3

47 Which of the following is not a bird?
(a) Golden Mahseer
(b) Indian Nightjar
(c) Spoonbill
(d) White Ibis

90 Certain species of which one of the following organisms are well known as cultivators of fungi?
(a) Ant
(b) Cockroach
(c) Crab
(d) Spider

45 With reference to "Gucchi" sometimes mentioned in the news, consider the following statements:
1. It is a fungus.
2. It grows in some Himalayan forest areas.
3. It is commercially cultivated in the Himalayan foothills of north-eastern India.
Which of the statements given above is/are correct?
(a) 1 only
(b) 3 only
(c) 1 and 2
(d) 2 and 3

29

The 'Common Carbon Metric', supported by UNEP, has been developed for

- (a) assessing the carbon footprint of building operations around the world
- (b) enabling commercial farming entities around the world to enter carbon emission trading
- (c) enabling governments to assess the overall carbon footprint caused by their countries
- (d) assessing the overall carbon foot-print caused by the use of fossil fuels by the world in a unit time

75

Which one of the following has been constituted under the Environment (Protection) Act, 1986?

- (a) Central Water Commission
- (b) Central Ground Water Board
- (c) Central Ground Water Authority
- (d) National Water Development Agency

52

With reference to 'palm oil', consider the following statements:

1. The palm oil tree is native to Southeast Asia.
2. The palm oil is a raw material for some industries producing lipstick and perfumes.

3. The palm oil can be used to produce biodiesel.

Which of the statements given above are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Topic	Year	Question	marks
Climate Change	2014	Should the pursuit of carbon credits and clean development mechanisms set up under UNFCCC be maintained even though there has been a massive slide in the value of a carbon credit? Discuss with respect to India's energy needs for economic growth.	12.5
Climate Change	2017	'Climate Change' is a global problem. How India will be affected by climate change? How Himalayan and coastal states of India will be affected by climate change?	15

Pollution and degradation	2013	What are the consequences of Illegal mining? Discuss the Ministry of Environment and Forest's concept of GO AND NO GO zones for coal mining sector.	10
Pollution and degradation	2013	Enumerate the National Water Policy of India. Taking river Ganges as an example, discuss the strategies which may be adopted for river water pollution control and management. What are the legal provisions of management and handling of hazardous wastes in India?	10
Pollution and degradation	2014	Environmental Impact Assessment studies are increasingly undertaken before a project is cleared by the Government. Discuss the environmental impacts of coal-fired thermal plants located at coal pitheads.	12.5
Pollution and degradation	2015	Discuss the Namami Gange and National Mission for Clean Ganga (NMCG) programmes and causes of mixed results from the previous schemes. What quantum leaps can help preserve the river Ganga better than incremental inputs?	12.5
Pollution and degradation	2018	What are the impediments in disposing the huge quantities of discarded solid wastes which are continuously being generated? How do we remove safely the toxic wastes that have been accumulating in our habitable environment?	10
Pollution and degradation	2018	Sikkim is the first 'Organic State' in India. What are the ecological and economical benefits of Organic State?	10
Pollution and degradation	2019	Coastal sand mining, whether legal or illegal, poses one of the biggest threats to our environment. Analyse the impact of sand mining along the Indian coasts, citing specific examples.	10
Pollution and degradation	2020	What are the key features of the National Clean Air Programme (NCAP) initiated by the Government of India?	15
Pollution and degradation	2020	What are the salient features of the Jal Shakti Abhiyan, launched by the Government of India for water conservation and water security?	10

Sustainable Development	2014	National Urban Transport Policy emphasises on 'moving people' instead of 'moving vehicles'. Discuss critically the success of the various strategies of the Government in this regard.	12.5
Sustainable Development	2017	Not many years ago, river linking was a concept but it is becoming reality in the country. Discuss the advantages of river linking and its possible impact on the environment.	10
Sustainable Development	2019	Define the concept of carrying capacity of an ecosystem as relevant to an environment. Explain how understanding this concept is vital while planning for sustainable development of a region.	15

Energy	2013	Write a note on India's green energy corridor to alleviate the problem of conventional energy.	10
Energy	2013	What do you understand by Run-of river hydroelectricity project? How is it different from any other hydroelectricity project?	5
Energy	2015	To what factors can be the recent dramatic fall in equipment cost and tariff of solar energy be attributed? What implications does the trend have for thermal power producers and related industry?	12.5
Energy	2016	Give an account of the current status and the targets to be achieved pertaining to renewable energy sources in the country. Discuss in brief the importance of National Programme on Light Emitting Diodes (LEDs).	12.5
Energy	2018	"Access to affordable, reliable, sustainable and modern energy is the sine qua non to achieve Sustainable Development Goals (SDGs)". Comment on the progress made in India in this regard.	10
Energy	2018	With growing energy needs should India keep on expanding its nuclear energy programme? Discuss the facts and fears associated with nuclear energy.	15
Energy	2020	Describe the benefits of deriving electric energy from sunlight in contrast to the conventional energy generation. What are the initiatives offered by our Government for this purpose?	15

Conservation	2018	What is wetland? Explain the Ramsar concept of 'wise use' in the context of wetland conservation. Cite two examples of Ramsar sites from India.	10
Conservation	2018	How does biodiversity vary in India? How is the Biological Diversity Act, 2002 helpful in conservation of flora and fauna?	15

EIA	2016	Rehabilitation of human settlements is one of the important environmental impacts which always attracts controversy while planning major projects. Discuss the measures suggested for mitigation of this impact while proposing major developmental projects.	12.5
EIA	2020	How does the draft Environment Impact Assessment (EIA) Notification, 2020 differ from the existing EIA Notification, 2006?	10

2021 questions

Q. No.	Question	Marks	Section
6	Explain the purpose of the Green Grid Initiative launched at World Leaders Summit of the COP26 UN Climate Change Conference in Glasgow in November, 2021. When was this idea first floated in the International Solar Alliance (ISA)?	10	Energy
7	Describe the key points of the revised Global Air Quality Guidelines (AQGs) recently released by the World Health Organisation (WHO). How are these different from its last update in 2005? What changes in India's National Clean Air Programme are required to achieve these revised standards?	10	Pollution and degradation
17	Describe the major outcomes of the 26th session of the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC). What are the commitments made by India in this conference?	15	Climate Change

Pollution and degradation	2022	Discuss in detail the photochemical smog emphasising its formation, effects and mitigation. Explain the 1999 Gothenburg Protocol.	10
Energy	2022	Do you think India will meet 50 percent of its energy needs from renewable energy by 2030? Justify your answer. How will the shift of subsidies from fossil fuels to renewables help achieve the above objective? Explain.	15
Climate Change	2022	Discuss global warming and mention its effects on global climate. Explain the control measures to bring down the level of greenhouse gases which cause global warming, in the light of Kyoto Protocol, 1997.	15

Ecology

Introduction

Levels of Organization

Components of Ecosystem

Energy Flow in the Ecosystem

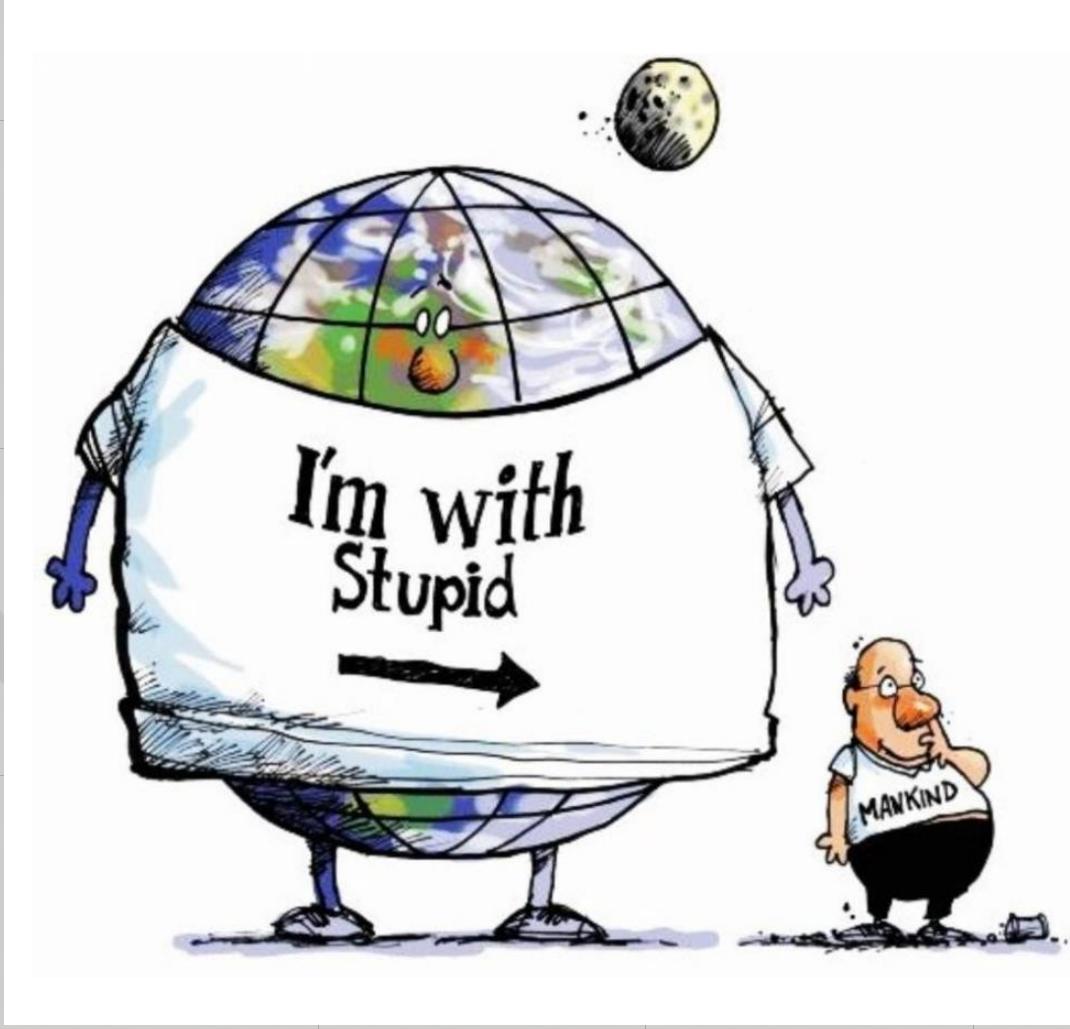
Ecological Succession

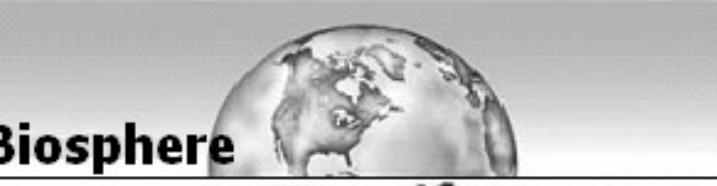
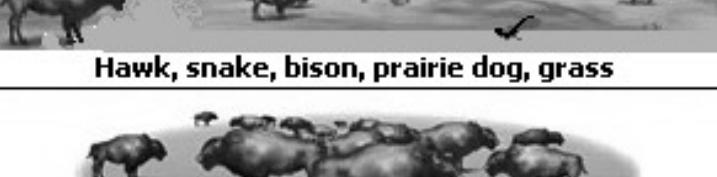
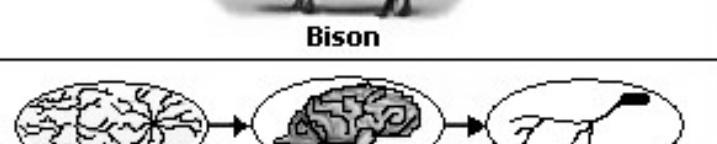
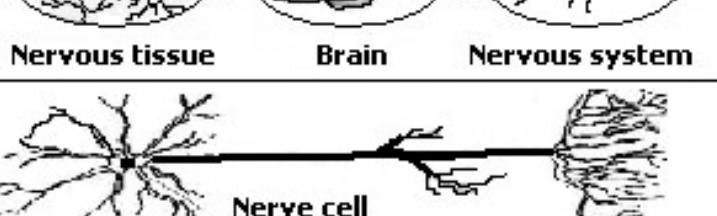
Functions of ecosystem

Biogeochemical cycles

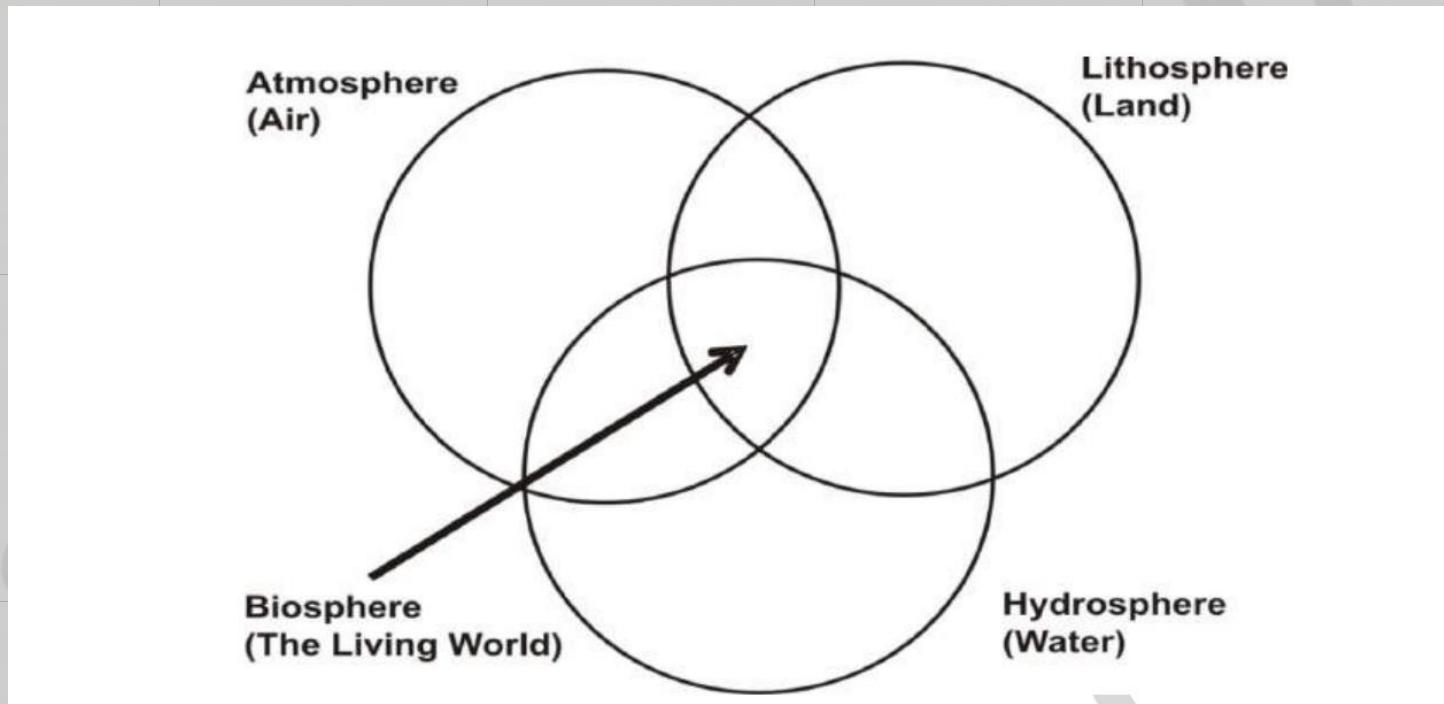
Types of Ecosystems

<https://www.youtube.com/watch?v=QQYgCxu988s>



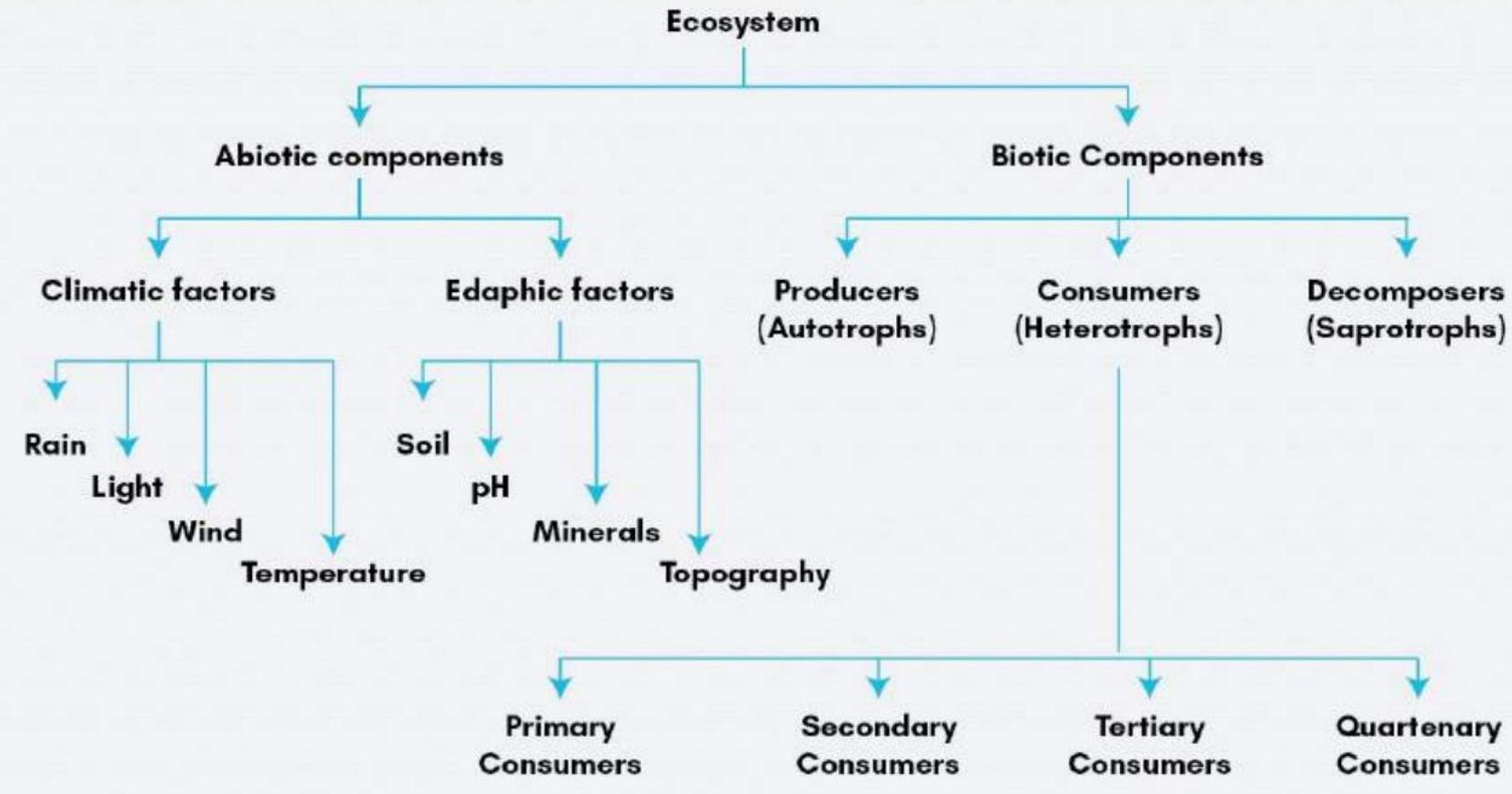
Biosphere	The part of Earth that contains all ecosystems	 Biosphere
Ecosystem	Community and its nonliving surroundings	 Hawk, snake, bison, prairie dog, grass, stream, rocks, air
Community	Populations that live together in a defined area	 Hawk, snake, bison, prairie dog, grass
Population	Group of organisms of one type that live in the same area	 Bison herd
Organism	Individual living thing	 Bison
Groups of Cells	Tissues, organs, and organ systems	 Nervous tissue → Brain → Nervous system
Cells	Smallest functional unit of life	 Nerve cell
Molecules	Groups of atoms, smallest unit of most chemical compounds	 water DNA

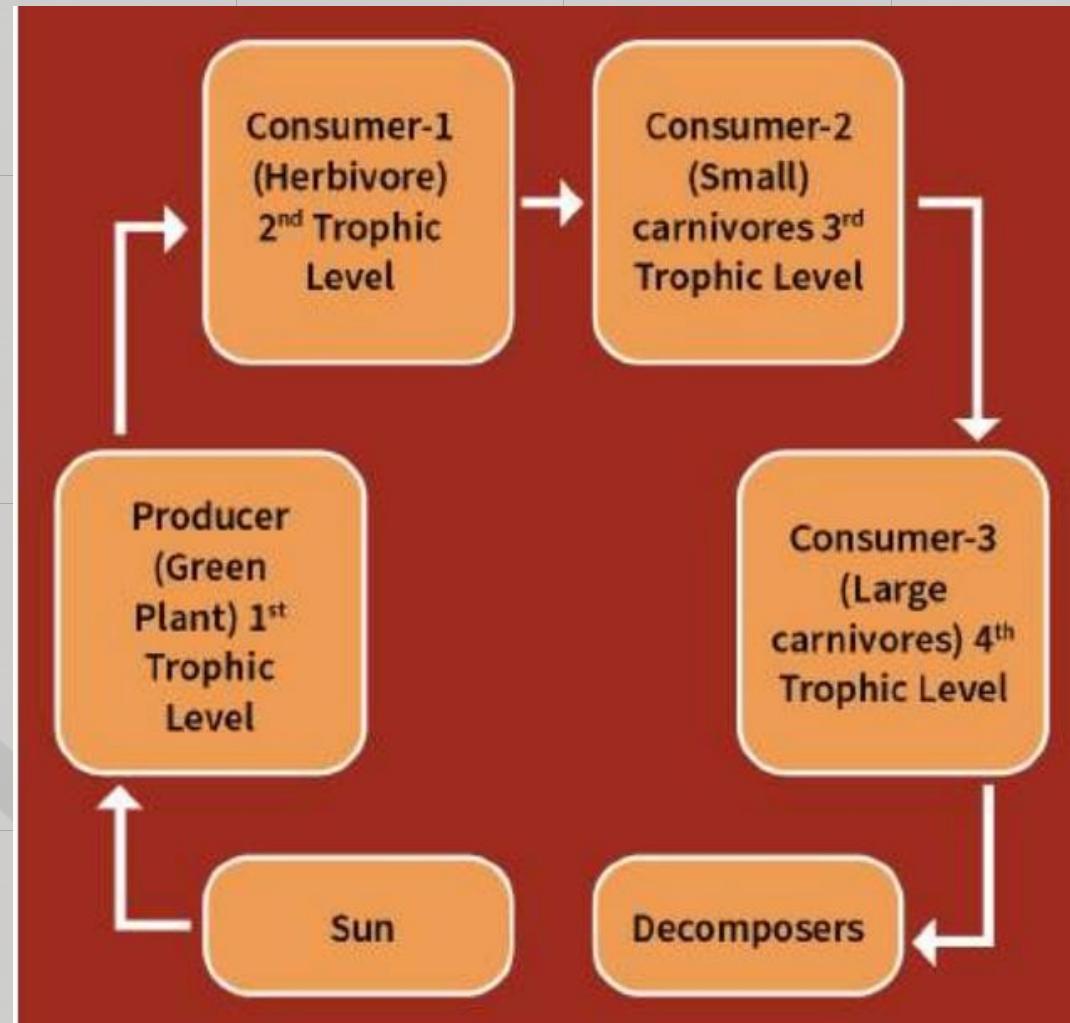
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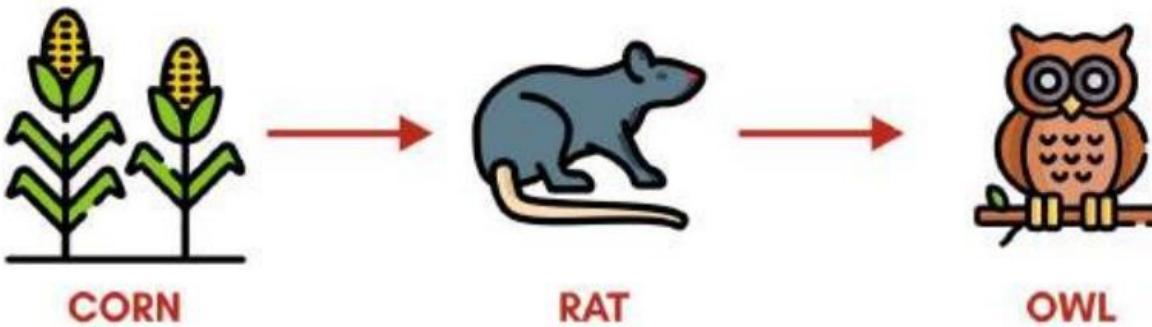


Biome	Ecosystem
It is a large area of land with distinct climate and plant and animal species.	It is the interaction of abiotic and biotic components between each other in a given area.
It is a large geographical area.	It is a small geographical area.
It is greatly influenced by climatic factors such as snow, ice, rainfall, temperature etc.	It is not much influenced by the climatic factors like ice, snowfall, temperature etc.
It is a larger category of ecological units. It contains multiple ecosystems within it.	It is a part of biome made of biotic and abiotic factors.
As a biome is a collection of species it has a great diversity of plant and animal species.	An ecosystem has a less diversity of plants and animals species than that of a biome as it is smaller in size.
Some common examples of biomes include desert, tundra, grasslands, and tropical rain forests.	Some common examples include coral reefs, ponds, Gulf of Mexico etc.
Latitude has a great influence on a biome.	An ecosystem is not affected by latitude.
All the animals of a biome may not interact with each other.	All the animals and organisms of an ecosystem interact with each other.

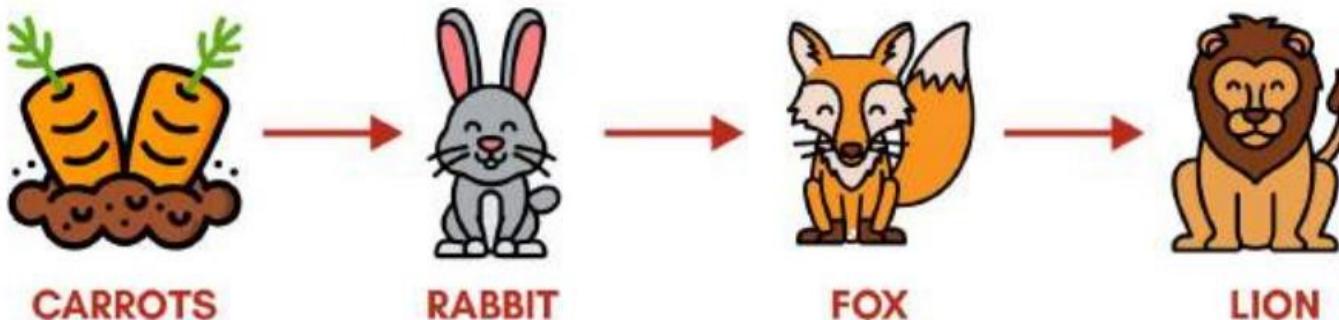
Components of Ecosystem



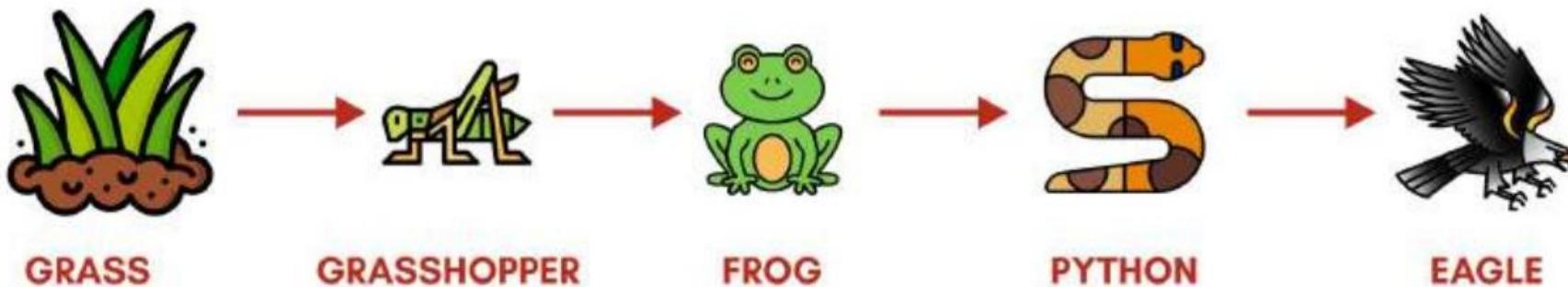




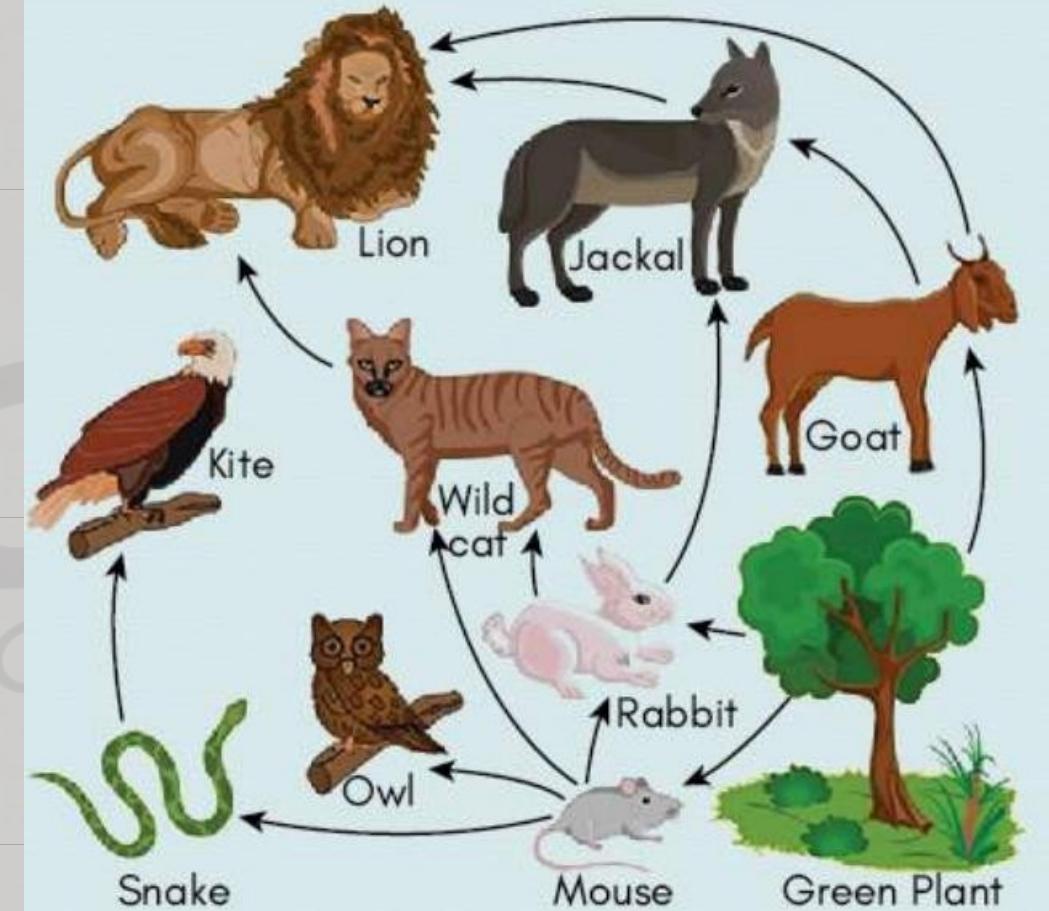
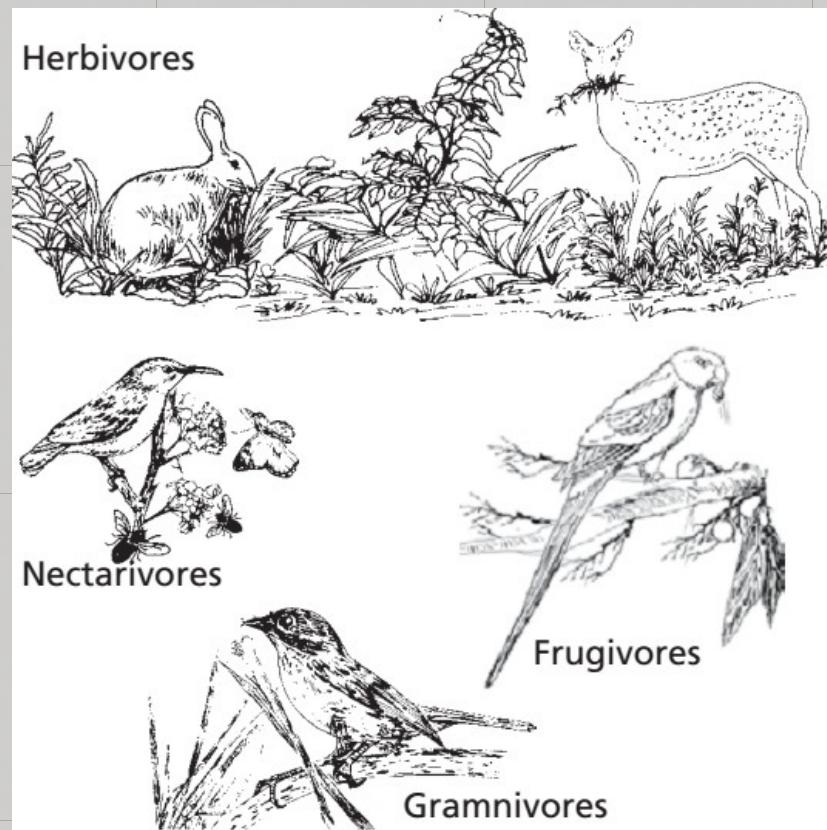
A three linked food chain



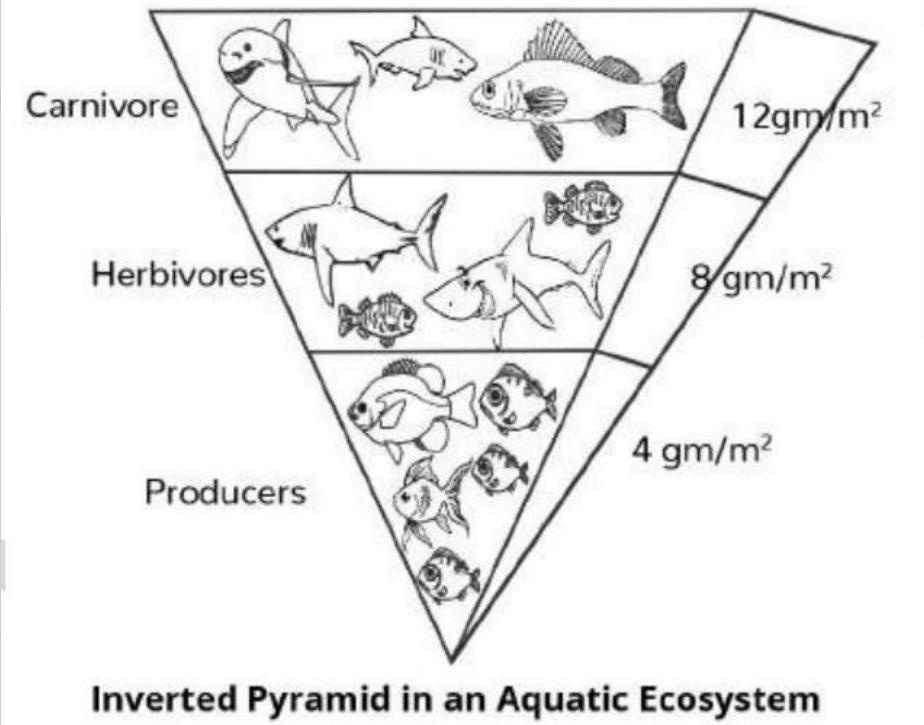
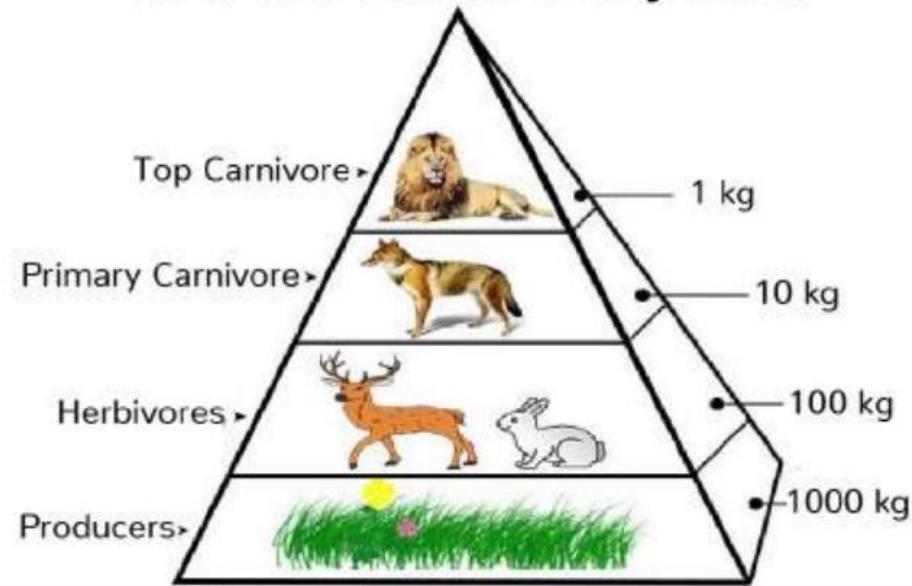
A Four linked food chain

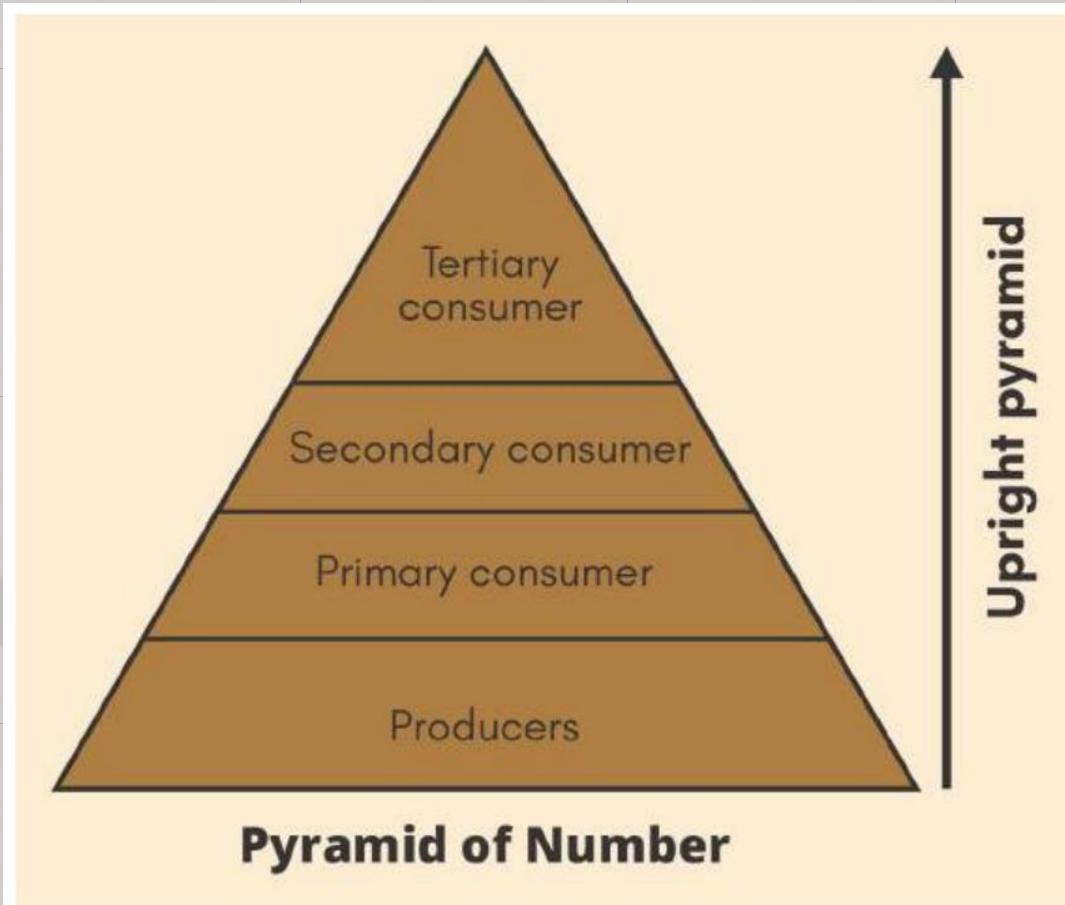


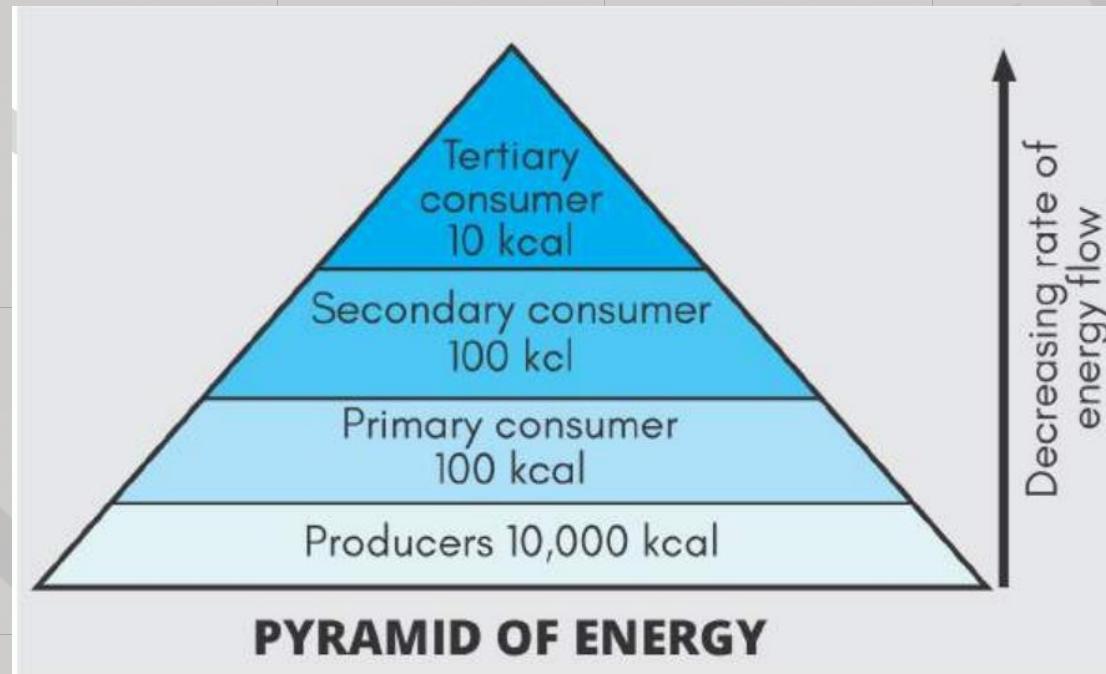
A Five linked food chain



Upright Pyramid of biomass in a Terrestrial Ecosystem







Sl. No.	Interaction	Species A	Species B
Positive Interaction	1 Mutualism	+	+
	2 Commensalism	+	0
	3 Proto-cooperation	+	+
	4 Ammensalism	0	-
	5 Parasitism	+	-
	6 Predation	+	-
	7 Cannibalism	+	-
	8 Competitions	-	-

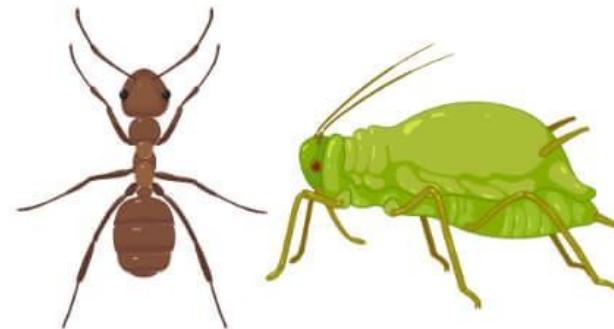


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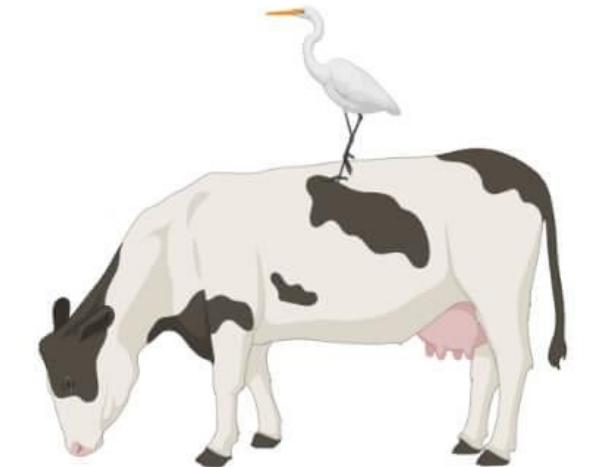


Protocooperation Interaction

Definition and Examples

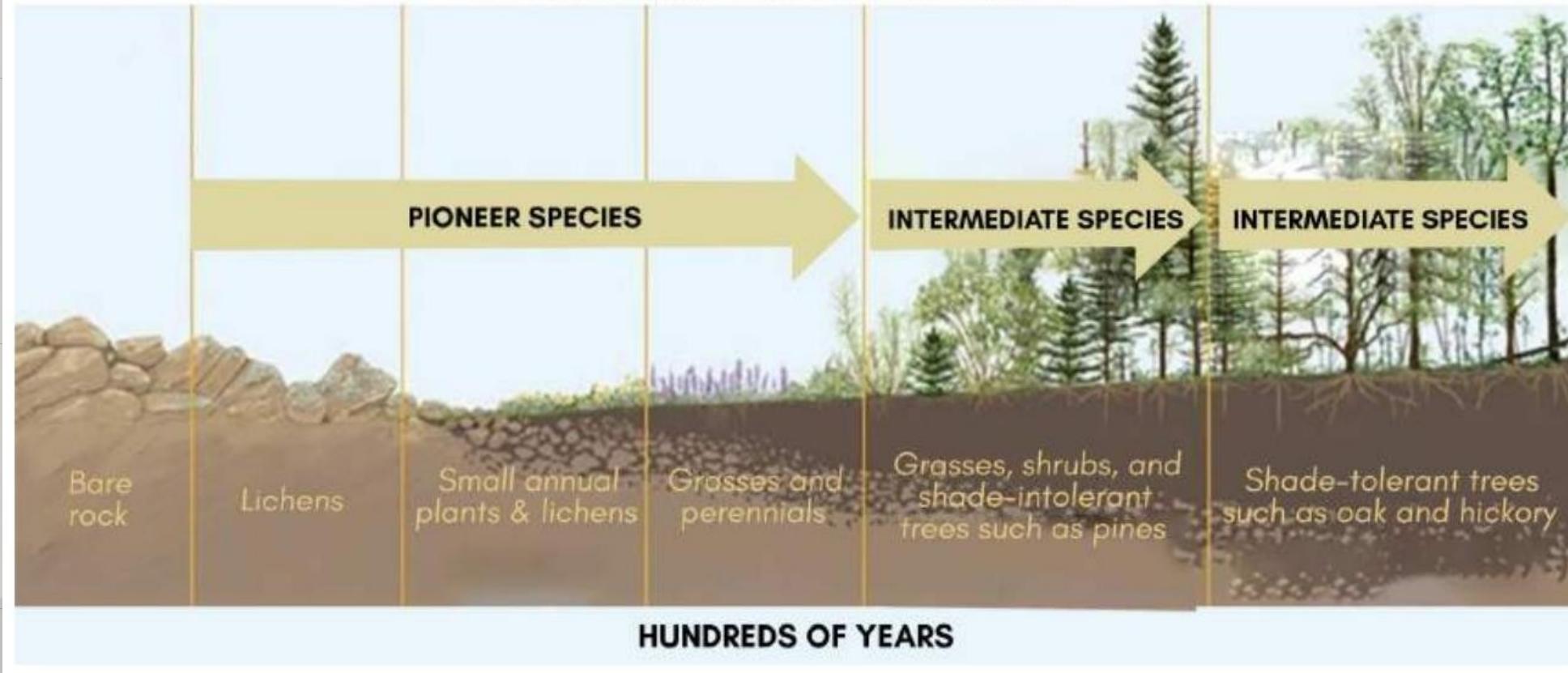


Ants and aphids

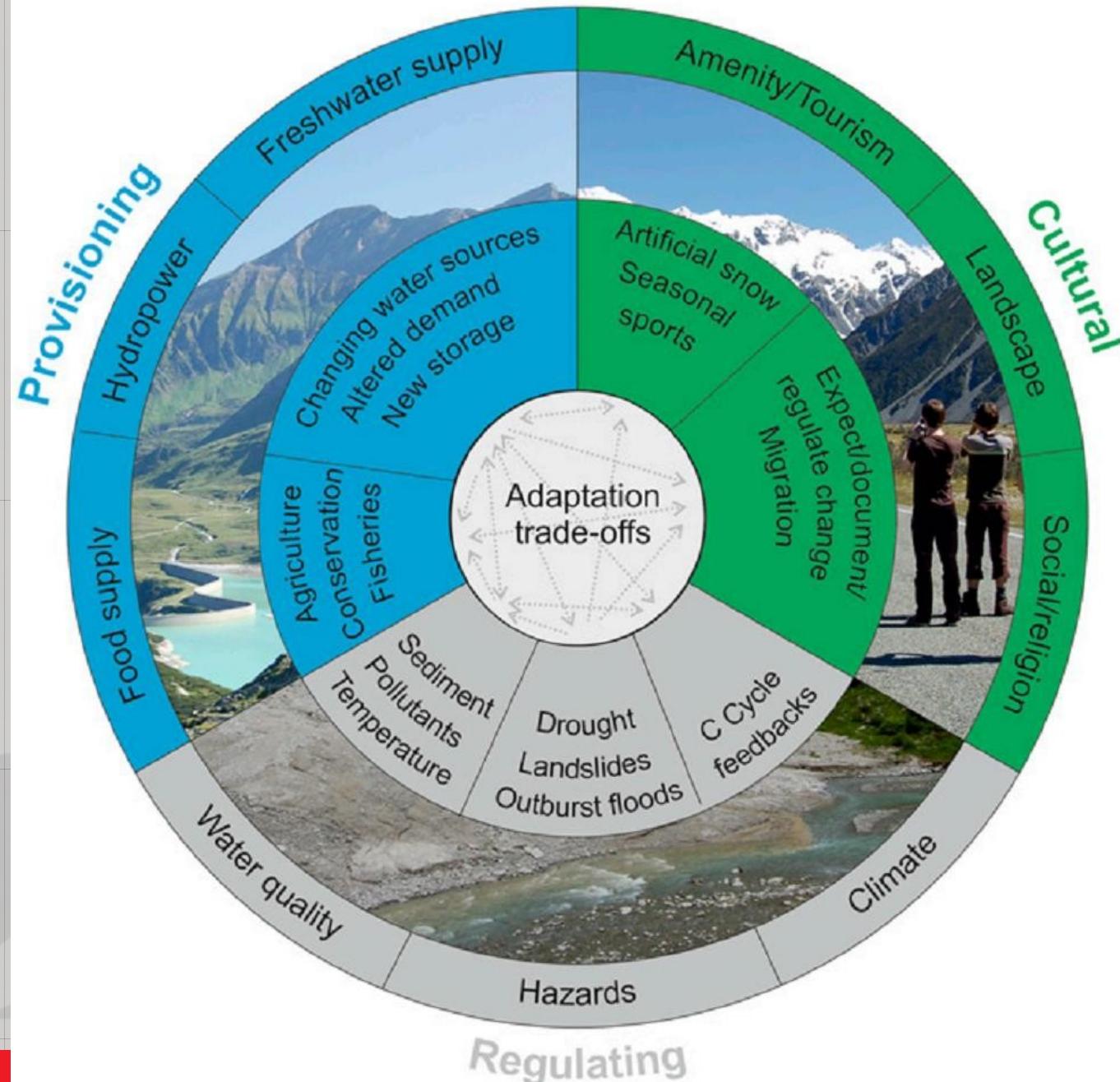


Cattle egret and animals

PRIMARY SUCCESSION

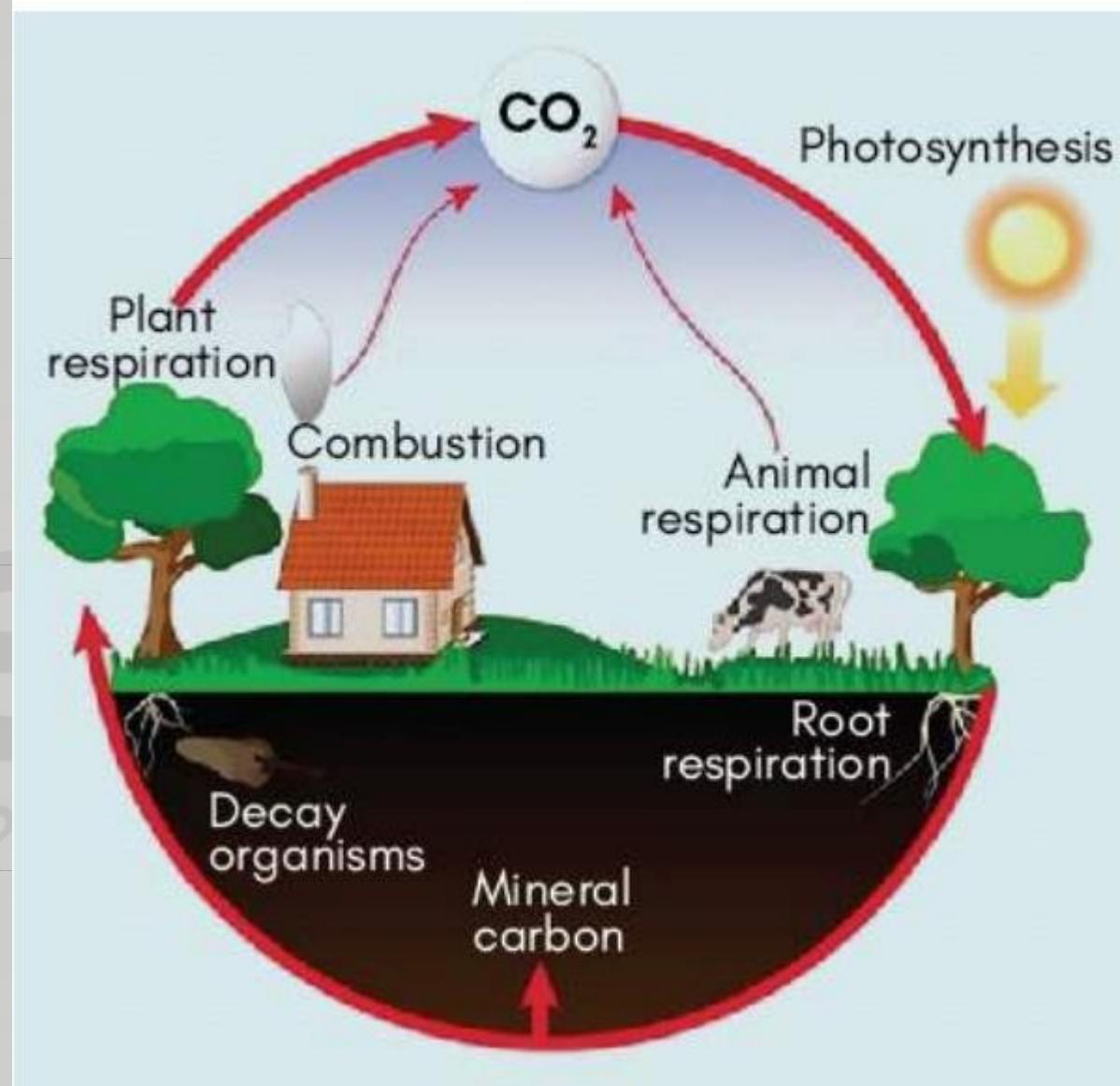


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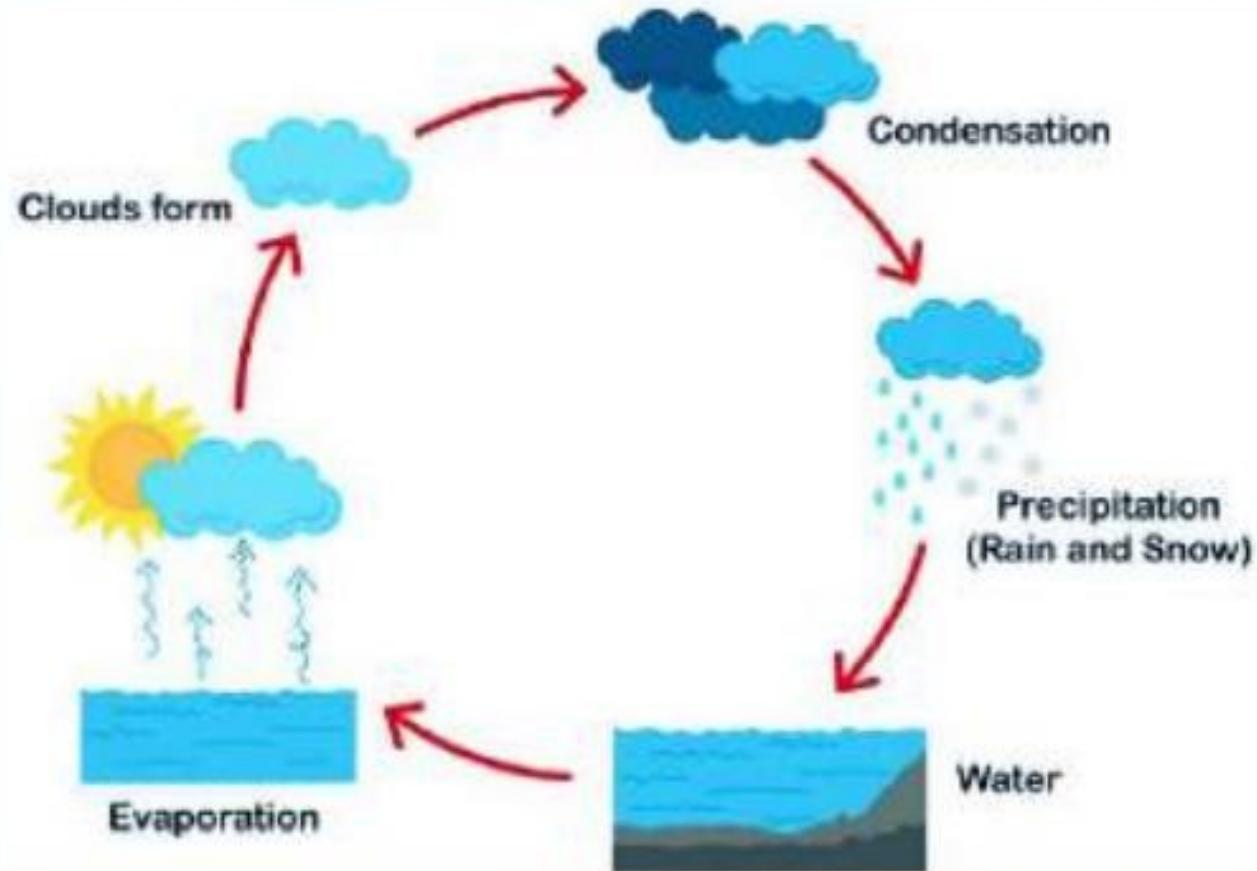


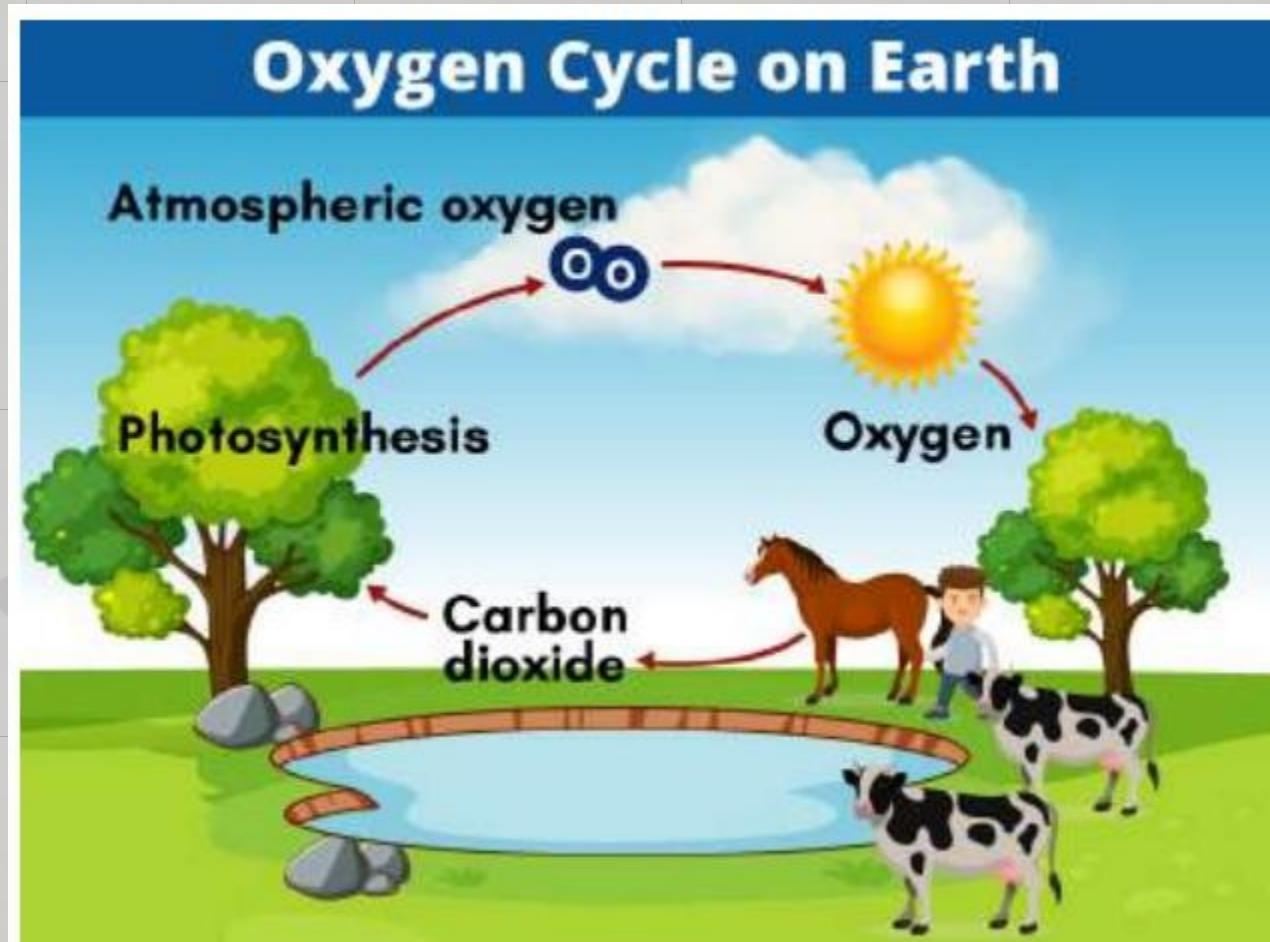
Ecosystem Services

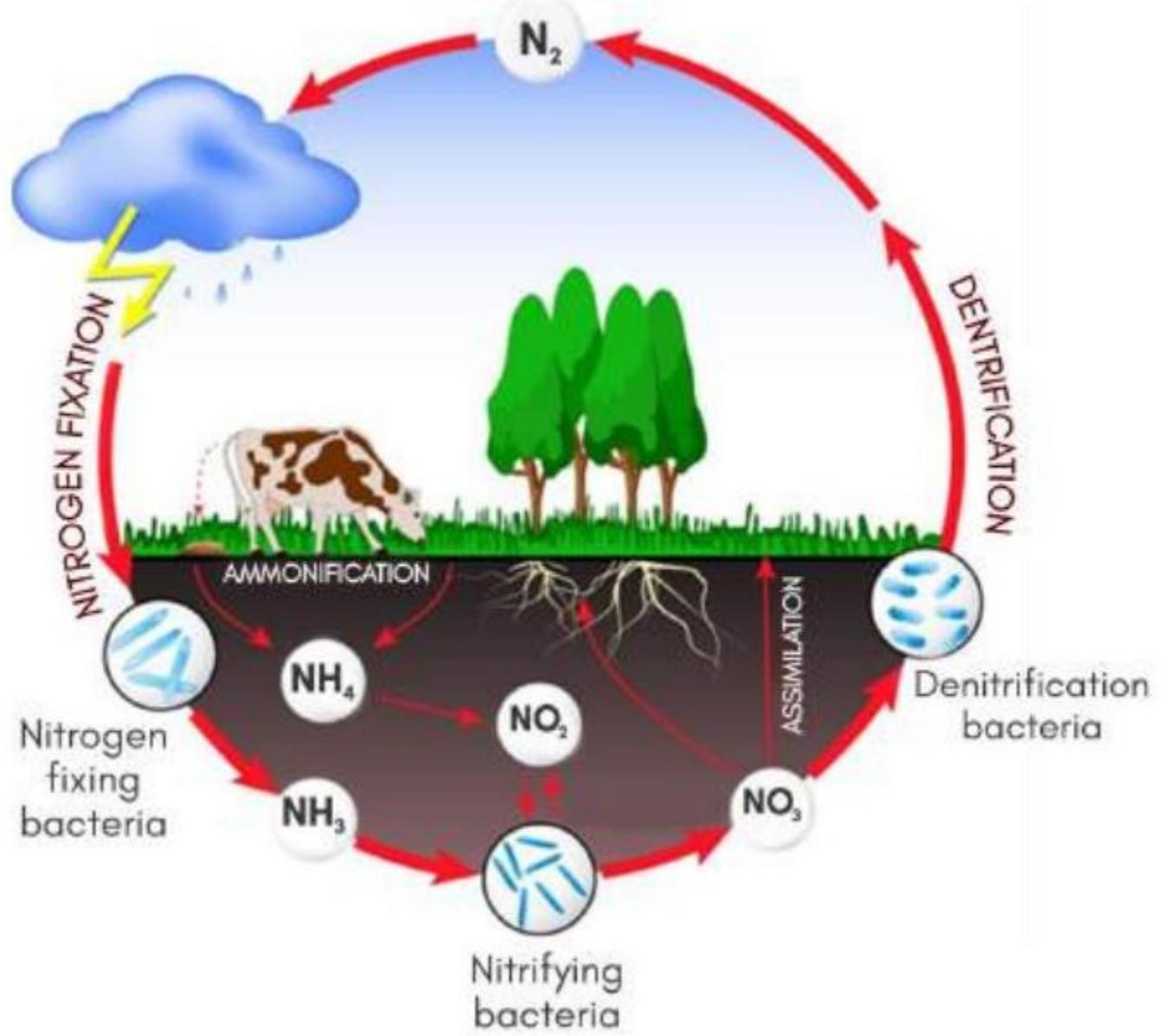
PROVISIONING SERVICES	REGULATING SERVICES	CULTURAL SERVICES
The “products” obtained from ecosystems	Benefits obtained from the regulation of ecosystem processes	Nonmaterial benefits obtained from ecosystems
Foods Fibers Ornamentals Medicines Biofuels Fresh water Genetic resources	Climate regulation Flood prevention Erosion control Pest control Pollination Seed dispersal Disease regulation	Educational Recreational Sense of place Spiritual Cognitive development Stress relief Gardening
SUPPORTING SERVICES		
Services necessary for the production of all other ecosystem services		
Biodiversity Nutrient recycling Primary productivity		

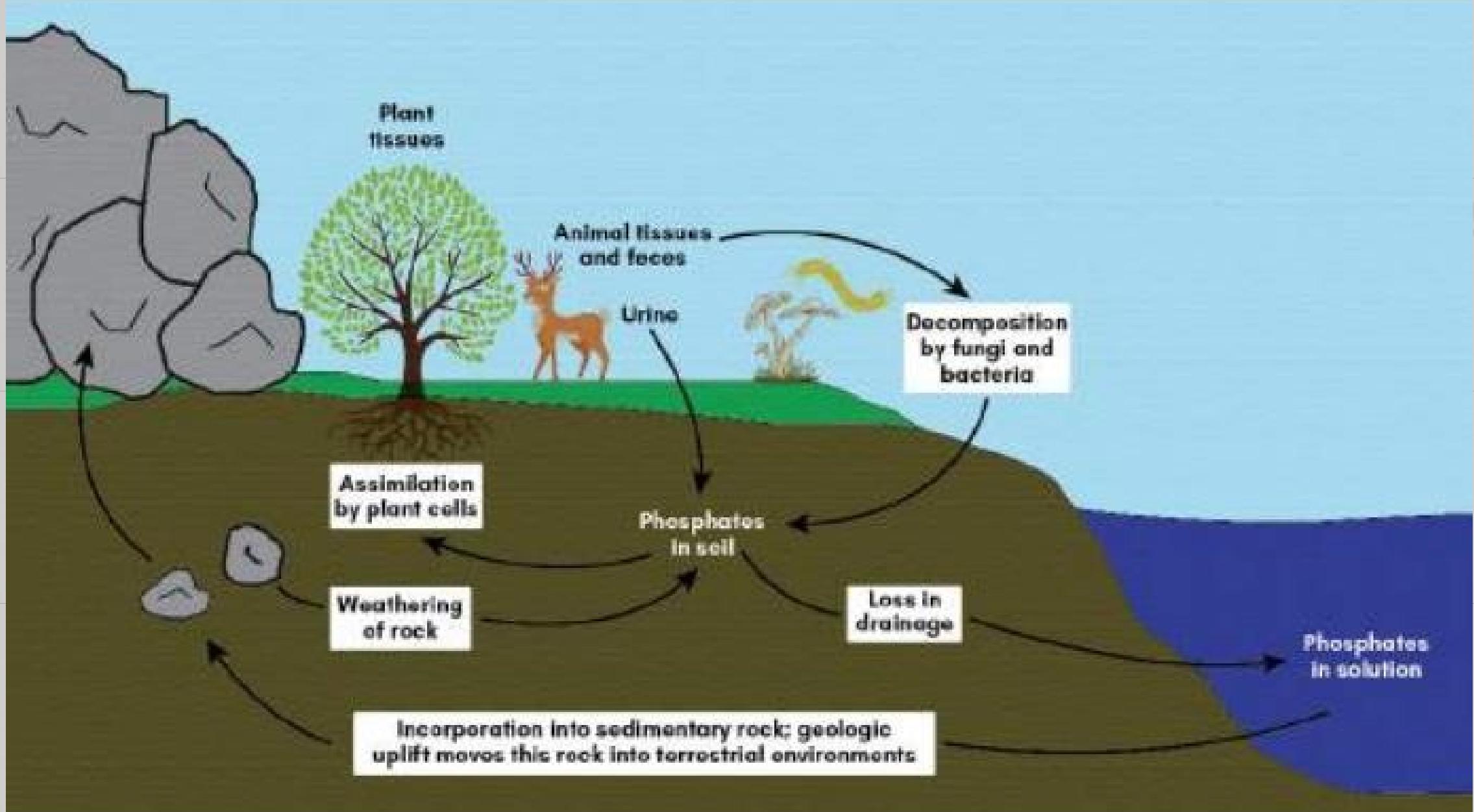


Water cycle

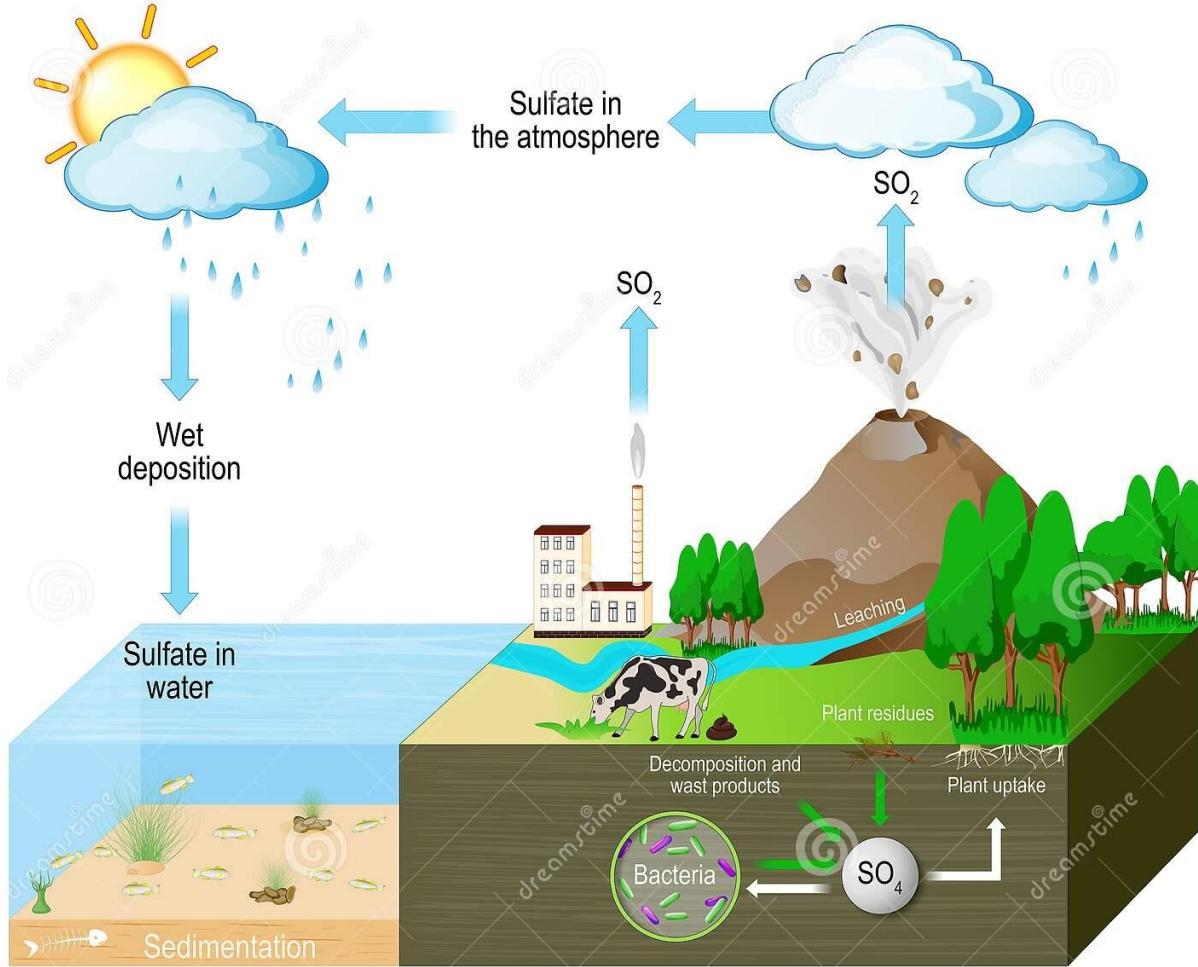




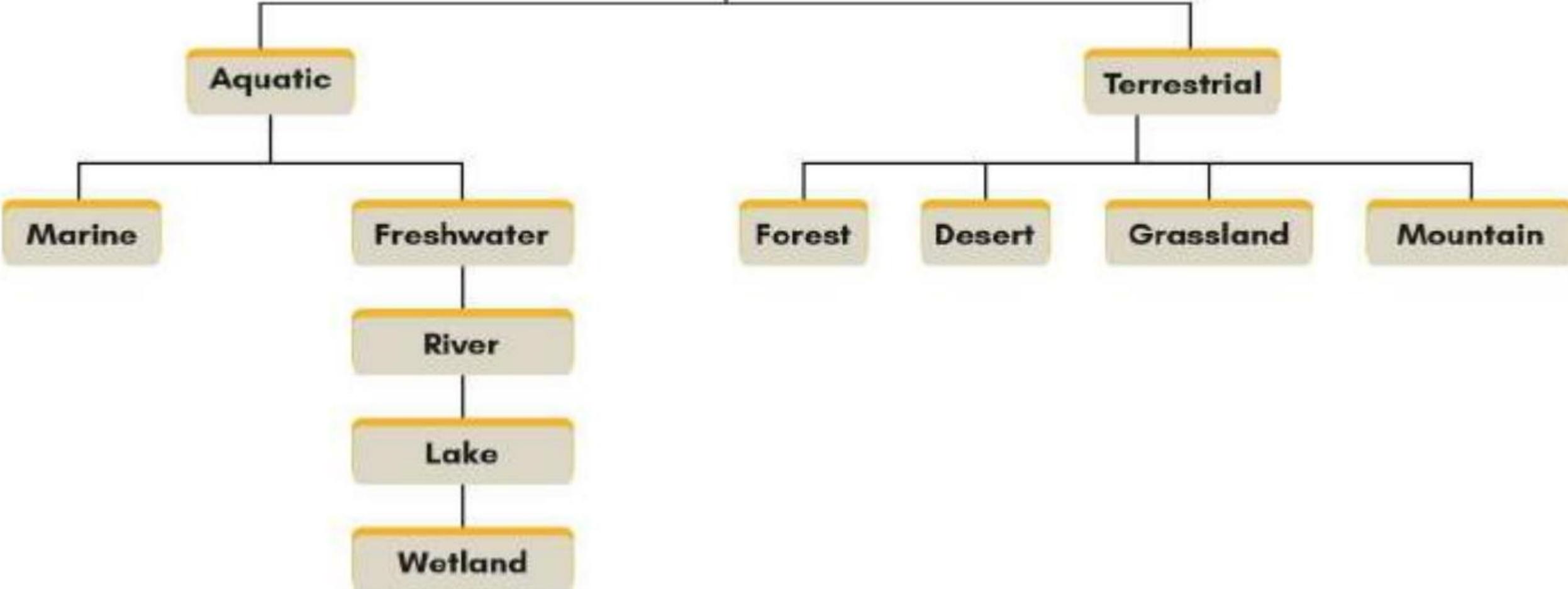


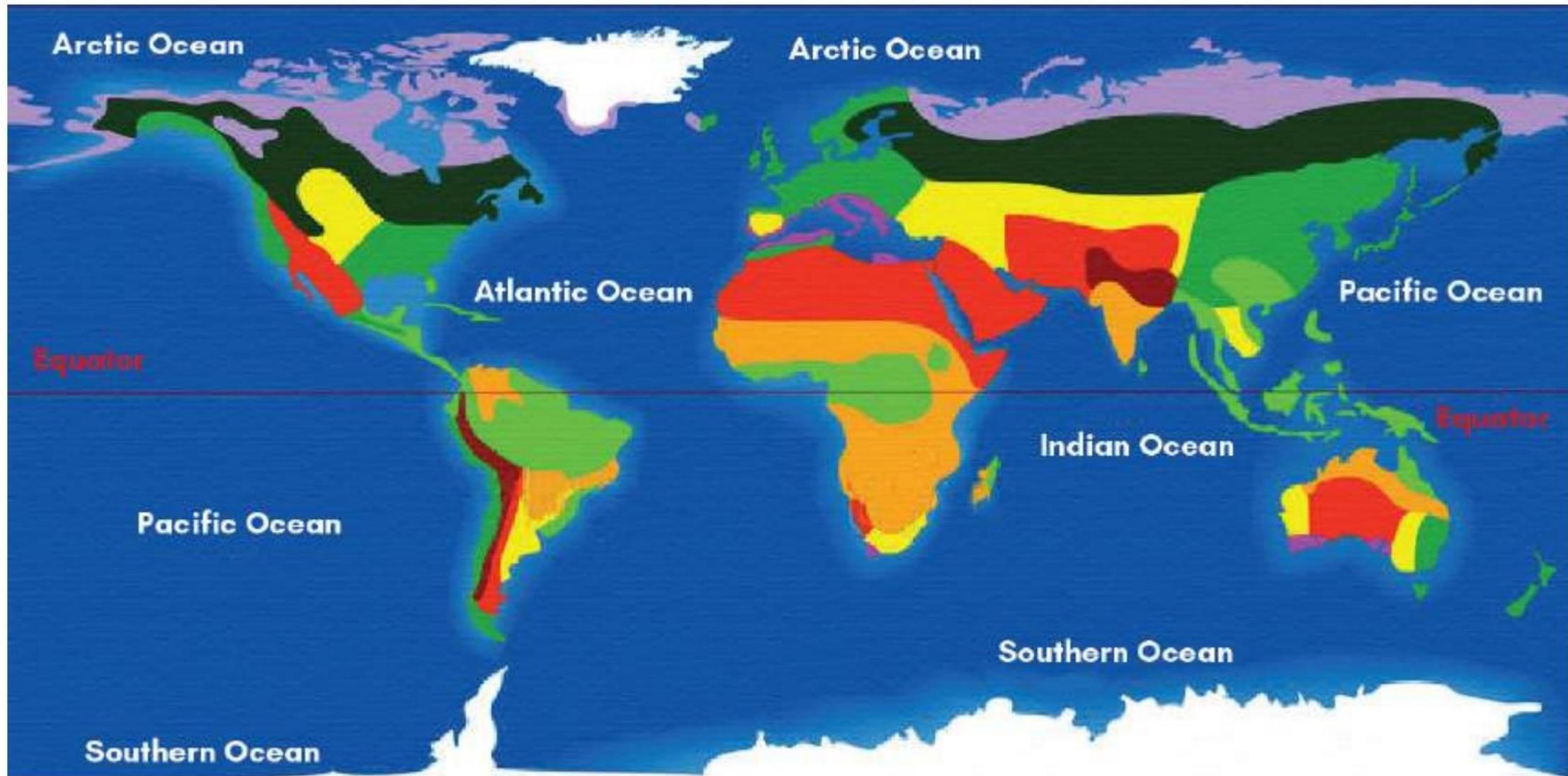


Sulfur cycle



Natural Ecosystem





Ice sheet and polar desert	Mixed and deciduous forest	Savanna
Tundra	Tropical rainforest	Desert
Taiga	Steppe	Mediterranean vegetation
Montane (alpine tundra and montane forest)		

Table 15.1 : World Biomes

<i>Biomes</i>	<i>Subtypes</i>	<i>Regions</i>	<i>Climatic Characteristics</i>	<i>Soil</i>	<i>Flora and Fauna</i>
Forest	A. Tropical 1. Equatorial 2. Deciduous B. Temperate C. Boreal	A1. 10° N-S A2. 10° - 25° N-S B. Eastern North America, N.E. Asia, Western and Central Europe C. Broad belt of Eurasia and North America (parts of Siberia, Alaska, Canada and Scandinavia)	A1. Temp. 20-25°C, evenly distributed A2. Temp. 25-30°C, Rainfall, ave. ann. 1,000mm, seasonal B. Temp. 20-30° C, Rainfall evenly distributed 750-1,500mm, Well-defined seasons and distinct winter. C. Short moist moderately warm summers and long cold dry winter; very low temperatures. Precipitation mostly snowfall 400 -1,000mm	A1. Acidic, poor in nutrients A2. Rich in nutrients B. Fertile, enriched with decaying litter C. Acidic and poor in nutrients, thin soil cover	A1. Multi-layered canopy tall and large trees A2. Less dense, trees of medium height; many varieties co-exist. Insects, bats, birds and mammals are common species in both B. Moderately dense broad leaved trees. With less diversity of plant species. Oak, Beach, Maple etc. are some common species. Squirrels, rabbits, skunks, birds, black bears, mountain lions etc. C. Evergreen conifers like pine, fur and spruce etc. Woodpeckers, hawks, bears, wolves, deer, hares and bats are common animals

Desert	A. Hot and Dry desert B. Semi arid desert C. Coastal desert D. Cold desert	A. S a h a r a , Kalahari , Marusthali, Rub-el-Khali B. Marginal areas of hot deserts C. Atacama D. Tundra climatic regions	A. Temp. 20 - 45°C. B. 21 - 38°C. C. 15 - 35°C. D. 2 - 25°C A-D Rainfall is less than 50 mm	Rich in nutrients with little or no organic matter	A-C. Scanty vegetation; few large mammals , insects, reptiles and birds D. Rabbits, rats, antelopes and ground squirrels
Grassland	A. Tropical Savannah B. Temperate Steppe	A. Large areas of Africa , Australia, South America and India B. Parts of Eurasia and North America	A. Warm hot climates, Rainfall 500-1,250 mm B. Hot summers and cold winter. Rainfall 500 - 900 mm	A. Porous with thin layer of humus. B. Thin flocculated soil, rich in bases	A. Grasses; trees and large shrubs absent; giraffes zebras, buffalos, leopards, hyenas, elephants, mice, moles, snakes and worms etc., are common animals B. Grasses; occasional trees such as cottonwoods, oaks and willows; gazelles, zebras, rhin-

					oceros, wild horses, lions, varieties of birds, worms, snakes etc., are common animals
Aquatic	A. Freshwater B. Marine	A. Lakes, streams, rivers and wetlands B. Oceans, coral reefs, lagoons and estuaries	A-B Temperatures vary widely with cooler air temperatures and high humidity	A. Water, swamps and marshes B. Water, tidal swamps and marshes	Algal and other aquatic and marine plant communities with varieties of water dwelling animals
Altitudinal	—	Slopes of high mountain ranges like the Himalayas, the Andes and the Rockies	Temperature and precipitation vary depending upon latitudinal zone	Regolith over slopes	Deciduous to tundra vegetation varying according to altitude



Tundra Biome

<https://www.youtube.com/watch?v=RT6x5GVPFG8>

<https://www.youtube.com/watch?v=6uYzC7tq9RM>

<https://www.youtube.com/watch?v=MfstYSUscBc>

Taiga Biome



VISION
IAS
ACTIONS



Grassland Biome

<https://www.youtube.com/watch?v=xQE1FcAXlHU>

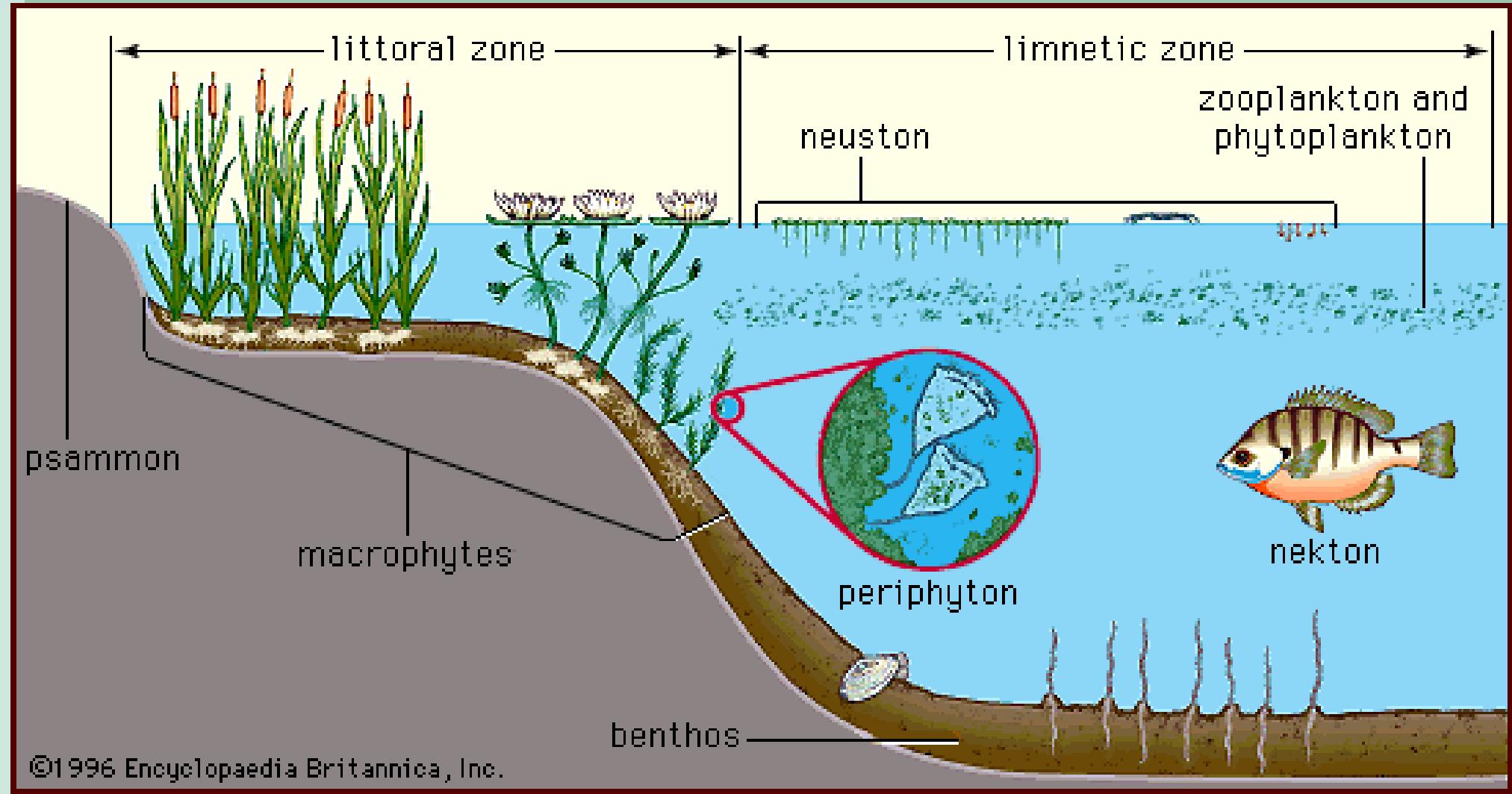


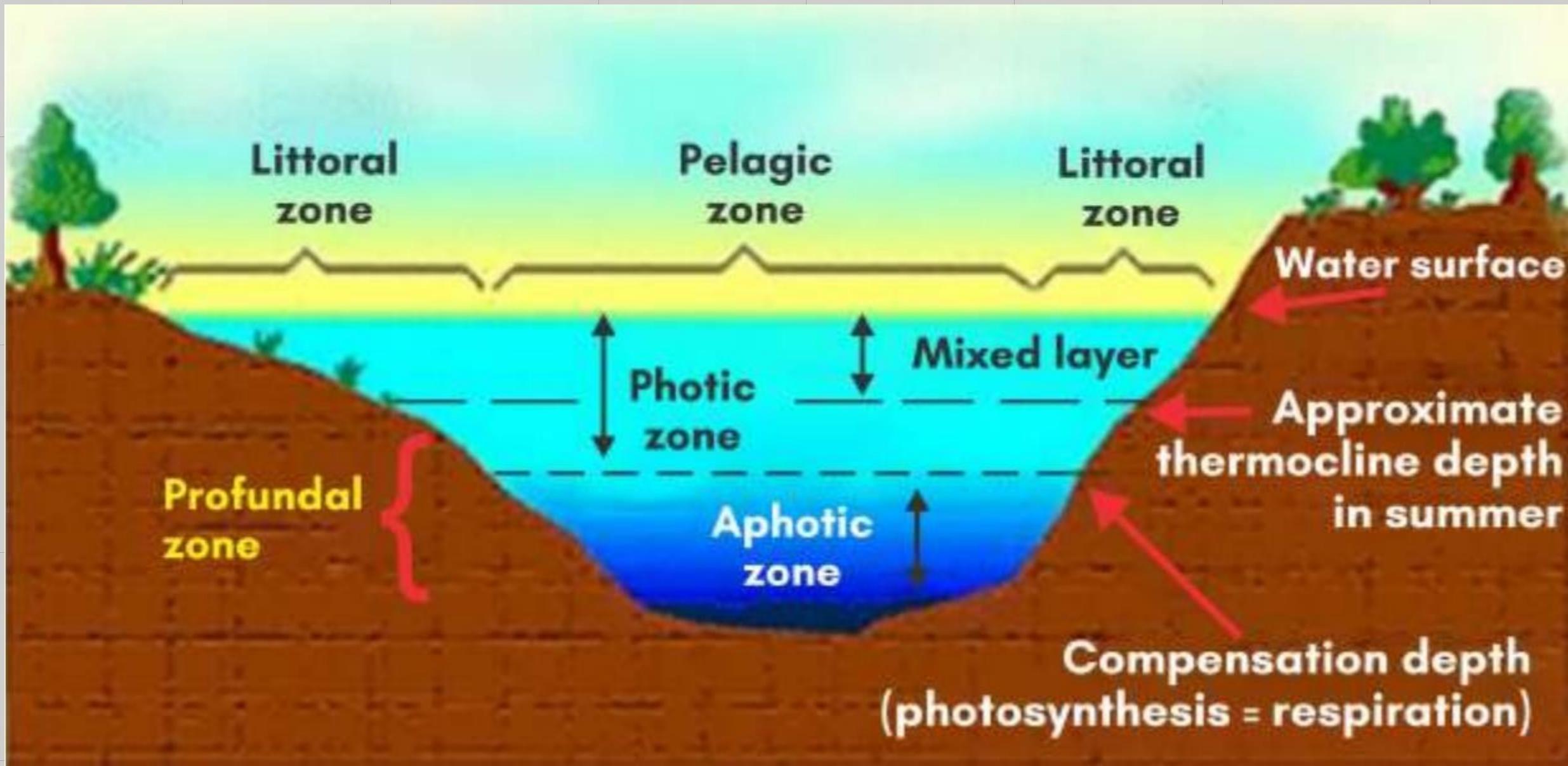
Rainforest biome



Desert Biome

<https://www.youtube.com/watch?v=n4crvs-KTBw>





Characteristic	Lake	Wetland (shallow lake)
Origin	<ul style="list-style-type: none"> Largest is due to tectonic forces: Fluvial, Geomorphic, increase in the water table, etc. 	<ul style="list-style-type: none"> Mostly Fluvial, Residual lakes
Water turnover	<ul style="list-style-type: none"> Permanent 	<ul style="list-style-type: none"> Permanent or Temporary
Water level changes	<ul style="list-style-type: none"> Relatively small 	<ul style="list-style-type: none"> Relatively Large
Thermal stratification	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> No
Vertical mixing	<ul style="list-style-type: none"> Thermally regulated 	<ul style="list-style-type: none"> Wind regulated
Dominant Producer	<ul style="list-style-type: none"> Phytoplankton 	<ul style="list-style-type: none"> Macrophytes
Food chain	<ul style="list-style-type: none"> Grazing Pathway 	<ul style="list-style-type: none"> Detritus Pathway
Productivity	<ul style="list-style-type: none"> Low 	<ul style="list-style-type: none"> High
Trophic status	<ul style="list-style-type: none"> Oligotrophic 	<ul style="list-style-type: none"> Mostly Eutrophic
Functions-Flood control	<ul style="list-style-type: none"> Less Significant 	<ul style="list-style-type: none"> Significant
Waste treatment	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Yes

<https://www.youtube.com/watch?v=z8oDKMOfpQ>



Questions??



- Online query (For faster reply)
- Read and revise what is taught
- Read the reference material
- Mentoring sessions

If Dil Maange beyond MORE...

Mail: rajesh@visionias.in
Twitter: [@naturiousoul](https://twitter.com/naturiousoul)

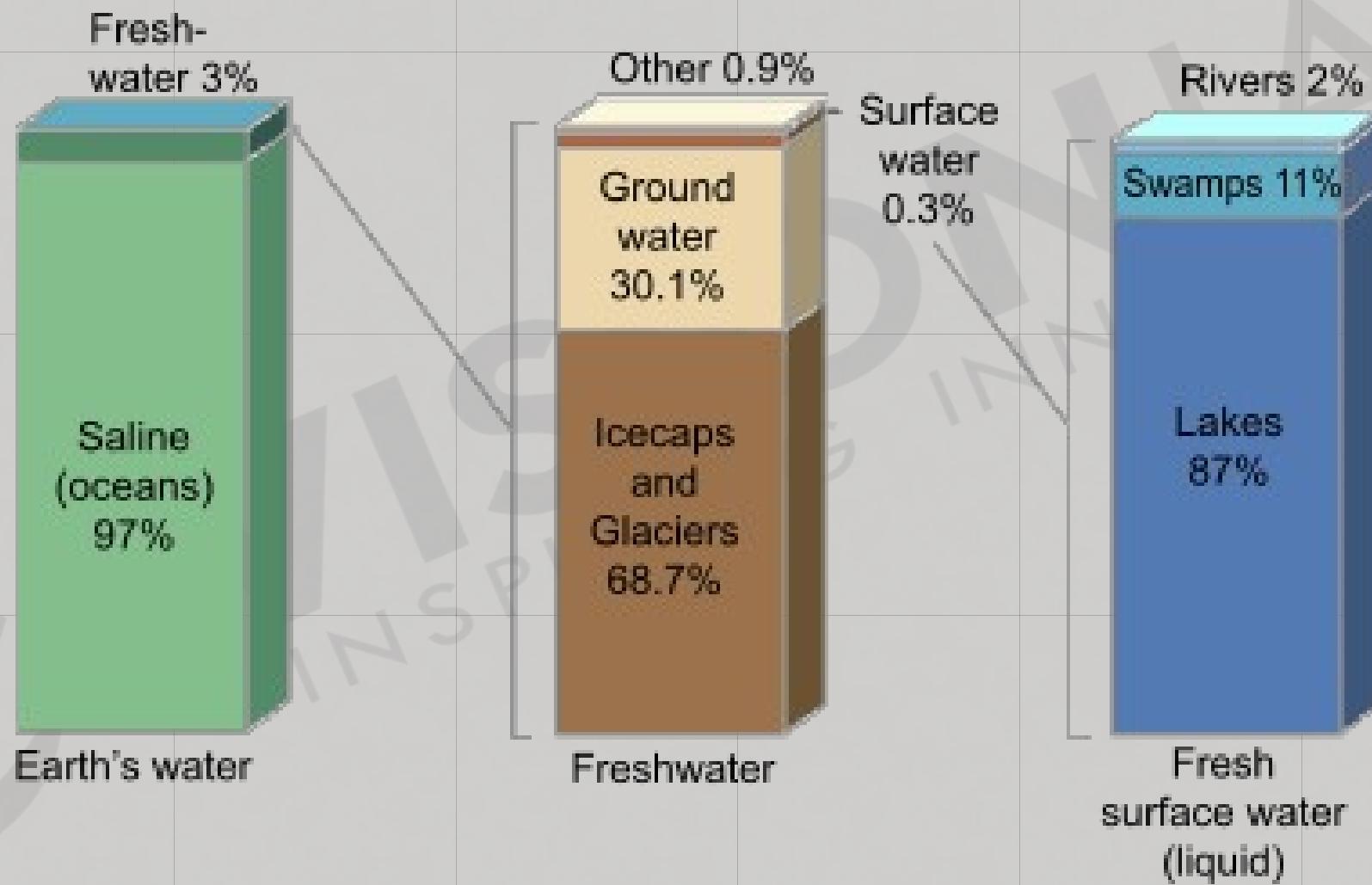


ENVIRONMENT

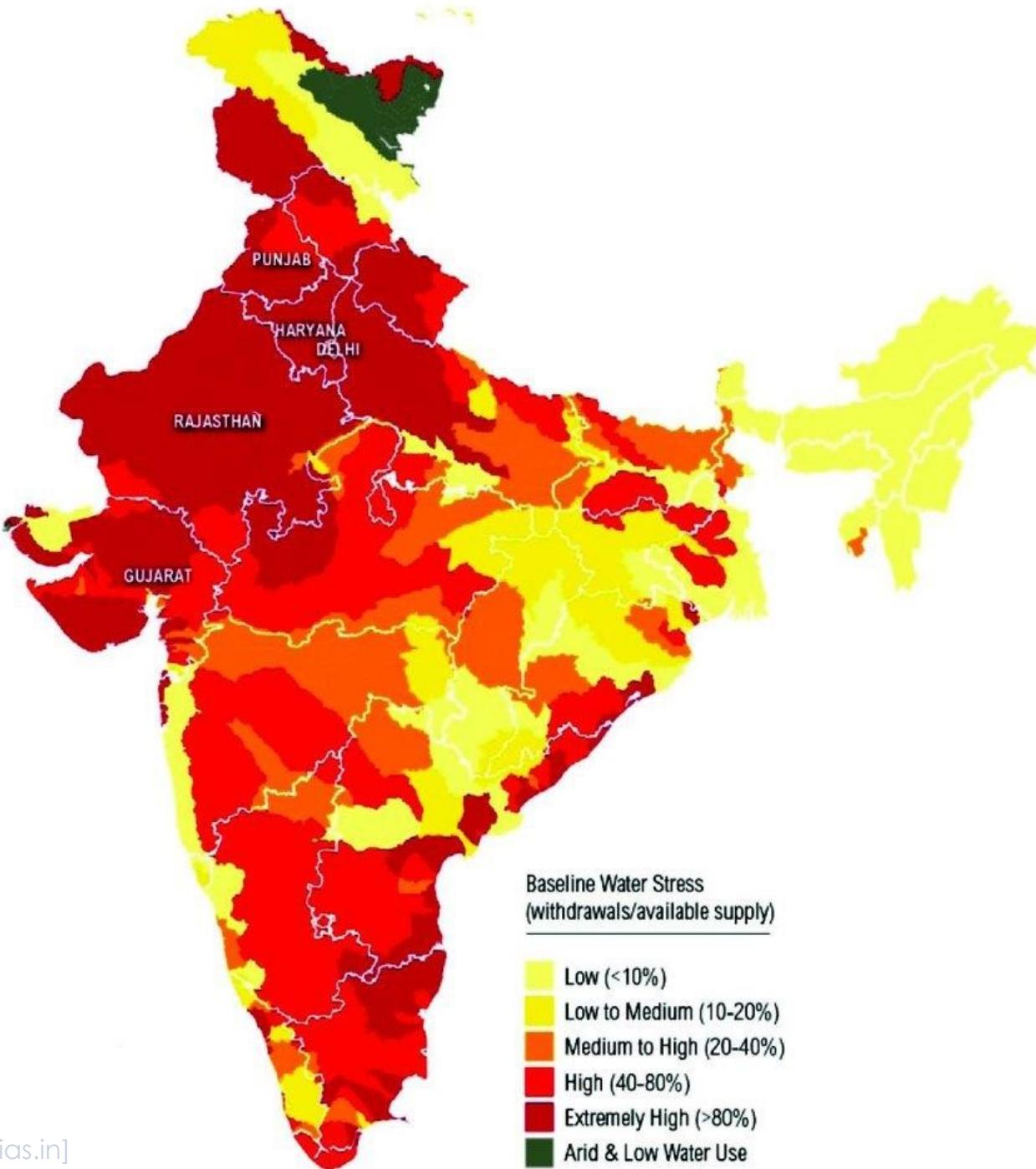
Environmental Degradation

- Water Stress
- Water Pollution
- Air Pollution
- Desertification and Land Degradation
- Global Warming and Climate Change
- Ozone Depletion
- Other types of environmental degradation

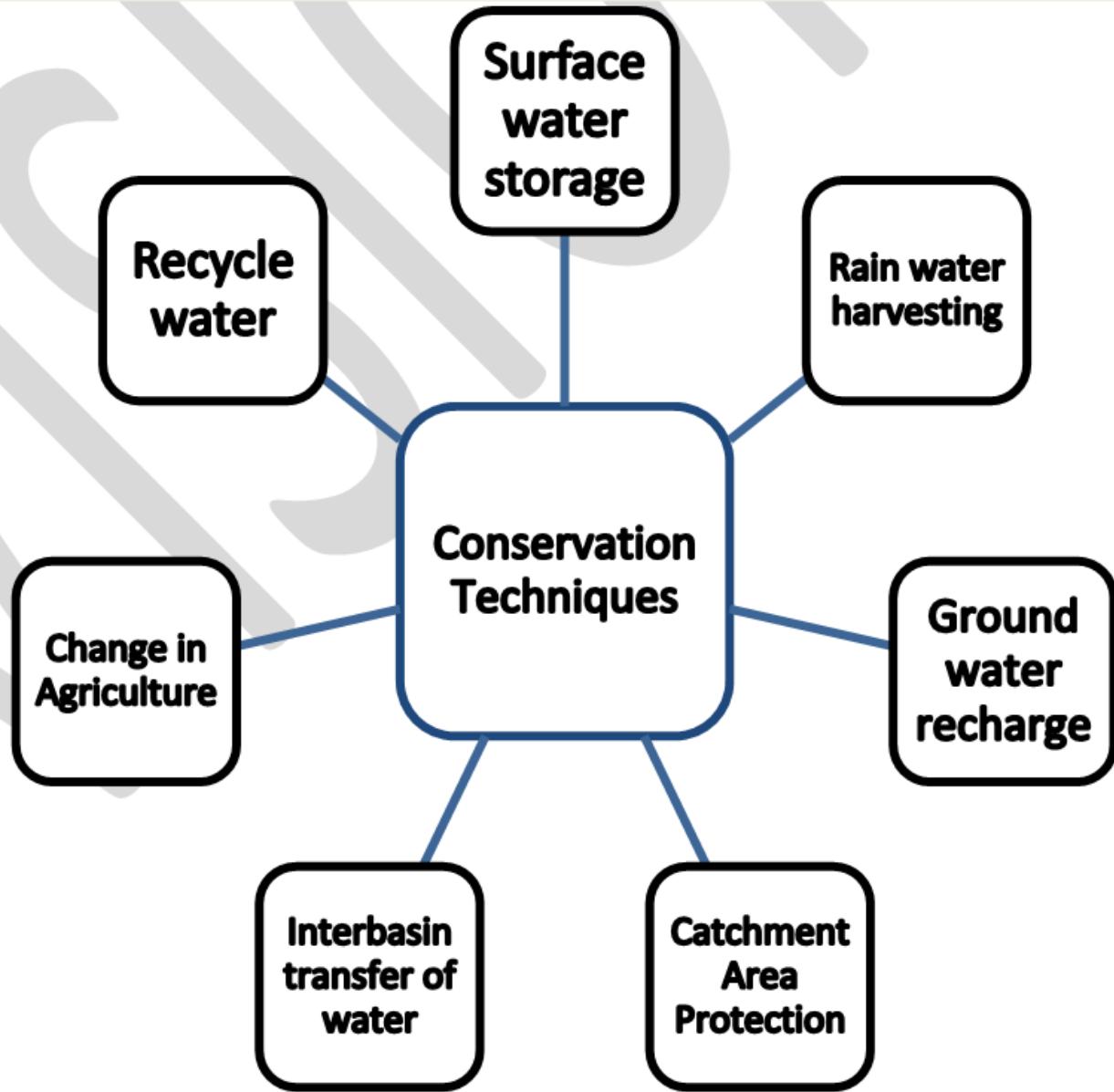
Distribution of Earth's Water









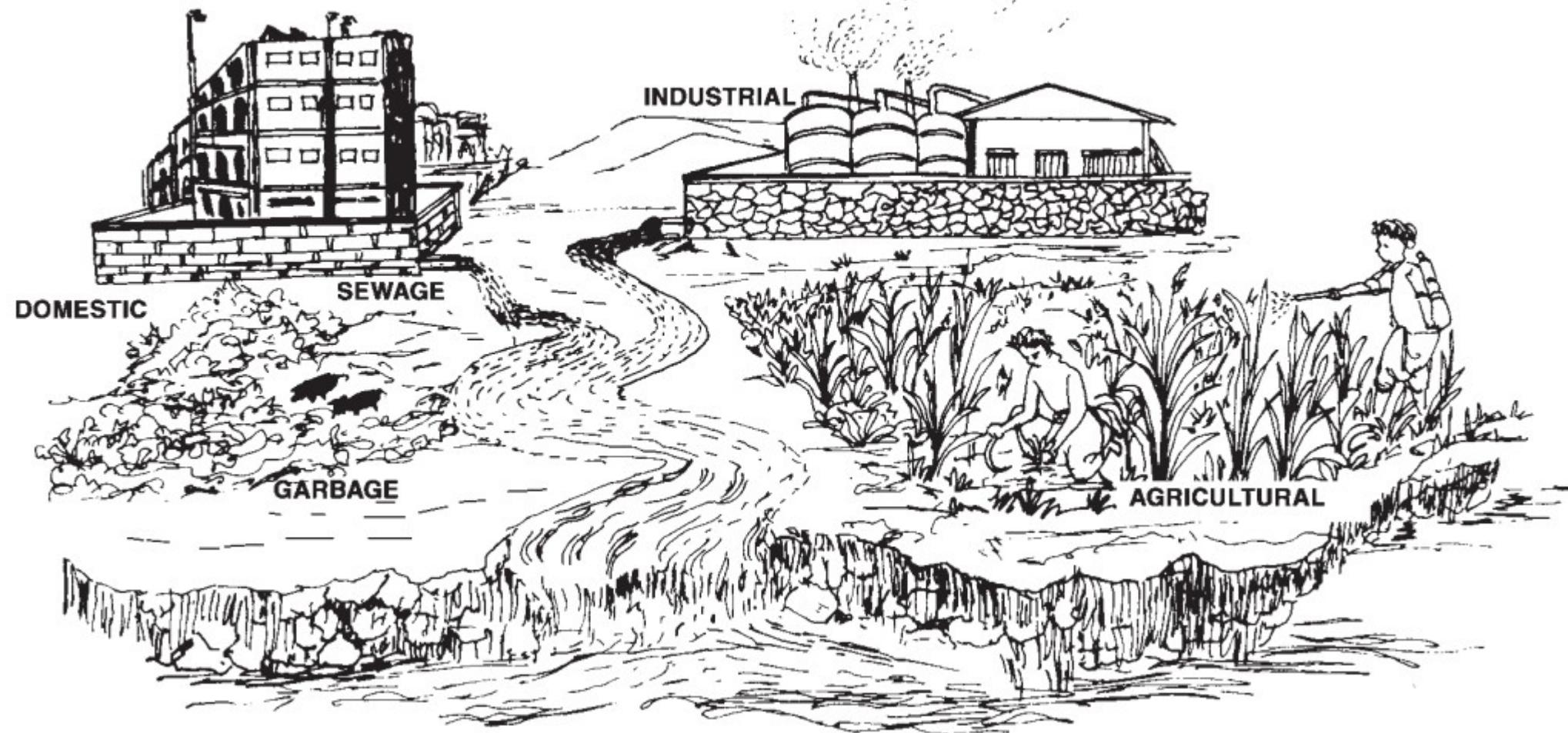


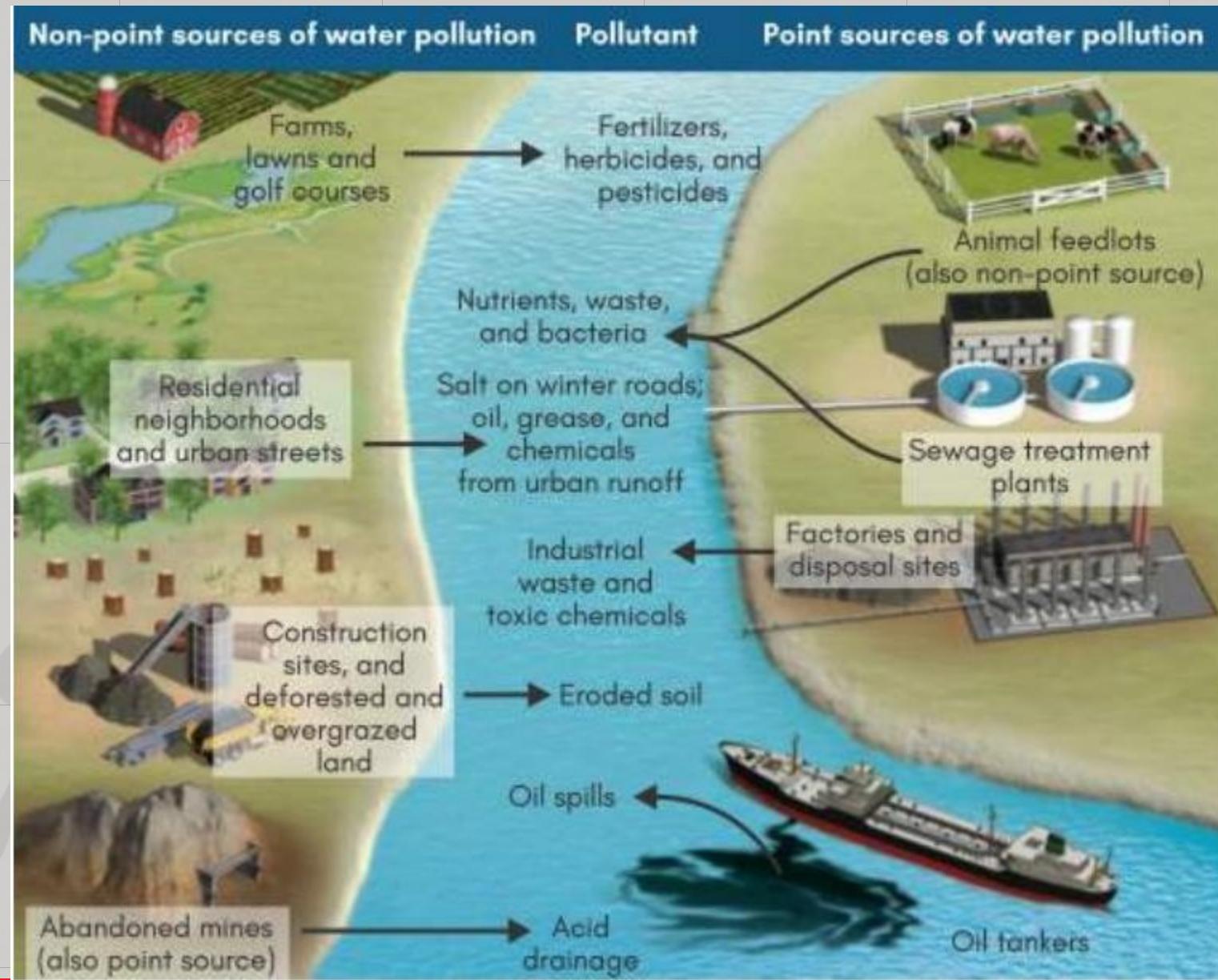
Urban Areas	Rural Areas
<p>Roof Top Rain Water / run off harvesting through</p> <ul style="list-style-type: none"> • Recharge Pit • Recharge Trench • Tube well • Recharge Well 	<p>Rain Water Harvesting through</p> <ul style="list-style-type: none"> • Gully Plug • Contour Bund • Gabion Structure • Percolation tank • Check Dam/ Cement Plug/ Nala Bund • Recharge shaft • Dug well Recharge • Ground Water Dams/Subsurface Dyke

Traditional Water Conservation System	State	Type
Jhalaras	Jodhpur(Rajasthan)	Stepwell
Talab bandhi	Bundelkhand (UP), Udaipur (Raj.)	Lake
Bawaris	Rajasthan	Stepwell
Taanka	Thar desert region of Rajasthan.	cylindrical paved underground pit
Ahar Pynes	South Bihar	Ahars are reservoirs with embankments on three sides that are
		built at the end of diversion channels like pynes. Pynes are artificial rivulets
Johad	Called madakas in Karnataka and pemghara in Odisha	Small earthen check dam
Panam Keni	Wayanad (Kerela)	Special type of well
Khadins	Jaisalmer (Rajasthan)	Embankment
Kund	western Rajasthan and Gujarat	Saucer-shaped catchment area
Baoli	Rajasthan, Delhi, Gujarat	Stepwell
Bhandara Phad	Maharashtra	Check dam
Buldhana Pattern	Buldhana district , Maharashtra	Storage type
Tamswada pattern	Nagpur and Wardha , Maharashtra	Storage type
Zings	Ladakh	Small tanks

Kuhls	Himachal Pradesh	Channels
Zabo	Nagaland	Channels
Jackwells	Shompen tribe of the Great Nicobar Islands	Wells
The Ramtek model	Maharashtra	Tanks
The Pat system	Jhabua district of Madhya Pradesh	Channels
The Eri system	Tamil Nadu	Tanks

Sources of Pollution



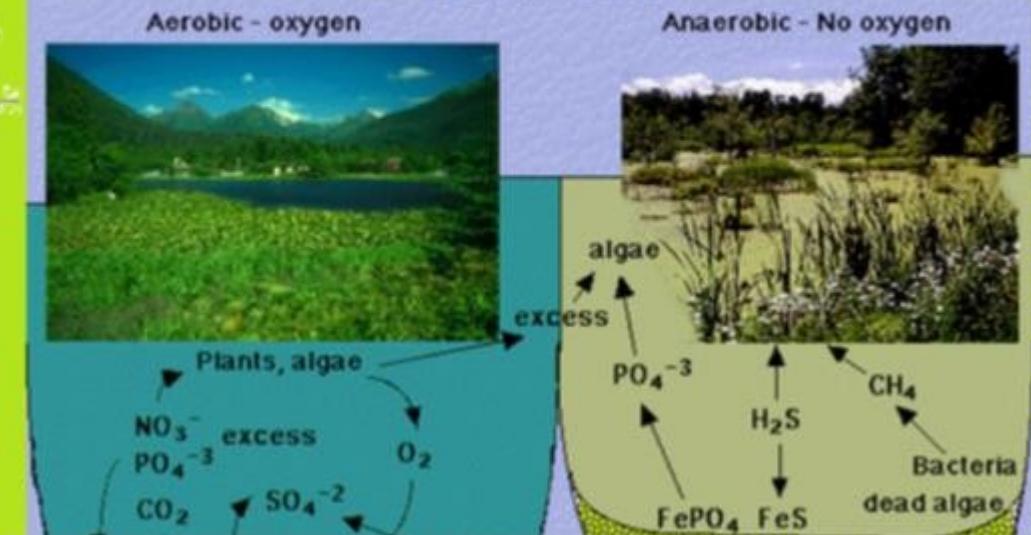




aquatic environment with extremely high level of nutrients

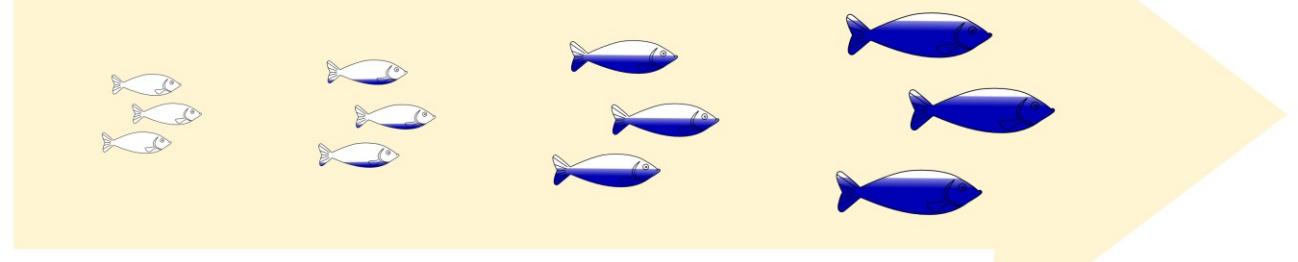
■ Anthropogenic eutrophication – eutrophication, caused by human beings

Eutrophication



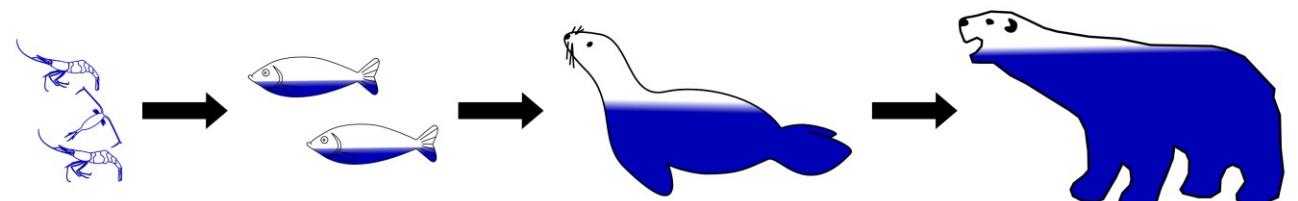


Bioaccumulation



Contaminant Levels

TIME

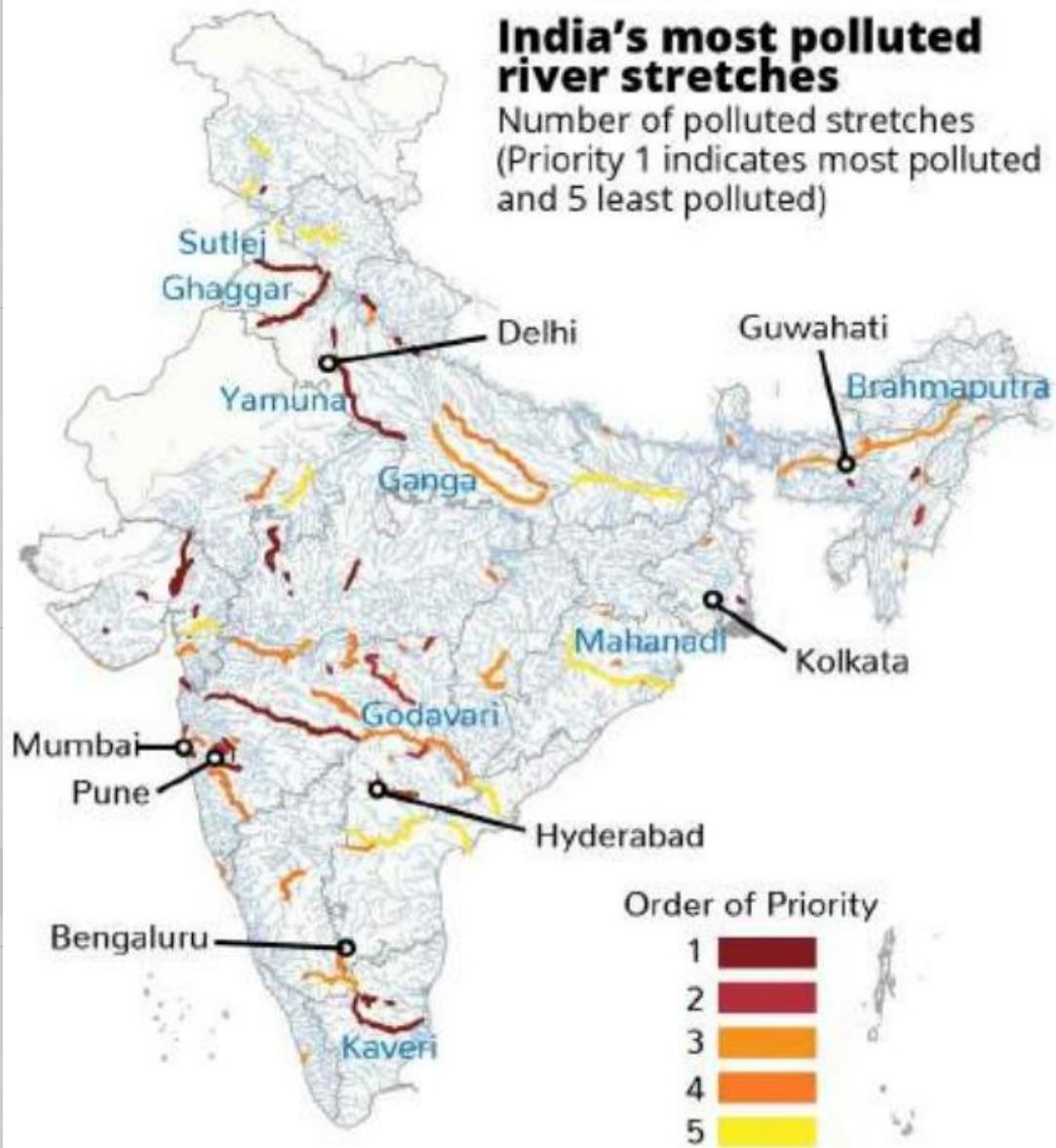


Contaminant Levels

Biomagnification

Completed Chart

Type of Water Pollution	Cause of Pollution	Symptoms of Pollution	Effect of Pollution	Source of Pollution
Biodegradable waste	Humans and animals	Decreasing numbers of fish and other aquatic life, increasing number of bacteria	Increased number of bacteria, decreased oxygen levels, death of aquatic life	Run-off, improperly treated effluent,
Nutrients	Nitrates and phosphates	Green, cloudy, slimy, stinky water	Algae blooms, eutrophication of water source	Over use of fertilizers, run-off from fields, improper disposal of containers, wastewater treatment
Heat	Increased water temperature	Warmer water, less oxygen, fewer aquatic organisms	Decrease in oxygen levels, death of fish and plants	Industrial run-off, wastewater treatment
Sedimentation	Suspended particles settling out of water	Cloudy water, increased amount of bottom	Warms up water, decreases depth of water source, deposits toxins	Construction sites, farming and livestock operations, logging, flooding, city run-off, dams
Chemicals	Toxic and hazardous chemicals	Water colour changes, develops an odour, aquatic life die out	Kills aquatic life, can enter human food chain, leads to birth defects, infertility, cancer and other diseases in humans and animals	Human-made, improper disposal, run-off, dams, landfill leachate, industrial discharge, acid rain
Radioactive pollutants	Radioactive isotopes	Increased rates of birth defects and cancer in human and animal populations.	Kills aquatic species and leads to cancer and death in humans and other animals	Waste water discharges from factories, hospitals and uranium mines
Medical	Medicines, antibiotics	Infertility in aquatic organisms, and other unknown symptoms	Unknown	Humans dumping medicines into water systems, wastewater treatment
Microbiological	Bacteria, viruses, protozoa	People and animals become ill with gastrointestinal disorders	Undrinkable water	Improper treatment of water/effluent, can occur naturally



India's most polluted stretches of rivers in 2018, identified by the Central Pollution Control Board. Level of pollution decreases with priority level, with priority 1 the most polluted. Priority 1,2 and 3 stretches are highlighted, while only selected priority 4 and 5 stretches in major rivers are highlighted.



Pollutant	Source	Harmful effects
Gaseous Pollutants		
Oxides of Carbon (CO and CO ₂)	Burning of wood and coal and other fossil fuels like petroleum	Global warming Respiratory issues
Oxides of Sulphur (SO ₂ and H ₂ S)	Power plants and refineries Volcanic eruptions When Sulphur containing fuel is burnt	Acid rain Respiratory issues Loss of chlorophyll in plants (Chlorosis)
Oxides of Nitrogen (NO and N ₂ O)	Naturally (Lightning) In Automobile exhaust: (at high temperature) $N_2(g) + O_2(g) \rightarrow 2NO(g)$ $2NO(g) + O_2(g) \rightarrow 2NO_2(g)$	Irritation in eyes and lungs Low productivity in plants Acid rain
Hydrocarbons (Benzene and Ethylene)	Automobiles and Petroleum industries (Incomplete combustion of fuels)	Respiratory issues Carcinogenic
Particulate Pollutants		
Suspended Particulate matter: <ul style="list-style-type: none"> • Fly Ash • Lead and other metals • Dust 	Thermal power plants Construction activities metallurgical processes Automobiles exhaust	Smog (Smoke + Fog) leads to Poor visibility Breathing problems Lead interferes with the development of red blood cells Carcinogenic
Fibres (Cotton, wool!)	Textiles and carpet weaving industries	Lung disorders



BROWN CARBON

Organic molecules like tar balls or fats, given off by long-smoldering fires



BLACK CARBON

Carbon particles given off by hot fires, like coal plants, forest fires, and combustion from cars

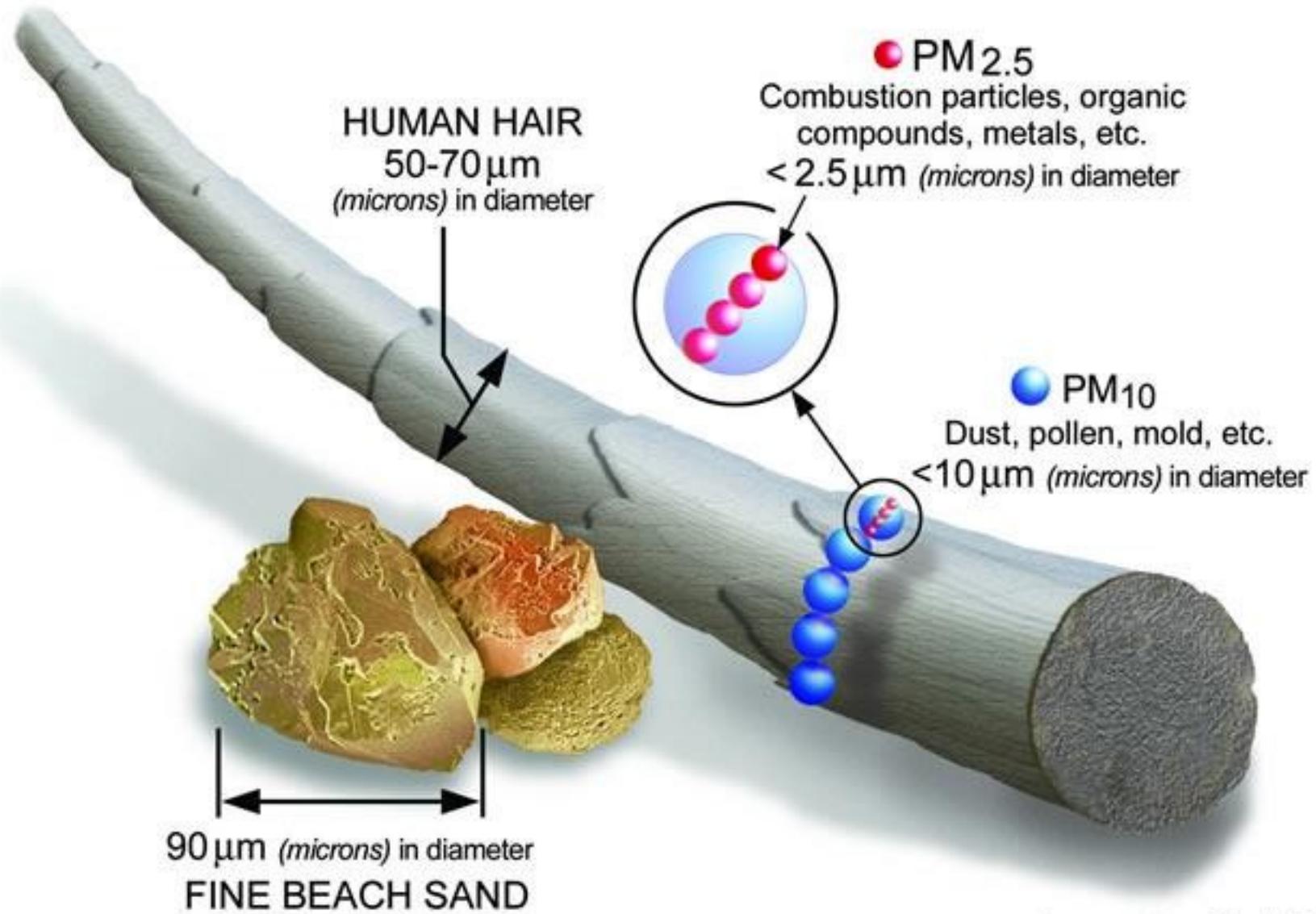
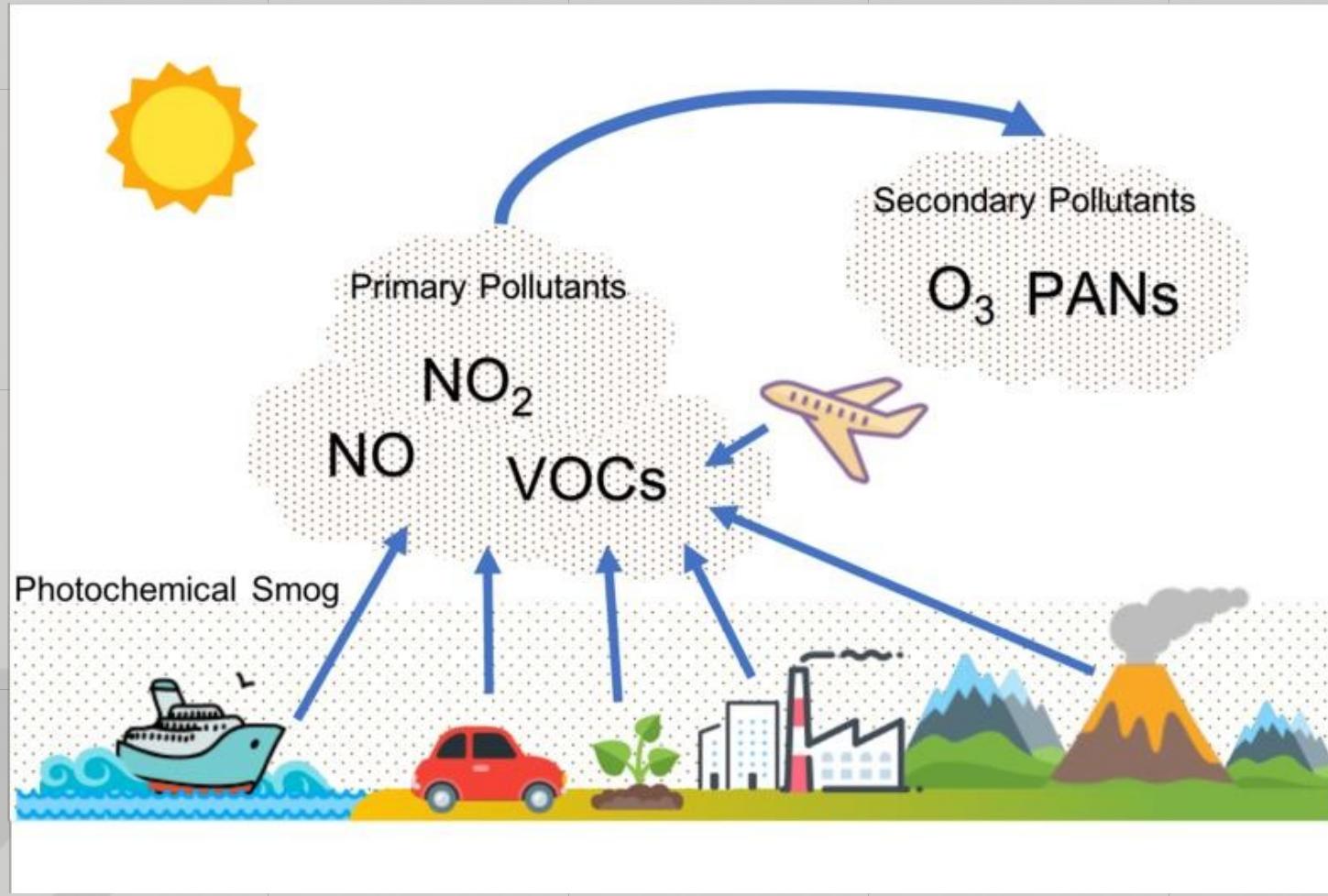
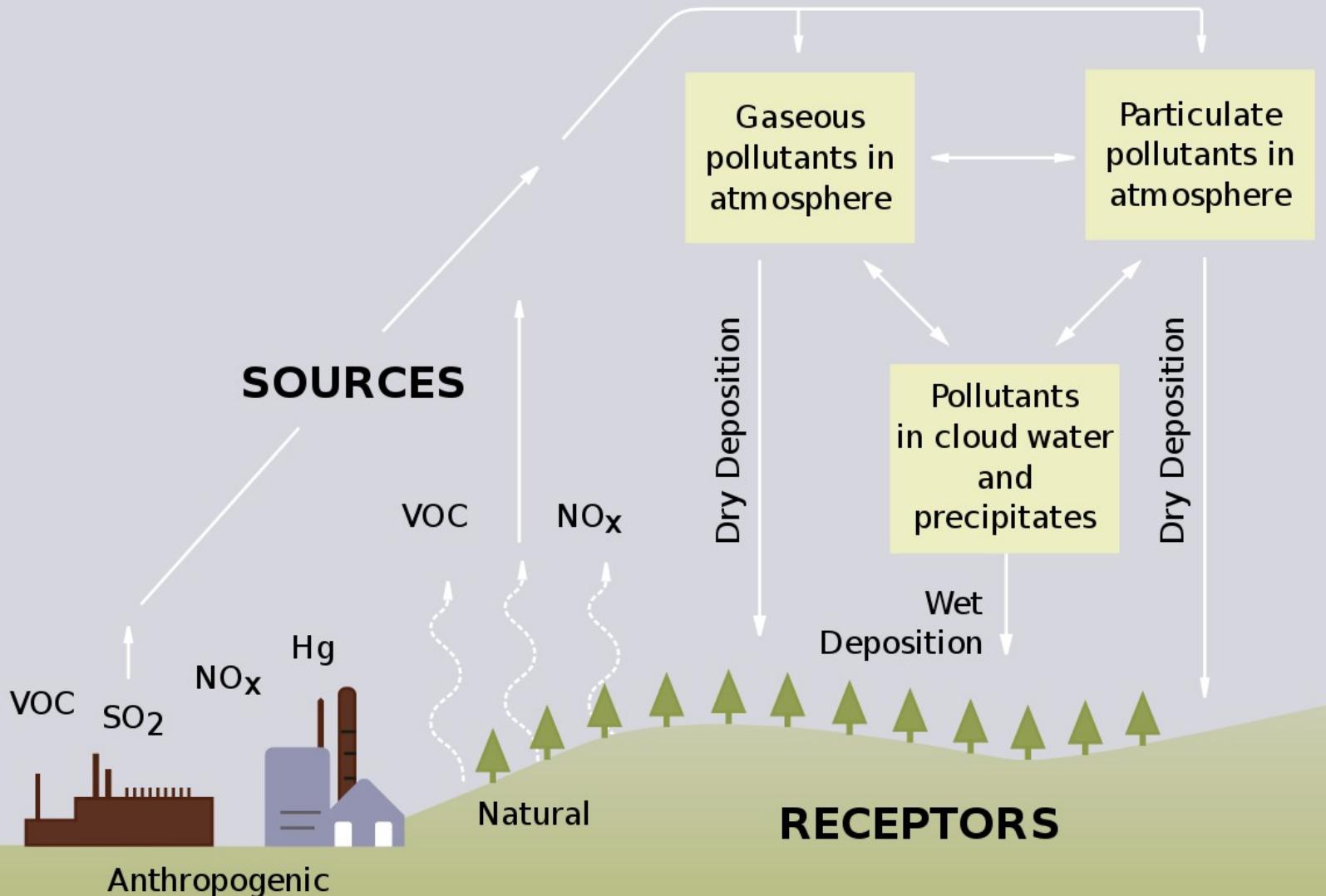


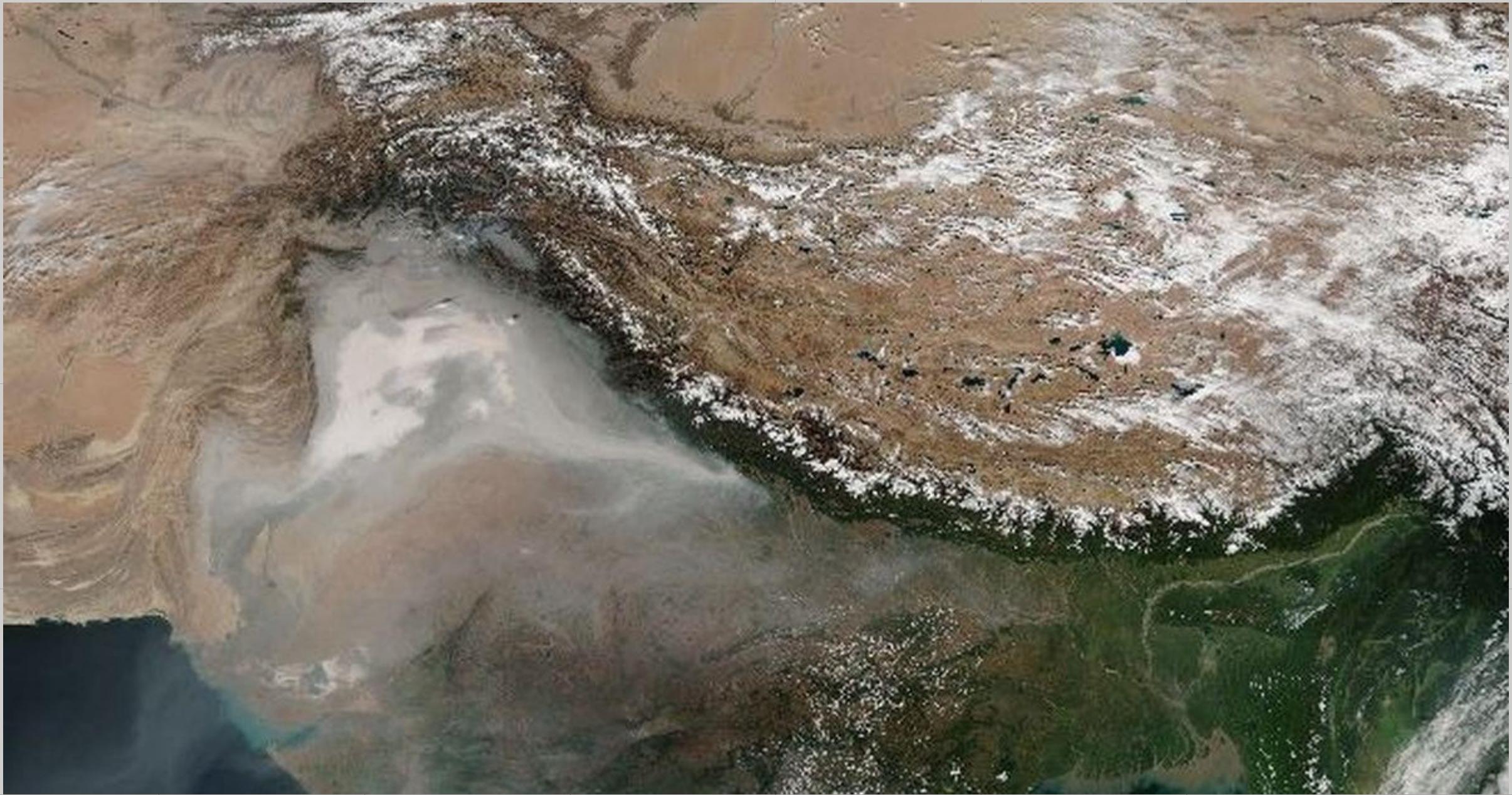
Image courtesy of the U.S. EPA

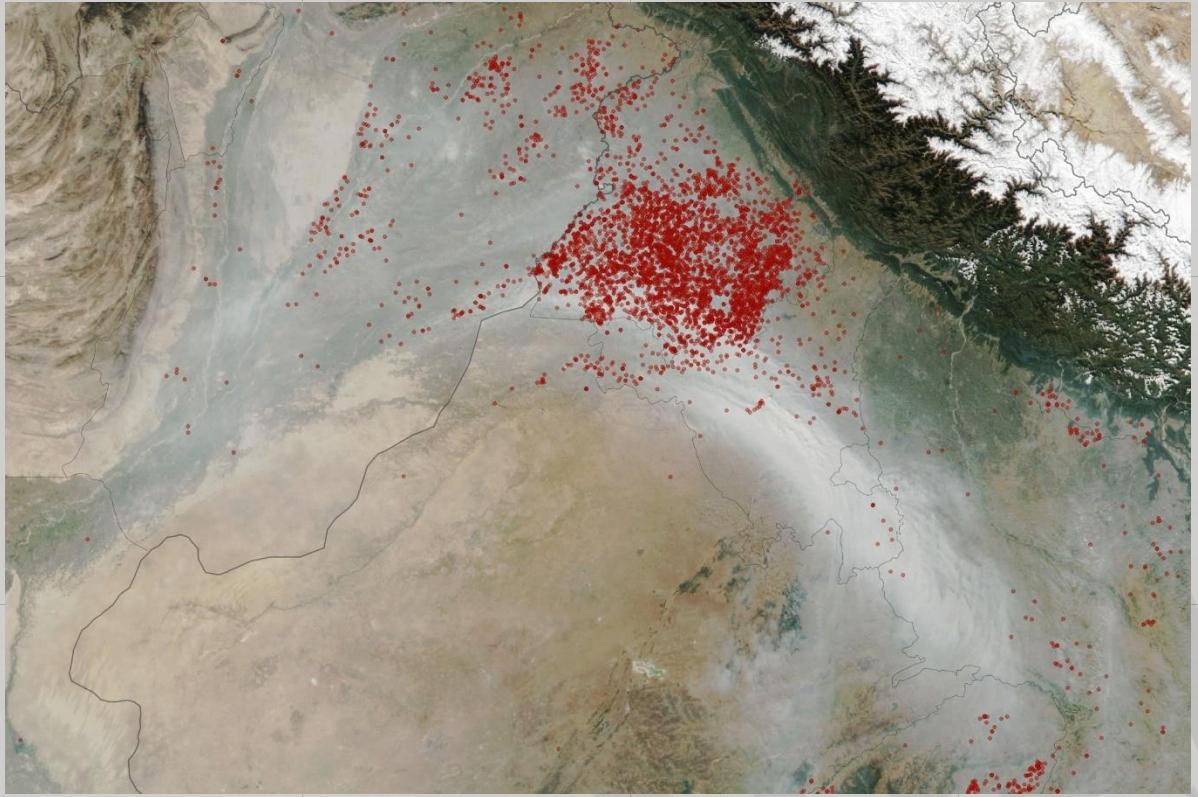




Classical smog	Photochemical smog
<ol style="list-style-type: none"> 1. This is formed due to buildup of sulphur oxides and particulate matter from fuel combustion. 2. It involves smoke and fog. 3. It occurs in cool humid climate (in winter). 4. This type of smog was first observed in London in 1952. 5. It has high concentration of SO_2 and, therefore, is reducing in character. 6. It causes bronchitis and irritation i.e., problems in lungs. 	<ol style="list-style-type: none"> 1. This is formed due to photochemical reaction of sunlight on the nitrogen oxides and hydrocarbons produced by automobiles and factories. 2. It does not involve any smoke or fog. 3. It occurs in warm, dry and sunny climate (in summer). 4. This type of smog was first observed in Los Angeles in 1950. 5. It has high concentration of oxidising agents and, therefore, is oxidising in character. 6. It causes irritation in eyes.

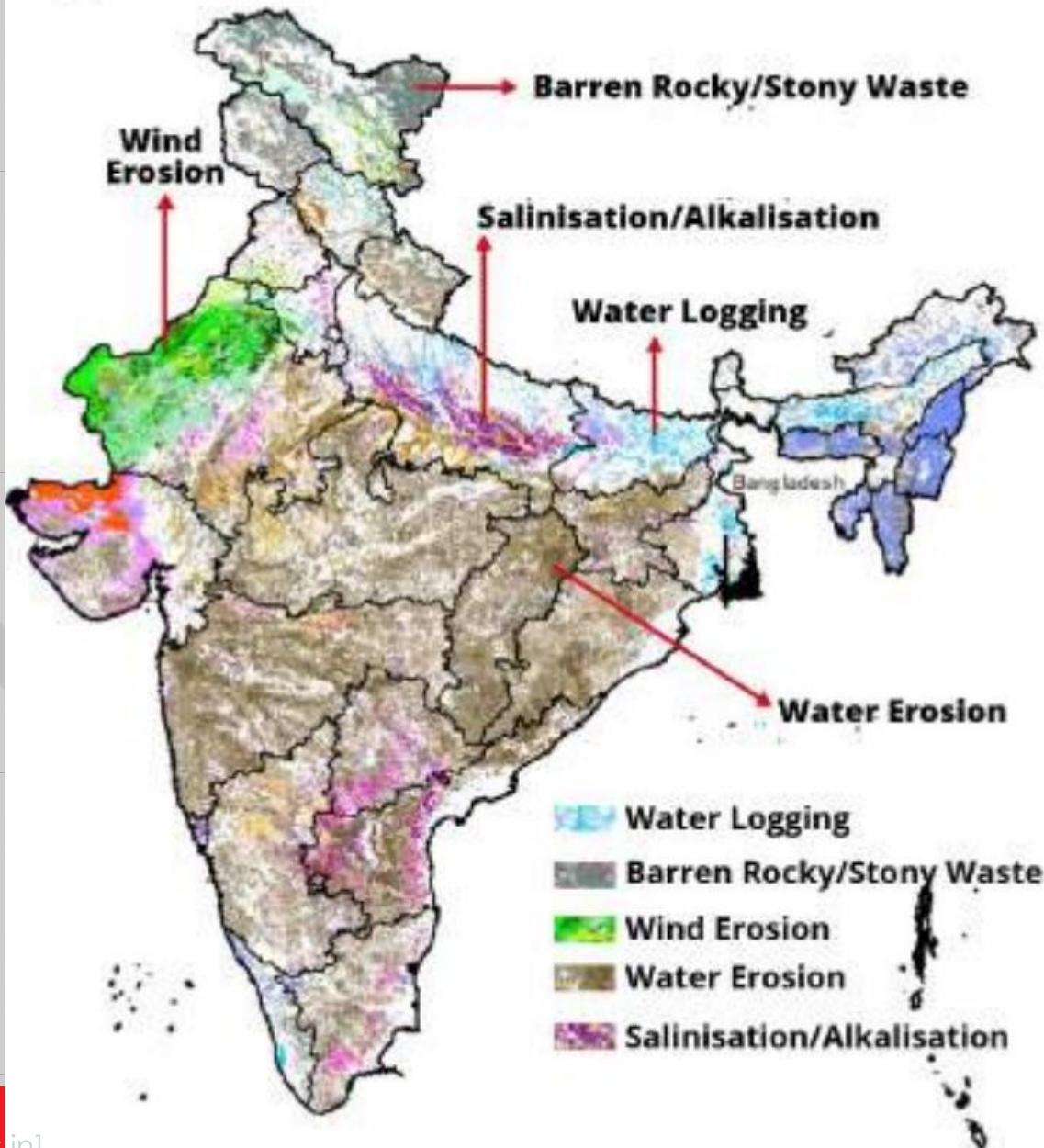








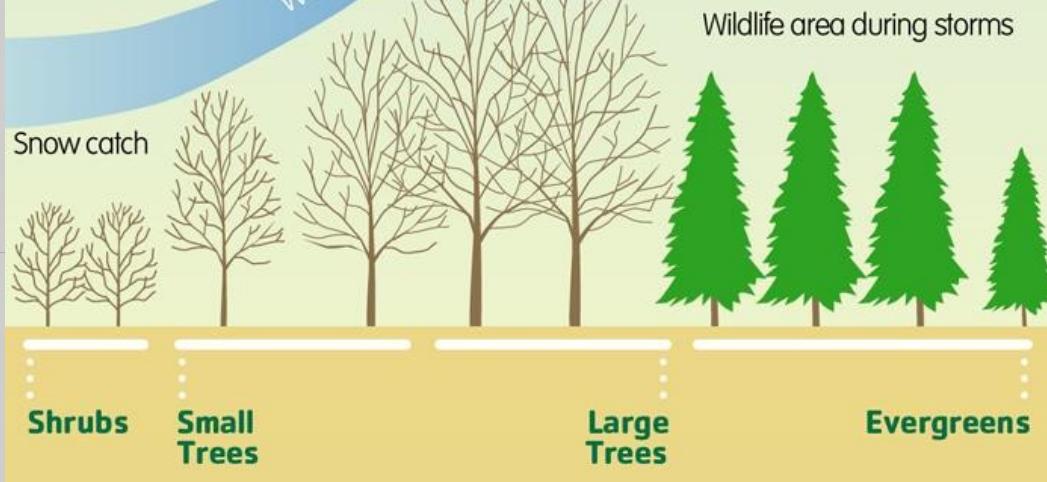
LAND DEGRADATION IN INDIA



Impacts on	Response on/through		Results in
1. Ecosystem services	Provisioning services	Ex.- Conversion of forestland into farmland	Increased food availability however reduced biodiversity and ground carbon storage
	Regulation services	Ex.- Water regulation services impact	Flooding, drought
	Cultural services	Local knowledge system, recreation, tourism	Directly impacted
	Supporting services	Ex.- Deforestation and expansion of extensive agriculture	Degradation of natural habitat.
2. Climate	Carbon sink		Higher carbon release in atmosphere
	Release of non-CO ₂ GHGs		Through increased rice cultivation, ruminant stocks and manure disposal results in higher release of CH ₄ , N ₂ O, and NH ₃ gases.
	Albedo change		Increased grazing, deforestation and forest fires results in albedo change impacting global radiative balance, net climate cooling/warming.

3. Food Security and Poverty	Agricultural productivity	Annual productivity decline undermines sustainable development, food and water insecurity, involuntary human migration, even civil conflict.
	GDP	Negative and quite strong impact, however difficult to quantify.
4. Gender and Education	Increased timing requirement for Food production, Fuel wood collection, soil and water conservation	Missing schools, higher dropout rate, reduced child care time, reduced time for other work and for leisure activities.
5. Human Health	Indirect impact	Through climate change, biodiversity loss, agricultural productivity, etc.
	Direct impact	Chronic bronchitis and respiratory illness.

Cross-Section Of a 10-Row Shelterbelt





LAND DEGRADATION NEUTRALITY

Land Degradation Neutrality is defined as "a state whereby the amount of healthy and productive land resources, necessary to support ecosystem services, remains stable or increases within specified temporal and spatial scales."

Current LDN Intergovernmental Working Group definition

THE FUTURE WE WANT - RIO +20

"We recognize the need for urgent action to reverse land degradation. In view of this, we will strive to achieve a land degradation-neutral world in the context of sustainable development. This should act to catalyse financial resources from a range of public and private sources."

Source: United Nations, 2013

TARGET

15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world

https://www.youtube.com/watch?v=G4H1N_yXBiA



CLIMATE DRIVERS



The current global average temperature is 0.85° C higher than it was in the late 19th century.

NATURAL CAUSES



VARIATIONS IN SOLAR RADIATION: Every 11 years, the number of sunspots changes from a maximum number to a minimum number. The sun emits slightly more radiation during active periods of sunspots.



MOVEMENT OF CRUSTAL PLATES: It causes changes in global circulation patterns of air and ocean water and the climate of the continents.



EL NIÑO-SOUTHERN OSCILLATION: An El Niño warm-water phase changes global weather patterns.



ORBITAL CHANGES: The Milankovitch Theory explains the cyclical changes in Earth's orbit and tilt that cause the climate fluctuations that occur over thousands of years.



VOLCANIC ERUPTIONS: They discharge carbon dioxide, emit aerosols, volcanic ash and sulfur dioxide. Volcanic aerosols can block a percentage of sunlight and cause a cooling that may last for 1-2 years.

ANTHROPOGENIC CAUSES



GHG EMISSIONS: heat-trapping emissions from burning coal, gas and oil in power plants and cars; cutting down and burning forests; tiny pollution particles (aerosols); black carbon pollution more commonly referred to as soot



CHANGES IN LAND USE PATTERN: It brings about changes in surface albedo.



DEFORESTATION: It leads to changes in evapotranspiration rates and soil moisture characteristics. Desertification also increases surface albedo.



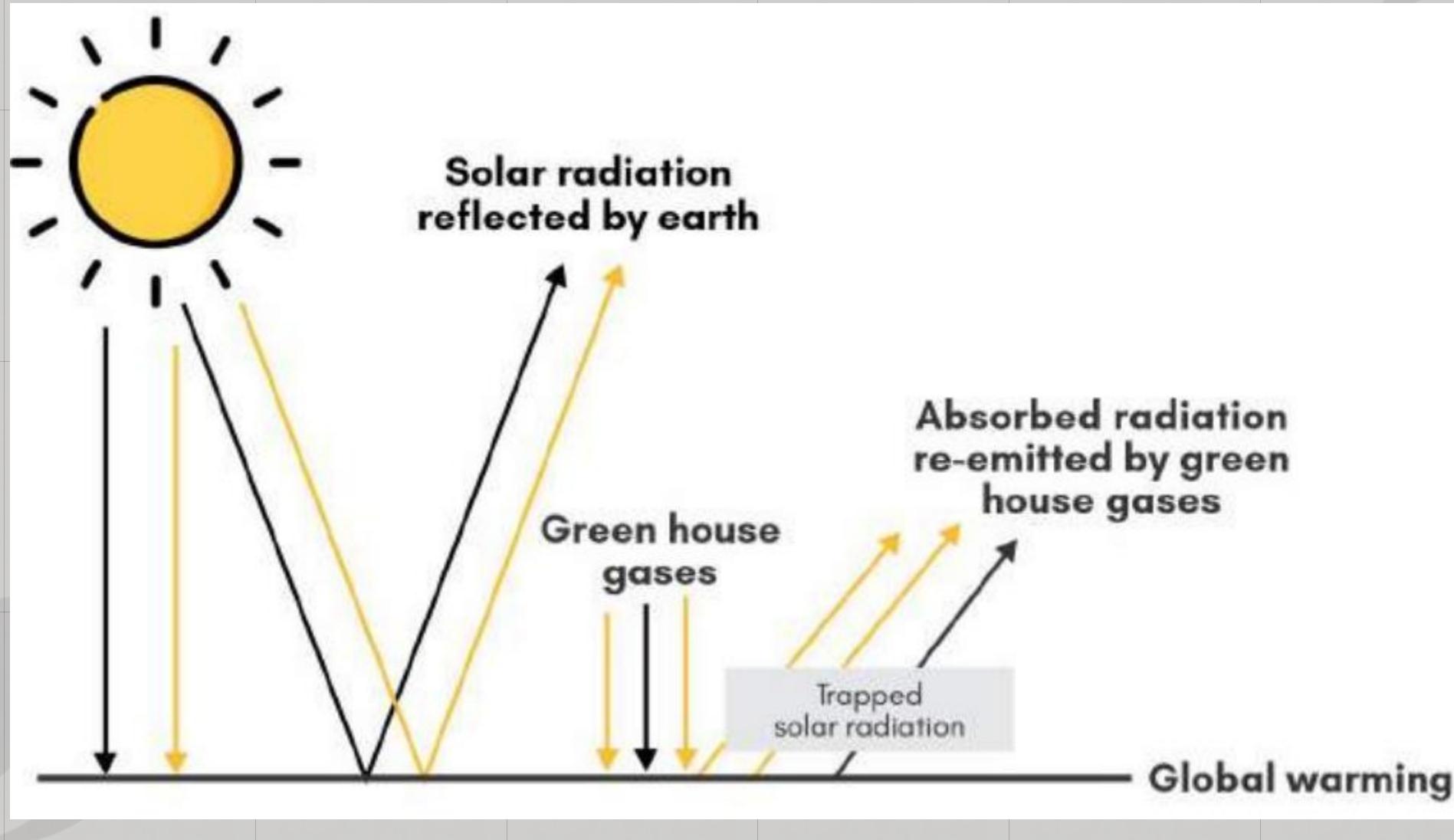
INCREASING LIVESTOCK FARMING: Cows and sheep produce large amounts of methane when they digest their food.

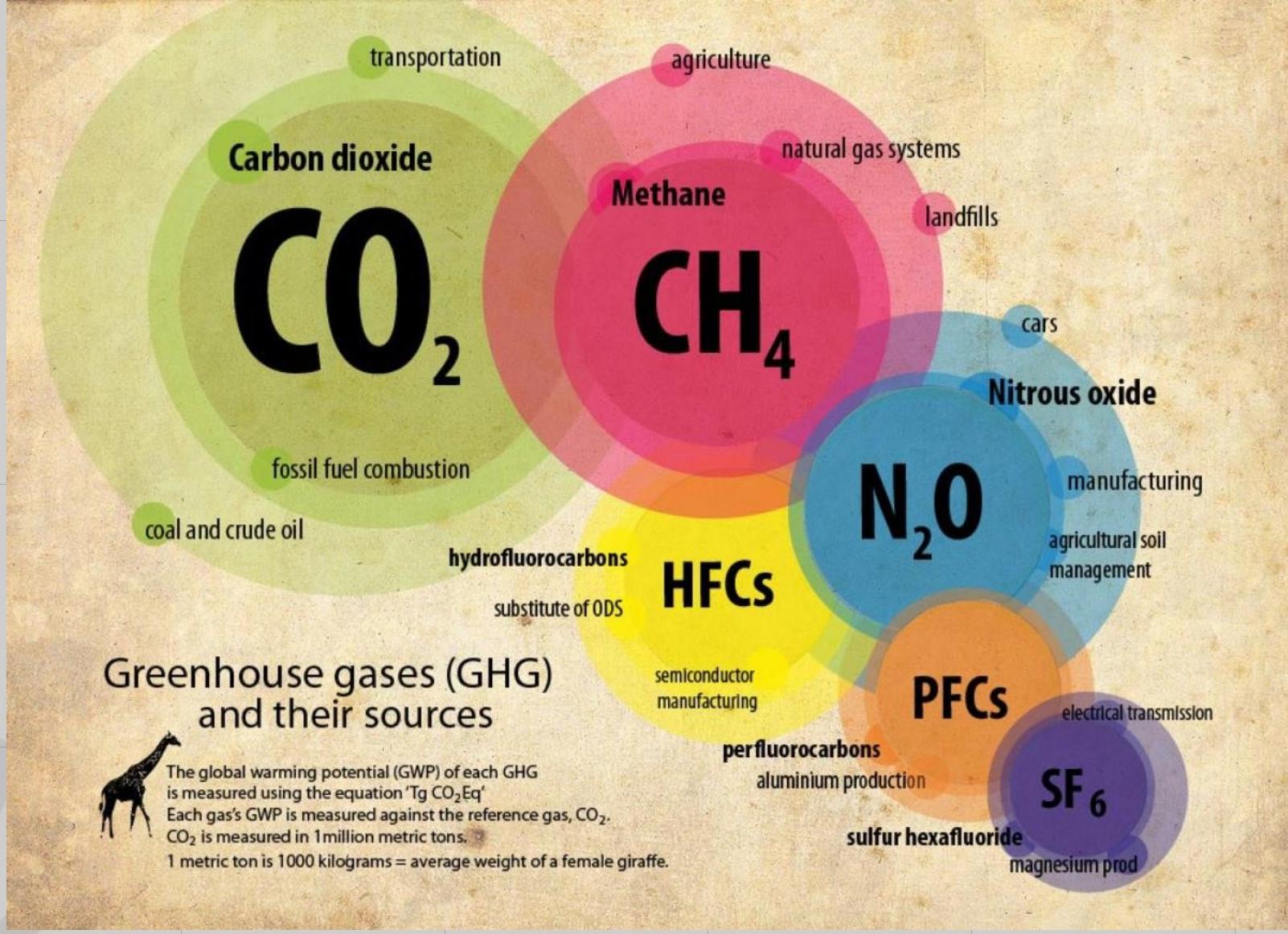


FERTILISERS CONTAINING NITROGEN: They produce nitrous oxide emissions.



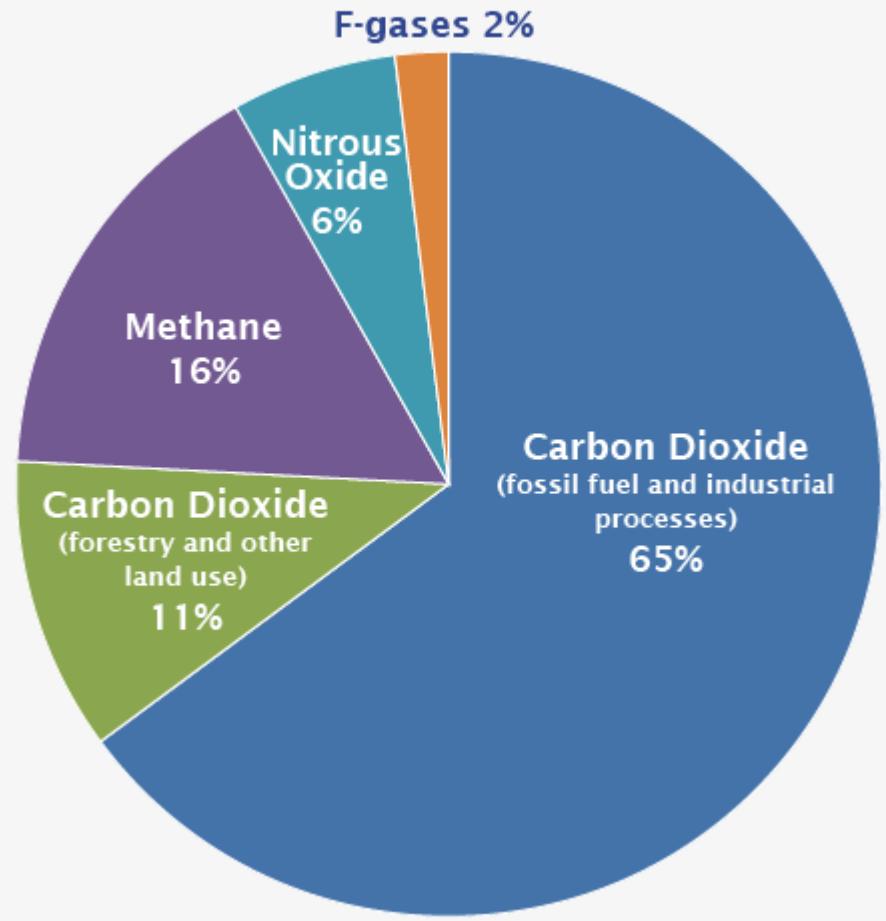
FLUORINATED GASES: They produce a very strong warming effect, up to 23,000 times greater than CO₂.





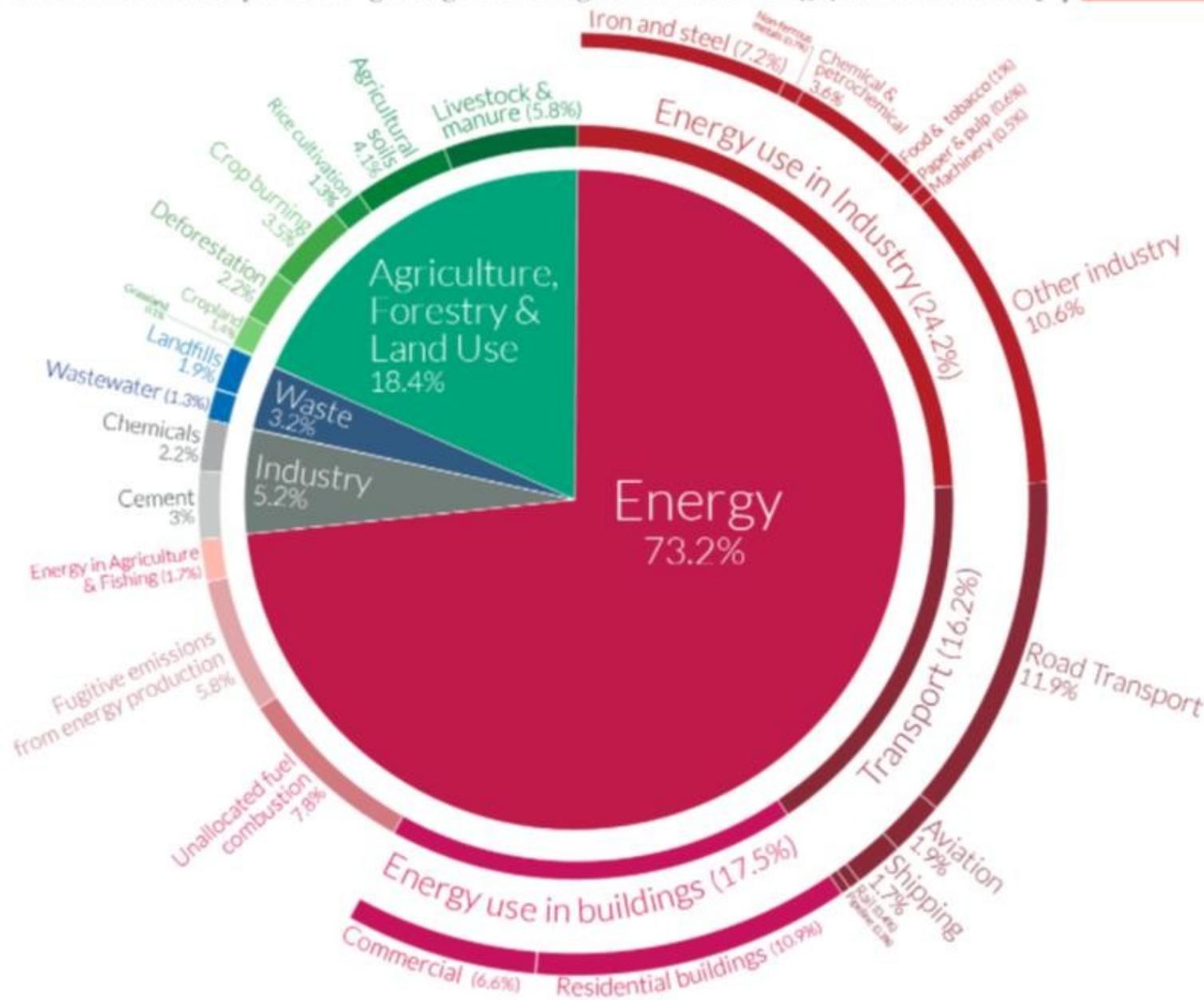
Greenhouse Gas (GHG)	Atmospheric Lifetime (yrs)	Global Warming Potential (GWP)
Carbon dioxide (CO ₂)	50-200	1
Methane (CH ₄)	12±3	21
Nitrous oxide (N ₂ O)	120	310
Hydrofluorocarbons (HFCs)	1.5 to 209	150 to 11,700
Perfluorocarbons (PFCs)	2,600 to 50,000	6,500 to 9,200
Sulfur Hexafluoride (SF ₆)	3,200	23,900

Global Greenhouse Gas Emissions by Gas



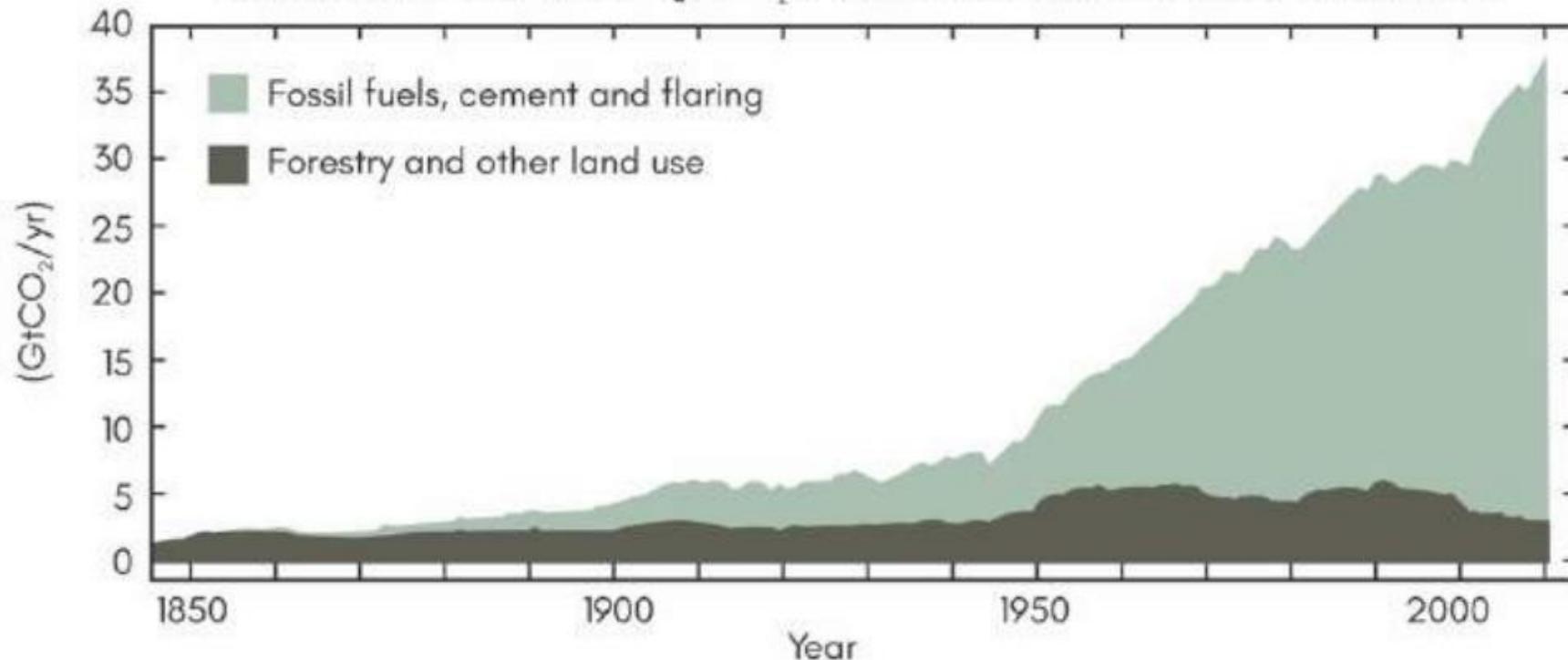
Global greenhouse gas emissions by sector

This is shown for the year 2016 – global greenhouse gas emissions were 49.4 billion tonnes CO₂eq.

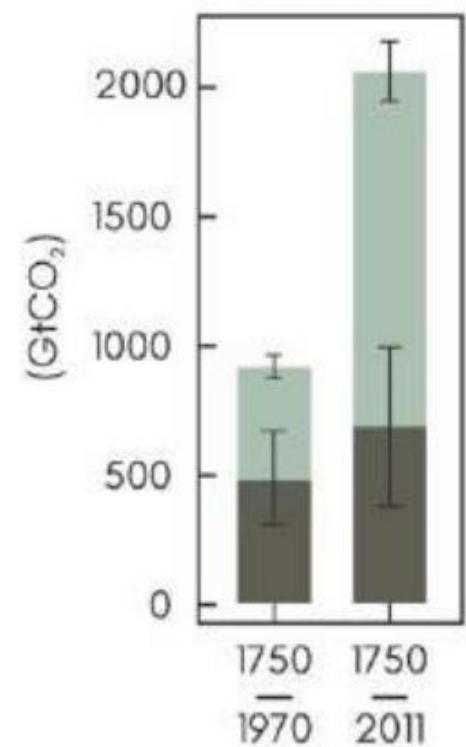


Global Anthropogenic CO₂ Emissions

Quantitative information of CH₄ and N₂O emission time series from 1850 to 1970 is limited.

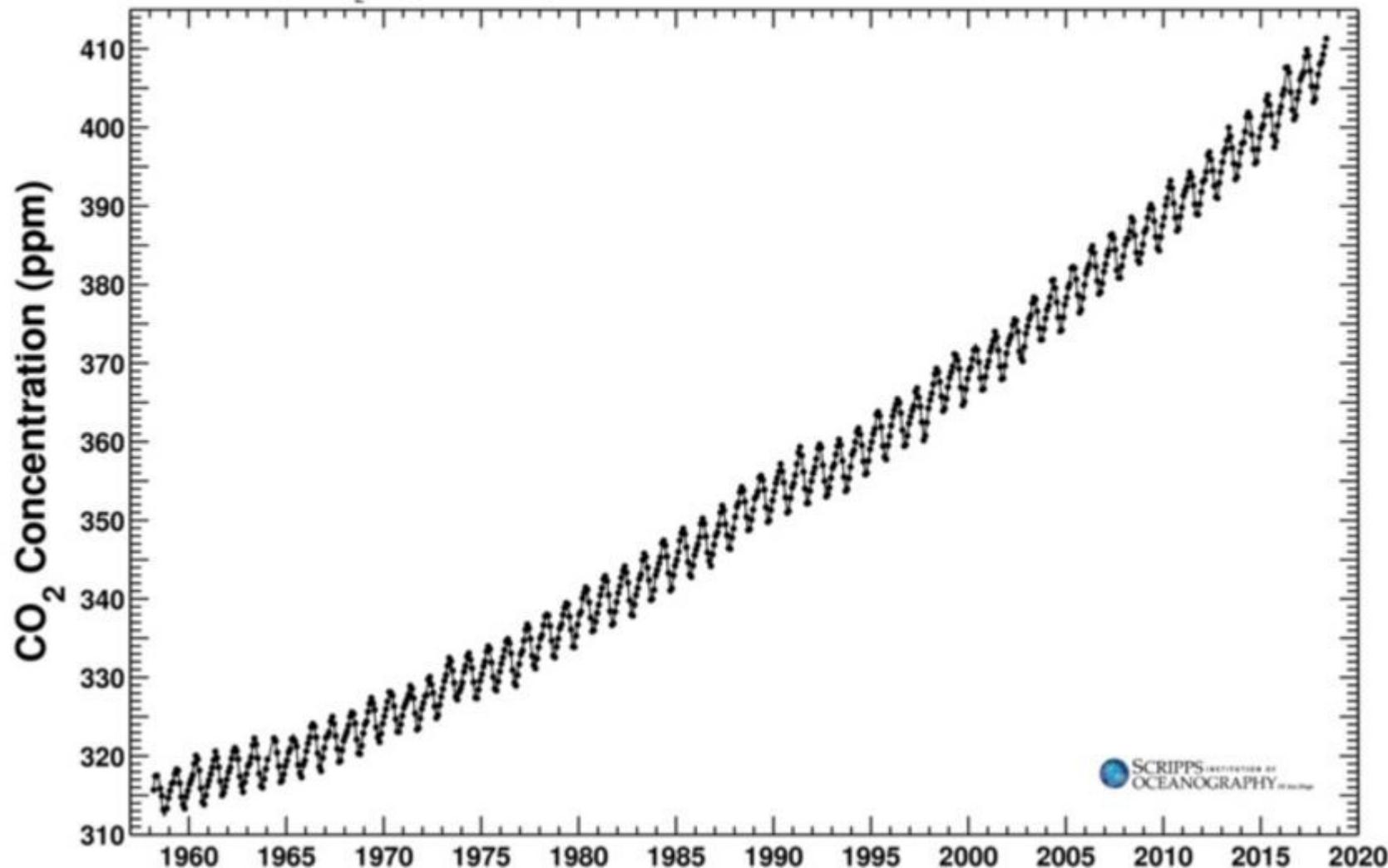


Cumulative CO₂ emissions



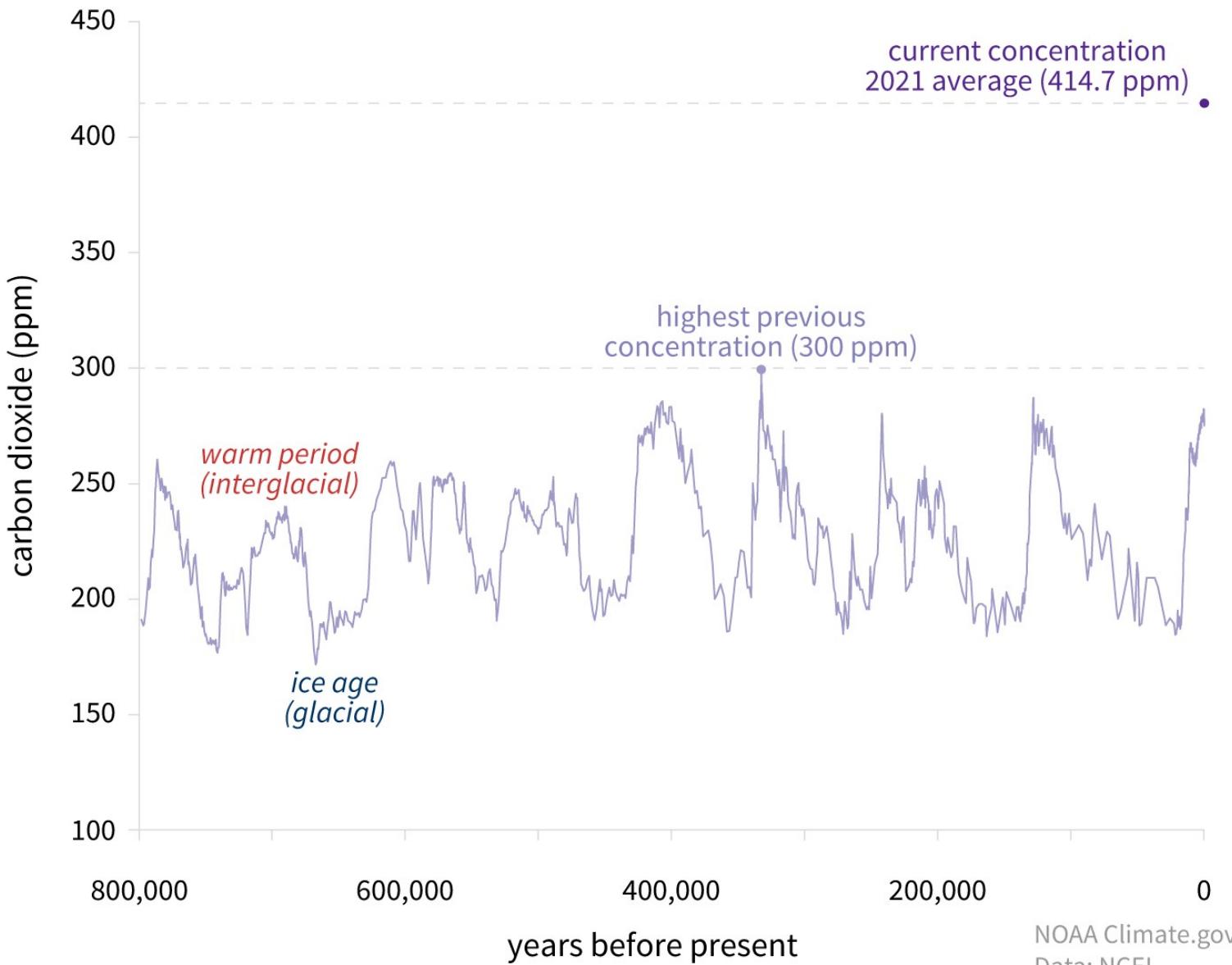
Monthly Average Carbon Dioxide Concentration

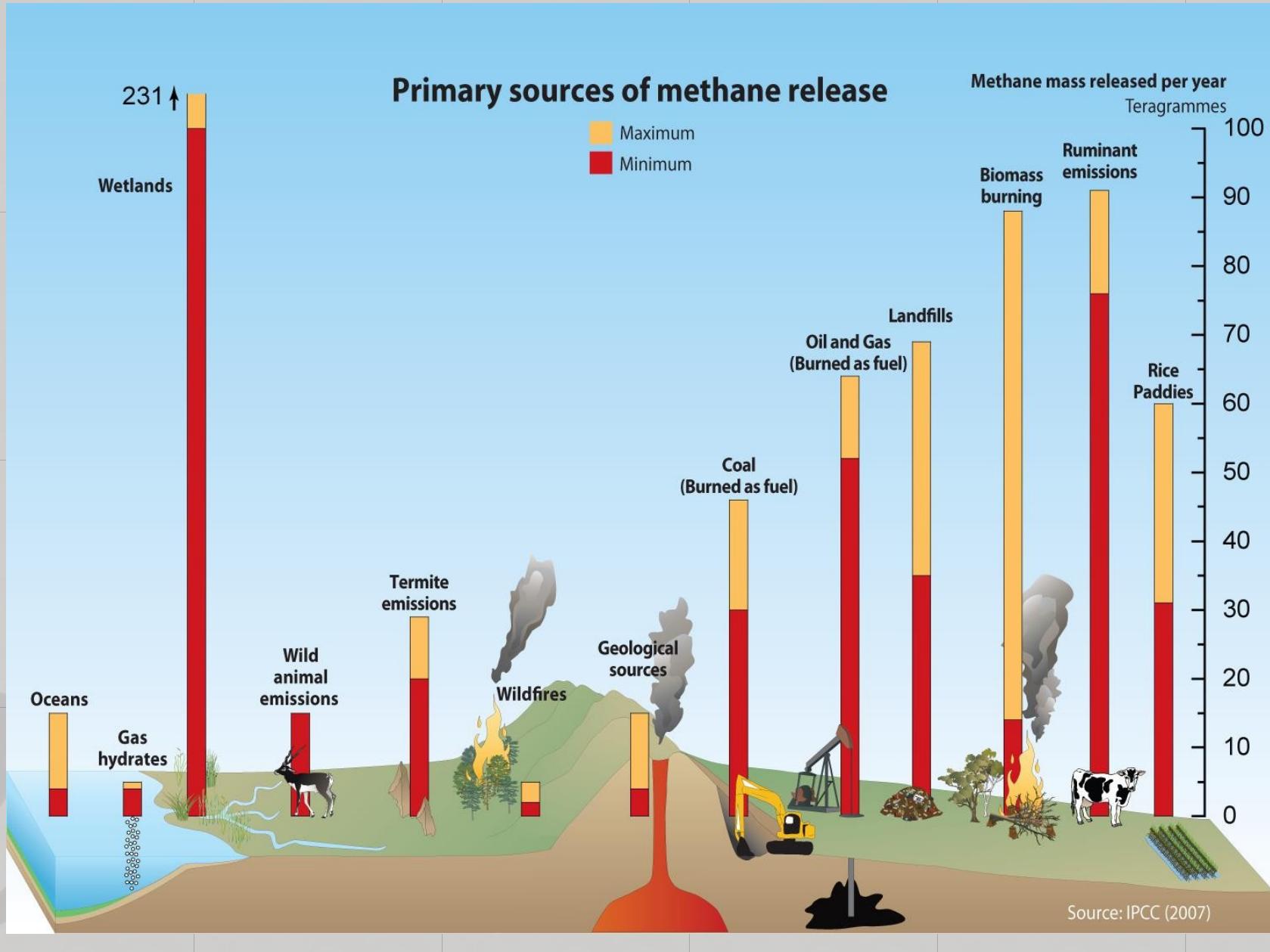
Data from Scripps CO₂ Program Last updated June 2018



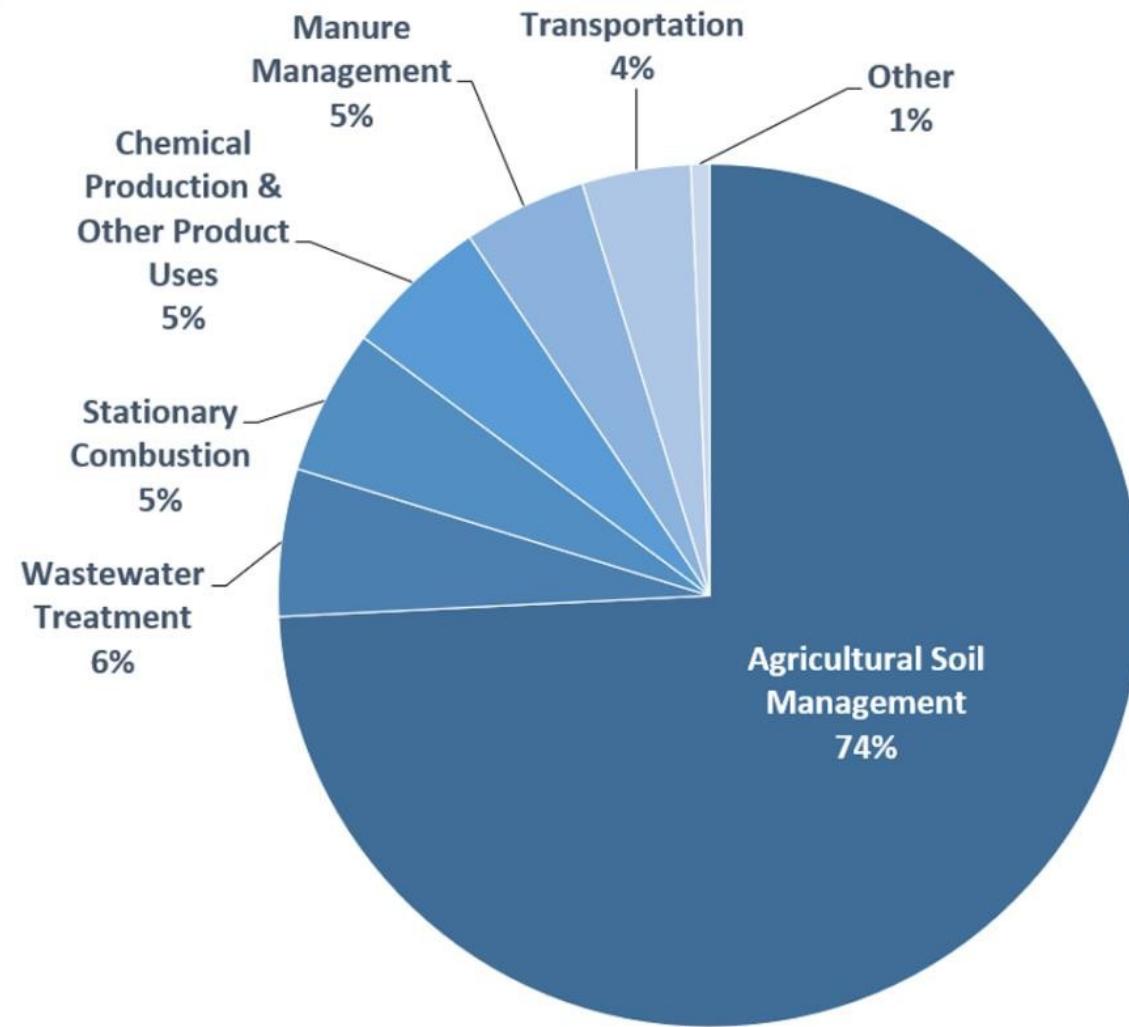
SCRIPPS INSTITUTION OF
OCEANOGRAPHY

CARBON DIOXIDE OVER 800,000 YEARS

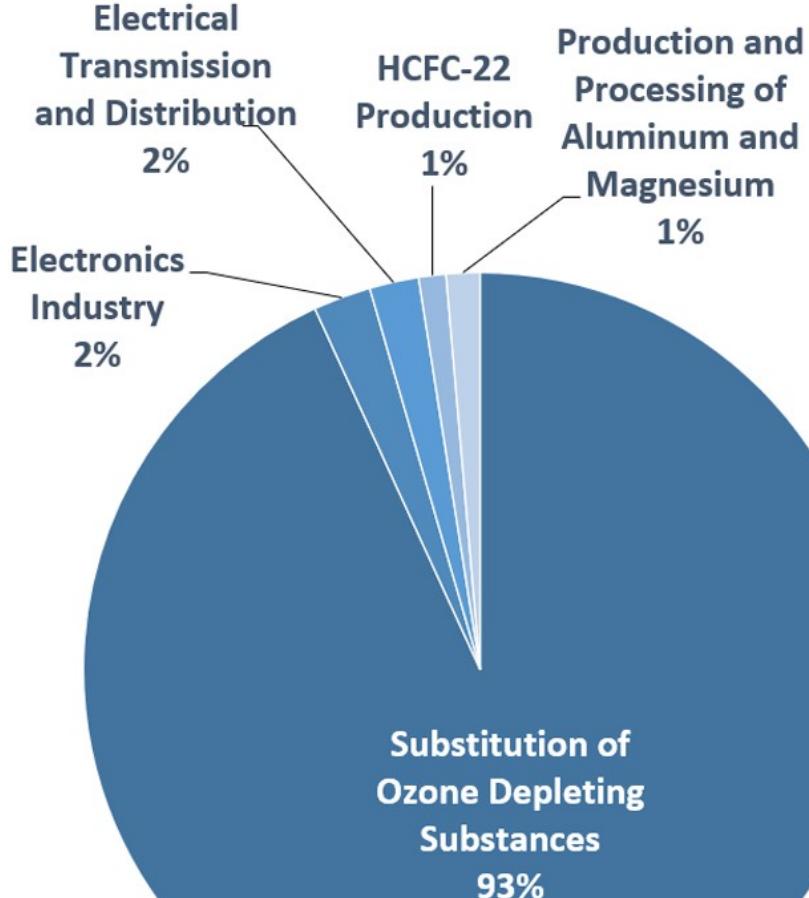




2020 U.S. Nitrous Oxide Emissions, By Source

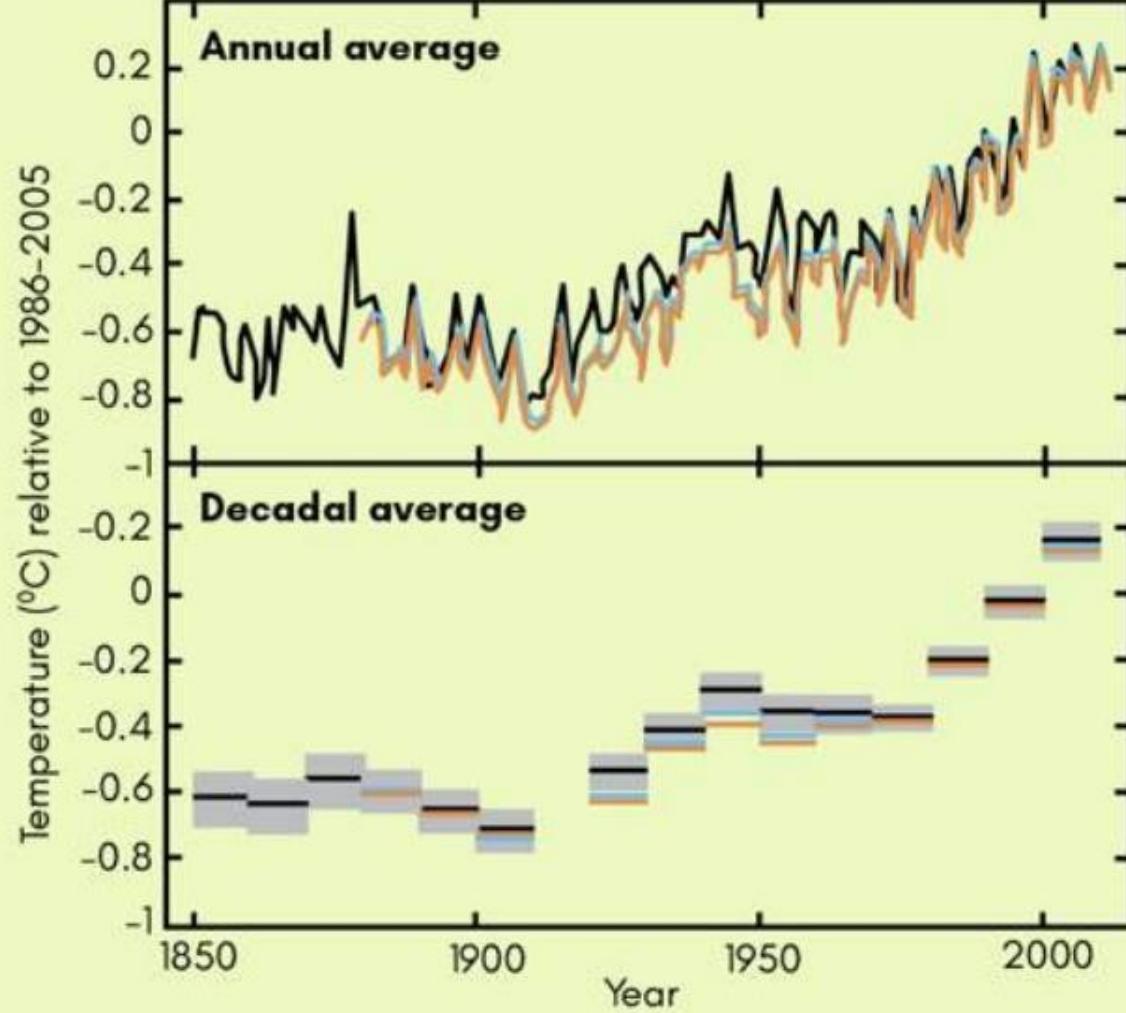


2020 U.S. Fluorinated Gas Emissions, By Source



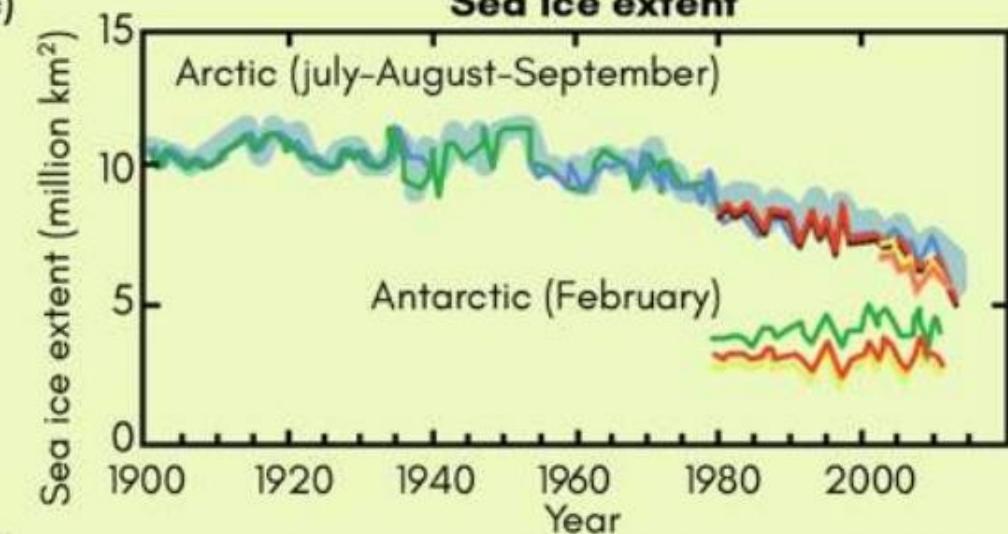
(a)

Observed globally averaged combined land and ocean surface temperature anomaly 1850-2012



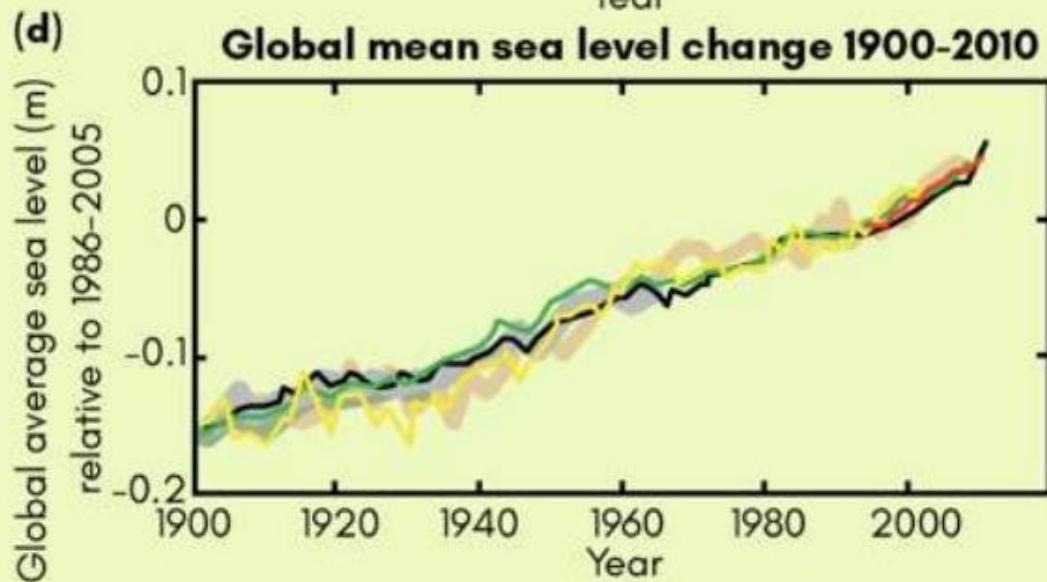
(c)

Sea ice extent

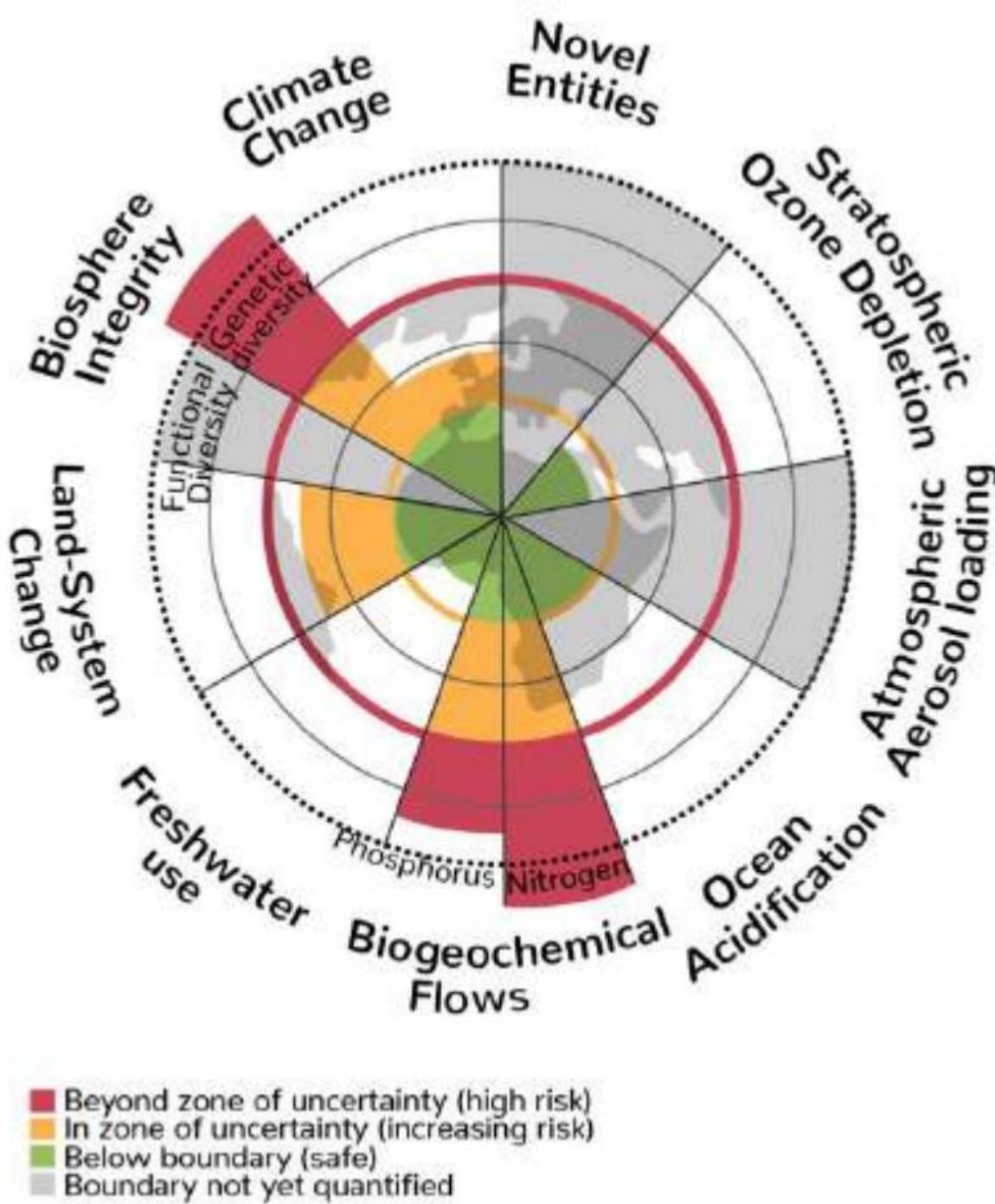


(d)

Global mean sea level change 1900-2010



<https://www.youtube.com/watch?v=jWoCXLuTIkI>



NOW

Warmer - fresher - acidified

CO₂

Dust
Storms

Light

Nutrient
supply

Carbonate solubility
Low oxygen mid-water

FUTURE

CO₂

Dust
Storms

Light

Nutrient
supply

Carbonate solubility

Low oxygen mid-water



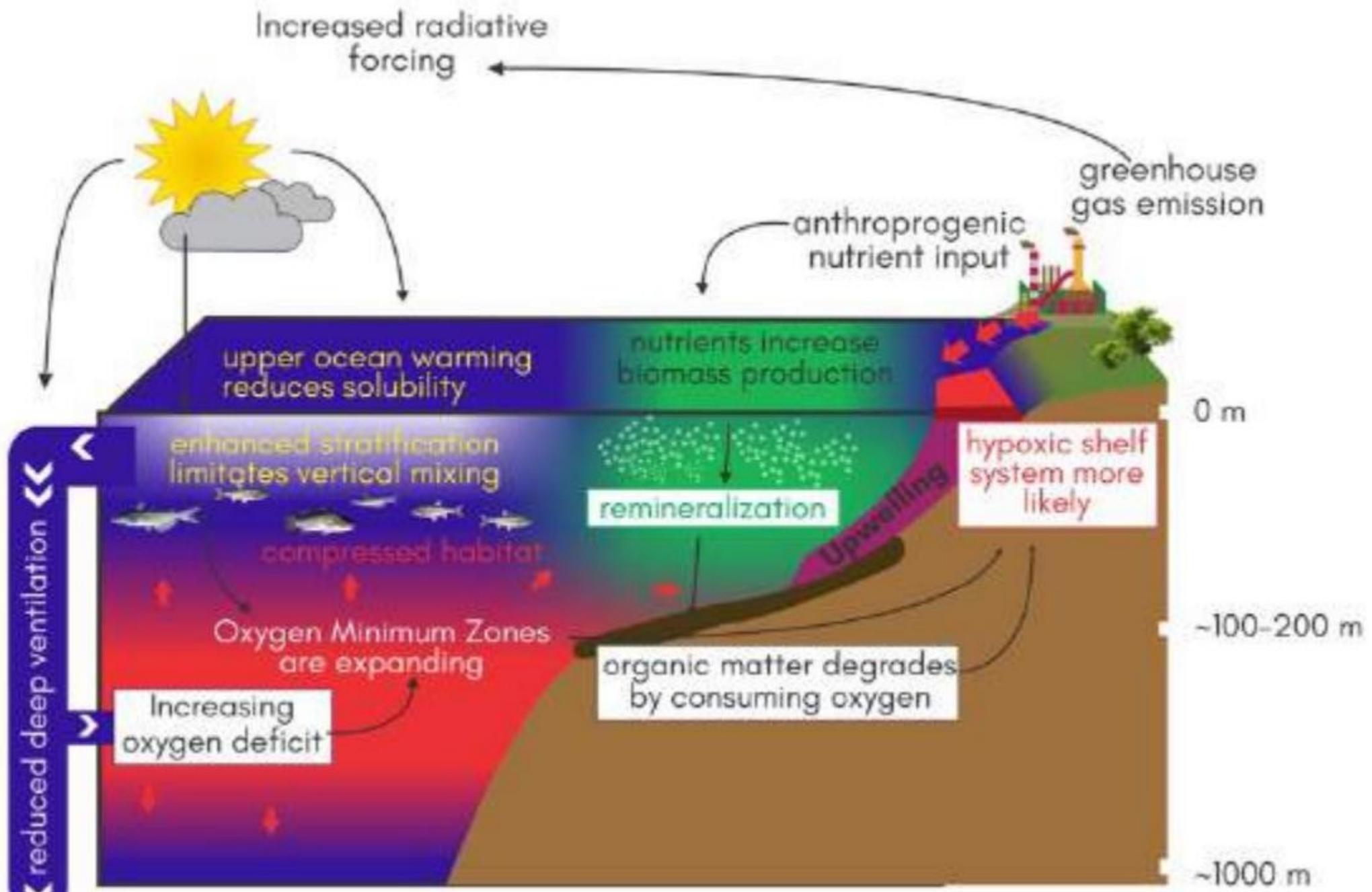
Impacts of Ocean Acidification

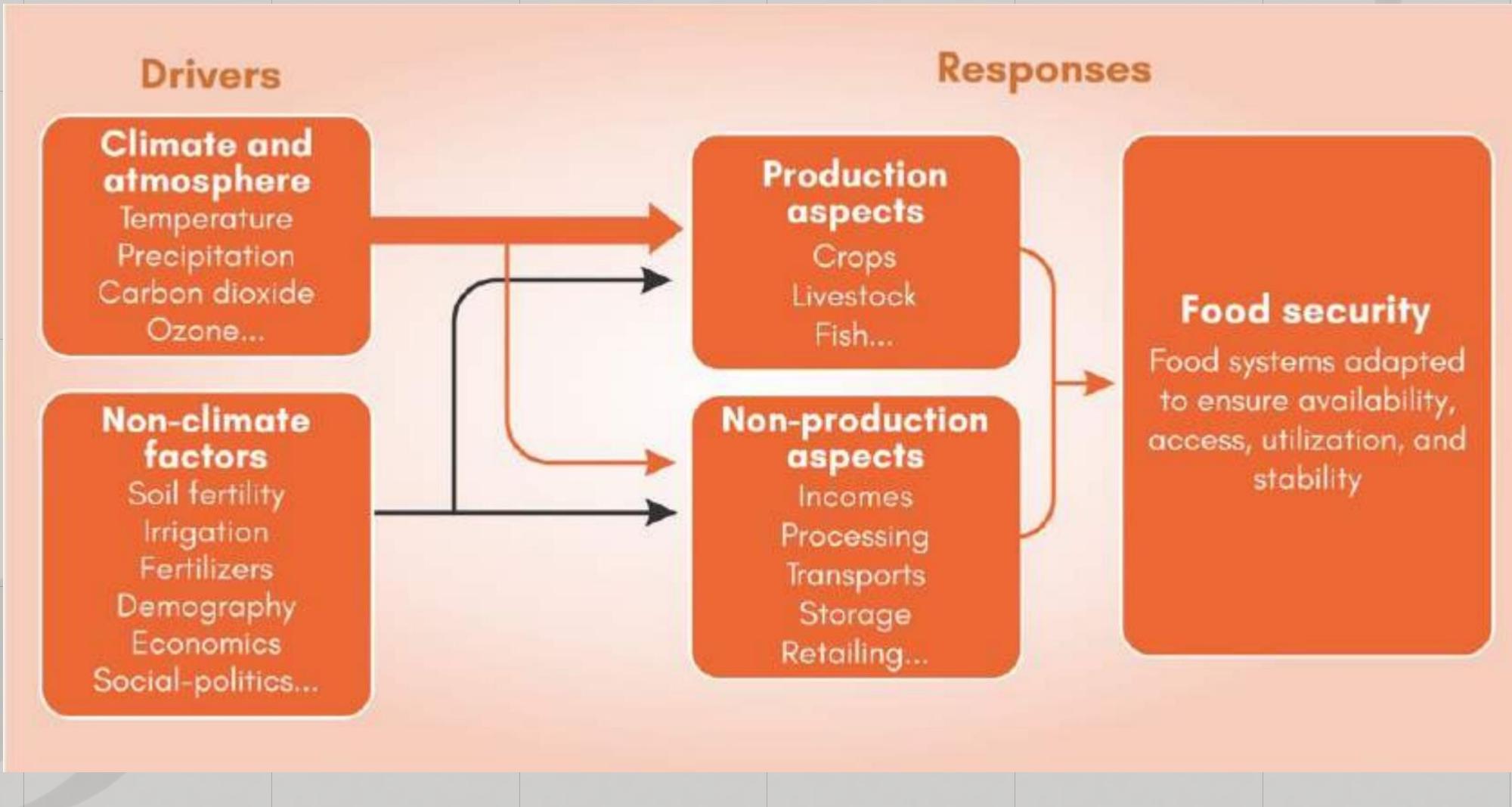
IMPACT ON OCEAN ECOSYSTEM	IMPACTS ON SHELL BUILDER SPECIES	IMPACTS ON FISH & SEAWEEDS
<ul style="list-style-type: none">◆ Ecosystem services such as Coastal protection, food production and income	<ul style="list-style-type: none">◆ Ex- Corals, Oysters, Mussels◆ Fewer carbonate ions available to build and maintain their shells,	<ul style="list-style-type: none">◆ Changes in species growth & reproduction◆ Geographical distribution of species affected

OCEAN ACIDIFICATION

How will changes in ocean chemistry affect marine life?







HOW ARE GENDER, CLIMATE CHANGE AND SECURITY LINKED?

Gender norms and power dynamics impact women and men's exposure to physical hazards and capacity to cope with risks, through differentiated:

- Access, use and control of natural resources
- Control of economic assets
- Physical mobility & migration
- Decision-making power
- Household or community expectations

Climate change hazards.

- Droughts
- Sea level rise
- Extreme weather events
- Warmer temperatures



Insecurity at multiple levels

- Household
- Community
- State
- Inter-state and cross border



...can expose women and men to new risks or exacerbate existing challenges.

...can undermine women and men's ability to adapt, prevent, or recover from climate-related risks.

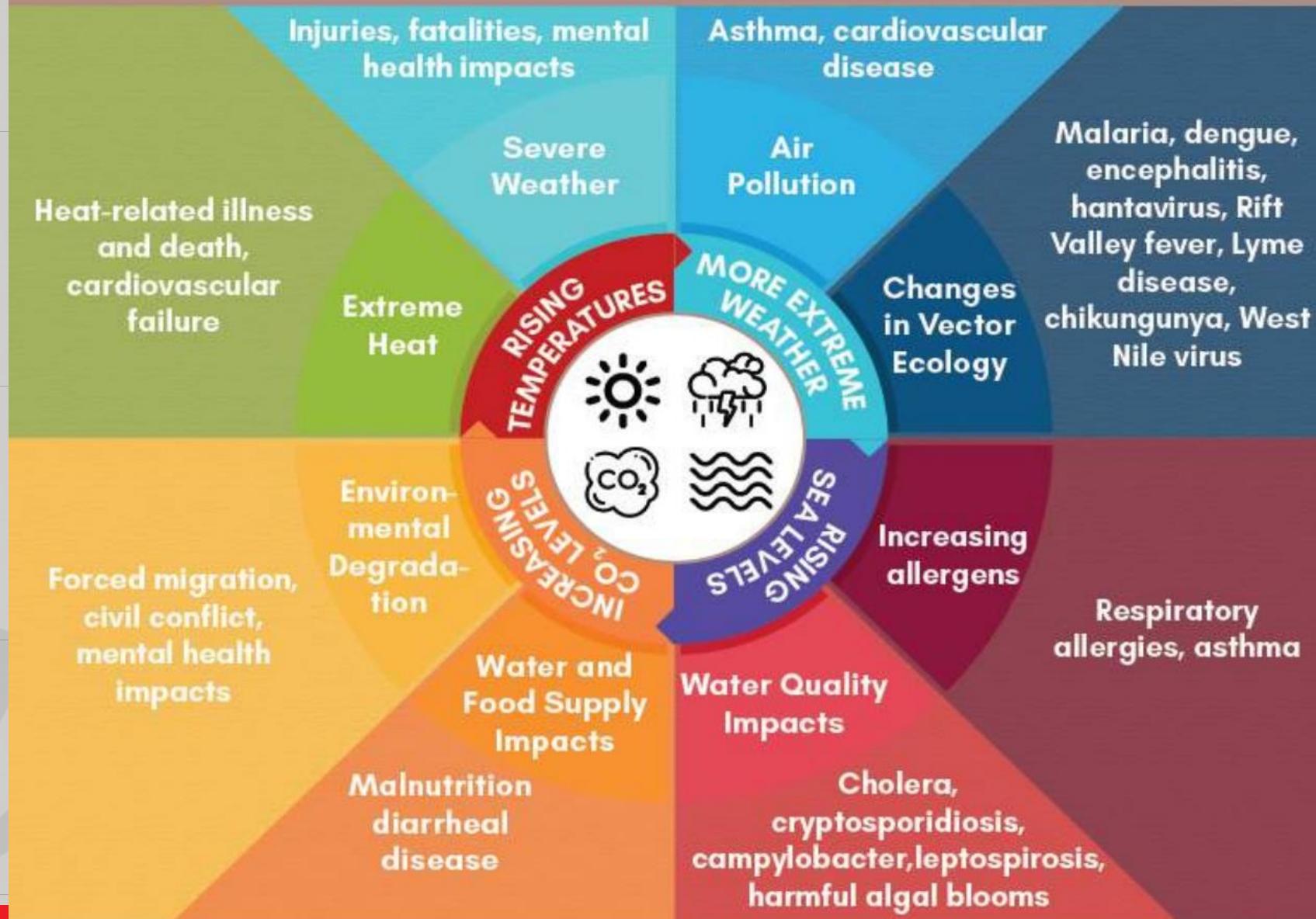
For example

- Water scarcity can expose women to increased risk of gender-based violence.
- Faltering livelihoods can contribute to men's decisions to join armed groups.
- Drought can shift pastoralist migration patterns causing families to split, increasing household burdens for women and exposing men to insecure routes.

For example

- Denying women resources limits households' capacity to cope with economic stress caused by agricultural shocks.
- Conflict or violence can limit access to resources necessary to cope with environmental stress and exacerbate gender inequalities.
- Weak or limited governance can reinforce exclusionary decision-making on land use planning and natural resource management.

IMPACT OF CLIMATE CHANGE ON HUMAN HEALTH



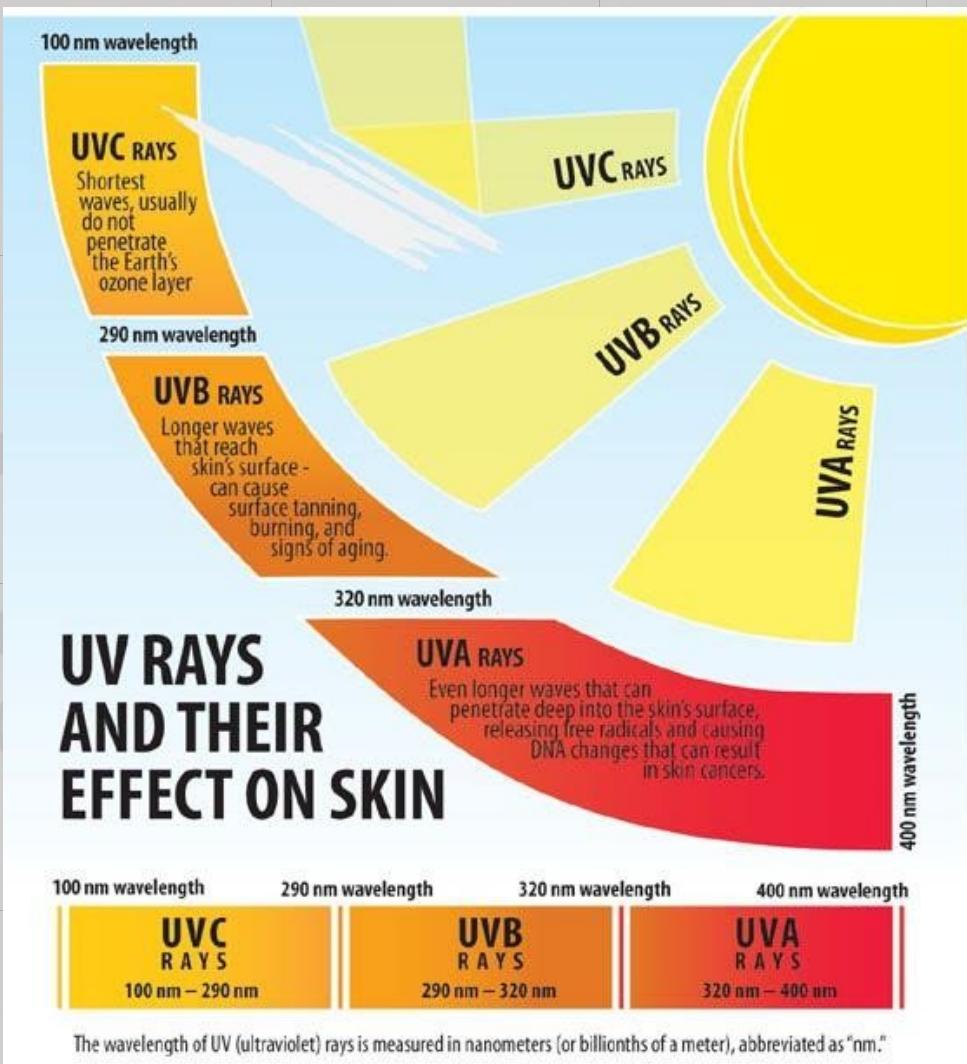
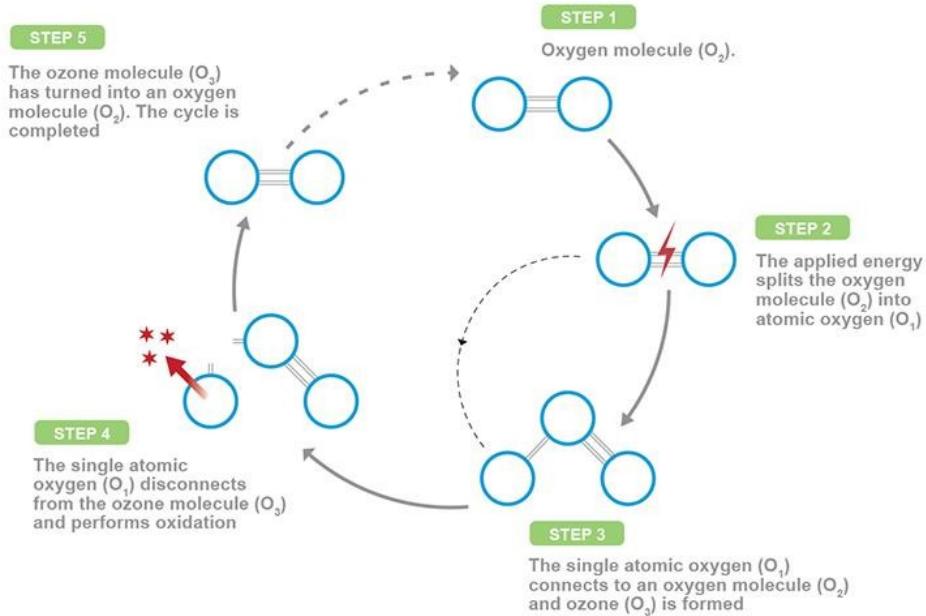
Temperature Rise	<ul style="list-style-type: none"> • India's average temperature has risen by around 0.7°C during 1901–2018 • By the end of the twenty-first century, relative to the recent past (1976–2005 average) it is projected- <ul style="list-style-type: none"> ◦ Average temperatures to rise by approximately 4.4°C. ◦ frequency of summer (April–June) heat waves over India is projected to be 3 to 4 times higher ◦ Amplification of heat stress is expected across India, particularly over the Indo-Gangetic and Indus river basins. • Causes: The surface air temperature changes over India are attributed mostly by greenhouse gases and partially offset by other anthropogenic forcing including aerosols and LULC change.
Sea-level rise in the North Indian Ocean (NIO)	<ul style="list-style-type: none"> • While, the major contribution to global mean sea-level rise is from glacier melt, thermal expansion (thermosteric) has dominated sea-level rise in the NIO. The NIO rose at a rate of 3.3 mm year during 1993–2017 against a rate of 1.06–1.75 mm per year during 1874–2004. The water along India's coasts is expected to rise by 20-30 cm by 2100. • SST of the tropical Indian Ocean has risen by 1°C on average during 1951–2015, markedly higher than the global average SST warming of 0.7°C. • Causes: Sea-level rise of the NIO during the recent 3–4 decades are closely linked to the weakening trend of summer monsoon winds and the associated slowdown of heat transport out of the NIO.

Change in Rainfall pattern	<ul style="list-style-type: none"> Summer monsoon rainfall (June to September) over India which contribute to more than 75% of the annual rainfall has declined by 6% between 1951-2015 especially in the densely populated Indo-Gangetic plains and the Western Ghats. The frequency of localized heavy rain occurrences has significantly increased by 75% during 1950–2015. Monsoon onset dates are likely to be early or not to change much, and the monsoon retreat dates are likely to be delayed, resulting in lengthening of the monsoon season. Causes: Global-scale anthropogenic forcing such as GHGs as well as regional-scale forcing such as aerosols and LULC changes i.e. increasing urbanisation.
Floods	<ul style="list-style-type: none"> Flooding events over India have also increased since 1950, in part due to enhanced occurrence of localized, short-duration intense rainfall events. Flooding occurrences due to intense rainfall are projected to increase in the future. Higher rates of glacier and snowmelt in a warming world would enhance stream flow and compound flood risk over the Himalayan river basins. The Indus, Ganga and Brahmaputra basins are considered particularly at risk of enhanced flooding in the future in the absence of additional adaptation and risk mitigation measures.
Droughts	<ul style="list-style-type: none"> The area affected by drought has increased by 1.3% per decade over the last 6–7 decades. Climate model projections indicate a high likelihood of increase in the frequency (>2 events per decade), intensity and area under drought conditions in India by the end of the twenty-first century. Causes: increased variability of monsoon precipitation and increased water vapour demand in a warmer atmosphere that tend to decrease soil moisture content.

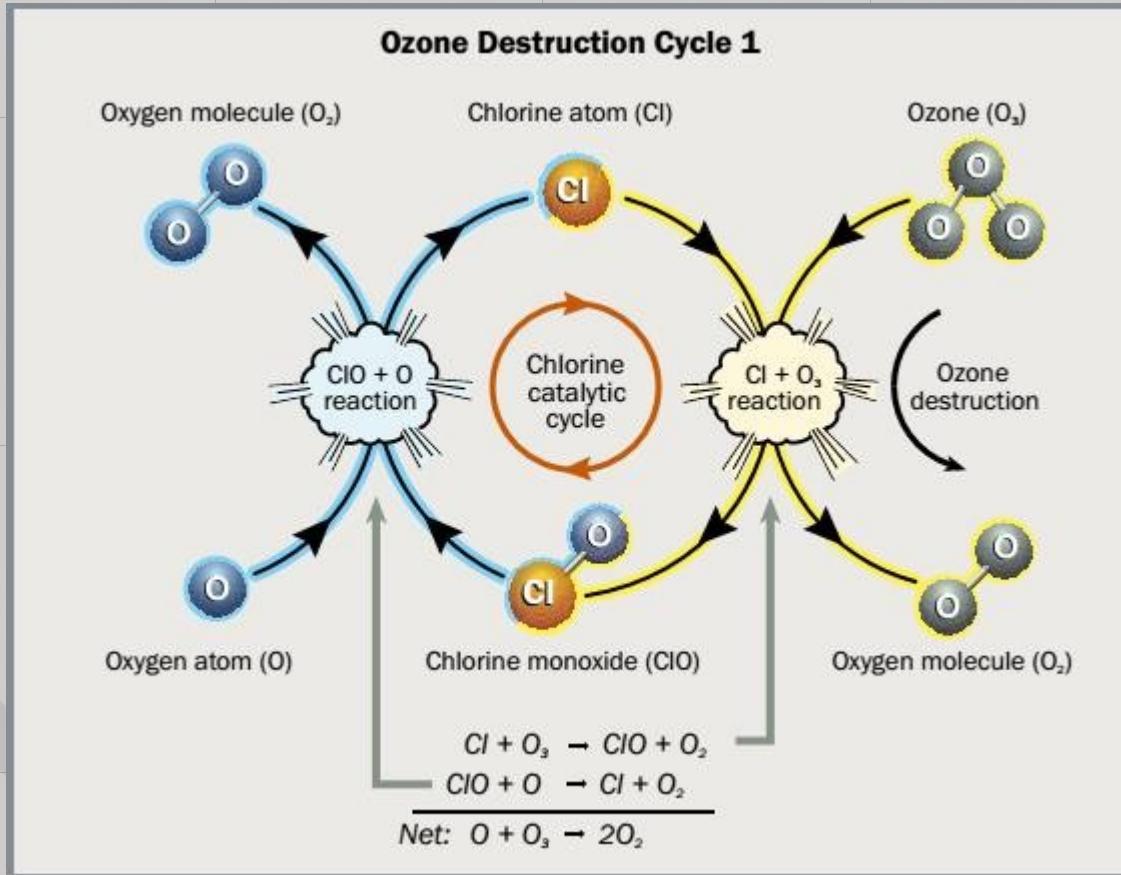
Tropical Cyclonic Storms	<ul style="list-style-type: none"> The intensity of tropical cyclones (TC) is closely linked to ocean SST and heat content. There has been a significant reduction in the annual frequency of tropical cyclones over the NIO basin since the middle of the twentieth century (1951–2018). In contrast, the frequency of very severe cyclonic storms (VSCSs) during the post-monsoon season has increased significantly (+1 event per decade) during the last two decades (2000–2018). Climate models project a rise in the intensity of tropical cyclones in the NIO basin during the twenty-first century.
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Himalayan Cryosphere	<ul style="list-style-type: none"> The Hindu Kush Himalayas (HKH) (largest area of permanent ice cover outside the North and South Poles, also known as the ‘Third Pole’) underwent rapid warming at a rate of about 0.2°C per decade during the last 6–7 decades. Higher elevations of the Tibetan Plateau (> 4 km) experienced even stronger warming in a phenomenon alluded to as Elevation Dependent Warming. With continued global warming, the temperature in the HKH is projected to rise by about 5.2°C during the twenty-first century. The HKH experienced a significant decline in snowfall and glacial area in the last 4–5 decades. With continuing warming, climate models project a continuing decline in snowfall over the HKH during the 21st century. The Kathmandu-based International Centre for Integrated Mountain Development’s (ICIMOD) “Hindu Kush Himalaya Assessment” reveals that more than one-third of the glaciers in the region could retreat by 2100, even if the global temperature rise is capped at 1.5°C.
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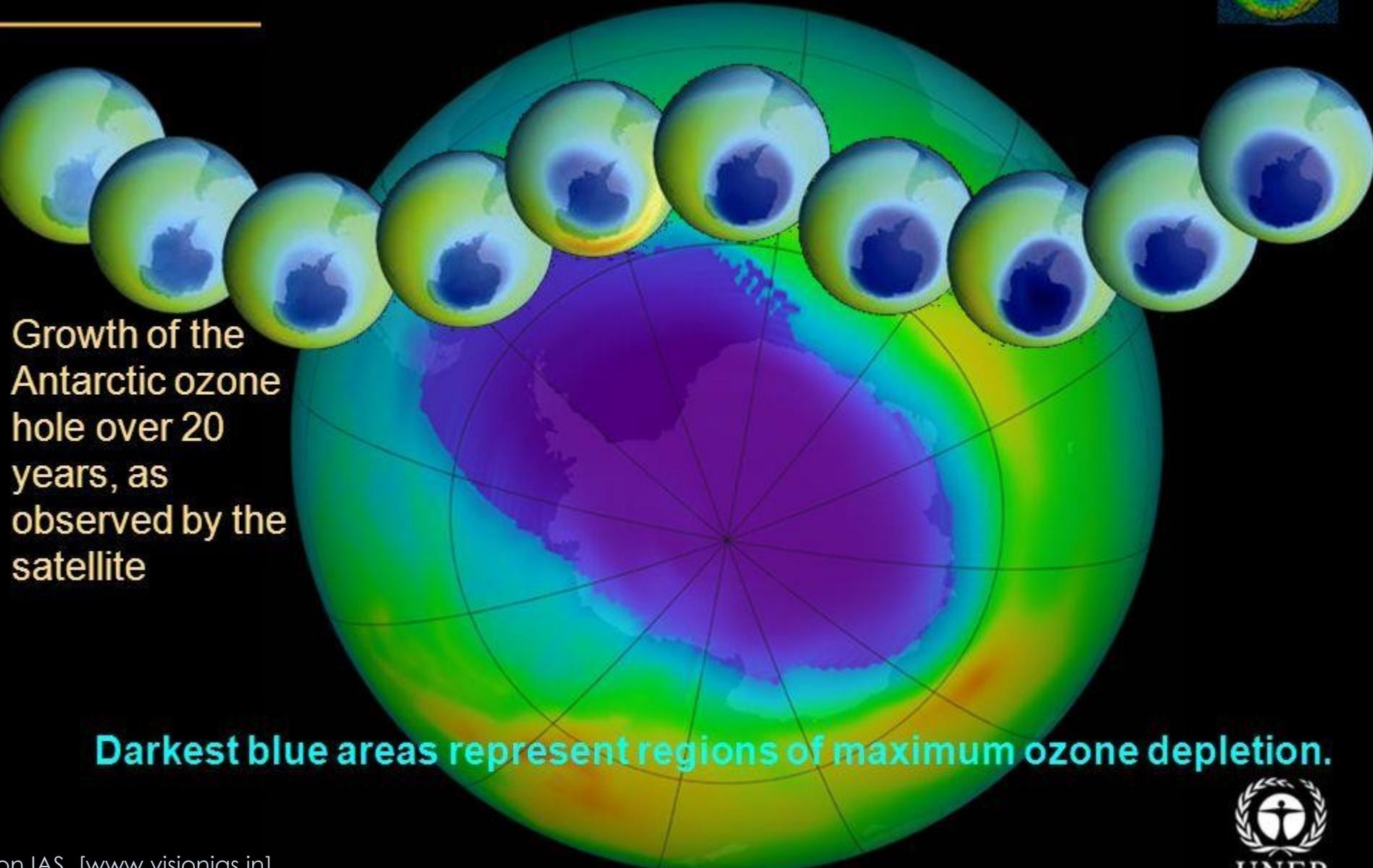
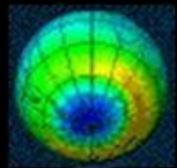
The Oxygen - Ozone - Oxygen cycle

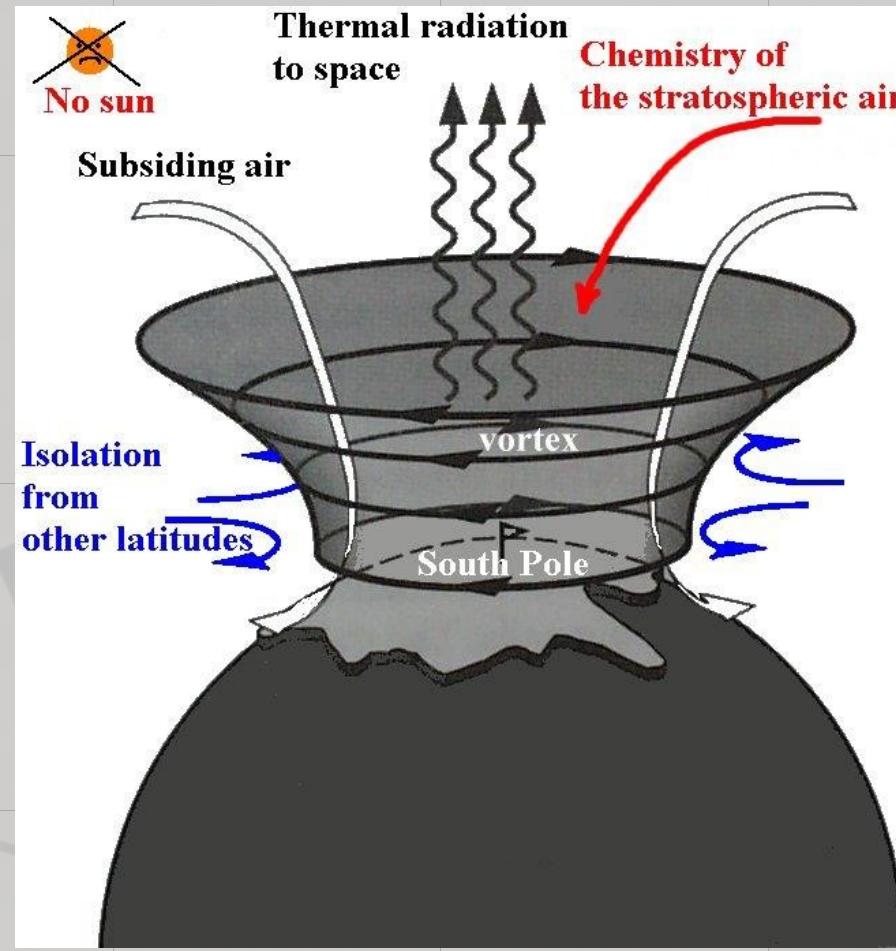


Ozone depleting agent	Compound	Uses
Chlorine (Cl)	CFC, Carbon tetra chloride, Methyl chloroform	Refrigerant, propellants of aerosol spray, plastic foam manufacturing, fire extinguishers, Dry clean agent,
Bromine (Br)	HBFC, Methyl Bromide	Fire extinguisher, pesticides
Nitric Oxide (NO)	Nitrous Oxide	Industrial and agriculture uses



Lecture 5a: Formation of Ozone Hole





Effects of Ozone depletion	
Humans	Damage to DNA, genetic mutation; Skin diseases; Cataract and damage to eyes; Reduced immunity
Plants and Ecosyste ms	Crop productivity, plant metabolism & development cycle; Reproductive capacities, changes in species composition; Biogeochemical cycles
Air quality	Chemical reactivity of gases increases Changes in the concentration of O ₃ , H ₂ O ₂ , OH Changes in lifetime of CH ₄ & other GHGs

<https://www.youtube.com/watch?v=aU6pxSNDPhs>

Questions??



- Online query (For faster reply)
- Read and revise what is taught
- Read the reference material
- Mentoring sessions

If Dil Maange beyond MORE...

Mail: rajesh@visionias.in
Twitter: [@naturiousoul](#)



ENVIRONMENT

Biodiversity and its conservation

What is Biodiversity?

Levels and measurements

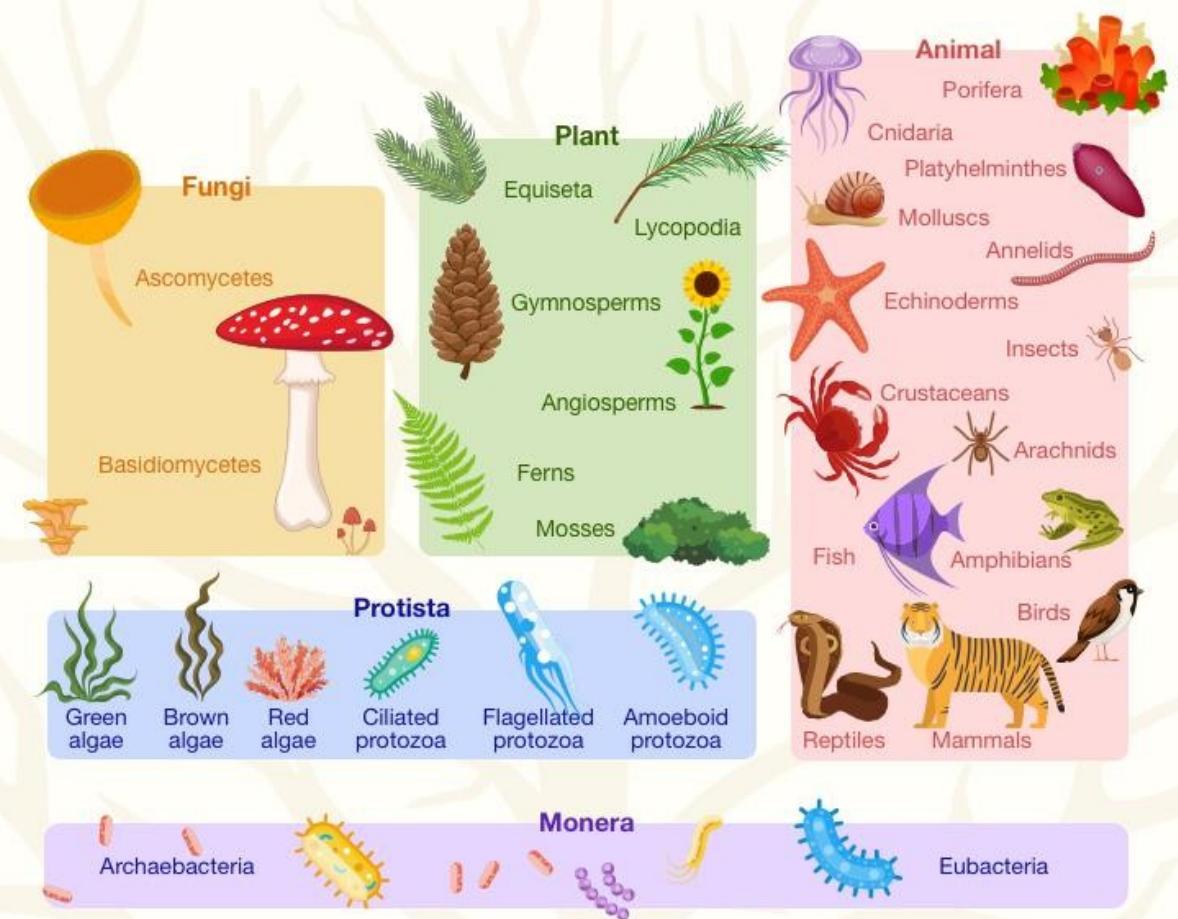
Distribution

Loss of Biodiversity

Conservation of Biodiversity

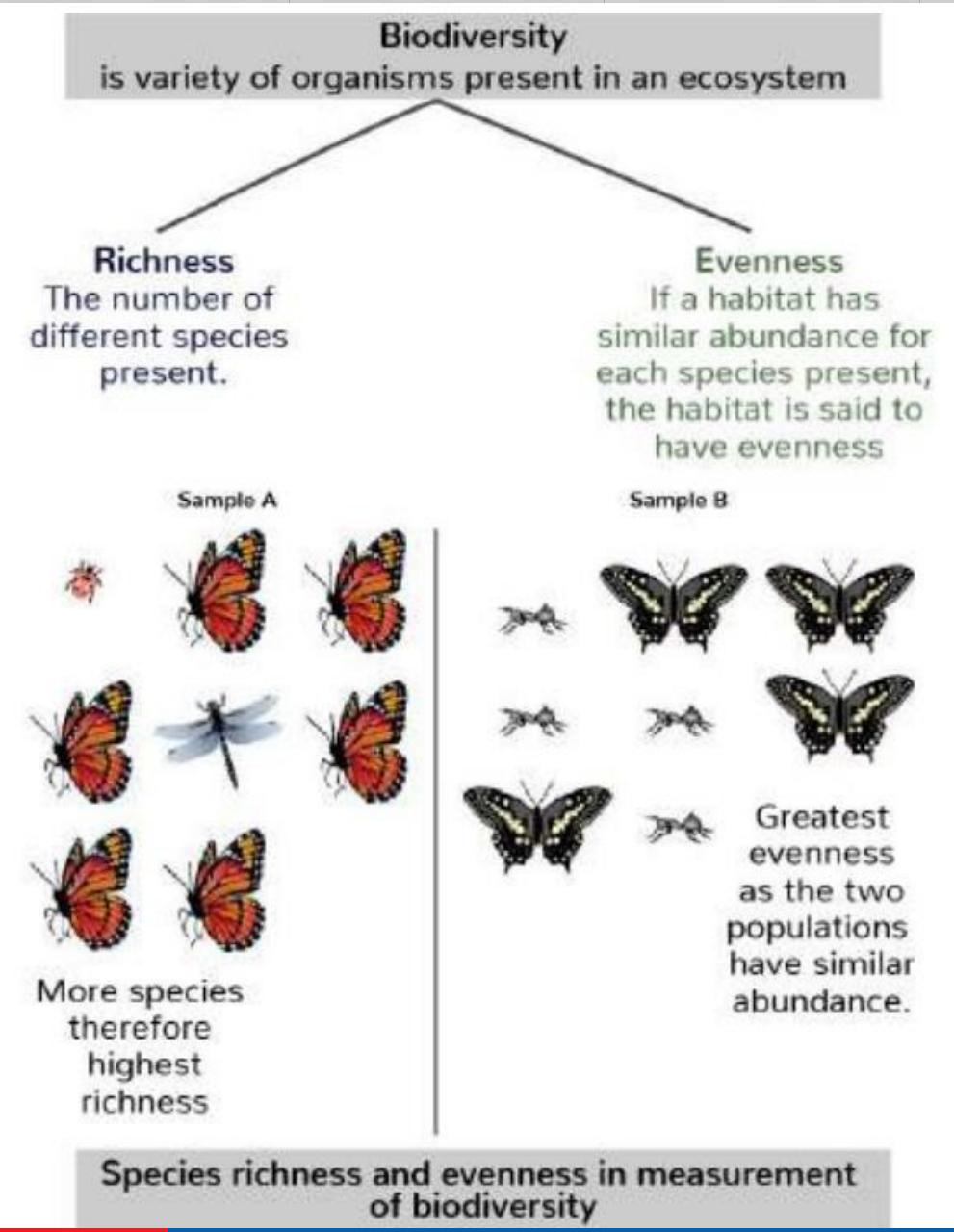
The kingdoms of living things

and their species at a glance



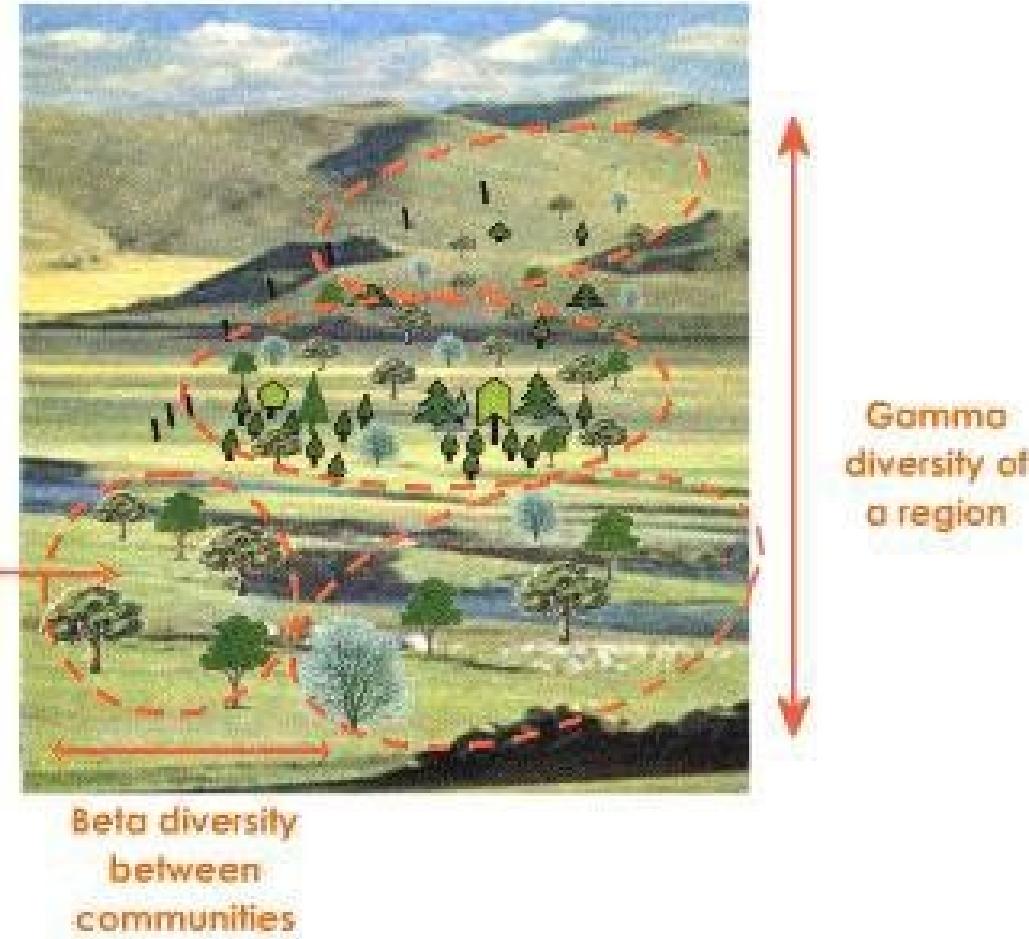
The 1992 United Nations Earth Summit in Rio de Janeiro defined biological diversity as "the variability among living organisms from all sources, including, 'inter alia', terrestrial, marine, and other aquatic ecosystems, and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems".

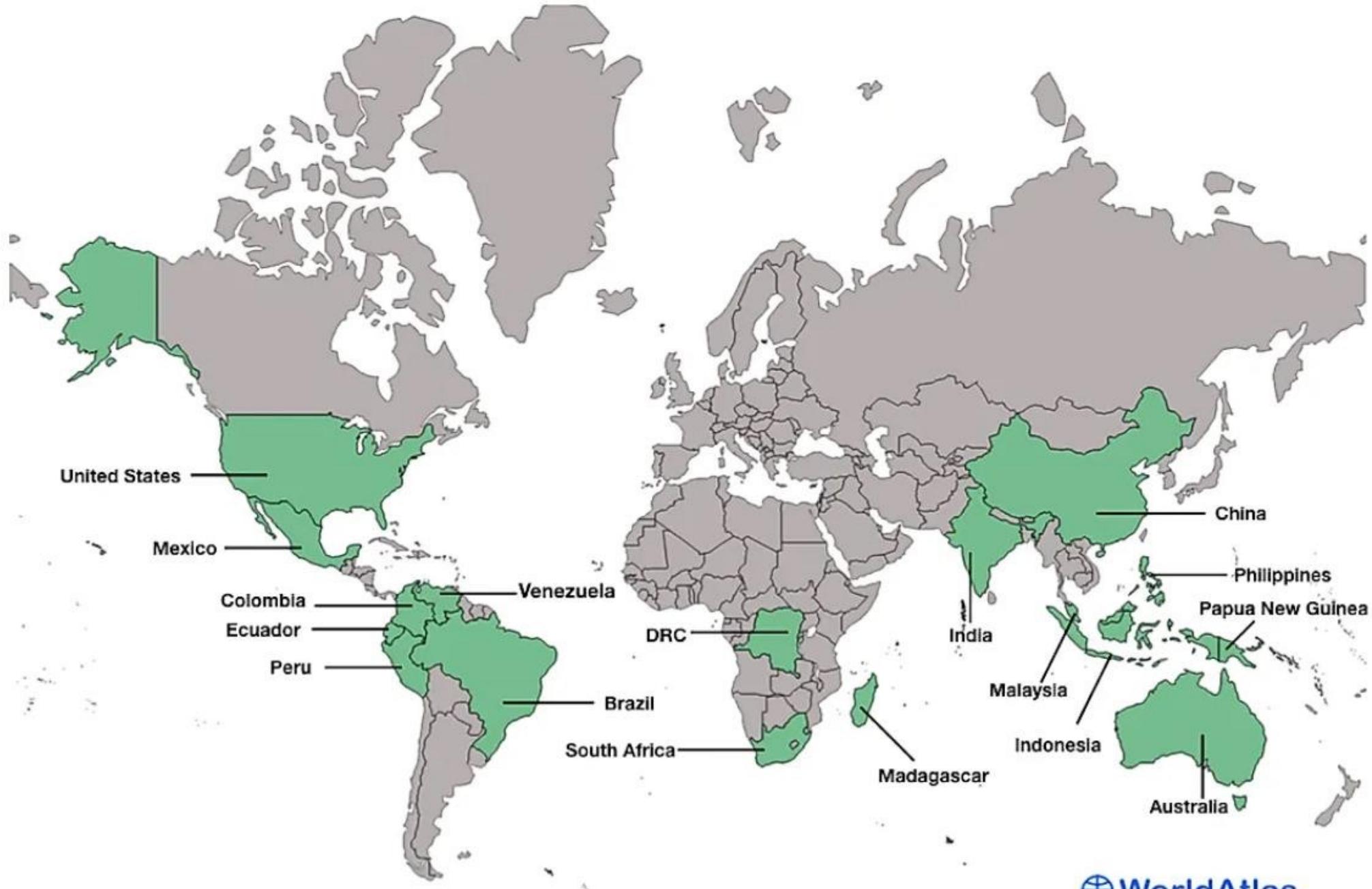


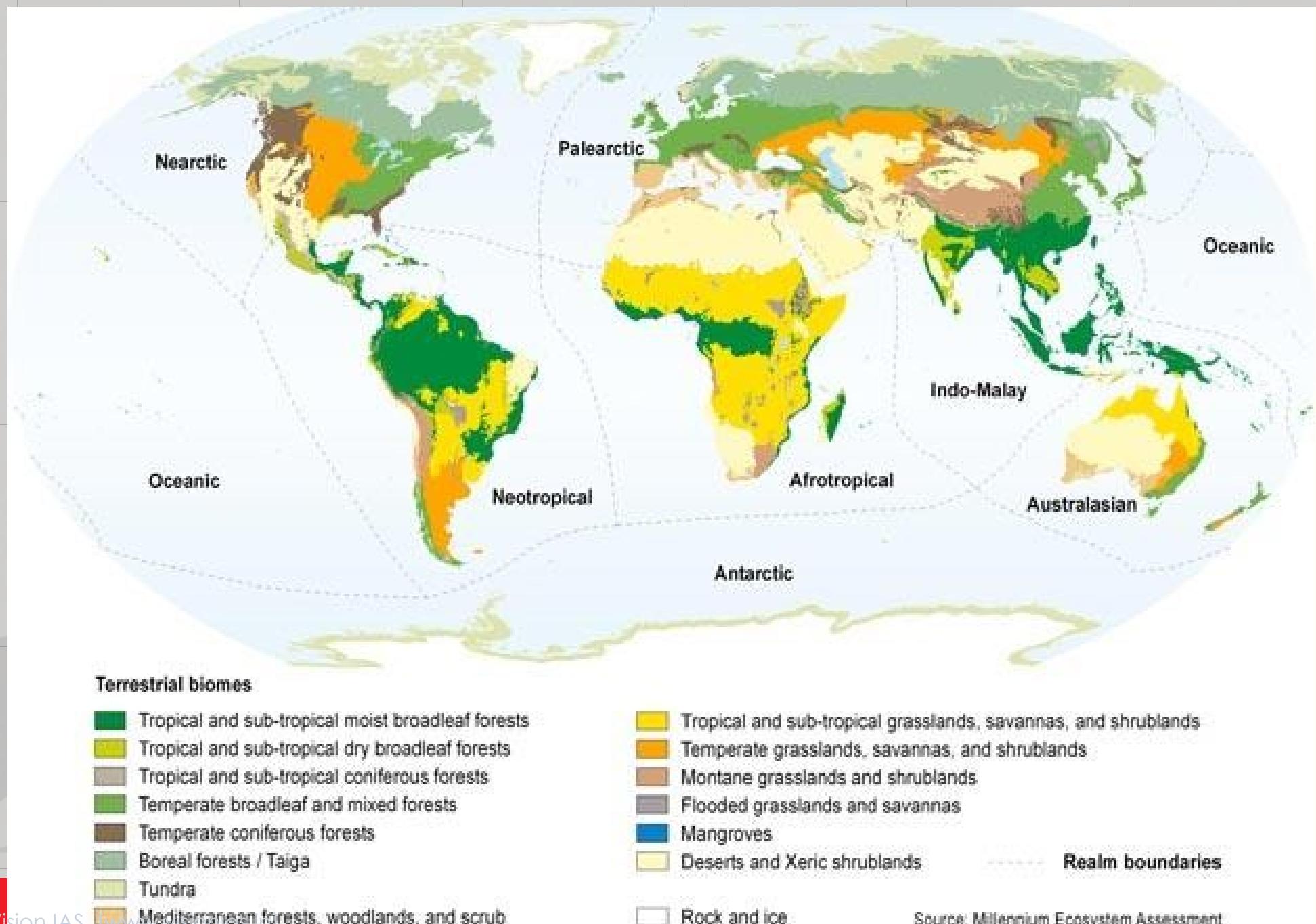


Species Richness can be divided into 3 types:

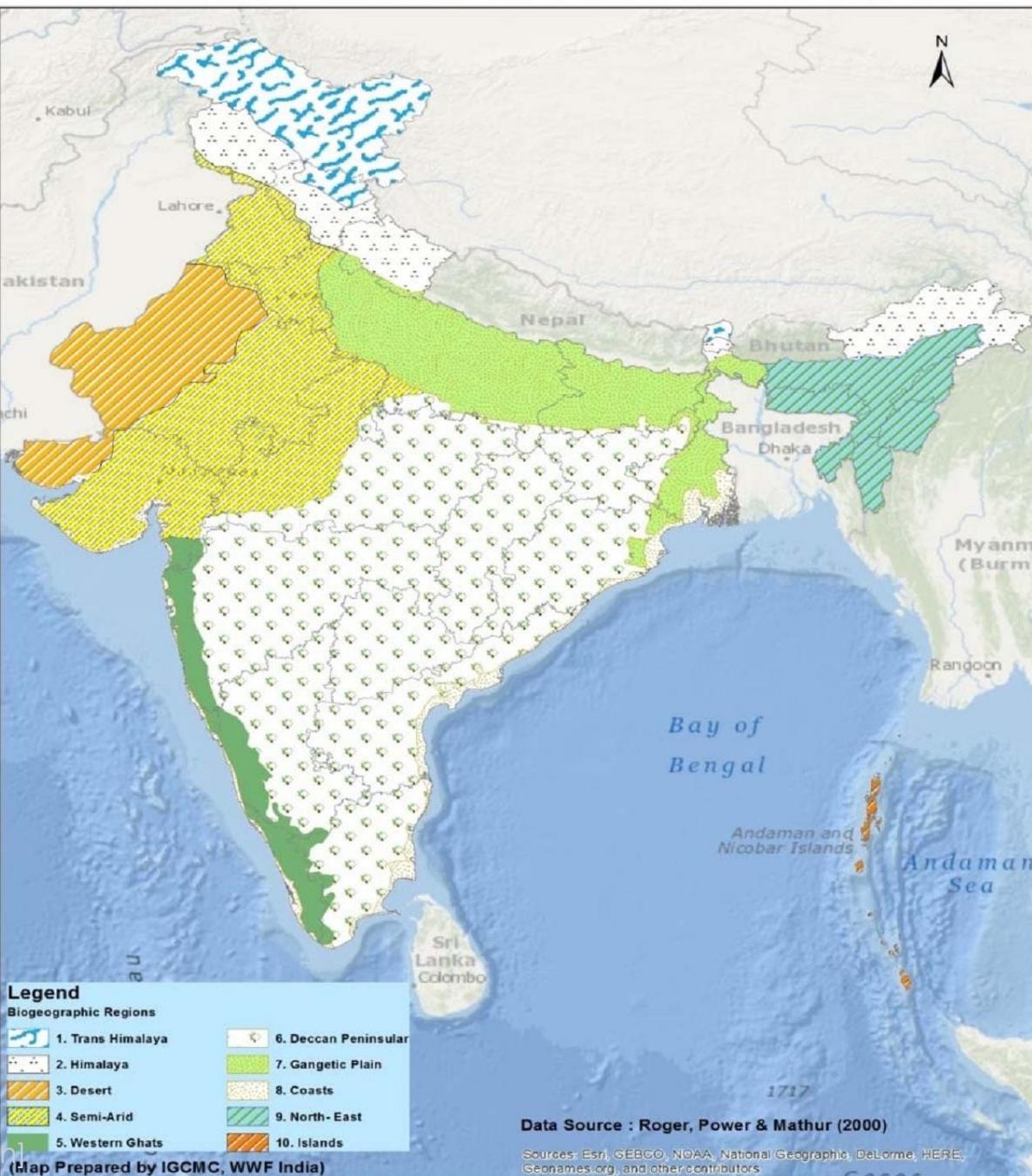
- a) **α -Diversity**- Alpha diversity refers to diversity within a particular area, community or ecosystem, and is measured by counting the number of taxa (usually species) within the ecosystem.
- b) **β -Diversity**- Beta diversity is species diversity between ecosystems; this involves comparing the number of taxa that are unique to each of the ecosystems.
- c) **γ -Diversity**- Gamma diversity is a measurement of the overall diversity for different ecosystems within a region.







BIOGEOGRAPHICAL REGIONS OF INDIA



TRANS HIMALAYAS



HIMALAYAS



© photo-travel.com.ua

DESERT



VISION
IAS

SEMI ARID ZONE



SEM
ARID
ZONE

THE WESTERN GHATS



VISION
IAS

THE DECCAN PLATEAU



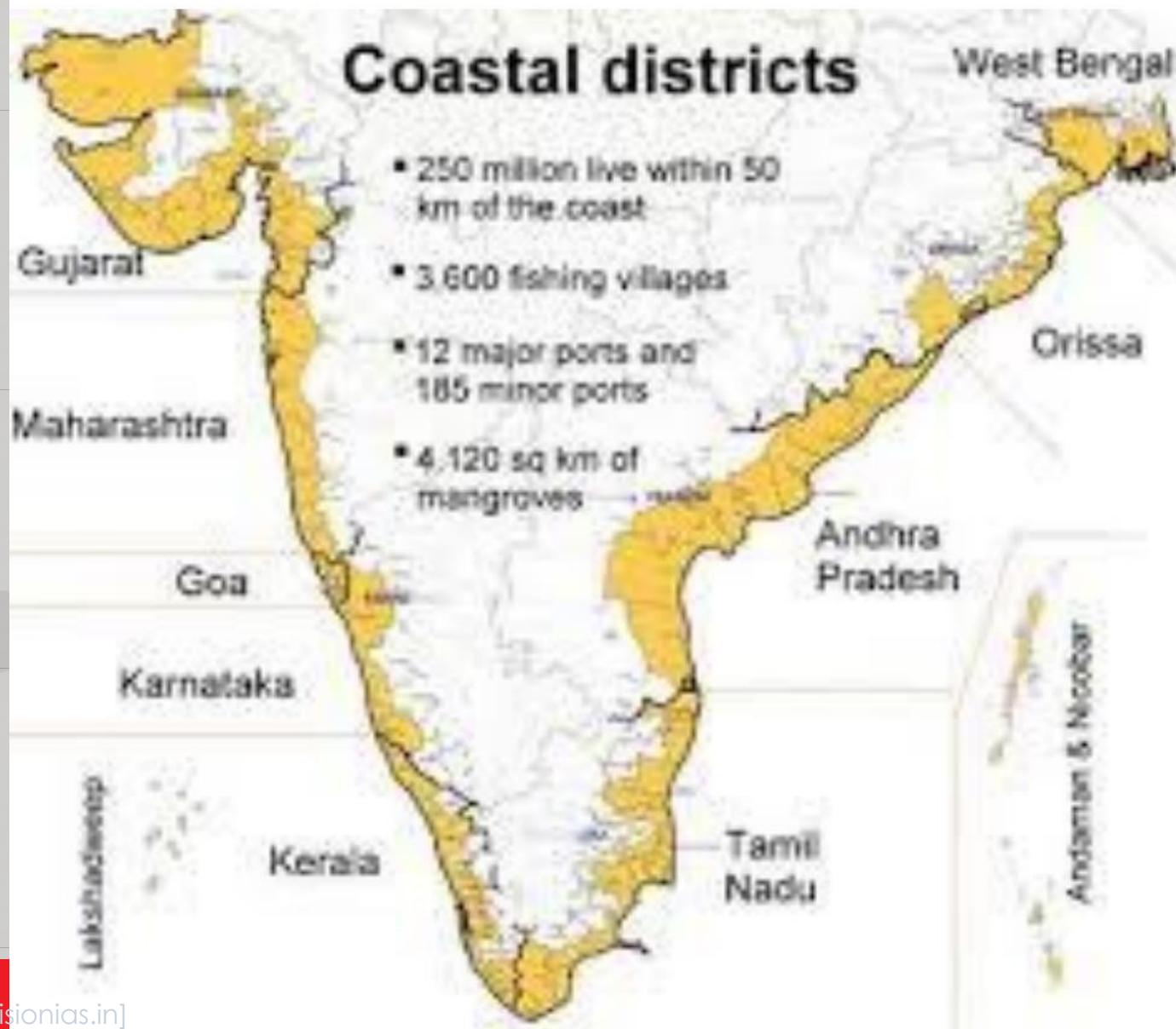
VISION
IAS

THE GANGETIC PLAINS



VISION
IAS

THE COASTS



THE NORTH EAST





Andaman Nicobar Island

Lakshadweep Islands



PRIMARY DRIVERS

HABITAT LOSS

Thinning, fragmenting, or outright destruction of an ecosystem's plant, soil hydrologic, and nutrient resources

INVASIVE SPECIES

Any nonnative species that significantly modifies or disrupts the ecosystems it colonizes

OVEREXPLOITATION

Process of harvesting too many aquatic or terrestrial animals, which depletes the stocks of some species while driving others to extinction

POLLUTION

Addition of any substance or any form of energy to the environment at a rate faster than it can be rendered harmless

CLIMATE CHANGE ASSOCIATED WITH GLOBAL WARMING

Modification of Earth's climate associated with rising levels of greenhouse gases in the atmosphere over the past one to two centuries

INFLUENCERS

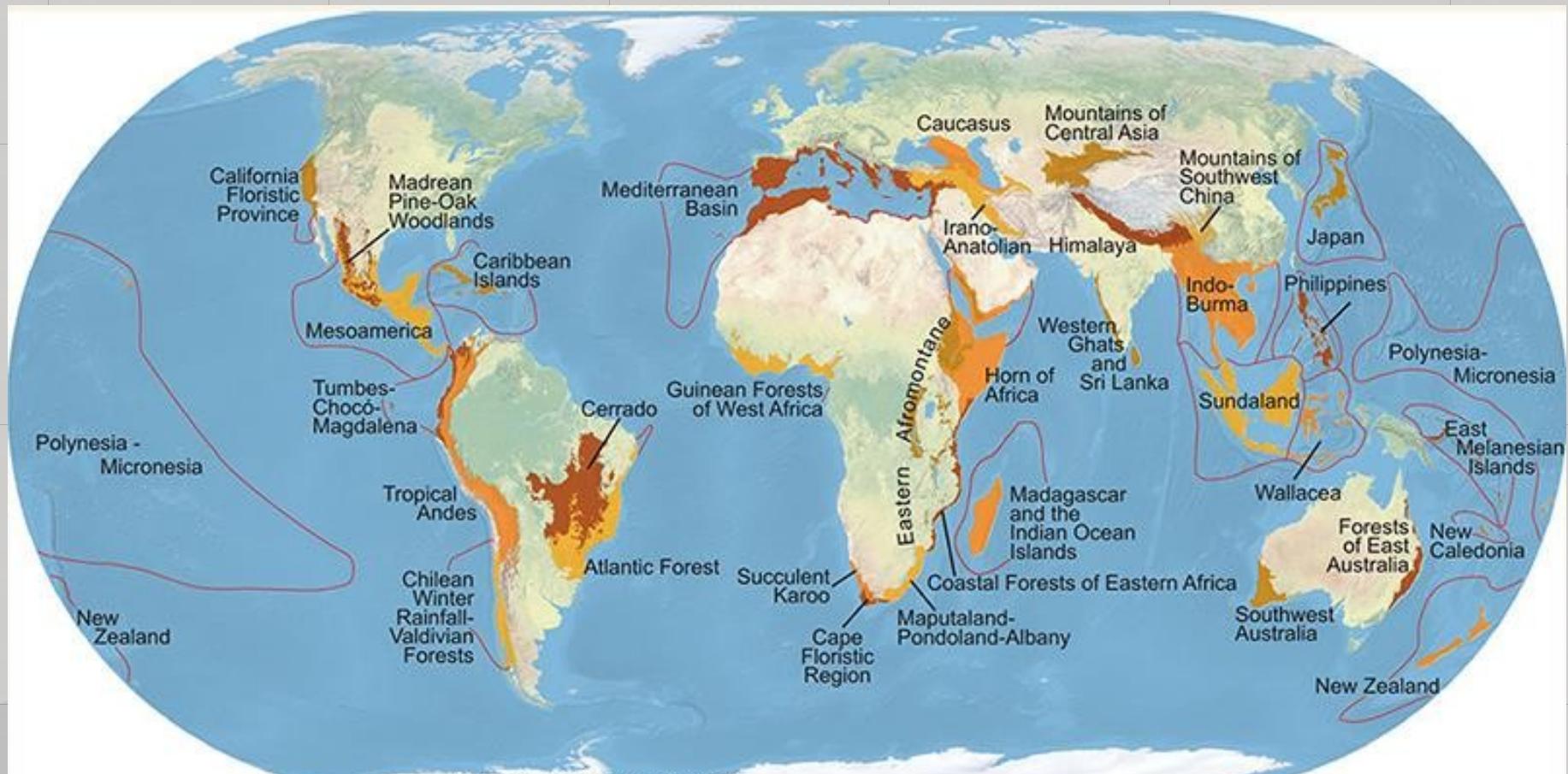
- Human population growth
- Increasing consumption
- Reduced resource efficiency

BIODIVERSITY LOSS

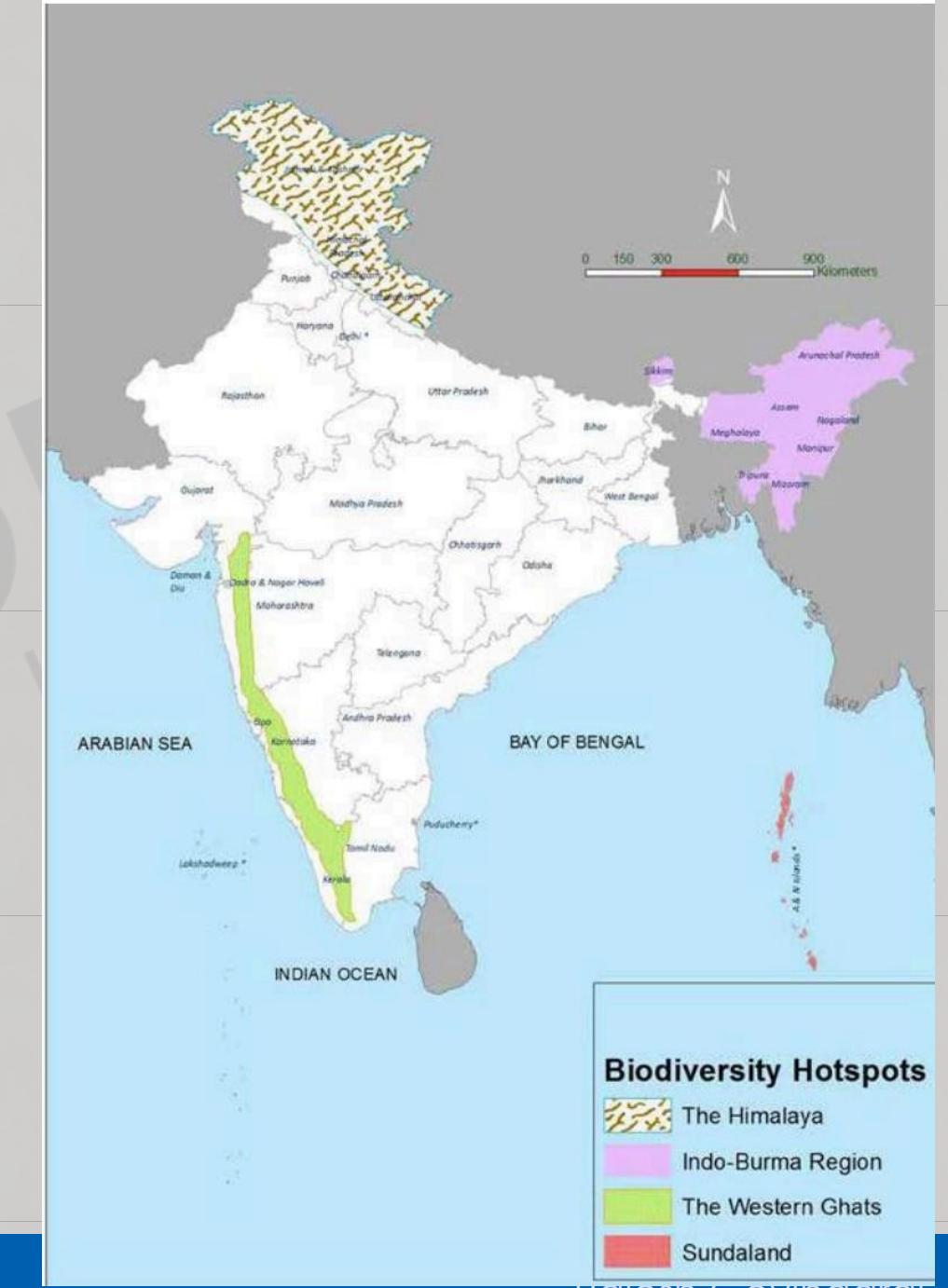
Reduction in the number of genes, individual organisms, species, and ecosystems in a given area



https://www.youtube.com/watch?v=H2qCL_YKBEU

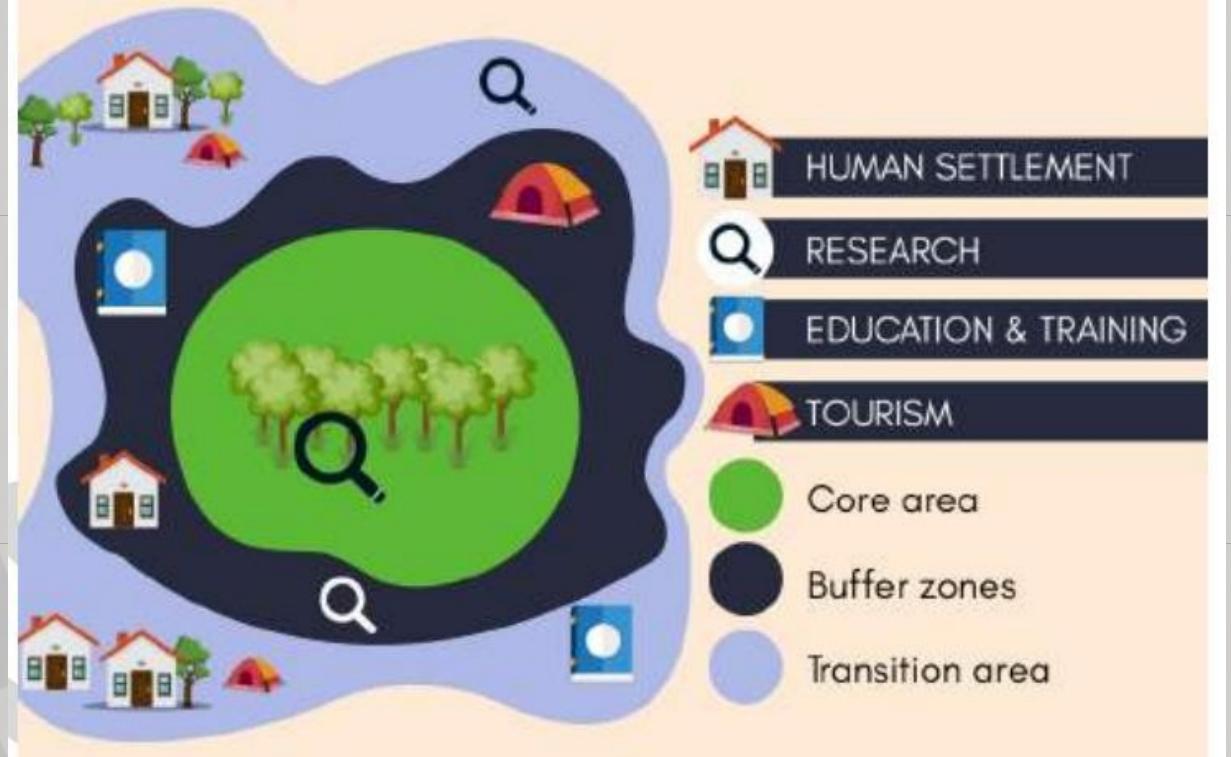


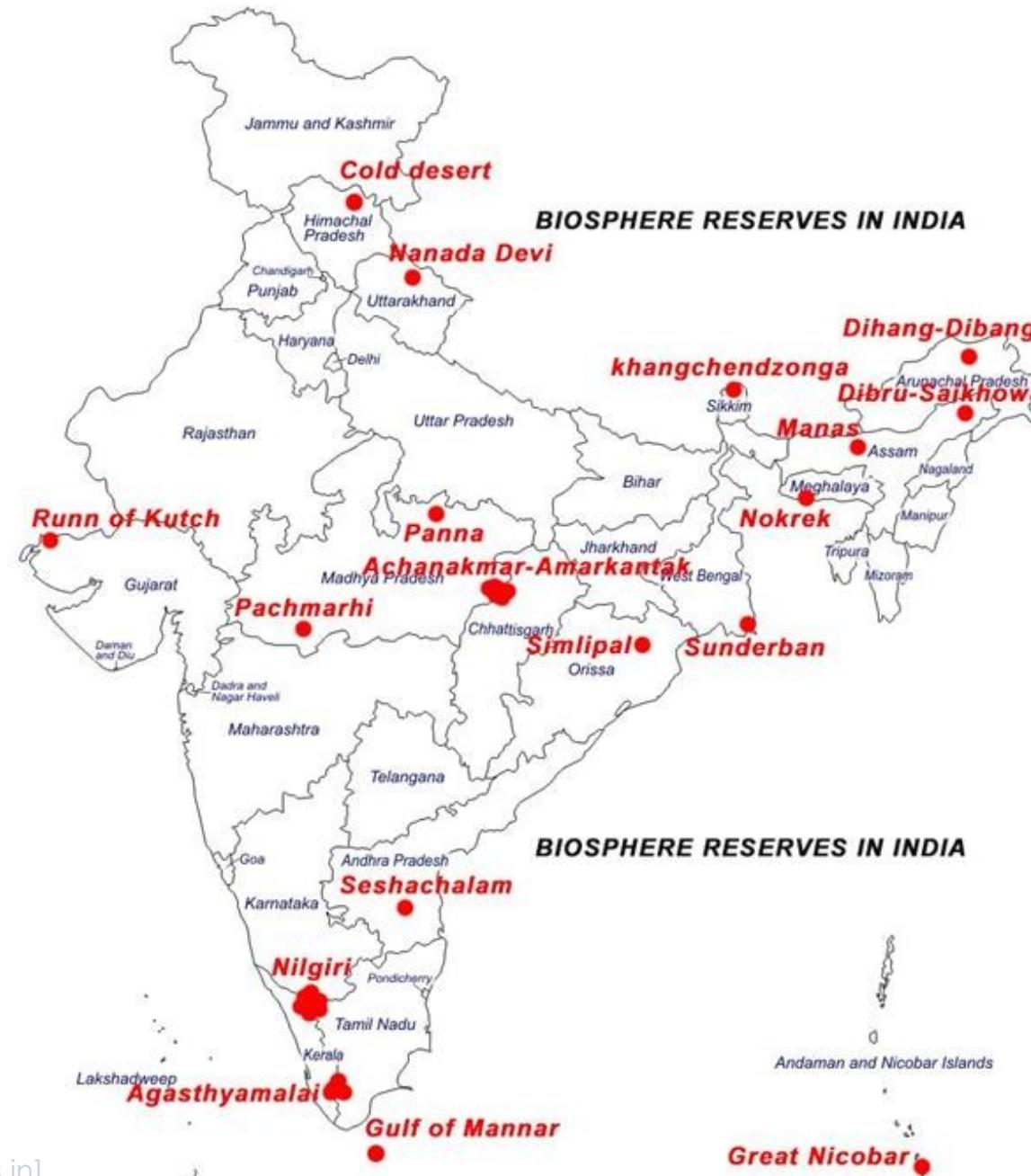
Conservation International (conservation.org) defines 35 biodiversity hotspots — extraordinary places that harbor vast numbers of plant and animal species found nowhere else. All are heavily threatened by habitat loss and degradation, making their conservation crucial to protecting nature for the benefit of all life on Earth.



List of SACRED GROVES

SI.No.	STATE	LOCAL TERM FOR SACRED GROVES
1	ANDHRA PRADESH	Pavithravana
2	ARUNACHAL PRADESH	Gumpa Forests (Sacred Groves attached to Buddhist monasteries)
3	GOA	Deorai, Pann
4	JHARKHAND	Sarana
5	KERALA	Kavu, Sara Kavu
6	MAHARASHTRA	Davrai, Devrahati, Devgudi
7	MANIPUR	Gamkhab, Mauhak (sacred bamboo reserves)
8	MEGHALAYA	Ki Law Lyngdoh, Ki Law Kyntang, Ki Law Niam
9	PUDUCHERRY	Kovil Kadu
10	RAJASTHAN	Orans, Kenkris, Jogmaya
11	TAMIL NADU	Swami shola, Koilkadu
12	UTTARAKHAND	Deo Bhumi, Bugyal (sacred alpine meadows)
13	WEST BENGAL	Garamthan, Harithan, Jahera, Sabitri than, Santalburithan







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ENVIRONMENT

Sections – Environment (Prelims + Mains)

Ecology

Environmental Degradation

Biodiversity

Conservation efforts

Sustainable Development

EIA & Environmental ethics

Sustainable Development

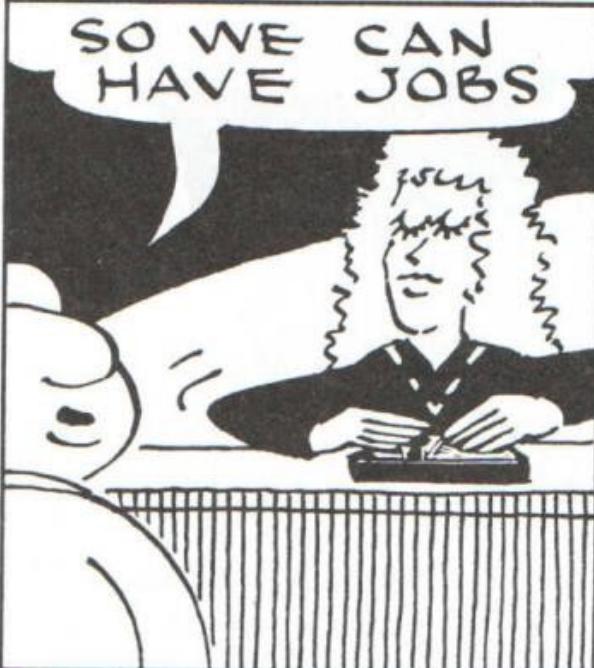
Sustainable Development – Concept

Sustainable Development Goals

Energy

Other concepts related to sustainability

MODERNE MAN



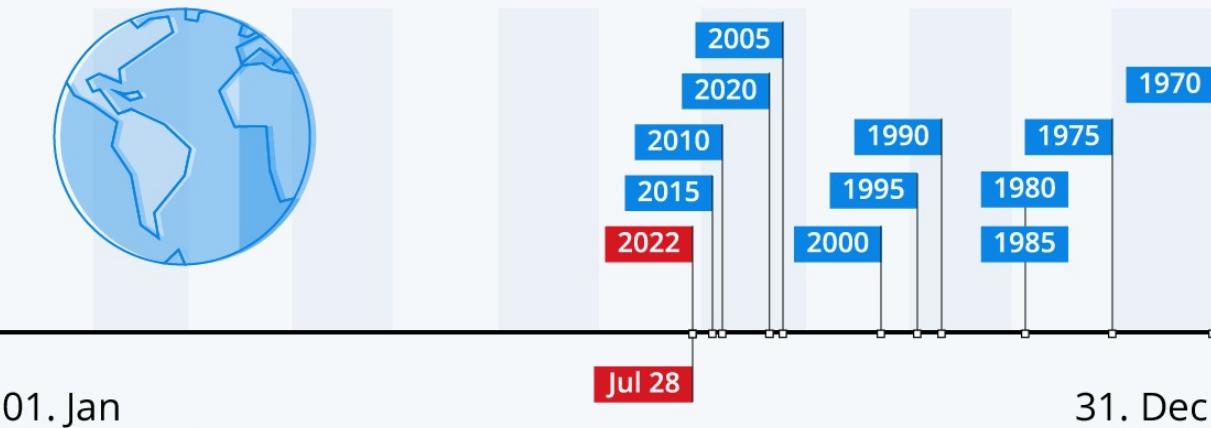




EARTH OVER SHOOT DAY

Earth Overshoot Day Is Coming Sooner and Sooner

Historical dates of Earth Overshoot Day



Earth Overshoot Day marks the date when humanity's demand for ecological resources in a given year exceeds what Earth can regenerate in that year.

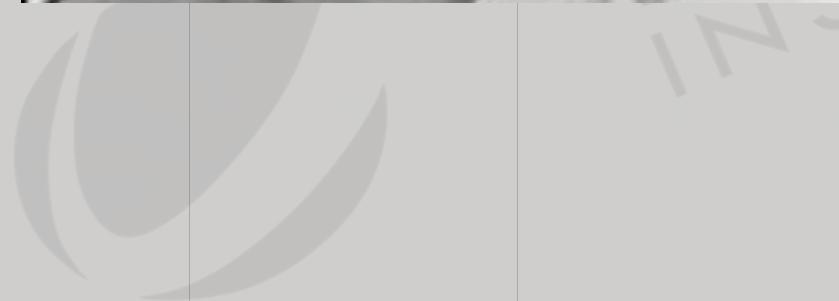
Source: Global Footprint Network





Earth provides enough to satisfy
every man's needs, but not every
man's greed.

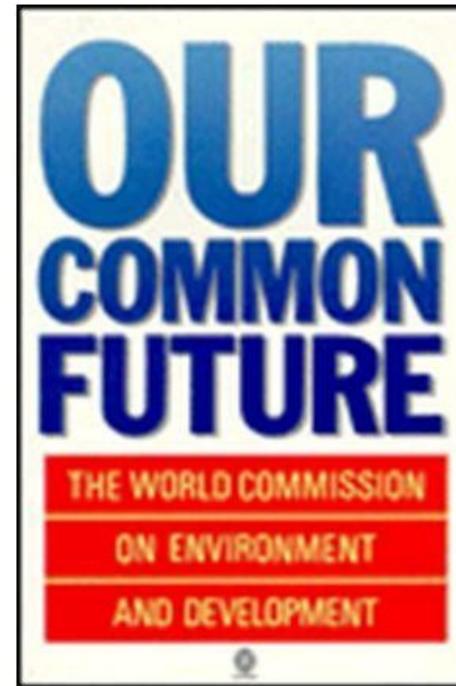
— *Mahatma Gandhi* —



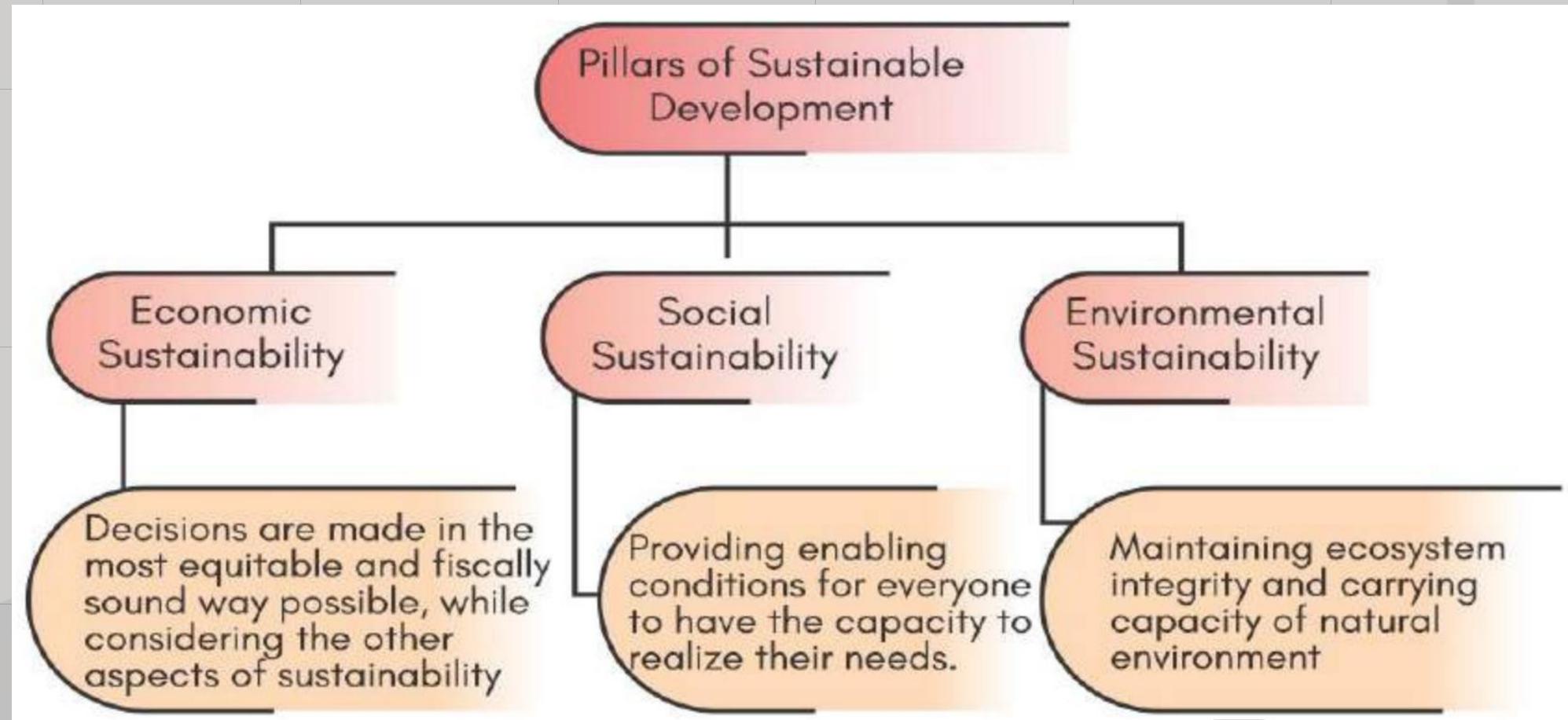
Sustainable Development

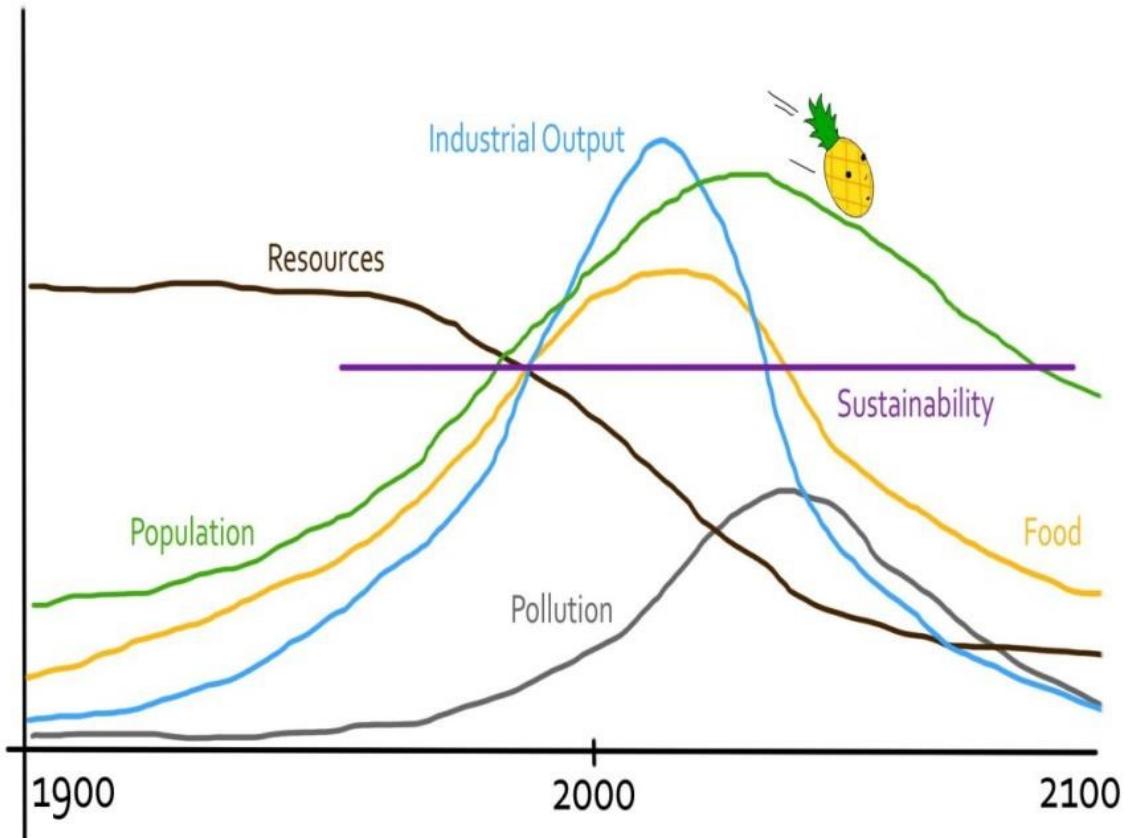
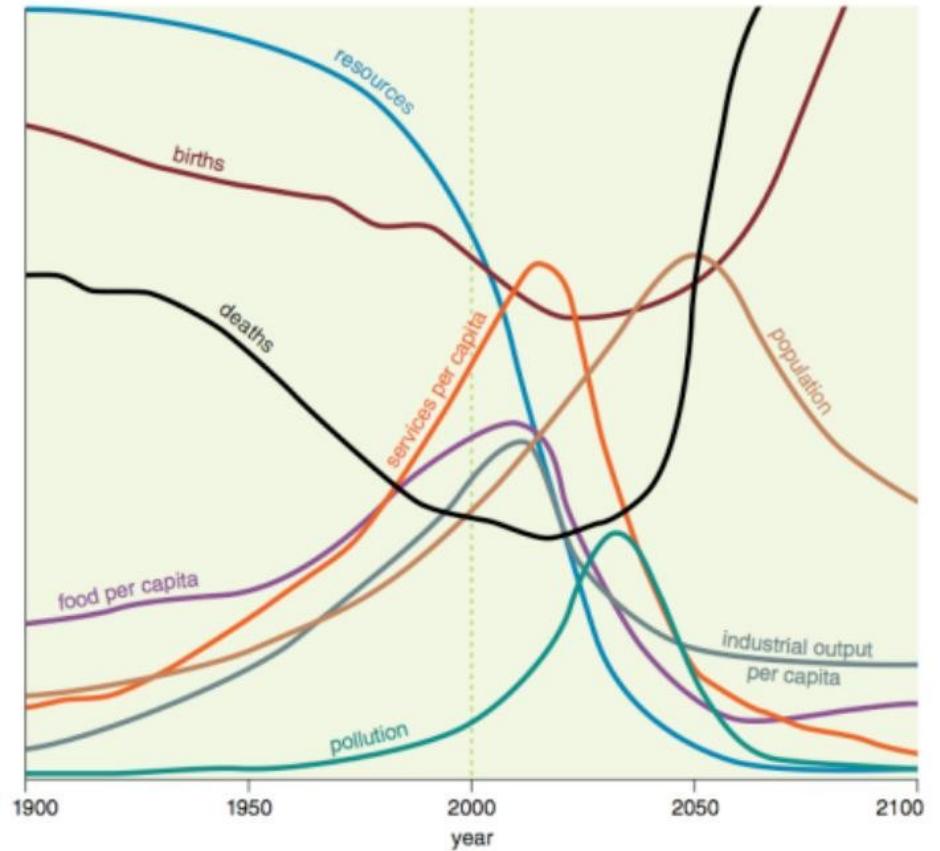
“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs”

Brundtland Commission
“Our common future” 1987



**Brundtland Commission
(WCED 1987)**





Donella Meadows at Massachusetts Institute of Technology, and published in 1972 in the book **Limits to Growth**

Later Meadows group at Massachusetts Institute of Technology, published a book **Beyond the Limits** in 1992



Goal 1: Eradicate Extreme Hunger and Poverty



Goal 2: Achieve Universal Primary Education



Goal 3: Promote Gender Equality and Empower Women



Goal 4: Reduce Child Mortality



Goal 5: Improve Maternal Health



Goal 6: Combat HIV/AIDS, Malaria and other diseases



Goal 7: Ensure Environmental Sustainability



Goal 8: Develop a Global Partnership for Development

MDGs and Target-Summary of progress achieved by India

GOAL 1: ERADICATE EXTREME POVERTY AND HUNGER

TARGET 1: Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day

Achieved

TARGET 2: Halve, between 1990 and 2015, the proportion of people who suffer from hunger

In progress

MDG 2: ACHIEVE UNIVERSAL PRIMARY EDUCATION

TARGET 3: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling

In progress

MDG 3: PROMOTE GENDER EQUALITY AND EMPOWER WOMEN

TARGET 4: Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015

Achieved

MDG 4: REDUCE CHILD MORTALITY

TARGET 5: Reduce by two-thirds, between 1990 and 2015, the Under - Five Mortality Rate

Nearly achieved.

MDG 5: IMPROVE MATERNAL HEALTH

TARGET 6: Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio

In progress

MDG 6: COMBAT HIV/AIDS, MALARIA AND OTHER DISEASES

TARGET 7: Have halted by 2015 and begun to reverse the spread of HIV/AIDS

Achieved

TARGET 8: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases

Achieved

MDG 7: ENSURE ENVIRONMENTAL SUSTAINABILITY

TARGET 9: Integrate the principle of sustainable development into country policies and programmes and reverse the loss of environmental resources.

In progress

TARGET 10: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation

Achieved for the indicator of drinking water. In progress for the indicator of Sanitation

TARGET 11: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers

The pattern not statistically discernible

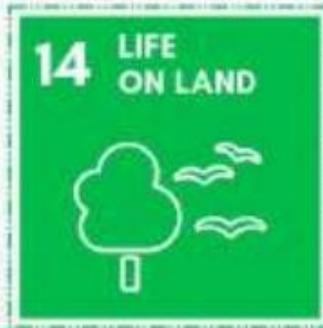
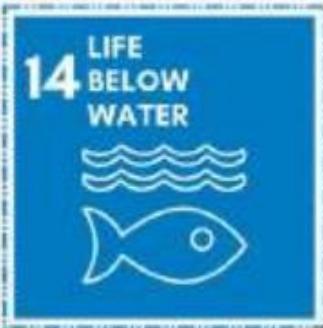
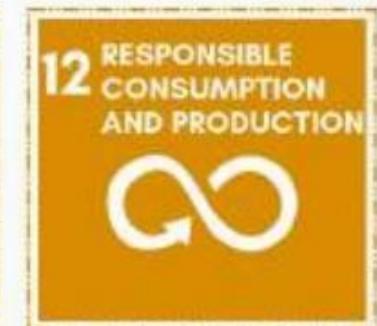
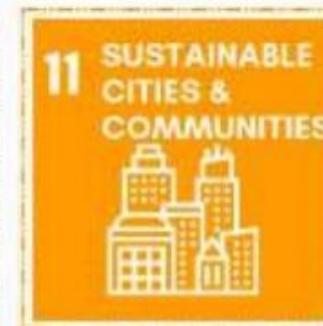
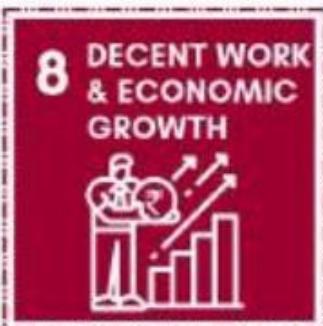
MDG 8: DEVELOP A GLOBAL PARTNERSHIP FOR DEVELOPMENT

TARGET 18: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications

Achieved



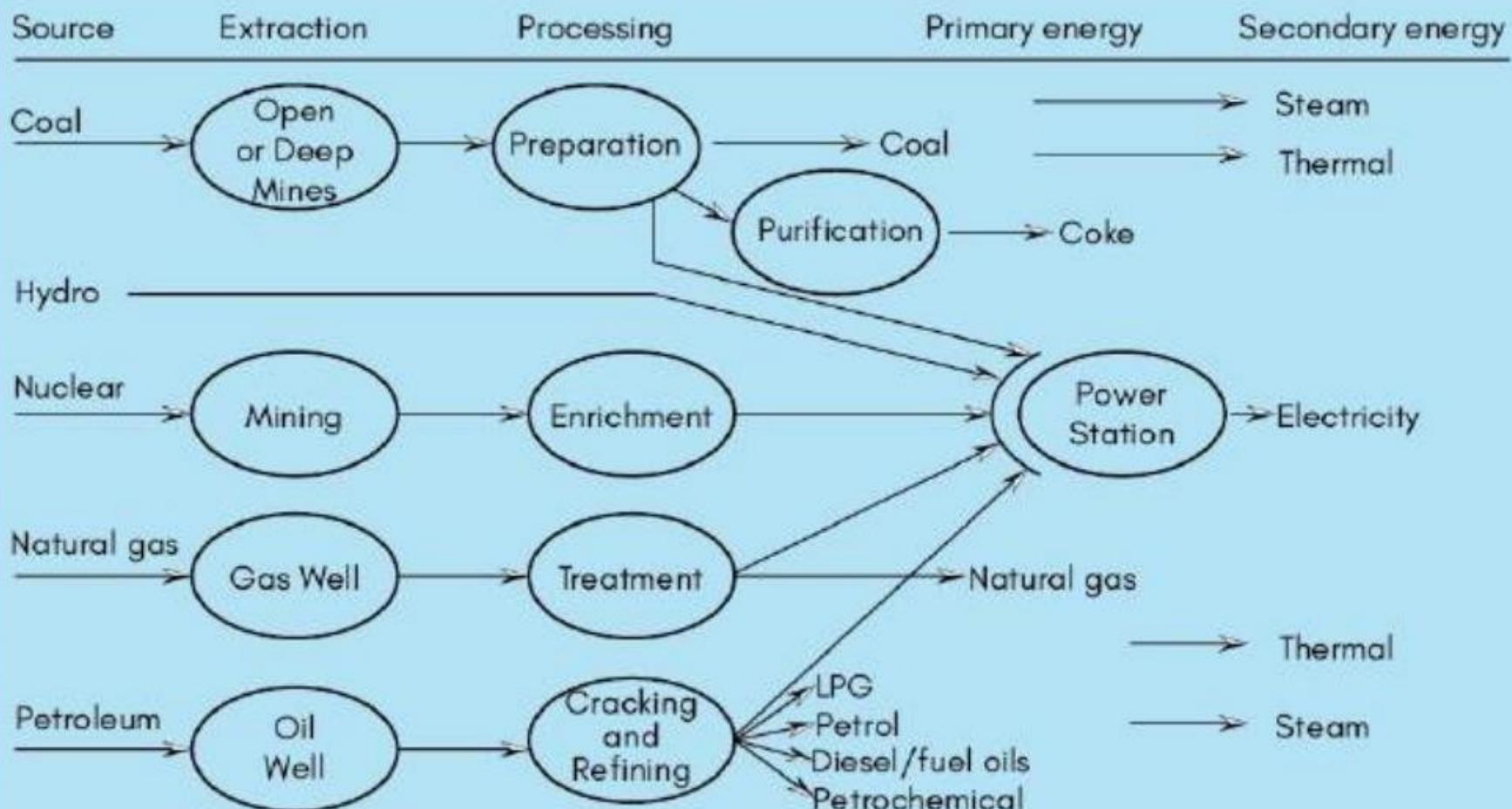
SUSTAINABLE DEVELOPMENT GOALS



Interconnectedness among SDGs



MAJOR PRIMARY AND SECONDARY SOURCES



Power Sector at a Glance ALL INDIA

Updated on 13-01-2023

Source: OM SECTION

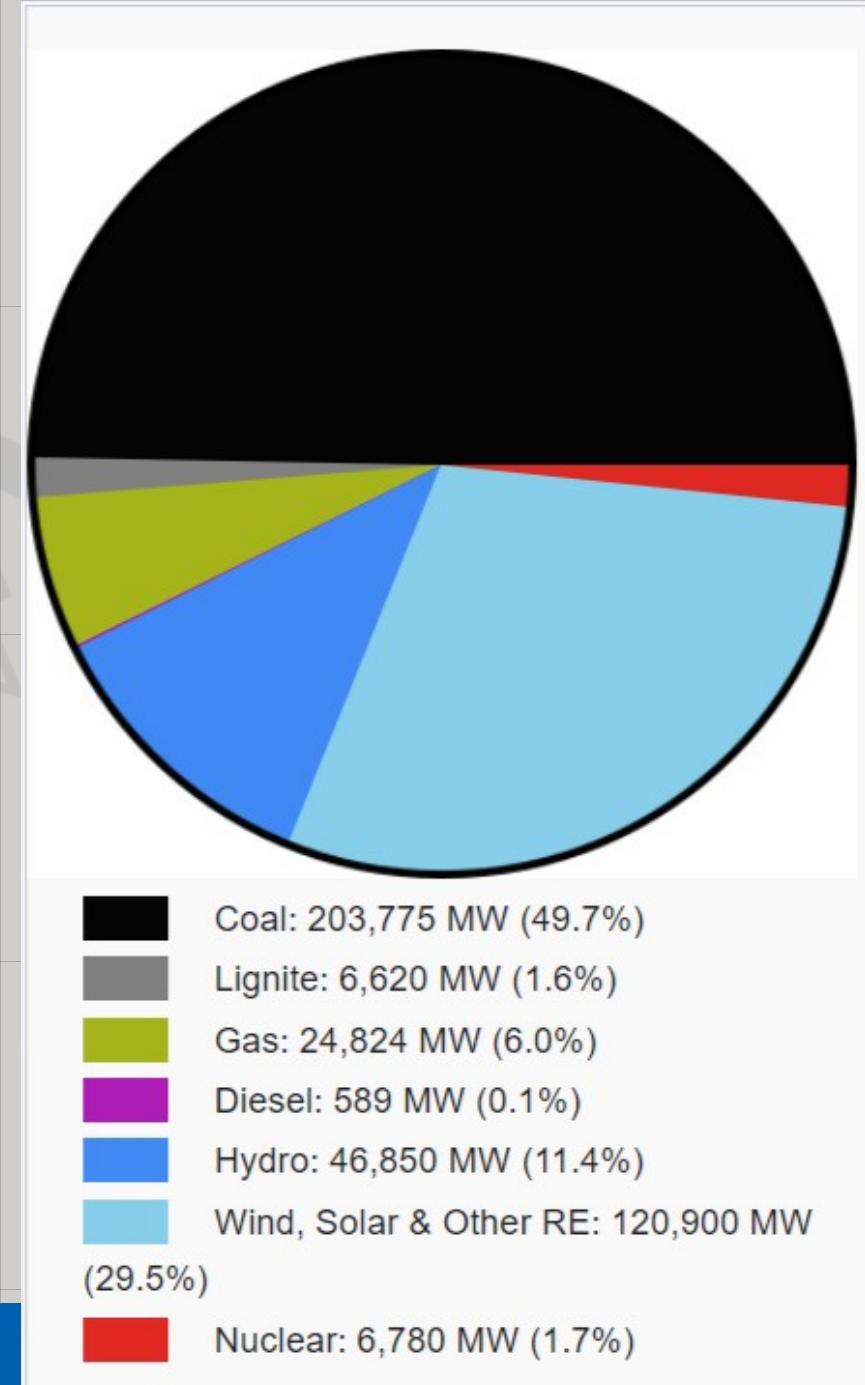
1. Total Installed Capacity (As on 31.12.2022) - Source : Central Electricity Authority (CEA)

INSTALLED GENERATION CAPACITY (SECTOR WISE) AS ON 31.12.2022

Sector	MW	% of Total
Central Sector	98,795	24.2%
State Sector	1,04,918	25.6%
Private Sector	2,06,627	50.4%
Total	4,10,339	

Installed GENERATION CAPACITY(FUELWISE) AS ON 31.12.2022

CATAGORY	INSTALLED GENERATION CAPACITY(MW)	% of SHARE IN Total
Fossil Fuel		
Coal	203,775	49.7%
Lignite	6,620	1.6%
Gas	24,824	6.1%
Diesel	589	0.1%
Total Fossil Fuel	2,35,809	57.5 %
Non-Fossil Fuel		
RES (Incl. Hydro)	167,750	40.7%
Hydro	46,850	11.4 %
Wind, Solar & Other RE	120,900	29.5 %
Wind	41,930	10.2 %
Solar	63,302	15.1 %
BM Power/Cogen	10,210	2.5 %
Waste to Energy	522	0.1 %
Small Hydro Power	4,936	1.2 %
Nuclear	6,780	1.7%
Total Non-Fossil Fuel	174,530	42.5%
Total Installed Capacity	410,339	100%
(Fossil Fuel & Non-Fossil Fuel)		

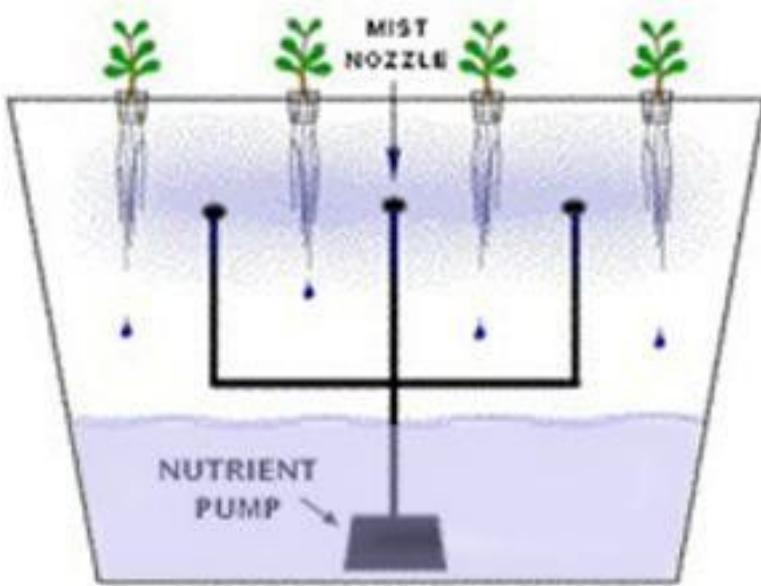


Source of energy/Fuel	Production	Advantages	Limitations
Solar energy	From natural sunlight	Environment friendly Ample or unlimited availability.	<ul style="list-style-type: none"> Limited capacity for storage of sunlight. Cloud cover may limit usefulness. Collecting equipment expensive
Wind energy	Windmills with Fans for directing winds	No pollution Available for free Not available everywhere or intermittently available.	Fans of wind mills visual hazards for flying birds and aeroplanes (visual pollution).
Tidal energy	Harnessing tidal power by suitable structures	Free and clean	<ul style="list-style-type: none"> Structures (plant) used for harnessing energy expensive. Plant disrupts natural flow of estuary and concentrate pollutants in the area
Hydel power or Hydropower	Dams built on river for electricity generation	World's hydroelectricity capacity high	<ul style="list-style-type: none"> Ecosystems behind dams disturbed. Human settlements up rooted for building dam. Habitat loss and consequent biodiversity loss. Developmental cost high. Fertile farmland lost and amount of nutrient rich silt on down river agricultural fields reduced.

Source of energy/Fuel	Production	Advantages	Limitations
Nuclear energy	Nuclear fission (splitting of atom) and Nuclear fusion	No air pollution Fuel efficient	<ul style="list-style-type: none"> • High cost of construction of nuclear plant. • Fear of security and nuclear accidents.
Geothermal energy	Wells drilled to trap steam which powers electrical generators. Steam naturally produced from underground water which gets heated due to very high temperature that region.	Environment friendly	<ul style="list-style-type: none"> • Problem of safe disposal of nuclear waste. • Steam contains Hydrogen Sulphide (H₂S) having odour of rotten eggs. • Minerals in the steam corrosive to pipe lines and equipment causing maintenance problems. • Minerals in the water toxic to fish.

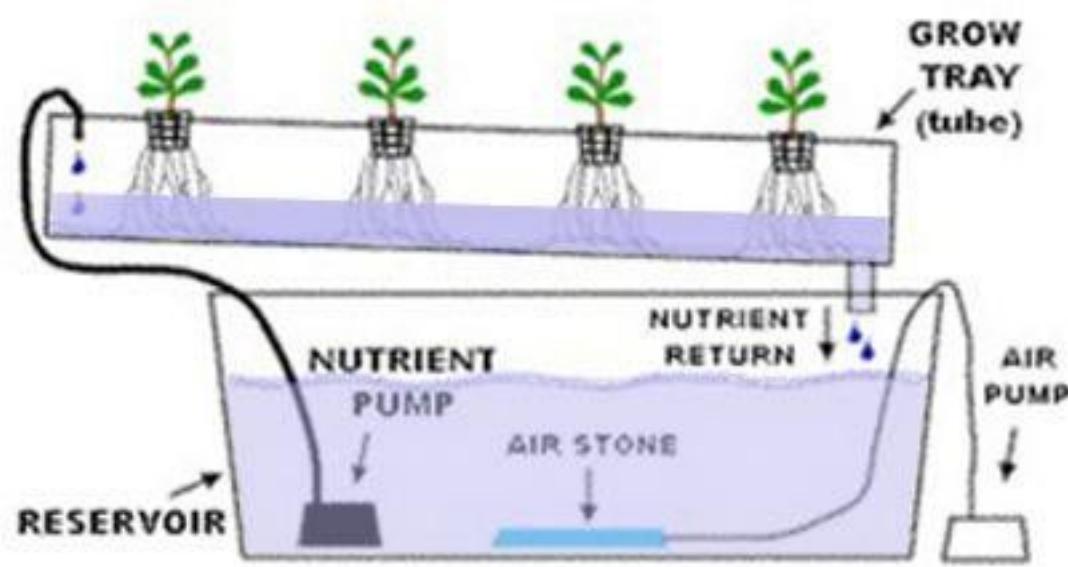
Source of energy/Fuel	Production	Advantages	Limitations
Biomass (1) Fuel wood	Cutting trees for fuel wood and burning them straight away	Cheap so popular in under developed and developing countries	<ul style="list-style-type: none"> • Comparatively low level of energy. • Bulky so difficult to transport. • Burning wood causes air pollution. • Destruction of forests to obtain fuel wood and so desertification. • Release lot of fly ash.
(2) Biomass conversion	Obtaining energy from chemical energy stored in biomass (or live material). Burned directly for cooking or to produce electricity converted to ethanol or methane (biogas)	Renew able energy	<ul style="list-style-type: none"> • May lead to food shortage because nutrients not returned to soil from biomass. • Growing maize for ethanol requires more energy expenditure than the amount of energy in the form of alcohol retrieved. • Land for growing food used for growing biomass for conversion into fuel.
Solid waste	Waste sorted and burnable material separated	<ul style="list-style-type: none"> • Decreases cost of fresh disposal • Reduces need for land fill sites 	<ul style="list-style-type: none"> • Causes air pollution for burning releases CO₂ and other gases. • Waste such as bleached paper and plastics have chlorine containing compounds which form dioxins which are highly toxic and suspected to be carcinogenic.

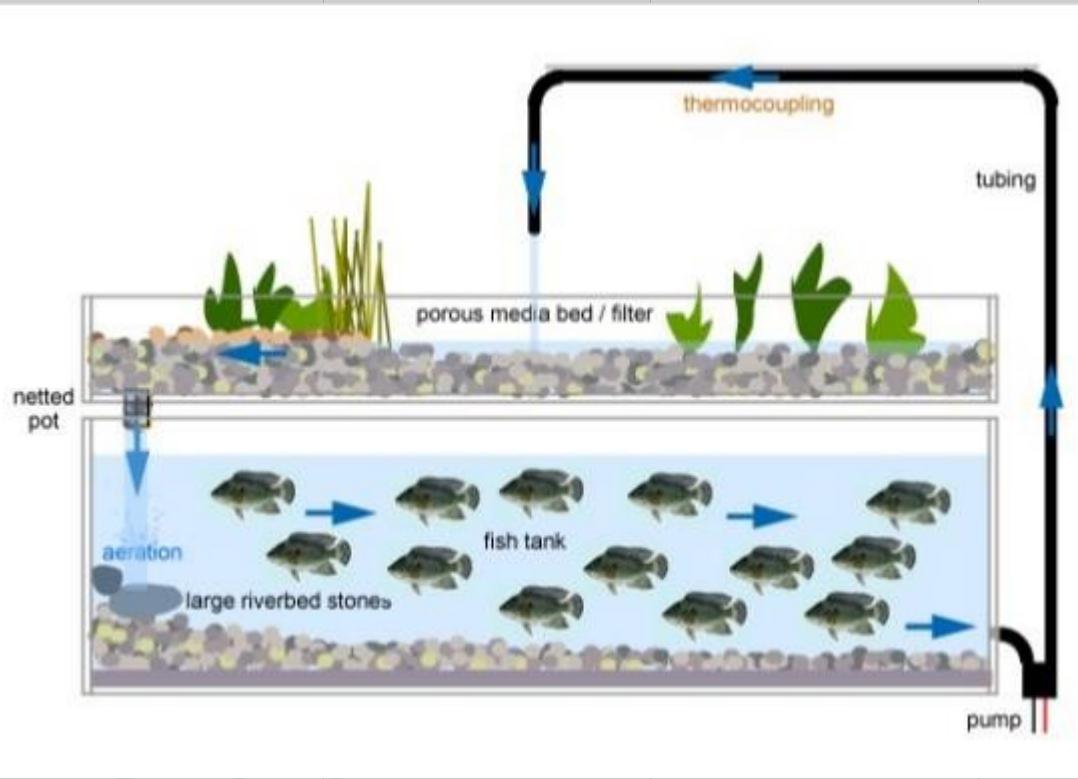
Aeroponics



VS

Hydroponics





Environmental Impact Assessment & Environmental Ethics

What is EIA?

Benefits of EIA

Principles of EIA

EIA process

EIA in India

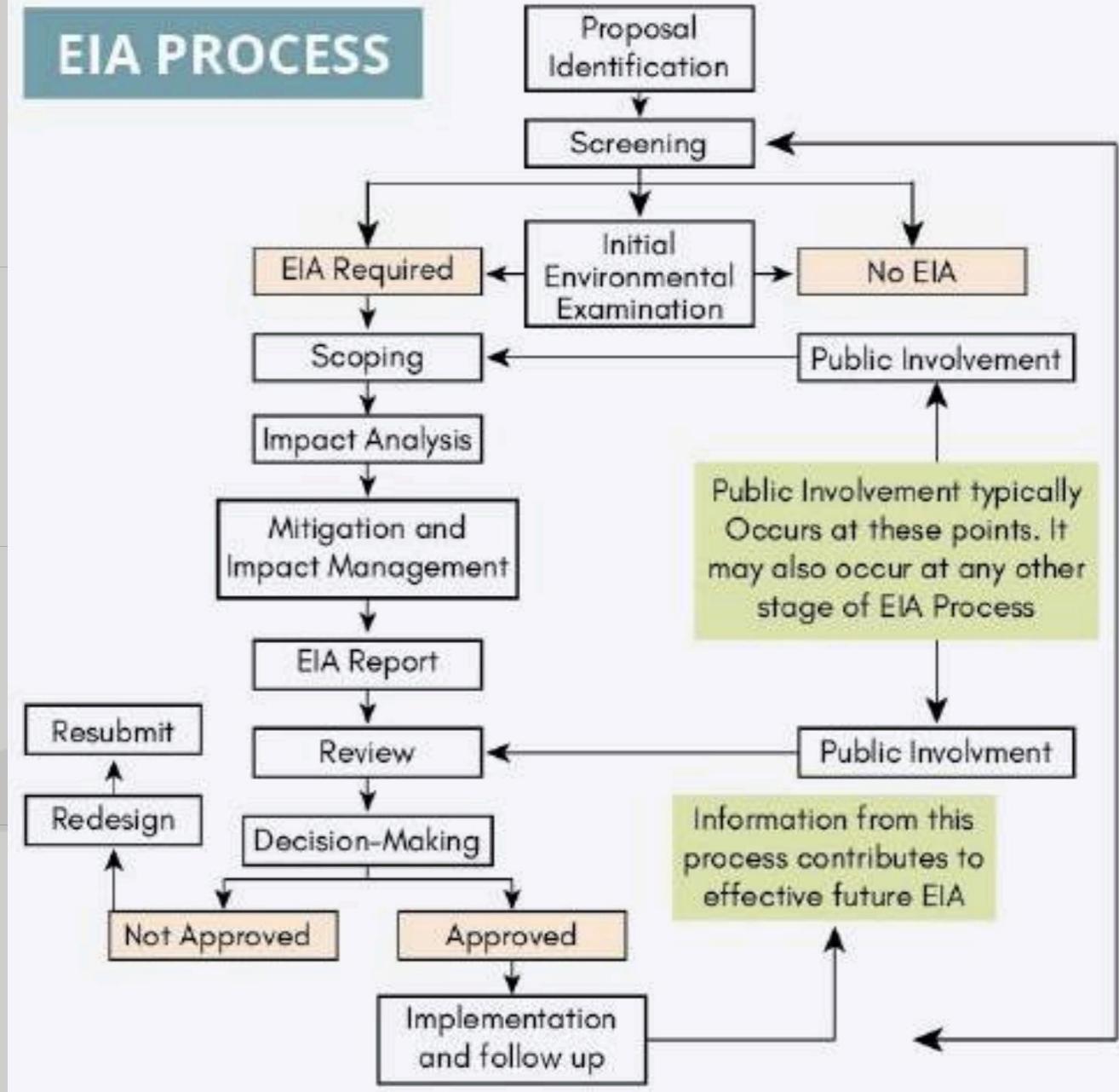
Criticism

Environmental Ethics



ENVIRONMENTAL IMPACT ASSESSMENT

EIA PROCESS



3.6.1. INDIA STATE OF FOREST REPORT (ISFR) 2021

By FSI under
the ministry
of MOEFCC

Biennial
survey

Since 1987

Forest Cover

- All lands more than one hectare in area, with a tree canopy density of more than 10%

Recorded Forest Area (RFA)

- Recorded as 'Forests' in government records.

Tree Cover

- Outside recorded forest areas exclusive of forest cover and less than the minimum mappable area of one hectare.

Carbon Stock



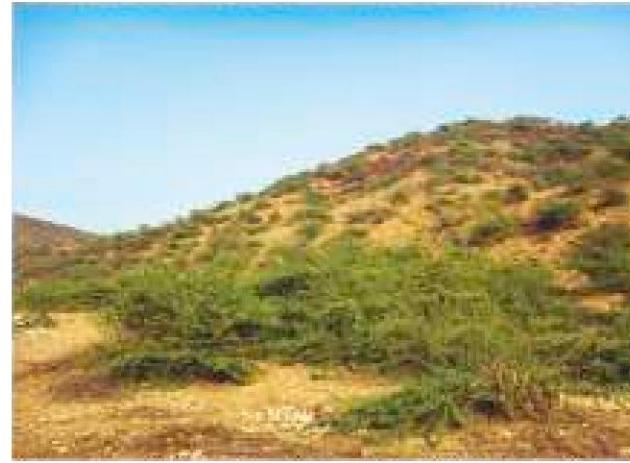
Very Dense Forest



Moderately Dense Forest



Open Forest



Scrub

Table 2.2 Forest cover classified in terms of canopy density classes

Class	Description	Open Forest	Scrub
Very Dense Forest	All lands with tree canopy density of 70 percent and above.		
Moderately Dense Forest	All lands with tree canopy density of 40 percent and more but less than 70 percent.		
Open Forest	All lands with tree canopy density of 10 percent and more but less than 40 percent.		
Scrub	Degraded forest lands with canopy density less than 10 percent.		
Non-forest	Lands not included in any of the above classes. (includes water)		

TABLE 1 Forest and Tree cover of India in 2019

Class	Area (sq km)	Percentage of Geographical Area
Forest Cover		
Very Dense Forest	99,278	3.02
Moderately Dense Forest	3,08,472	9.38
Open Forest	3,04,499	9.26
Total Forest Cover*	7,12,249	21.67
Tree Cover	95,027	2.89
Total Forest and Tree Cover	8,07,276	24.56
Scrub	46,297	1.41
Non-Forest#	25,28,923	76.92
Total Geographic Area	32,87,469	100.00

Table 1 Forest and Tree Cover of India in 2021

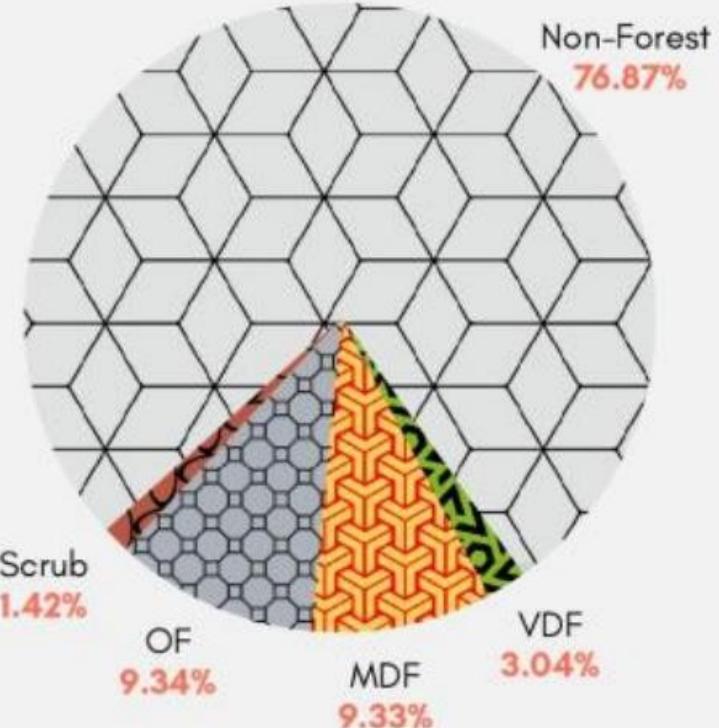
Class	Area (sq km)	Percentage of Geographical Area
Forest Cover		
Very Dense Forest	99,779	3.04
Moderately Dense Forest	3,06,890	9.33
Open Forest	3,07,120	9.34
Total Forest Cover*	7,13,789	21.71
Tree Cover	95,748	2.91
Total Forest and Tree Cover	8,09,537	24.62
Scrub	46,539	1.42
Non Forest#	25,27,141	76.87
Total Geographical Area	32,87,469	-

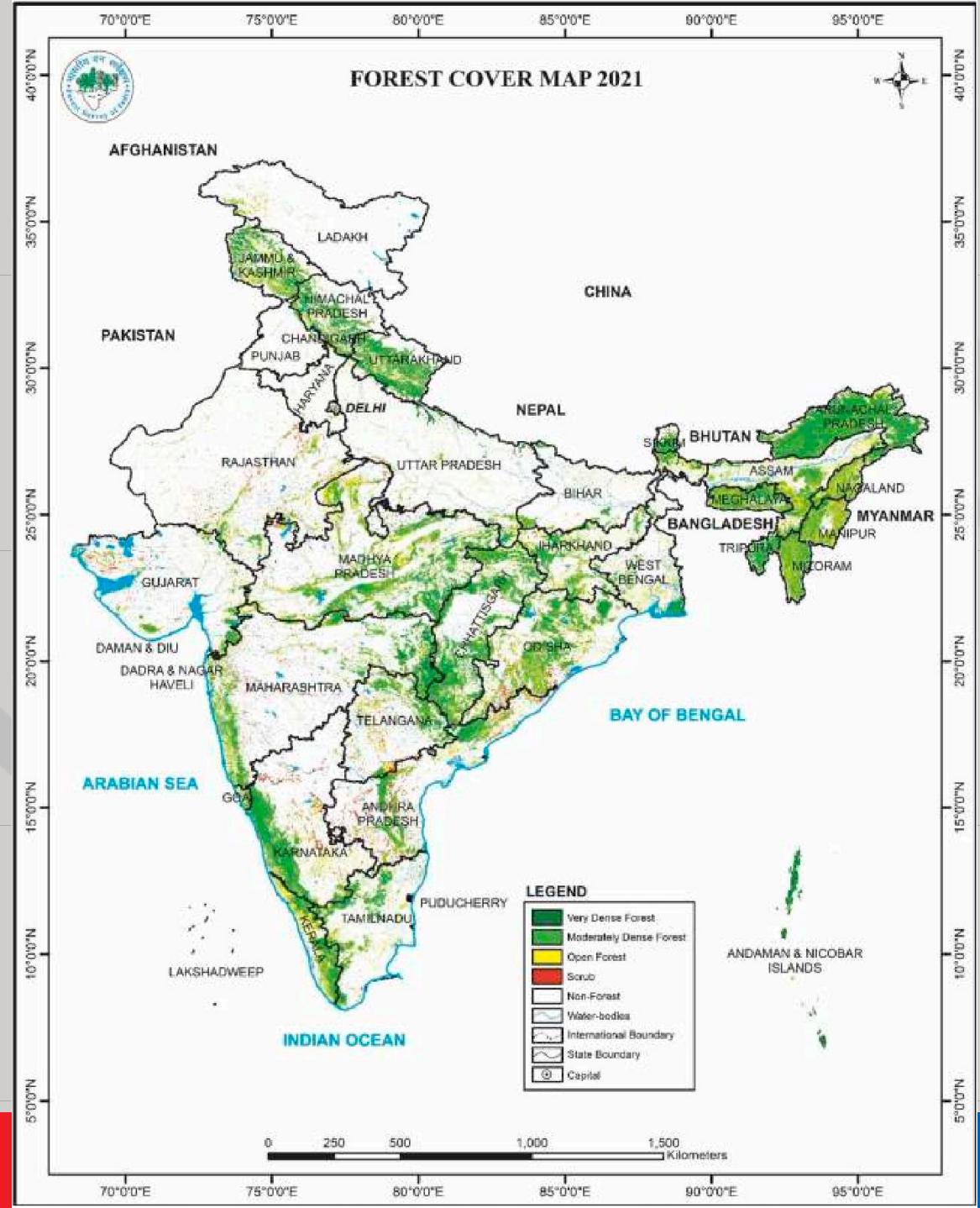
* Includes 4,992 sq km under Mangrove Cover

Non-forest includes Tree Cover (Percentage rounded off)

Total forest cover	↑ Increase of 1,540 sq km (0.22%)
Very Dense Forest (VDF)	↑ Increase of 501 sq km
Moderately Dense Forest (MDF)	↓ Decrease of 1,582 sq km
Open Forest (OF)	↑ Increase of 2,621 sq km
Scrub (not included in forest cover)	↑ Increase of 242 sq km

COMPOSITION OF FOREST COVER IN INDIA





No change wrt 2019

Forest cover
(by area)

MP

ArP

Chh

Od

MH

Forest cover
(percentage)

Miz – 84.5

ArP – 79

Megh

Mani

Naga

Increase in
forest cover
– top states

TG

AP

OD

KA

JhK

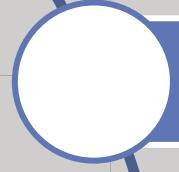
Loss in
forest cover
– top states

Arp

Mani

Megh

State with Maximum Tree cover: Maharashtra

36.18% of the total forest and tree cover of India – Trees Outside Forests (TOF)

40.17% of the total geographical area - Forest cover in the hill districts - decreasing

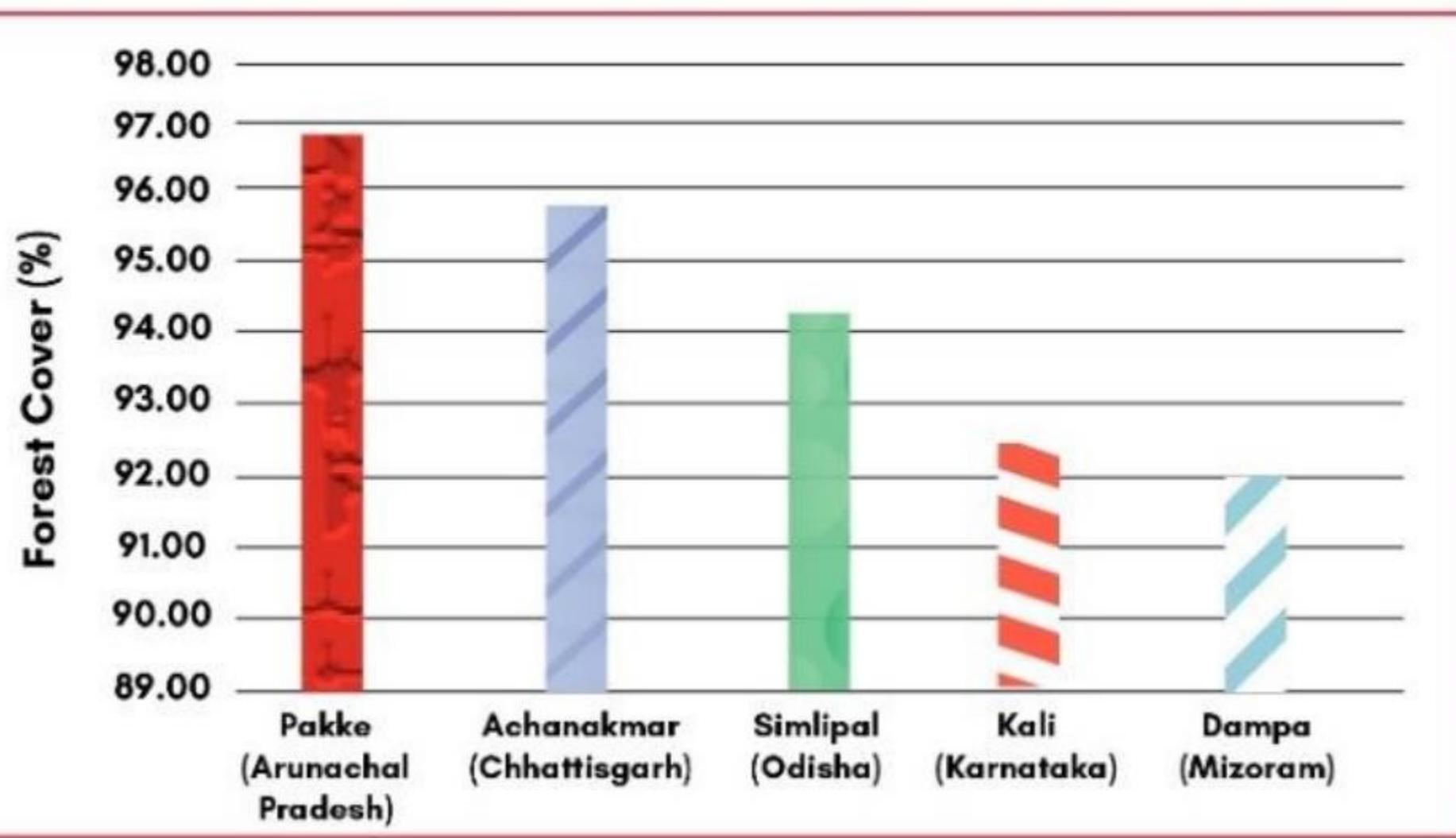
Northeastern region - Total forest cover: 64.66% of its geographical area - decreasing

7.80% of the country's total forest cover - in the TR (decreasing). Largest Forest Cover: NagarjunasagarSrisailam Tiger Reserve

TR with Highest Gain in Forest cover: Buxa, West Bengal.

TR with Highest Losses in Forest cover: Kawal, Telangana

Top Five Tiger Reserves in terms of forest cover as % of the area of the Tiger Reserve.



Mangrove: 4992 sq km (0.15% of country's geographical area). Increased by 17 sq km (0.34%)

Mangrove Cover: West Bengal, Gujarat, A&N Islands, Andhra Pradesh, Maharashtra, Odisha.

The total bamboo bearing area of the country is estimated as 1,49,443 sq km. There is a decrease of 10,594 sq km .

Top state in terms of Bamboo Bearing Area (%): Madhya Pradesh.

22.27% of the forest cover of the country is highly to extremely fire prone.

Top 3 States: Odisha, Madhya Pradesh and Chhattisgarh.

Climate hotspots

Questions??



- Online query (For faster reply)
- Read and revise what is taught
- Read the reference material
- Mentoring sessions

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Twitter: [@naturiousoul](https://twitter.com/naturiousoul)



ENVIRONMENT

Environmental Conservation

Timeline

Legislations

National Forest Policy

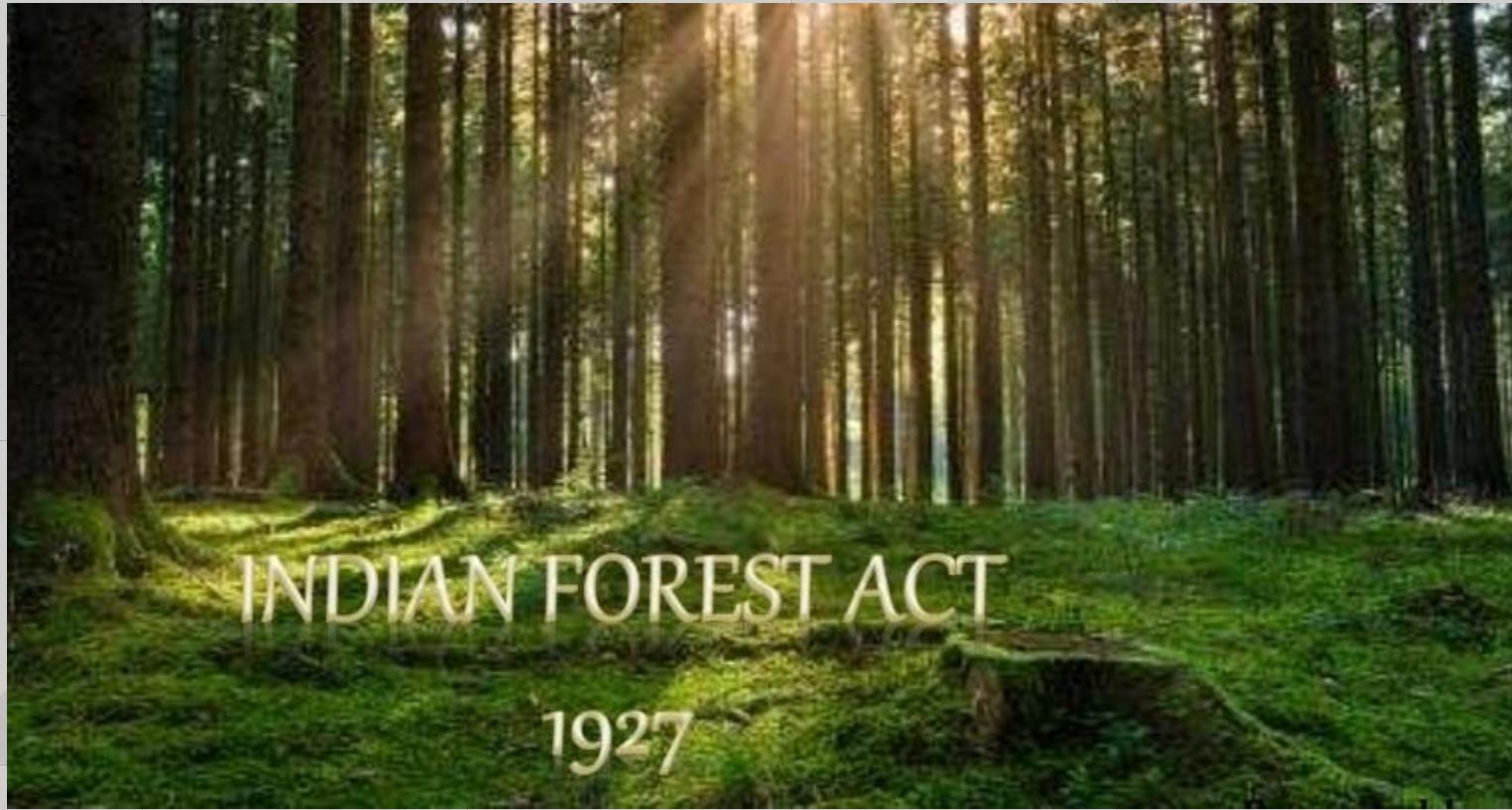
Waste management Rules and other rules

Conservation projects

International Initiatives

Constitutional Provisions:

- Part IV (Art 48A-Directive Principles of State Policies) stipulates that the State shall endeavor to protect and improve the environment and to safeguard the forests and wildlife of the country.
- Part IVA (Art 51A-Fundamental Duties) casts a duty on every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife, and to have compassion for living creatures.





THE WILD-LIFE PROTECTION ACT 1972



Table: Broad comparison of different

National park	Sanctuary
NP is <u>hitched to the habitat</u> of the <u>particular animal</u> like tiger, lion, hangul, rhino etc.	This is <u>generally species</u> oriented (pitcher plant, great Indian bustard)
The size range is 0.04 to 3162 km ² . Most common size is <u>100 to 500 km²</u>	Size rage is 0.61 to 7818 km ² Most common size is <u>100 to 500 km²</u>
<u>Boundaries are circumscribed by legislation</u>	<u>Boundaries are not sacrosanct</u>
<u>Except buffer zone, no biotic interference</u>	<u>Limited biotic interference</u>
<u>Tourism is permissible</u>	<u>Tourism is permissible</u>
<u>Research and scientific management is lacking</u>	<u>Research and scientific management is lacking</u>
<u>No attention is given for gene pool conservation</u>	<u>No attention is given for gene pool conservation</u>

CATEGORIES OF PLASTIC			
Type	Category	Examples	Recyclable?
Thermoplastics	PS (Polystyrene)	Foam hot drink cups, plastic cutlery, containers, and yogurt	Partially
	PP (Polypropylene)	Lunch boxes, take-out food containers, ice cream containers	Partially
	LDPE (Low-density polyethylene)	Garbage bins and bags	Partially
	PVC (Plasticized polyvinyl chloride or polyvinyl chloride)	Juice or squeeze bottles	Yes
	HDPE (High-density polyethylene)	Shampoo containers or milk bottles	Yes
	PET (Polyethylene terephthalate)	Fruit juice and soft drink bottles	Yes
	Thermoset and others	Multi-layer and laminated plastics, polyurethane foam, Bakelite, polycarbonate, melamine, nylon etc.	Yes

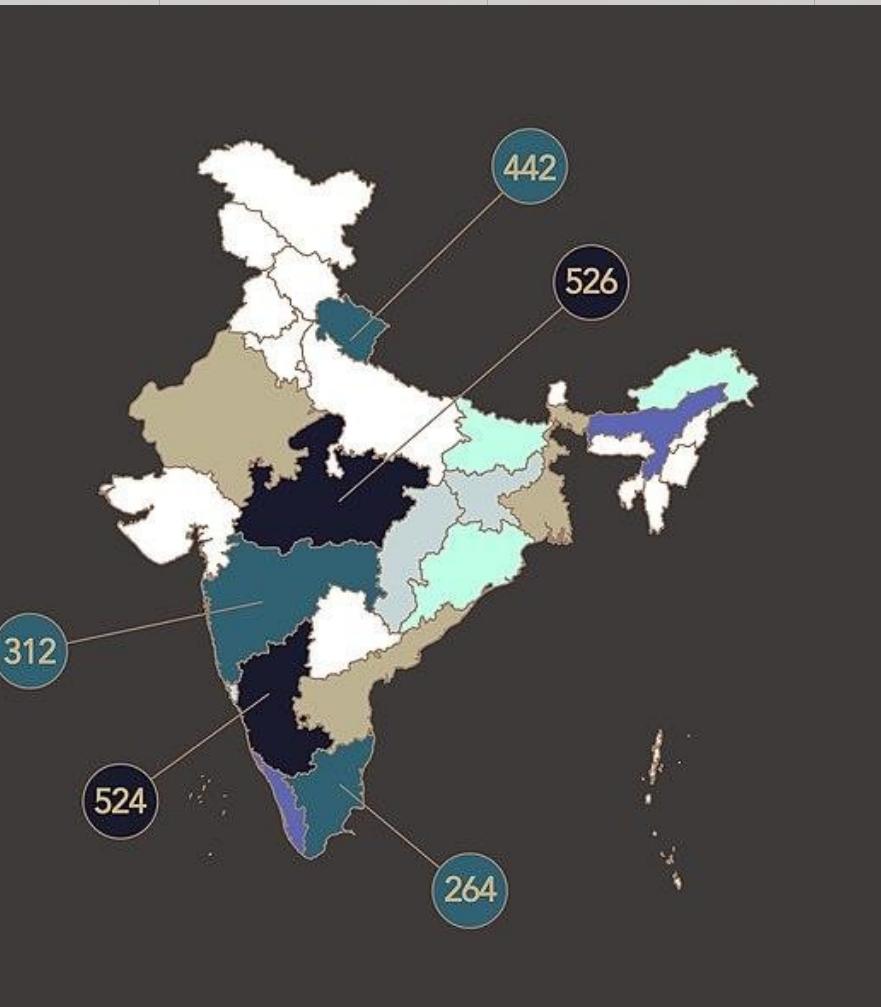
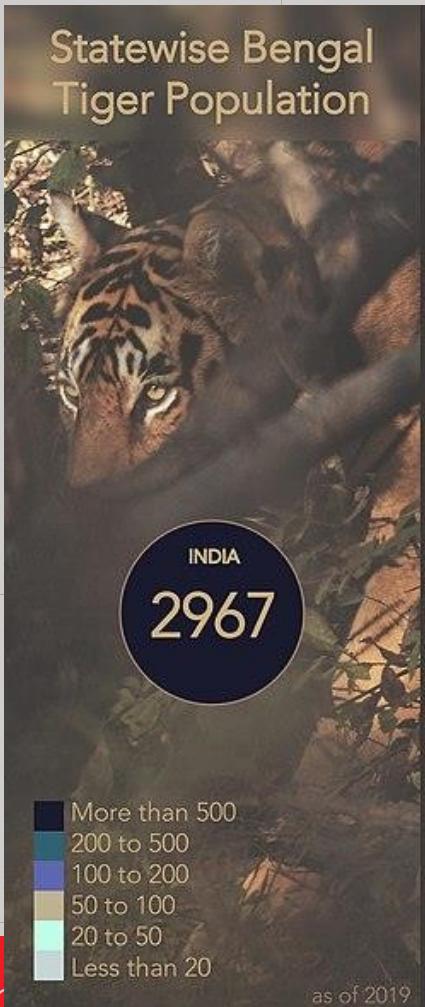
PLASTIC RESIN CODES



Coastal Regulation Zone Notification, 2018



Project Tiger



ENDANGERED

Global Conservation Efforts

Global Tiger Forum (GTF)

Global Tiger Initiative (GTI)

St. Petersburg Tiger Summit in
Russia, 2010

Global Tiger Recovery
Program (GTRP)

TX2

Conservation Assured Tiger
Standards CA|TS

Monitoring System for Tigers –
Intensive Protection and Ecological
Status (M-STrIPES)

CaTRAT (Camera Trap Data
Repository and Analysis Tool)

ExtractCompare & HotSpotter

Spatially explicit capture–recapture
(SECR)

Cytochrome-b marker

Maximum Entropy Models
(MaxEnt)



Ministry of Environment, Forest
and Climate Change

Do you know?

Project Elephant (PE) is a scheme by MoEF&CC launched in 1991-92 with the aim to



Protect elephants,
their habitat &
corridors



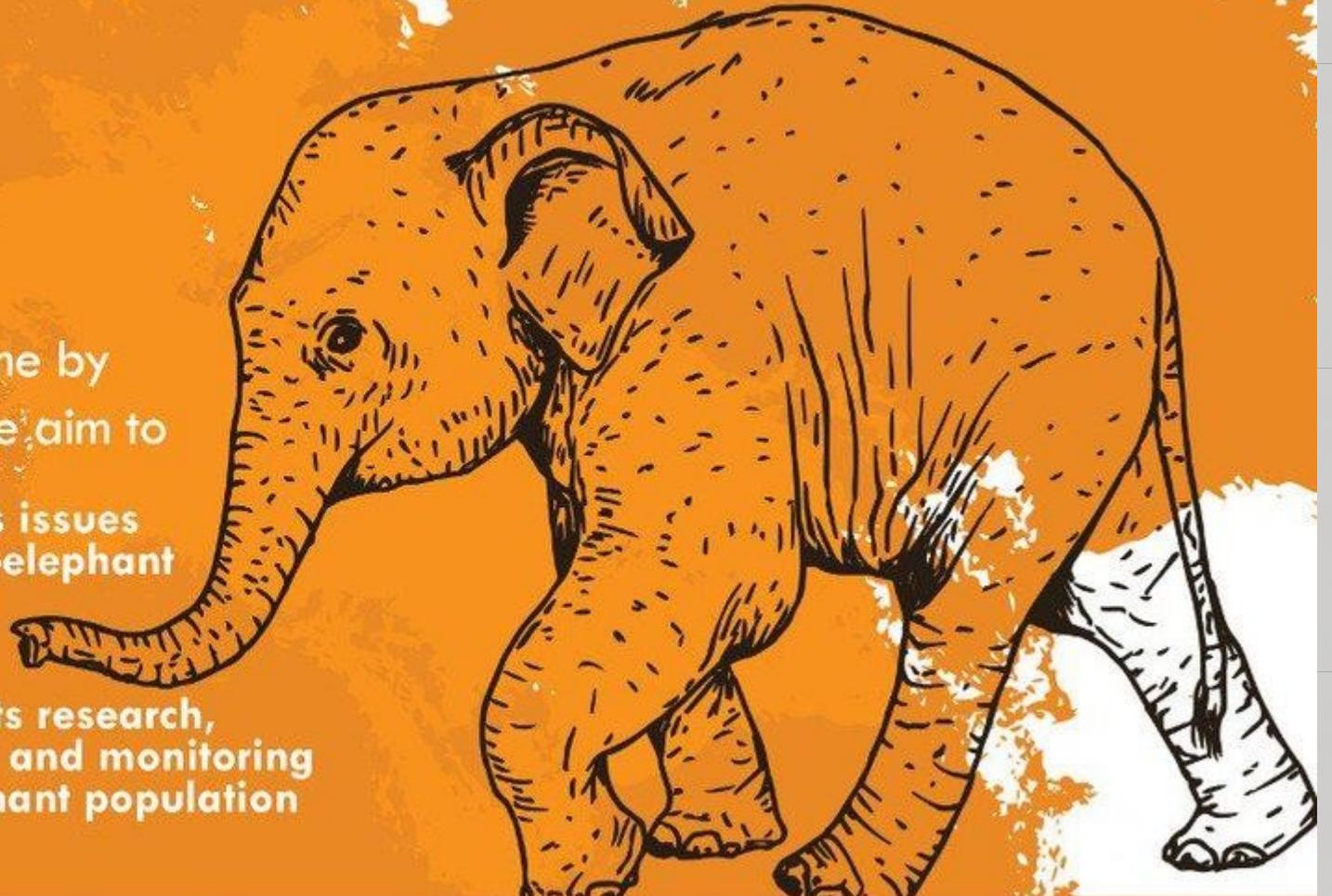
Address issues
of man-elephant
conflict



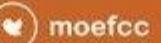
Provide welfare
of domesticated
elephants



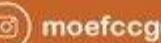
Conducts research,
training and monitoring
of elephant population



moefcc



moefcc



moefccgoi



moef.gov.in



PROJECT SNOW LEOPARD

UNCIA UNCIA

SCIENTIFIC NAME

VULNERABLE

IUCN STATUS

2009

INTRODUCTION OF PROJECT SNOW LEOPARD IN INDIA

1,28,000 SQ.KM

PROTECTED AREA UNDER PROJECT SNOW LEOPARD - INDIA

400-600

POPULATION IN INDIA

4500-7500

POPULATION IN THE WORLD



Conservation

Project Snow Leopard

Save our Snow Leopard (SOS)

Secure Himalaya

Global Snow Leopard and Ecosystem Program (GSLEP)

Snow Leopard Population Assessment in India (SLPAI)



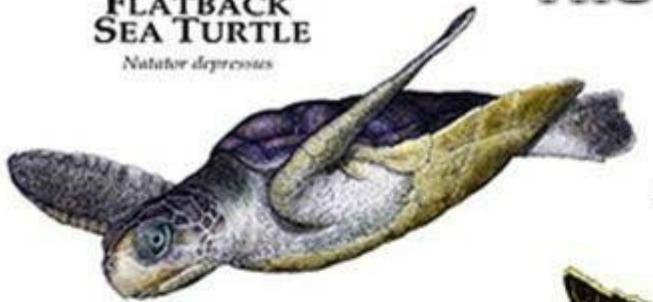
OLIVE RIDLEY
PROJECT

Ghost nets are nets that have been discarded, abandoned or lost in the ocean. They can continue to entangle endangered and vulnerable animals such as marine turtles, birds, sharks, rays, dugongs, dolphins and whales long after they have been discarded, abandoned or lost.

All Sea Turtle Species

The Species List

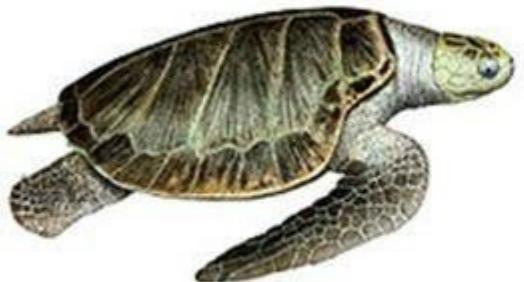
**FLATBACK
SEA TURTLE**
Natator depressus



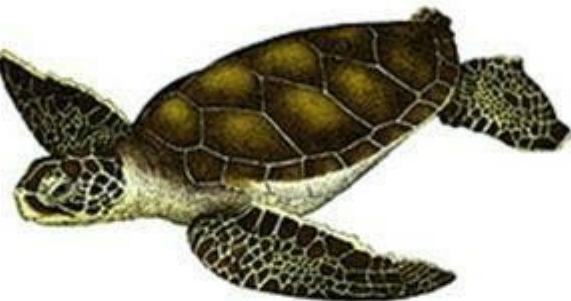
**GREEN
SEA TURTLE**
Chelonia mydas



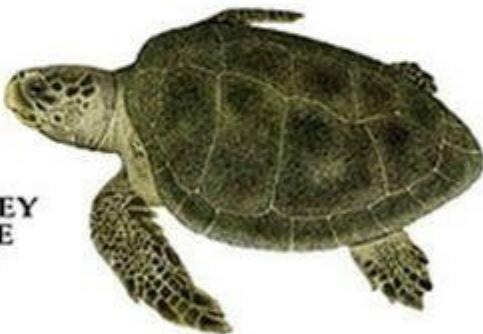
**OLIVE RIDLEY
SEA TURTLE**
Lepidochelys olivacea



**HAWKSBILL
SEA TURTLE**
Eretmochelys imbricata



**KEMP'S RIDLEY
SEA TURTLE**
Lepidochelys kempii



**LEATHERBACK
SEA TURTLE**
Dermochelys coriacea



**LOGGERHEAD
SEA TURTLE**
Caretta caretta



Sr. No.	Name of the Vulture Species	IUCN status	Pictorial Representation
1.	Oriental White-backed Vulture (<i>Gyps Bengalensis</i>)	Critically Endangered	
2.	Slender-billed Vulture (<i>Gyps Tenuirostris</i>)	Critically Endangered	
3.	Long-billed Vulture (<i>Gyps Indicus</i>)	Critically Endangered	
4.	Egyptian Vulture (<i>Neophron Percnopterus</i>)	Endangered	

5.	Red-Headed Vulture (<i>Sarcogyps Calvus</i>)	Critically Endangered	
6.	Indian Griffon Vulture (<i>Gyps Fulvus</i>)	Least Concerned	
7.	Himalayan Griffon (<i>Gyps Himalayensis</i>)	Near Threatened	
8.	Cinereous Vulture (<i>Aegypius Monachus</i>)	Near Threatened	
9.	Bearded Vulture or Lammergeier (<i>Gypaetus Barbatus</i>)	Near Threatened	

GREAT INDIAN BUSTARD



Critically Endangered

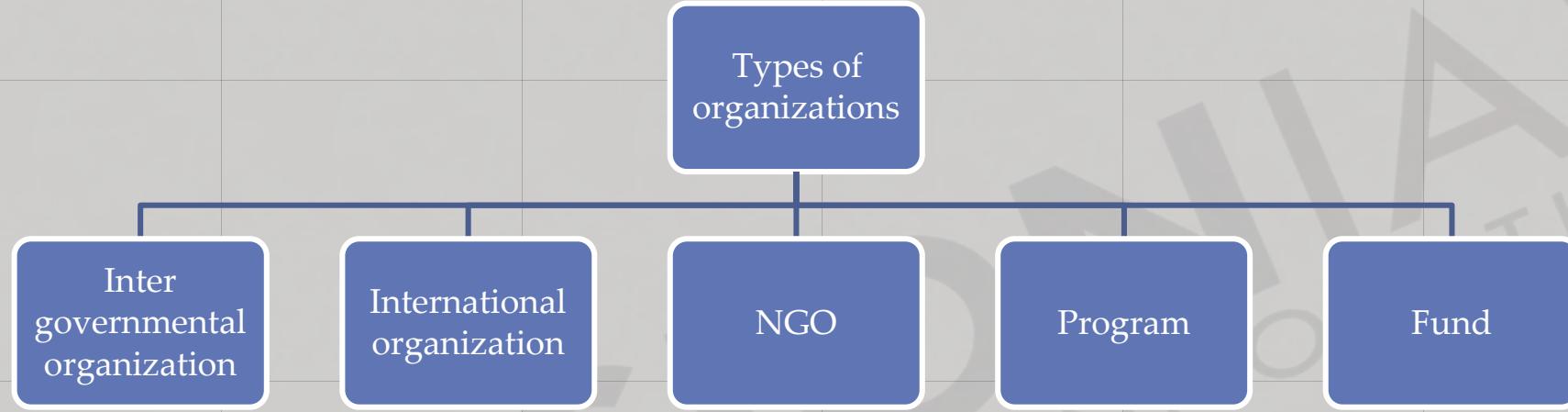
Conservation Efforts

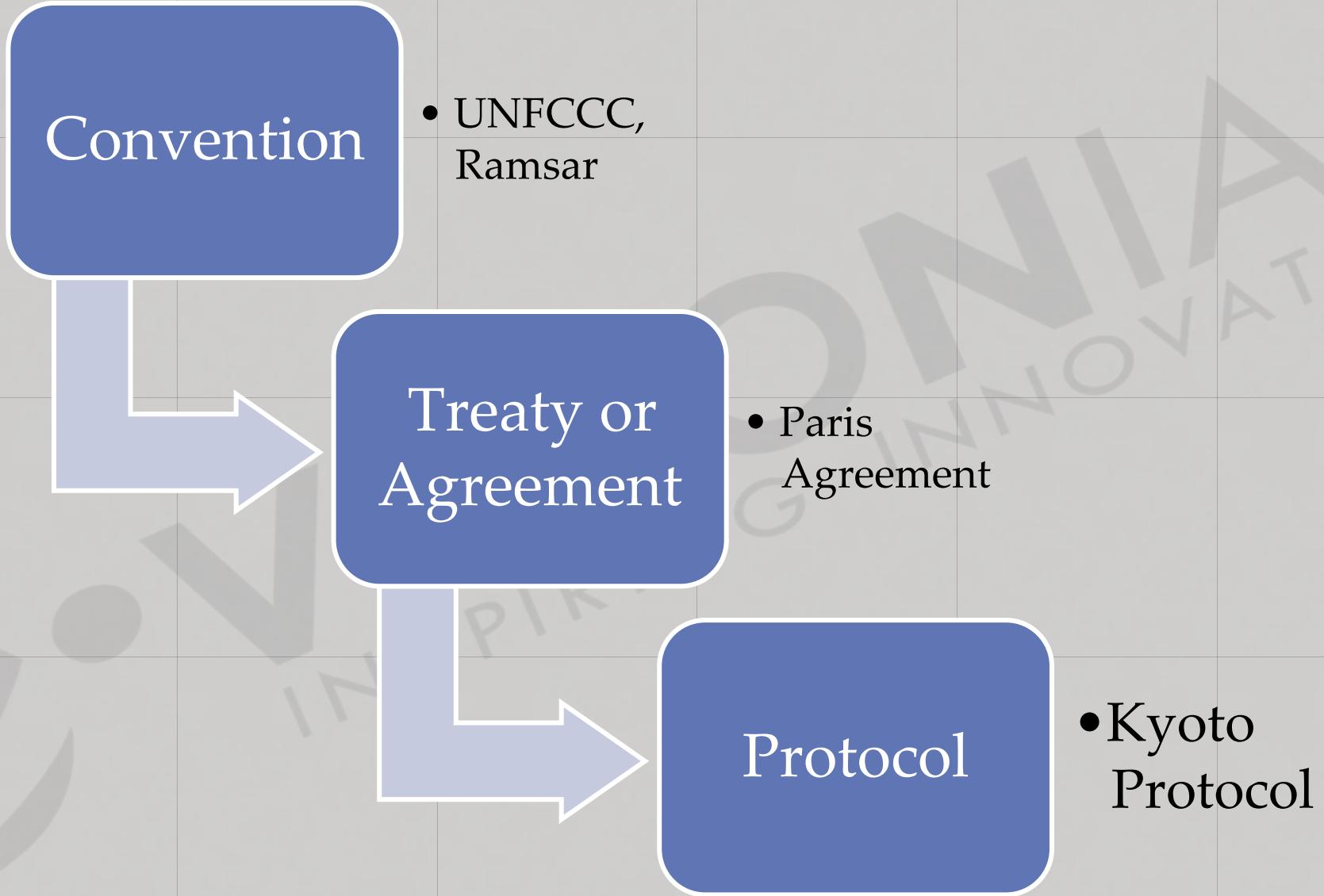
Integrated Development of Wildlife Habitats

Conservation project

HPC by Supreme Court

GIB protection zone



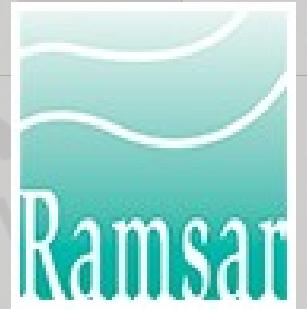


RAMSAR Convention

work towards wise use of all wetlands;

designate suitable wetlands for the list of Wetlands of International Importance (the “Ramsar List”) and ensure their effective management;

cooperate internationally on transboundary wetlands, shared wetland systems and shared species



Ramsar Convention

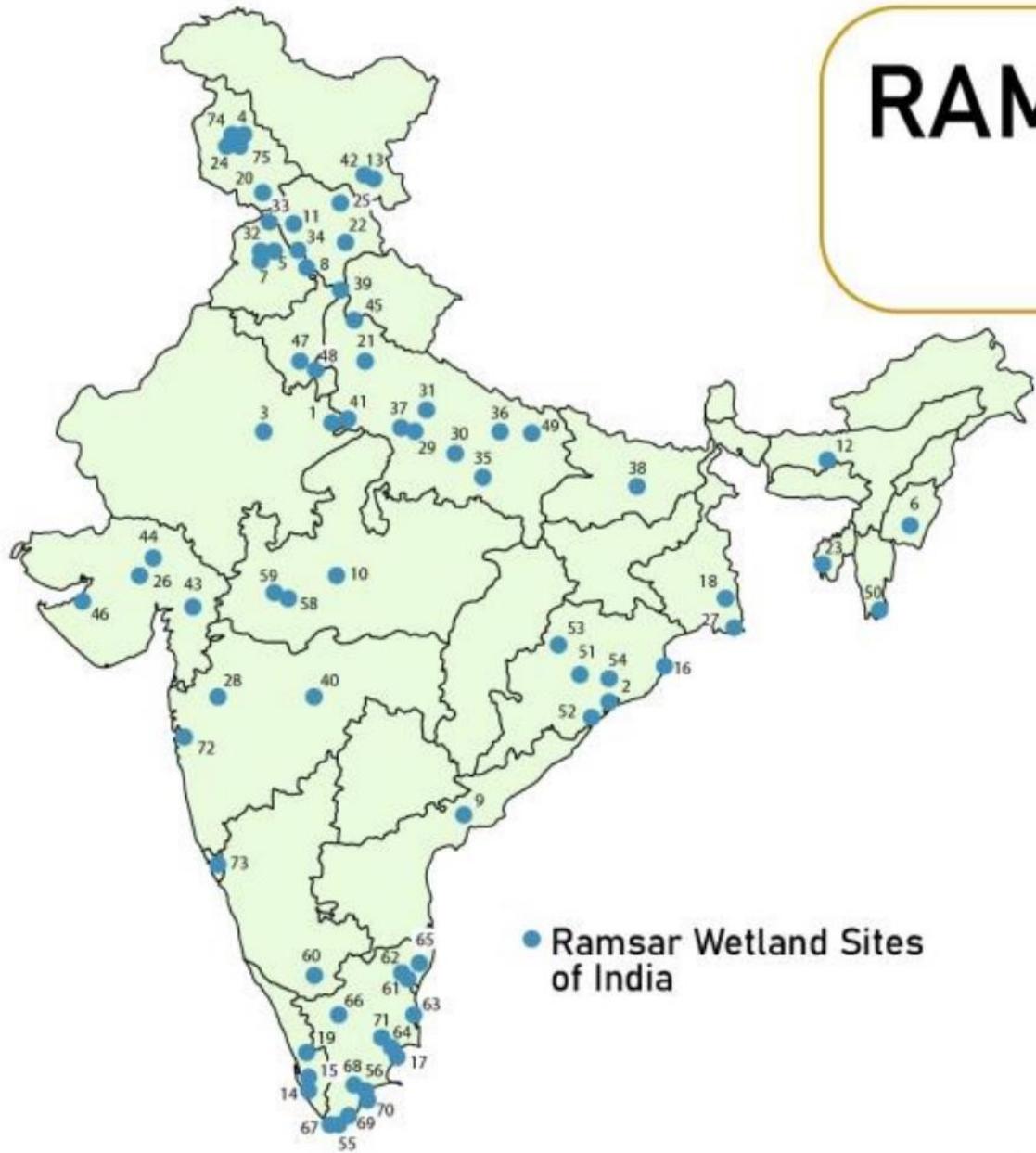
The Ramsar Convention has **6 International Organisation Partners:**

- **Birdlife International**
- **International Union for Conservation of Nature (IUCN)**
- **International Water Management Institute**
- **Wetlands International**
- **World Wide Fund for Nature (WWF)**
- **Wildfowl & Wetlands Trust (WWT)**

Nine criteria for identifying Wetlands of International Importance

1. Contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.
2. Supports vulnerable, endangered, or critically endangered species or threatened ecological communities.
3. Supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.
4. Supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.
5. Regularly supports 20,000 or more waterbirds.
6. Supports 1% of the individuals in a population of one species or subspecies of waterbird.
7. Supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.
8. Important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend. Specific criteria based on other taxa
9. Supports 1% of the individuals in a population of one species or subspecies of wetland-dependent nonavian animal species.

RAMSAR WETLAND SITES IN INDIA



S.NO	STATE LOCATION	DATE OF DECLARATION	AREA	S.NO	STATE LOCATION	DATE OF DECLARATION	AREA
1 Andhra Pradesh	Kolleru Lake	19.8.2002	901.00	39 Odisha	Tampara Lake	13.08.2022	3.00
2 Assam	Deepor Beel	19.8.2002	40.00	40 Punjab	Beas Conservation Reserve	26.9.2019	64.29
3 Bihar	Kabartal Wetland	21.07.2020	26.20	41 Punjab	Harike Lake	23.3.1990	41.00
4 Goa	Nanda Lake	06.08.2022	0.42	42 Punjab	Kanji Lake	22.1.2002	1.83
5 Gujarat	Khijadia Wildlife Sanctuary	13.04.2021	5.12	43 Punjab	Keshopur-Miani Community Reserve	26.9.2019	3.44
6 Gujarat	Nalsarovar Bird SanctuarY	24.09.2012	120.00	44 Punjab	Nangal Wildlife Sanctuary	26.9.2019	1.16
7 Gujarat	Thol Lake Wildlife Sanctuary	05.04.2021	6.99	45 Punjab	Ropar Lake	22.1.2002	13.65
8 Gujarat	Wadhvana Wetland	05.04.2021	6.30	46 Rajasthan	Keoladeo Ghana NP	1.10.1981	28.73
9 Haryana	Bhindawas Wildlife Sanctuary	25.05.2021	4.12	47 Rajasthan	Sambhar Lake	23.3.1990	240.00
10 Haryana	Sultanpur National Park	25.05.2021	1.43	48 Tamil Nadu	Chitrangudi Bird Sanctuary	13.08.2022	2.60
11 H&P	Chandertal Wetland	8.11.2005	0.49	49 Tamil Nadu	Gulf of Mannar Marine Biosphere Reserve	04.08.2022	526.72
12 H&P	Pong Dam Lake	19.8.2002	156.62	50 Tamil Nadu	Kanjirankulam Bird Sanctuary	13.08.2022	0.97
13 H&P	Renuka Wetland	8.11.2005	0.20	51 Tamil Nadu	Karikili Bird Sanctuary	04.08.2022	0.58
14 J&K	Hokera Wetland	8.11.2005	13.75	52 Tamil Nadu	Koonthankulam Bird Sanctuary	11.08.2021	0.72
15 J&K	Hygam Wetland Conservation Reserve	13.08.2022	8.02	53 Tamil Nadu	Pallikaranai Marsh Reserve Forest	04.08.2022	12.48
16 J&K	Shallbugh Wetland Conservation Reserve	13.08.2022	16.75	54 Tamil Nadu	Pichavaram Mangrove Point Calimere Wildlife and Bird Sanctuary	04.08.2022	14.79
17 J&K	Surinsar-Mansar Lakes	8.11.2005	3.50	55 Tamil Nadu	Suchindram Theroor Wetland Complex	19.8.2002	385.00
18 J&K	Wular Lake	23.3.1990	189.00	56 Tamil Nadu	Udhayamarthandapuram Bird Sanctuary	13.08.2022	0.94
19 Karnataka	Ranganathittu Bird Sanctuary	15.02.2022	5.18	57 Tamil Nadu	Vaduvur Bird Sanctuary	04.08.2022	0.44
20 Kerala	Asthamudi Wetland	19.8.2002	61.40	58 Tamil Nadu	Vedanthangal Bird Sanctuary	13.08.2022	1.13
21 Kerala	Sasthamkotta Lake	19.8.2002	3.73	59 Tamil Nadu	Sanctuary	04.08.2022	0.40
22 Kerala	Vembanad Kol Wetland	19.8.2002	1512.50	60 Tamil Nadu	Vellode Bird Sanctuary	04.08.2022	0.77
23 Ladakh	Tso Kar Wetland Complex	17.11.2020	95.77	61 Tamil Nadu	Vembannur Wetland Complex	04.08.2022	0.20
24 Ladakh	Tsomoriri Lake	19.8.2002	120.00	62 Tripura	Rudrasagar Lake	8.11.2005	2.40
25 Madhya Pradesh	Bhoj Wetlands	19.8.2002	32.01	63 Uttar Pradesh	Bakhira Wildlife Sanctuary	29.06.2021	28.94
26 Madhya Pradesh	Sakhy Sagar	01.07.2022	2.48	64 Uttar Pradesh	Haiderpur Wetland	8.12.2021	69.08
27 Madhya Pradesh	Sirpur Wetland	01.07.2022	1.61	65 Uttar Pradesh	Nawabganj Bird Sanctuary	19.9.2019	2.25
28 Madhya Pradesh	Yashwant Sagar	13.08.2022	8.23	66 Uttar Pradesh	Parvati Agra Bird Sanctuary	2.12.2019	7.22
29 Maharashtra	Lonar Lake	22.7.2020	4.27	67 Uttar Pradesh	Saman Bird Sanctuary	2.12.2019	5.26
30 Maharashtra	Nandur			68 Uttar Pradesh	Samaspur Bird Sanctuary	3.10.2019	7.99
	Madhameshwari	21.6.2019	14.37	69 Uttar Pradesh	Sandi Bird Sanctuary	26.9.2019	3.09
31 Maharashtra	Thane Creek	13.08.2022	65.21	70 Uttar Pradesh	Sarsai Nawar Jheel	19.9.2019	1.61
32 Manipur	Loktak Lake	23.3.1990	266.00	71 Uttar Pradesh	Sur Sarovar	21.8.2020	4.31
33 Mizoram	Pala Wetland	31.08.2021	18.50	72 Uttar Pradesh	Upper Ganga River	8.11.2005	265.90
34 Odisha	Ansupa Lake	13.08.2022	2.31	73 Uttarakhand	Asan Conservation Reserve	21.7.2020	4.44
35 Odisha	Bhitarkanika Mangroves	19.8.2002	650.00	74 West Bengal	East Kolkata Wetlands	19.8.2002	125.00
36 Odisha	Chilka Lake	1.10.1981	1165.00	75 West Bengal	Sunderbans Wetland	30.1.2019	4230.00
37 Odisha	Hirakud Reservoir	13.08.2022	654.00				
38 Odisha	Satkosia Gorge	10.12.2021	981.97				



CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora)

Genesis

- An international agreement between governments which was drafted as a result of a resolution adopted in 1963 at a meeting of members of IUCN . The text of the Convention was finally agreed in 1973 and entered in force in 1975 .

Objective

- To ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species

Headquarter



Membership



184 Parties

Is India a Party?

- **CITES Secretariat** is administered by UNEP and is located at **Geneva, Switzerland**.

Other key information



- Although CITES is legally binding on the Parties – in other words they have to implement the Convention – it does not take the place of national laws.
- CITES works by subjecting international trade in specimens of selected species to certain controls. The species covered by CITES are listed in three Appendices, according to the degree of protection they need.

3 APPENDICES of CITES

APPENDIX I

- Species threatened with extinction.
- International commercial trade is generally prohibited.

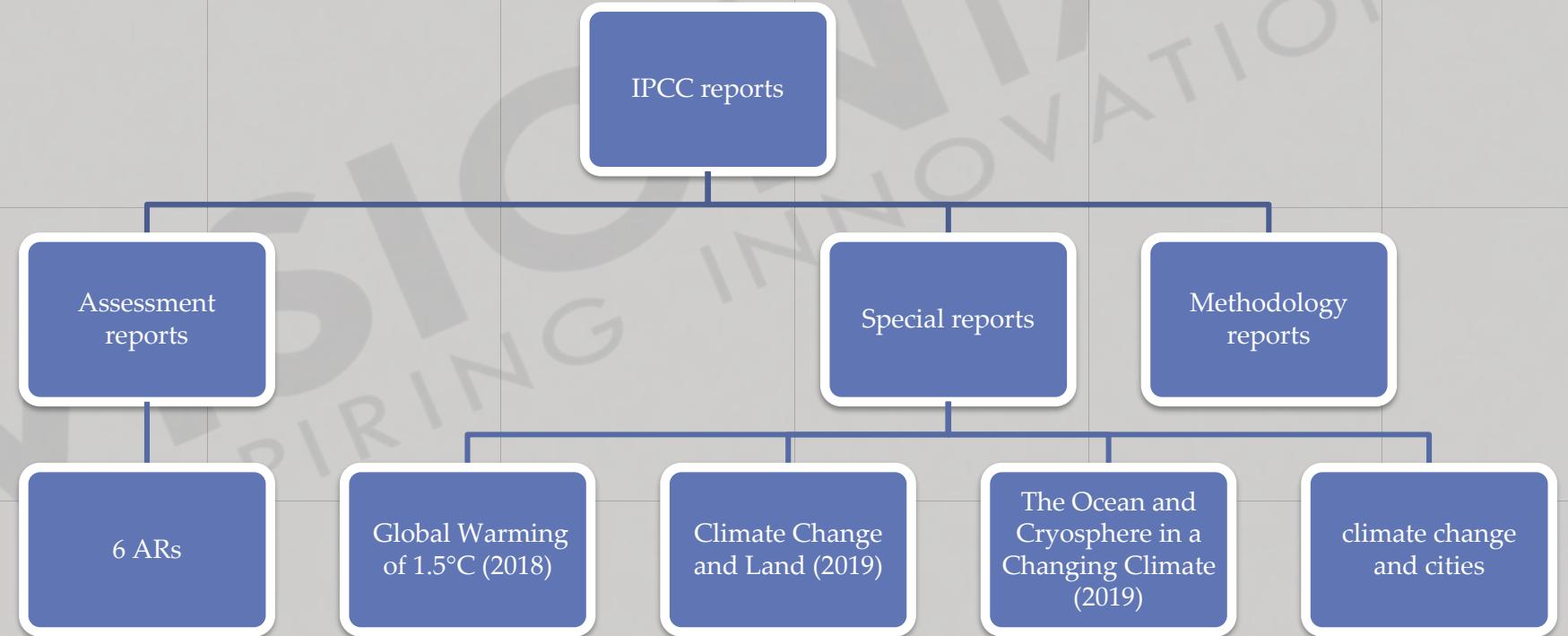
APPENDIX II

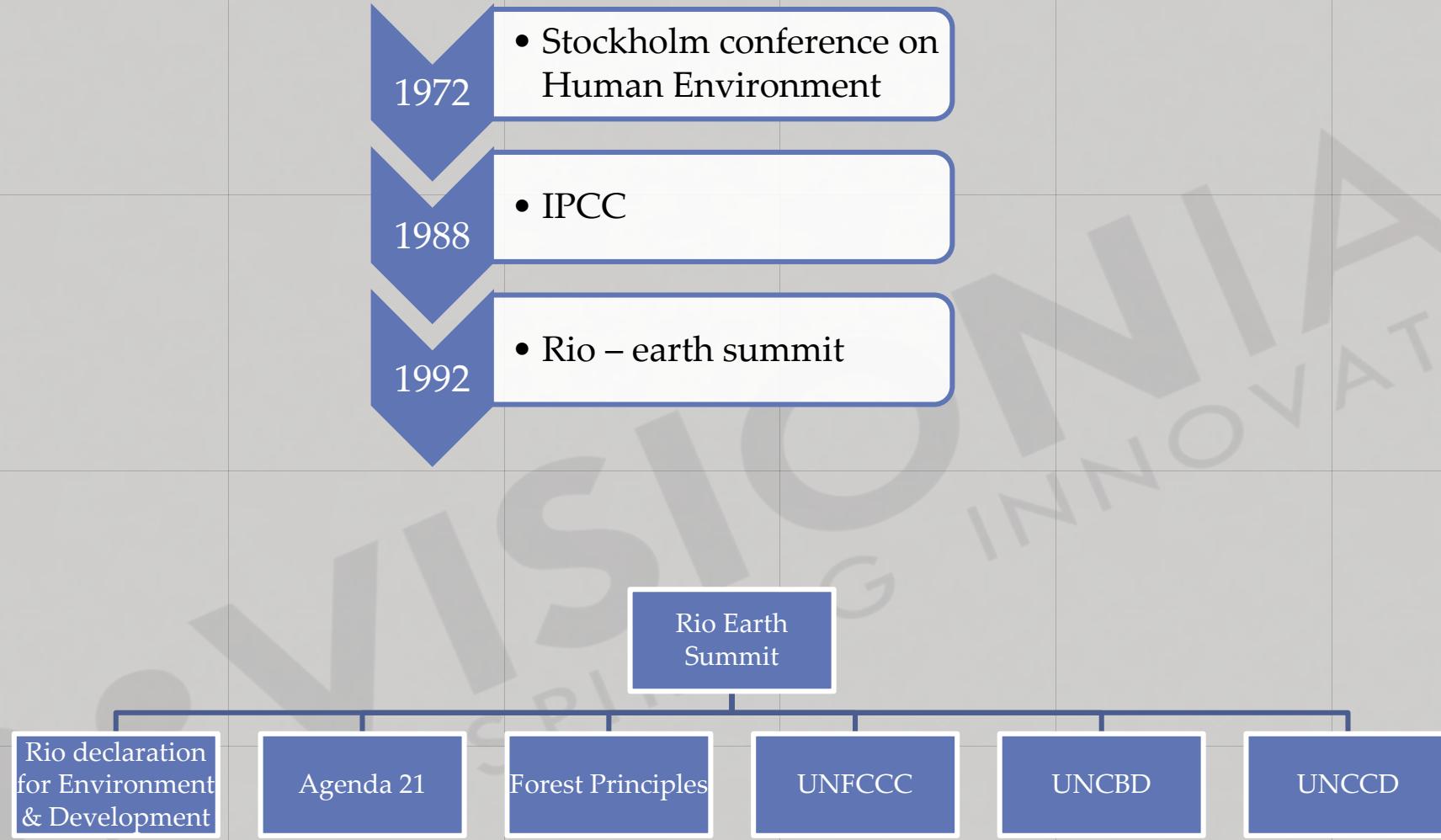
- Species not necessarily threatened with extinction but may become so unless trade is regulated.
- International commercial trade is allowed but controlled

APPENDIX III

- Species subject to regulation within the jurisdiction of a Party and for which the cooperation of other Parties is needed to control international trade.

About IPCC





UNFCCC

- Signed -1992
- Into force - 1994
- COP 1 – Berlin

Kyoto protocol

- Adopted in 1997
- into force – 2005
- 1st period – 2008 to 2012
- 2nd period – 2013 to 2020

Paris Agreement

- COP 21 - 2015
- Into force – 2016
- Starts from 2020

PANCHAMRITA: INDIA'S CLIMATE COMMITMENTS AT COP26 SUMMIT IN GLASGOW



Achieve the target of Net Zero by the year 2070



Increase non-fossil energy capacity to 500 GW by 2030



Meet 50 percent of its energy requirements from renewable energy by 2030



Reduce the total projected carbon emissions by one billion tonnes from now till 2030



Reduce the carbon intensity of its economy by less than 45 percent by 2030



Questions??



- Online query (For faster reply)
- Read and revise what is taught
- Read the reference material
- Mentoring sessions

If Dil Maange beyond MORE...

Mail: rajesh@visionias.in
Twitter: [@naturiousoul](https://twitter.com/naturiousoul)



ENVIRONMENT

Sections – Environment (Prelims + Mains)

Ecology

Environmental Degradation

Biodiversity

Conservation efforts

Sustainable Development

EIA & Environmental ethics

Sustainable Development

Sustainable Development – Concept

Sustainable Development Goals

Energy

Other concepts related to sustainability

MODERNE MAN



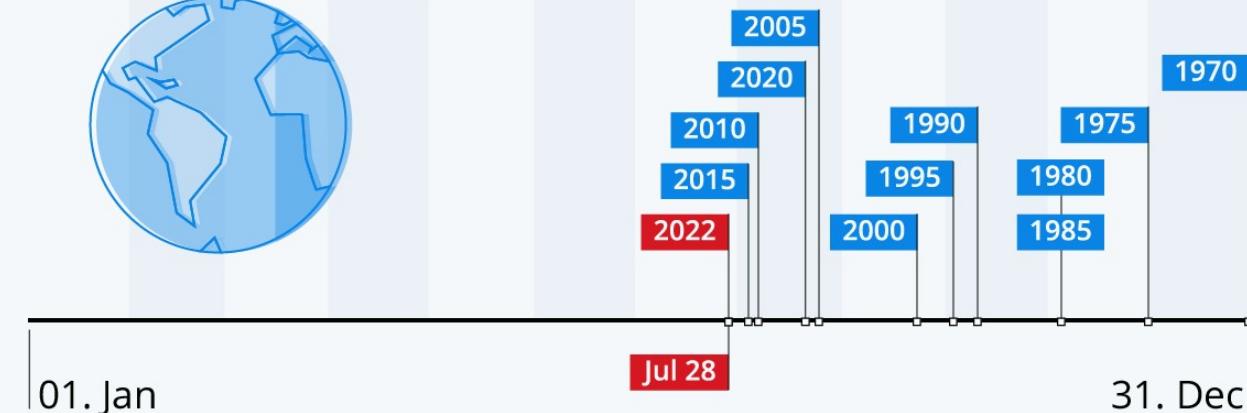




EARTH OVER SHOOT DAY

Earth Overshoot Day Is Coming Sooner and Sooner

Historical dates of Earth Overshoot Day



Earth Overshoot Day marks the date when humanity's demand for ecological resources in a given year exceeds what Earth can regenerate in that year.

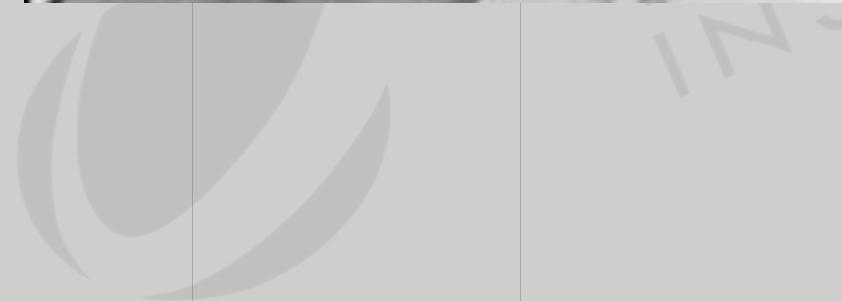
Source: Global Footprint Network





Earth provides enough to satisfy
every man's needs, but not every
man's greed.

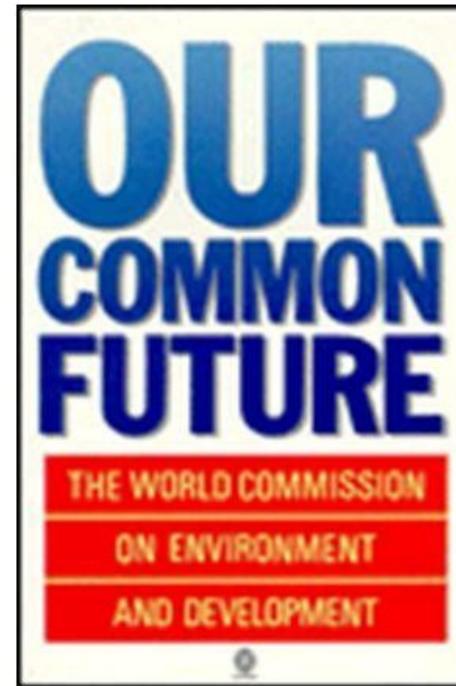
— *Mahatma Gandhi* —



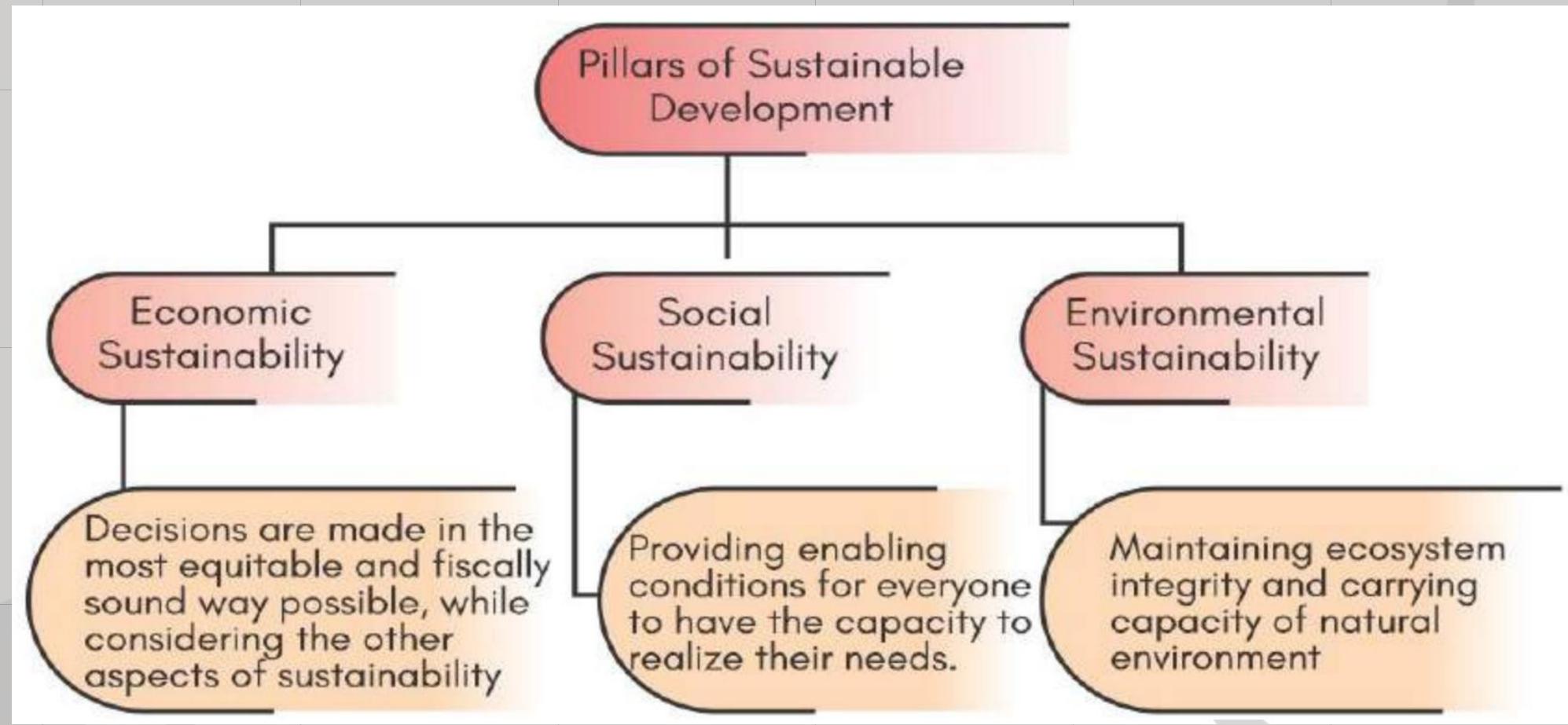
Sustainable Development

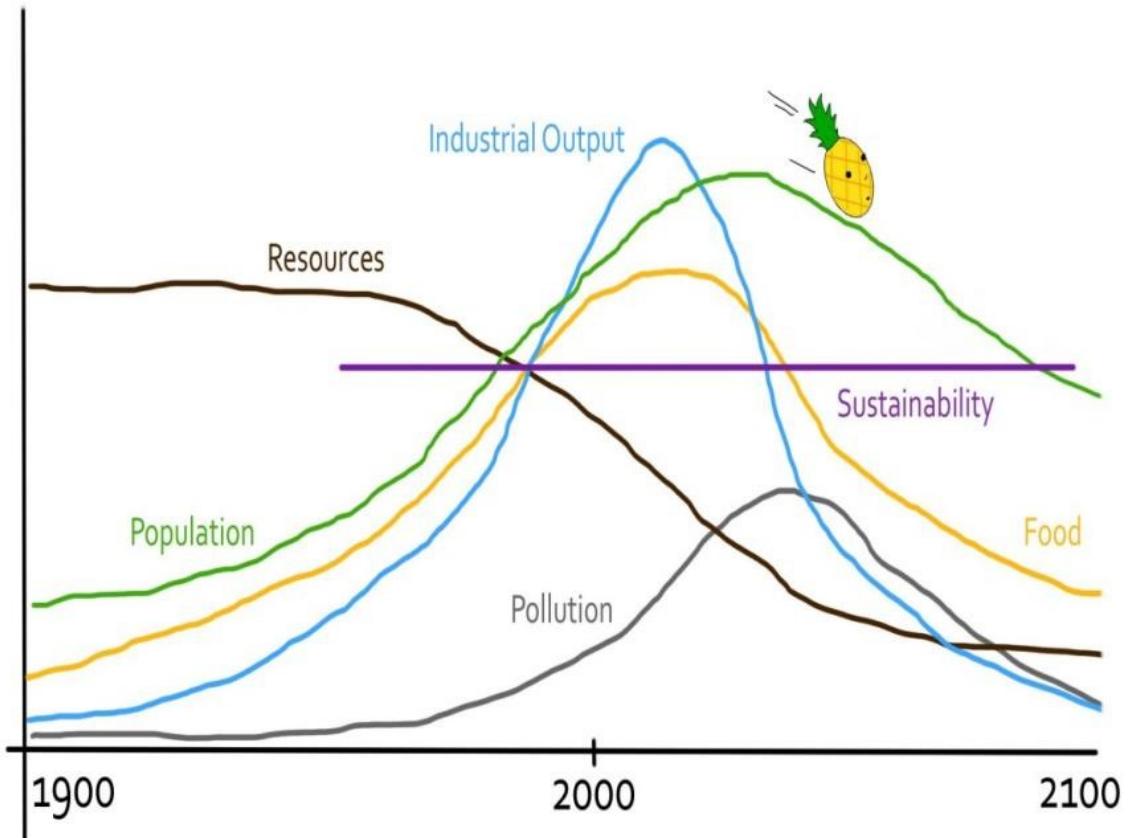
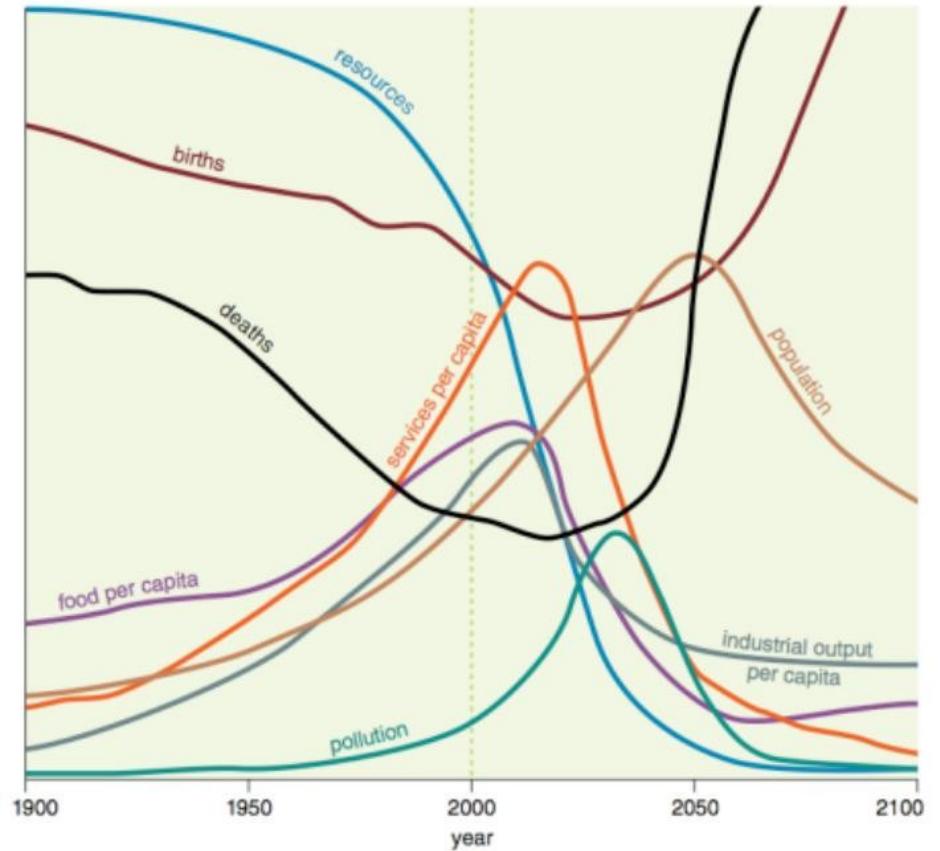
“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs”

Brundtland Commission
“Our common future” 1987



**Brundtland Commission
(WCED 1987)**





Donella Meadows at Massachusetts Institute of Technology, and published in 1972 in the book **Limits to Growth**

Later Meadows group at Massachusetts Institute of Technology, published a book **Beyond the Limits** in 1992



Goal 1: Eradicate Extreme Hunger and Poverty



Goal 2: Achieve Universal Primary Education



Goal 3: Promote Gender Equality and Empower Women



Goal 4: Reduce Child Mortality



Goal 5: Improve Maternal Health



Goal 6: Combat HIV/AIDS, Malaria and other diseases



Goal 7: Ensure Environmental Sustainability



Goal 8: Develop a Global Partnership for Development

MDGs and Target-Summary of progress achieved by India

GOAL 1: ERADICATE EXTREME POVERTY AND HUNGER

TARGET 1: Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day

Achieved

TARGET 2: Halve, between 1990 and 2015, the proportion of people who suffer from hunger

In progress

MDG 2: ACHIEVE UNIVERSAL PRIMARY EDUCATION

TARGET 3: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling

In progress

MDG 3: PROMOTE GENDER EQUALITY AND EMPOWER WOMEN

TARGET 4: Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015

Achieved

MDG 4: REDUCE CHILD MORTALITY

TARGET 5: Reduce by two-thirds, between 1990 and 2015, the Under - Five Mortality Rate

Nearly achieved.

MDG 5: IMPROVE MATERNAL HEALTH

TARGET 6: Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio

In progress

MDG 6: COMBAT HIV/AIDS, MALARIA AND OTHER DISEASES

TARGET 7: Have halted by 2015 and begun to reverse the spread of HIV/AIDS

Achieved

TARGET 8: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases

Achieved

MDG 7: ENSURE ENVIRONMENTAL SUSTAINABILITY

TARGET 9: Integrate the principle of sustainable development into country policies and programmes and reverse the loss of environmental resources.

In progress

TARGET 10: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation

Achieved for the indicator of drinking water. In progress for the indicator of Sanitation

TARGET 11: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers

The pattern not statistically discernible

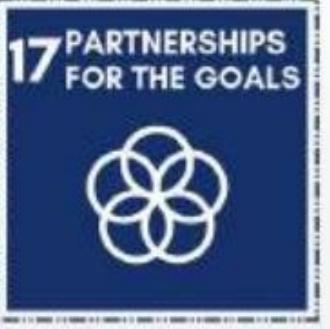
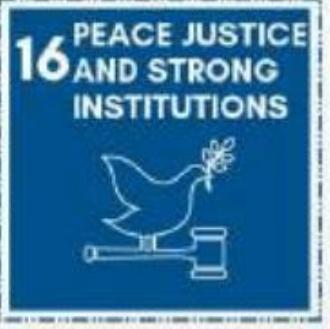
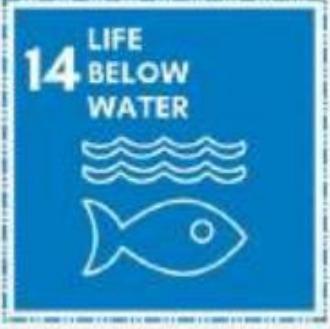
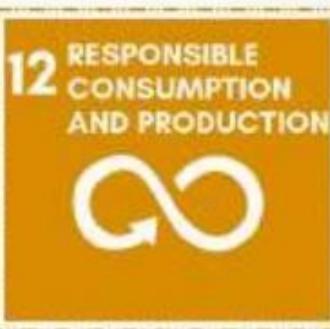
MDG 8: DEVELOP A GLOBAL PARTNERSHIP FOR DEVELOPMENT

TARGET 18: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications

Achieved



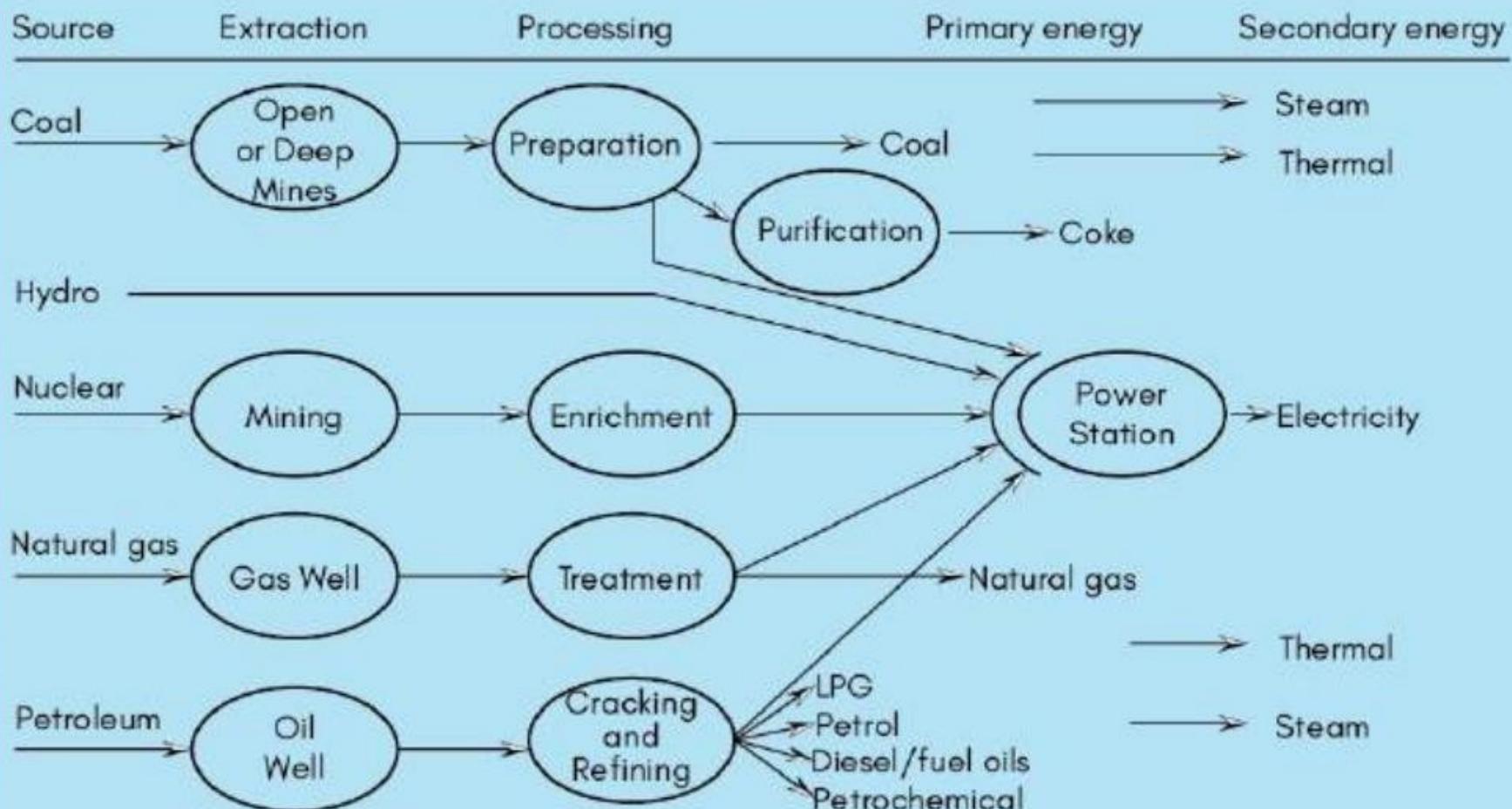
SUSTAINABLE DEVELOPMENT GOALS



Interconnectedness among SDGs



MAJOR PRIMARY AND SECONDARY SOURCES



Power Sector at a Glance ALL INDIA

Updated on 13-01-2023

Source: OM SECTION

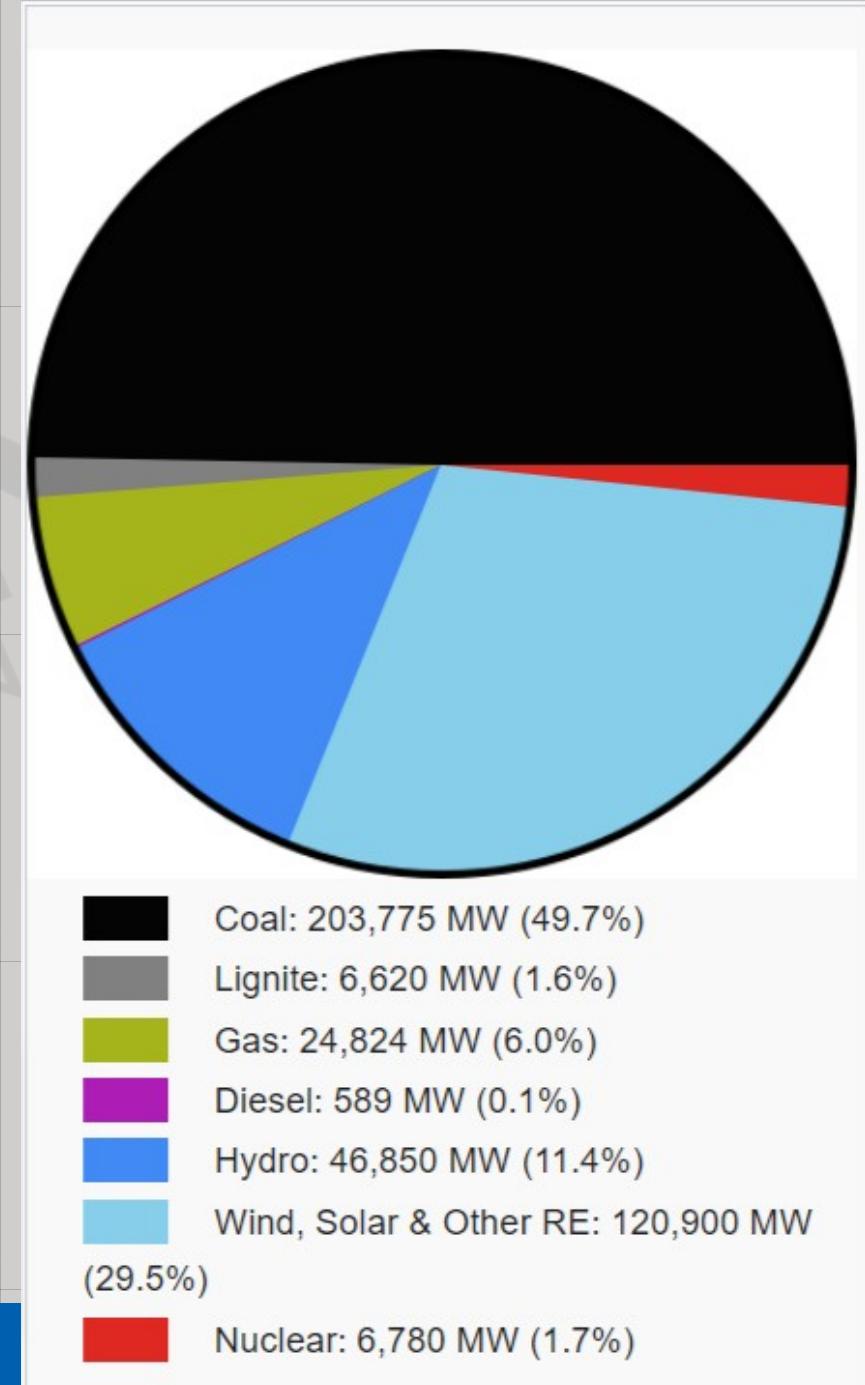
1. Total Installed Capacity (As on 31.12.2022) - Source : Central Electricity Authority (CEA)

INSTALLED GENERATION CAPACITY (SECTOR WISE) AS ON 31.12.2022

Sector	MW	% of Total
Central Sector	98,795	24.2%
State Sector	1,04,918	25.6%
Private Sector	2,06,627	50.4%
Total	4,10,339	

Installed GENERATION CAPACITY(FUELWISE) AS ON 31.12.2022

CATAGORY	INSTALLED GENERATION CAPACITY(MW)	% of SHARE IN Total
Fossil Fuel		
Coal	203,775	49.7%
Lignite	6,620	1.6%
Gas	24,824	6.1%
Diesel	589	0.1%
Total Fossil Fuel	2,35,809	57.5 %
Non-Fossil Fuel		
RES (Incl. Hydro)	167,750	40.7%
Hydro	46,850	11.4 %
Wind, Solar & Other RE	120,900	29.5 %
Wind	41,930	10.2 %
Solar	63,302	15.1 %
BM Power/Cogen	10,210	2.5 %
Waste to Energy	522	0.1 %
Small Hydro Power	4,936	1.2 %
Nuclear	6,780	1.7%
Total Non-Fossil Fuel	174,530	42.5%
Total Installed Capacity	410,339	100%
(Fossil Fuel & Non-Fossil Fuel)		

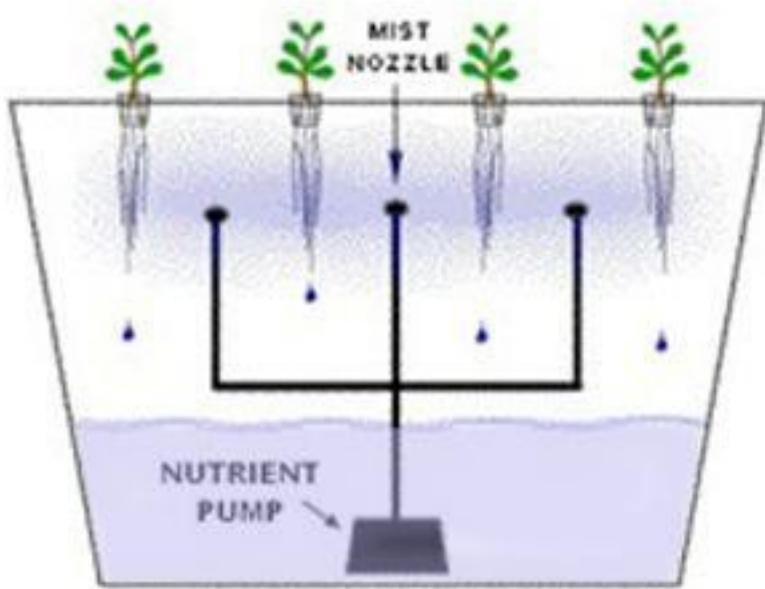


Source of energy/Fuel	Production	Advantages	Limitations
Solar energy	From natural sunlight	Environment friendly Ample or unlimited availability.	<ul style="list-style-type: none"> Limited capacity for storage of sunlight. Cloud cover may limit usefulness. Collecting equipment expensive
Wind energy	Windmills with Fans for directing winds	No pollution Available for free Not available everywhere or intermittently available.	Fans of wind mills visual hazards for flying birds and aeroplanes (visual pollution).
Tidal energy	Harnessing tidal power by suitable structures	Free and clean	<ul style="list-style-type: none"> Structures (plant) used for harnessing energy expensive. Plant disrupts natural flow of estuary and concentrate pollutants in the area
Hydel power or Hydropower	Dams built on river for electricity generation	World's hydroelectricity capacity high	<ul style="list-style-type: none"> Ecosystems behind dams disturbed. Human settlements up rooted for building dam. Habitat loss and consequent biodiversity loss. Developmental cost high. Fertile farmland lost and amount of nutrient rich silt on down river agricultural fields reduced.

Source of energy/Fuel	Production	Advantages	Limitations
Nuclear energy	Nuclear fission (splitting of atom) and Nuclear fusion	No air pollution Fuel efficient	<ul style="list-style-type: none"> • High cost of construction of nuclear plant. • Fear of security and nuclear accidents.
Geothermal energy	Wells drilled to trap steam which powers electrical generators. Steam naturally produced from underground water which gets heated due to very high temperature that region.	Environment friendly	<ul style="list-style-type: none"> • Problem of safe disposal of nuclear waste. • Steam contains Hydrogen Sulphide (H₂S) having odour of rotten eggs. • Minerals in the steam corrosive to pipe lines and equipment causing maintenance problems. • Minerals in the water toxic to fish.

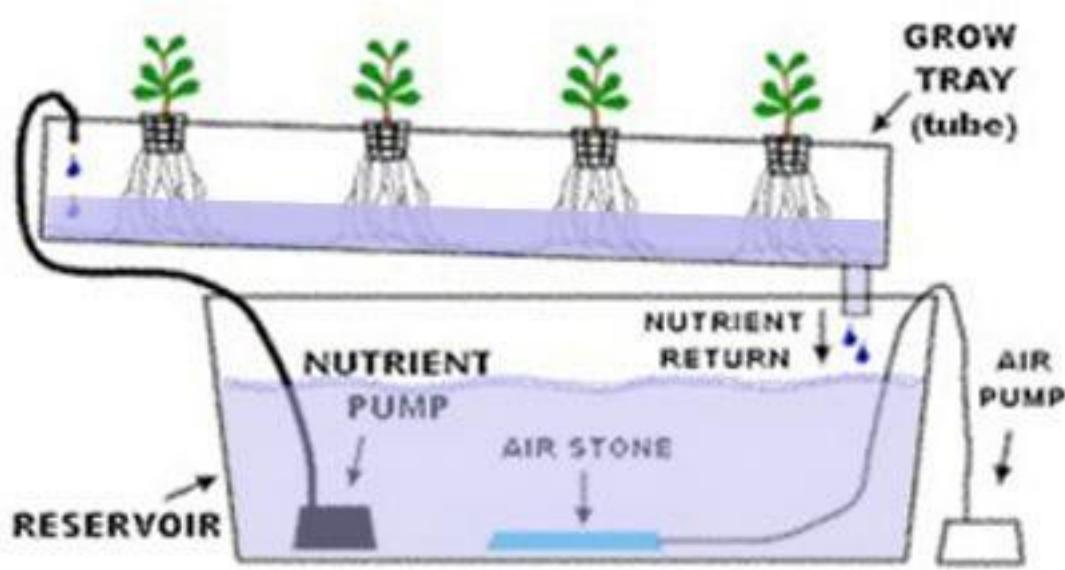
Source of energy/Fuel	Production	Advantages	Limitations
Biomass (1) Fuel wood	Cutting trees for fuel wood and burning them straight away	Cheap so popular in under developed and developing countries	<ul style="list-style-type: none"> • Comparatively low level of energy. • Bulky so difficult to transport. • Burning wood causes air pollution. • Destruction of forests to obtain fuel wood and so desertification. • Release lot of fly ash.
(2) Biomass conversion	Obtaining energy from chemical energy stored in biomass (or live material). Burned directly for cooking or to produce electricity converted to ethanol or methane (biogas)	Renew able energy	<ul style="list-style-type: none"> • May lead to food shortage because nutrients not returned to soil from biomass. • Growing maize for ethanol requires more energy expenditure than the amount of energy in the form of alcohol retrieved. • Land for growing food used for growing biomass for conversion into fuel.
Solid waste	Waste sorted and burnable material separated	<ul style="list-style-type: none"> • Decreases cost of fresh disposal • Reduces need for land fill sites 	<ul style="list-style-type: none"> • Causes air pollution for burning releases CO₂ and other gases. • Waste such as bleached paper and plastics have chlorine containing compounds which form dioxins which are highly toxic and suspected to be carcinogenic.

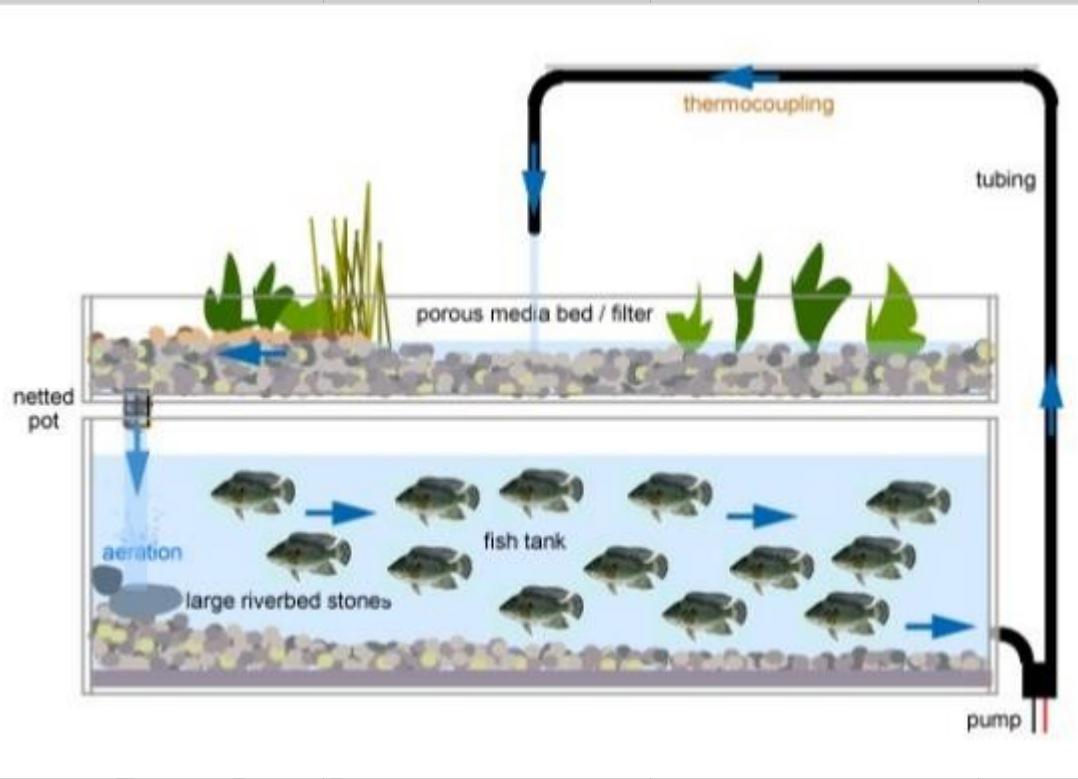
Aeroponics



VS

Hydroponics





Environmental Impact Assessment & Environmental Ethics

What is EIA?

Benefits of EIA

Principles of EIA

EIA process

EIA in India

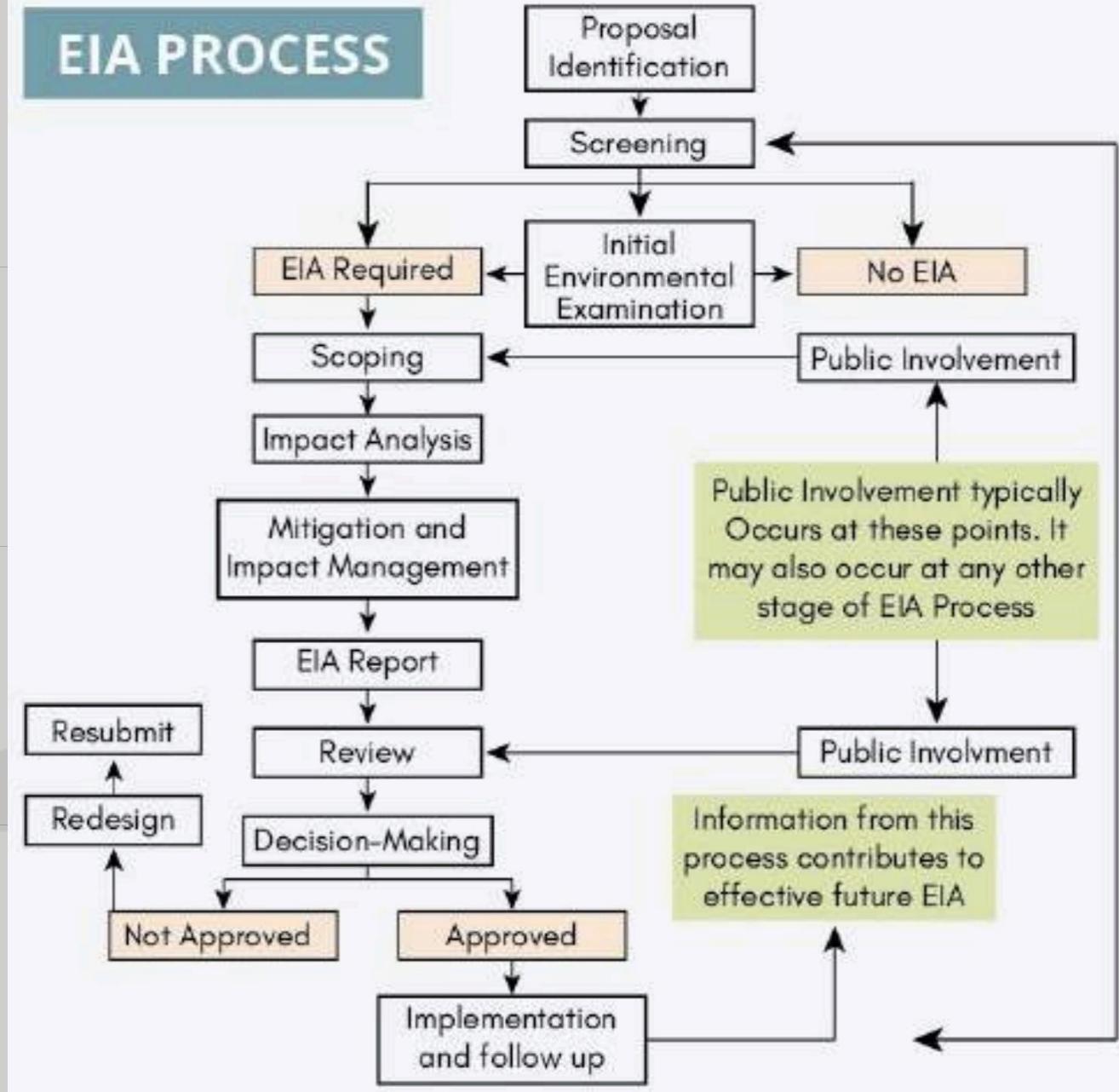
Criticism

Environmental Ethics



ENVIRONMENTAL IMPACT ASSESSMENT

EIA PROCESS



3.6.1. INDIA STATE OF FOREST REPORT (ISFR) 2021

By FSI under
the ministry
of MOEFCC

Biennial
survey

Since 1987

Forest Cover

- All lands more than one hectare in area, with a tree canopy density of more than 10%

Recorded Forest Area (RFA)

- Recorded as 'Forests' in government records.

Tree Cover

- Outside recorded forest areas exclusive of forest cover and less than the minimum mappable area of one hectare.

Carbon Stock



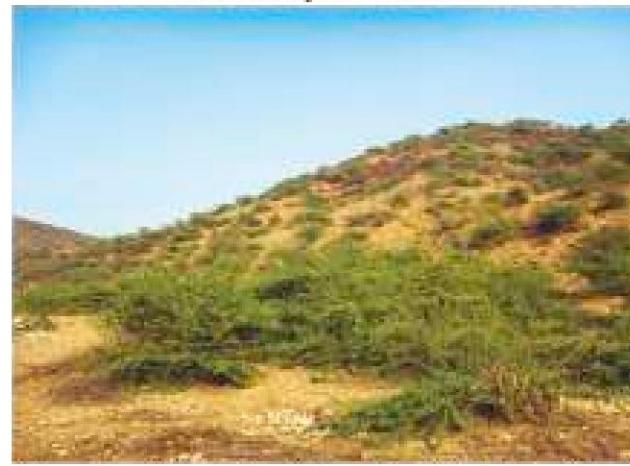
Very Dense Forest



Moderately Dense Forest



Open Forest



Scrub

Table 2.2 Forest cover classified in terms of canopy density classes

Class	Description	Open Forest	Scrub
Very Dense Forest	All lands with tree canopy density of 70 percent and above.		
Moderately Dense Forest	All lands with tree canopy density of 40 percent and more but less than 70 percent.		
Open Forest	All lands with tree canopy density of 10 percent and more but less than 40 percent.		
Scrub	Degraded forest lands with canopy density less than 10 percent.		
Non-forest	Lands not included in any of the above classes. (includes water)		

TABLE 1 Forest and Tree cover of India in 2019

Class	Area (sq km)	Percentage of Geographical Area
Forest Cover		
Very Dense Forest	99,278	3.02
Moderately Dense Forest	3,08,472	9.38
Open Forest	3,04,499	9.26
Total Forest Cover*	7,12,249	21.67
Tree Cover	95,027	2.89
Total Forest and Tree Cover	8,07,276	24.56
Scrub	46,297	1.41
Non-Forest#	25,28,923	76.92
Total Geographic Area	32,87,469	100.00

Table 1 Forest and Tree Cover of India in 2021

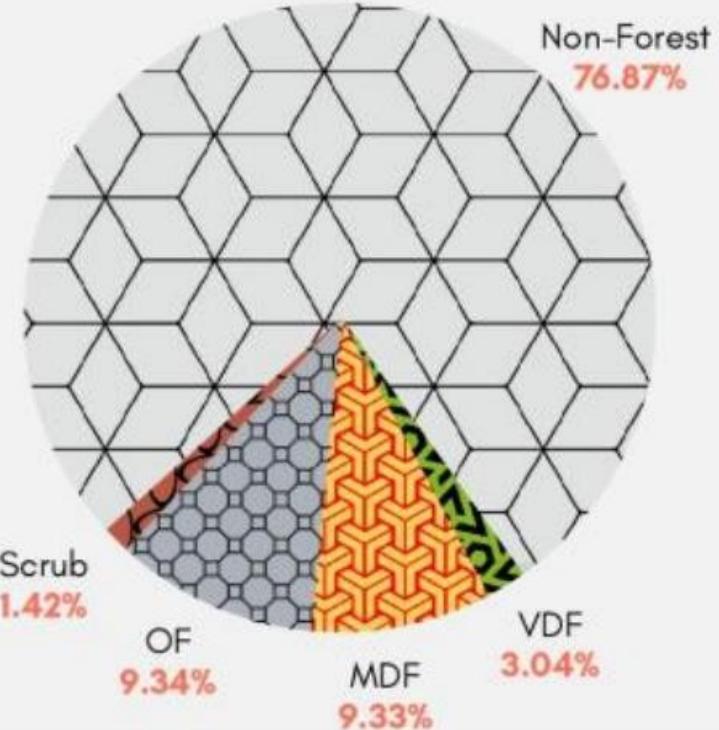
Class	Area (sq km)	Percentage of Geographical Area
Forest Cover		
Very Dense Forest	99,779	3.04
Moderately Dense Forest	3,06,890	9.33
Open Forest	3,07,120	9.34
Total Forest Cover*	7,13,789	21.71
Tree Cover	95,748	2.91
Total Forest and Tree Cover	8,09,537	24.62
Scrub	46,539	1.42
Non Forest#	25,27,141	76.87
Total Geographical Area	32,87,469	-

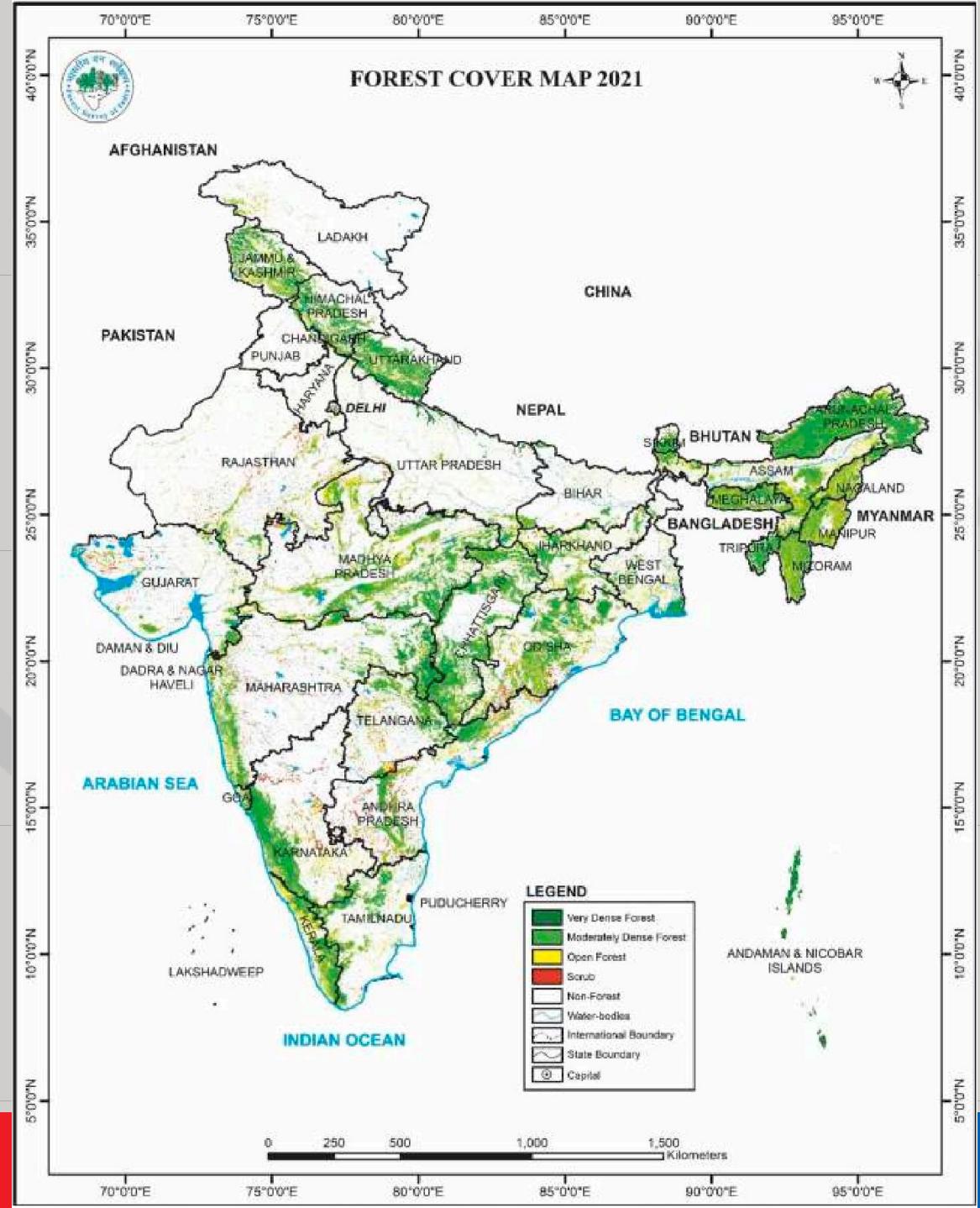
* Includes 4,992 sq km under Mangrove Cover

Non-forest includes Tree Cover (Percentage rounded off)

Total forest cover	↑ Increase of 1,540 sq km (0.22%)
Very Dense Forest (VDF)	↑ Increase of 501 sq km
Moderately Dense Forest (MDF)	↓ Decrease of 1,582 sq km
Open Forest (OF)	↑ Increase of 2,621 sq km
Scrub (not included in forest cover)	↑ Increase of 242 sq km

COMPOSITION OF FOREST COVER IN INDIA





No change wrt 2019

Forest cover
(by area)

MP

ArP

Chh

Od

MH

Forest cover
(percentage)

Miz – 84.5

ArP – 79

Megh

Mani

Naga

Increase in
forest cover
– top states

TG

AP

OD

KA

JhK

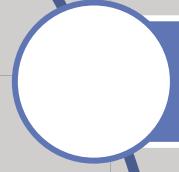
Loss in
forest cover
– top states

Arp

Mani

Megh

 State with Maximum Tree cover: Maharashtra

 36.18% of the total forest and tree cover of India – Trees Outside Forests (TOF)

 40.17% of the total geographical area - Forest cover in the hill districts - decreasing

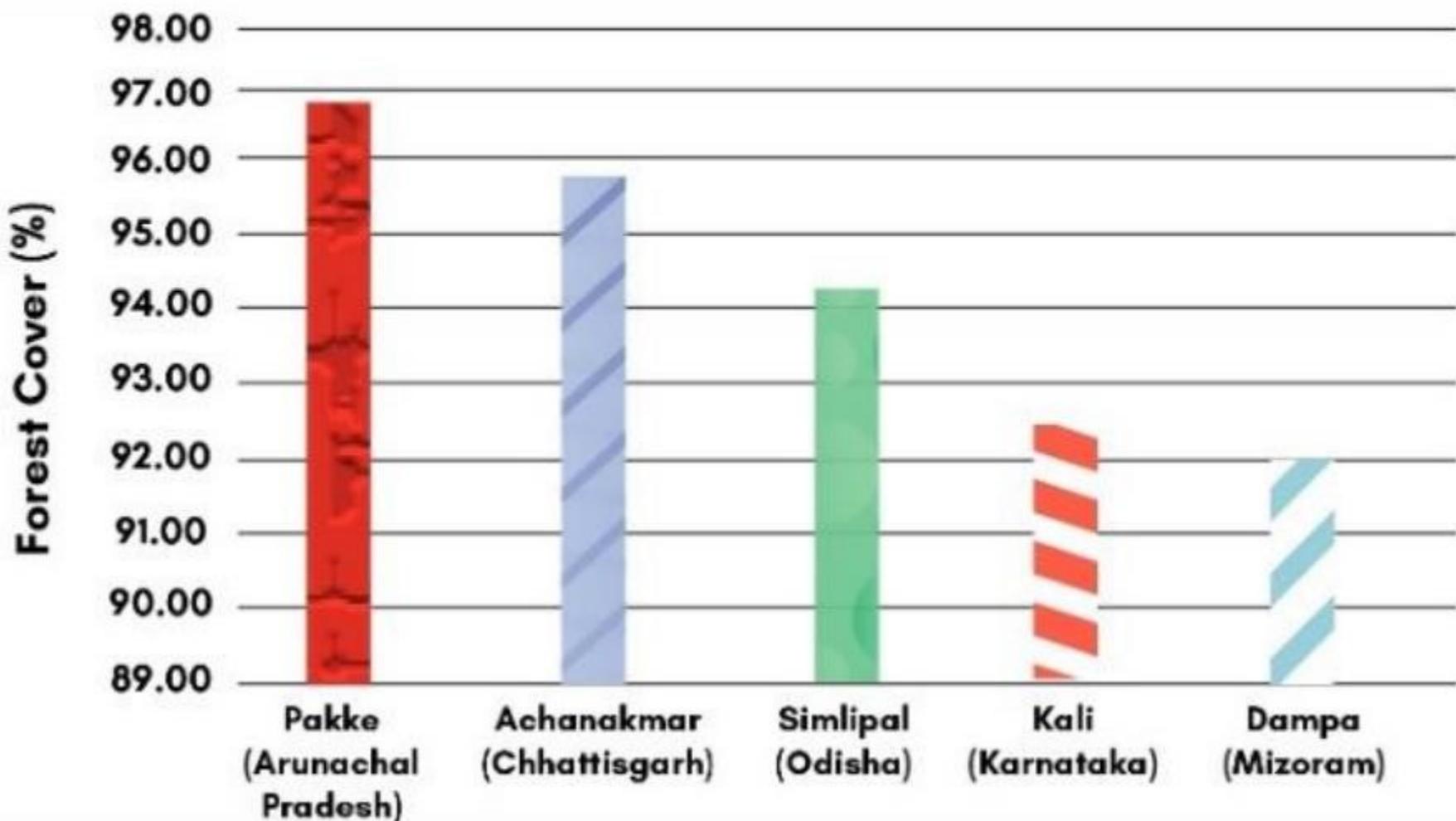
 Northeastern region - Total forest cover: 64.66% of its geographical area - decreasing

 7.80% of the country's total forest cover - in the TR (decreasing). Largest Forest Cover: NagarjunasagarSrisailam Tiger Reserve

 TR with Highest Gain in Forest cover: Buxa, West Bengal.

 TR with Highest Losses in Forest cover: Kawal, Telangana

Top Five Tiger Reserves in terms of forest cover as % of the area of the Tiger Reserve.



Mangrove: 4992 sq km (0.15% of country's geographical area). Increased by 17 sq km (0.34%)

Mangrove Cover: West Bengal, Gujarat, A&N Islands, Andhra Pradesh, Maharashtra, Odisha.

The total bamboo bearing area of the country is estimated as 1,49,443 sq km. There is a decrease of 10,594 sq km .

Top state in terms of Bamboo Bearing Area (%): Madhya Pradesh.

22.27% of the forest cover of the country is highly to extremely fire prone.

Top 3 States: Odisha, Madhya Pradesh and Chhattisgarh.

Climate hotspots



Questions??



- Online query (For faster reply)
- Read and revise what is taught
- Read the reference material
- Mentoring sessions

If Dil Maange beyond MORE...

Mail: rajesh@visionias.in
Twitter: [@naturiousoul](https://twitter.com/naturiousoul)



ENVIRONMENT

Environmental Conservation

Timeline

Legislations

National Forest Policy

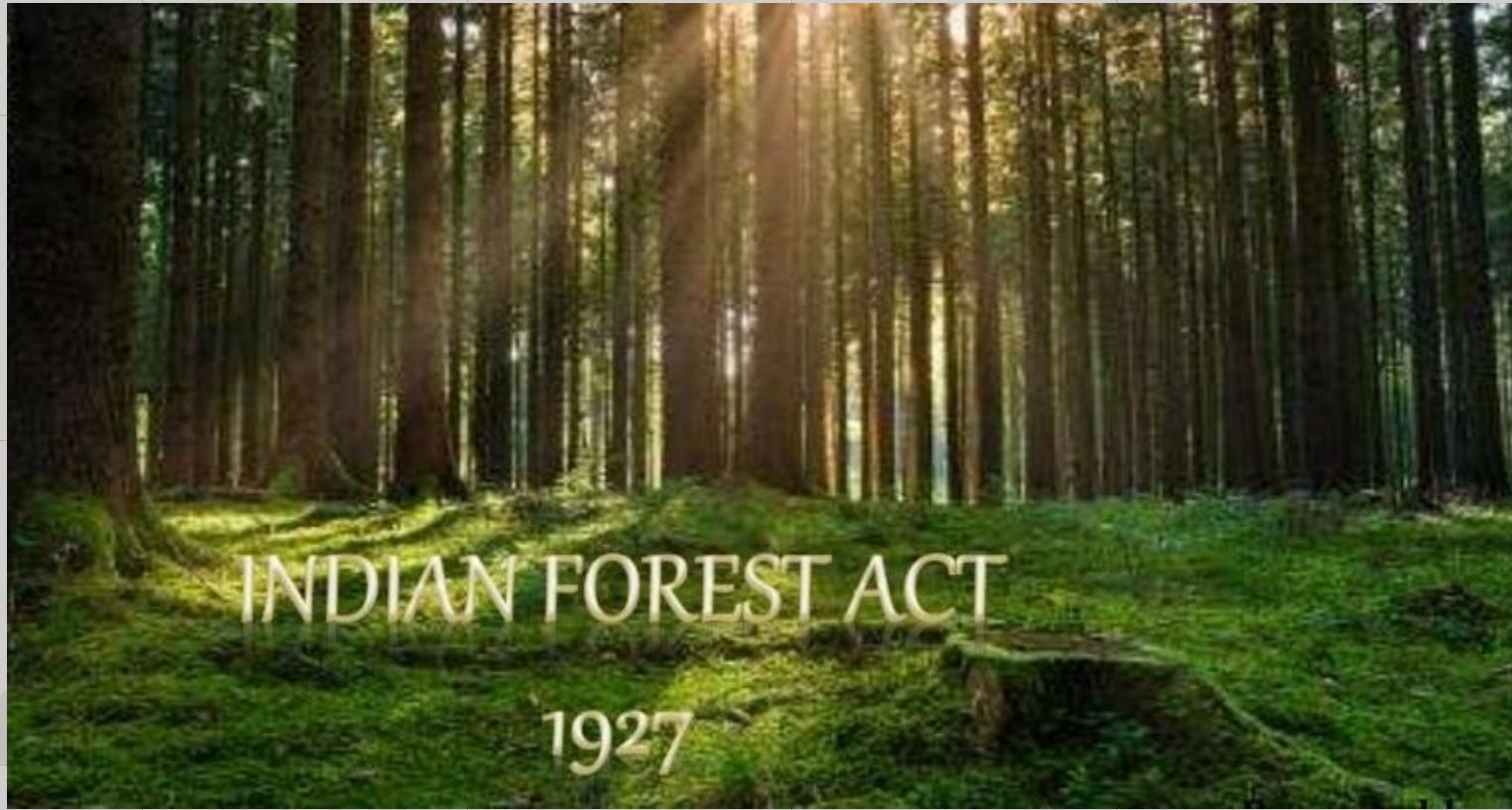
Waste management Rules and other rules

Conservation projects

International Initiatives

Constitutional Provisions:

- Part IV (Art 48A-Directive Principles of State Policies) stipulates that the State shall endeavor to protect and improve the environment and to safeguard the forests and wildlife of the country.
- Part IVA (Art 51A-Fundamental Duties) casts a duty on every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife, and to have compassion for living creatures.





THE WILD-LIFE PROTECTION ACT 1972

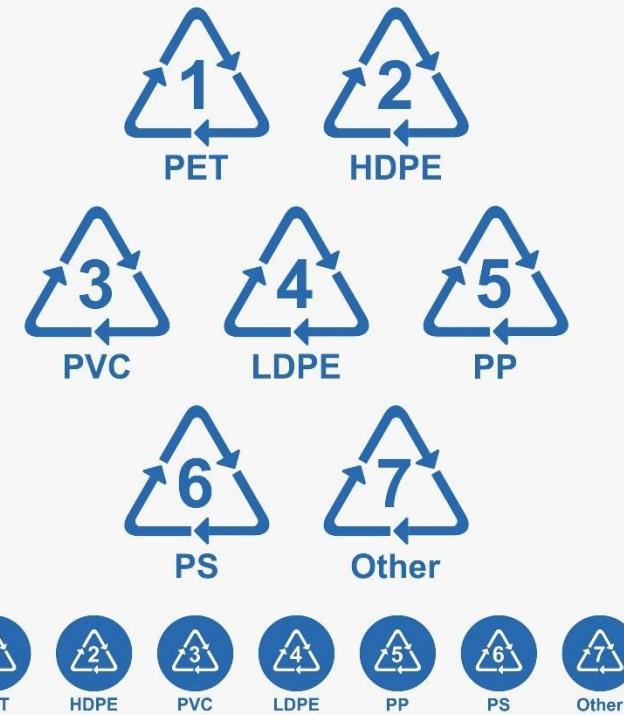


Table: Broad comparison of different

National park	Sanctuary
NP is <u>hitched to the habitat</u> of the <u>particular animal</u> like tiger, lion, hangul, rhino etc.	This is <u>generally species</u> oriented (pitcher plant, great Indian bustard)
The size range is 0.04 to 3162 km ² . Most common size is <u>100 to 500 km²</u>	Size rage is 0.61 to 7818 km ² Most common size is <u>100 to 500 km²</u>
<u>Boundaries are circumscribed by legislation</u>	<u>Boundaries are not sacrosanct</u>
<u>Except buffer zone, no biotic interference</u>	<u>Limited biotic interference</u>
<u>Tourism is permissible</u>	<u>Tourism is permissible</u>
<u>Research and scientific management is lacking</u>	<u>Research and scientific management is lacking</u>
<u>No attention is given for gene pool conservation</u>	<u>No attention is given for gene pool conservation</u>

CATEGORIES OF PLASTIC			
Type	Category	Examples	Recyclable?
Thermoplastics	PS (Polystyrene)	Foam hot drink cups, plastic cutlery, containers, and yogurt	Partially
	PP (Polypropylene)	Lunch boxes, take-out food containers, ice cream containers	Partially
	LDPE (Low-density polyethylene)	Garbage bins and bags	Partially
	PVC (Plasticized polyvinyl chloride or polyvinyl chloride)	Juice or squeeze bottles	Yes
	HDPE (High-density polyethylene)	Shampoo containers or milk bottles	Yes
	PET (Polyethylene terephthalate)	Fruit juice and soft drink bottles	Yes
	Thermoset and others	Multi-layer and laminated plastics, polyurethane foam, Bakelite, polycarbonate, melamine, nylon etc.	Yes

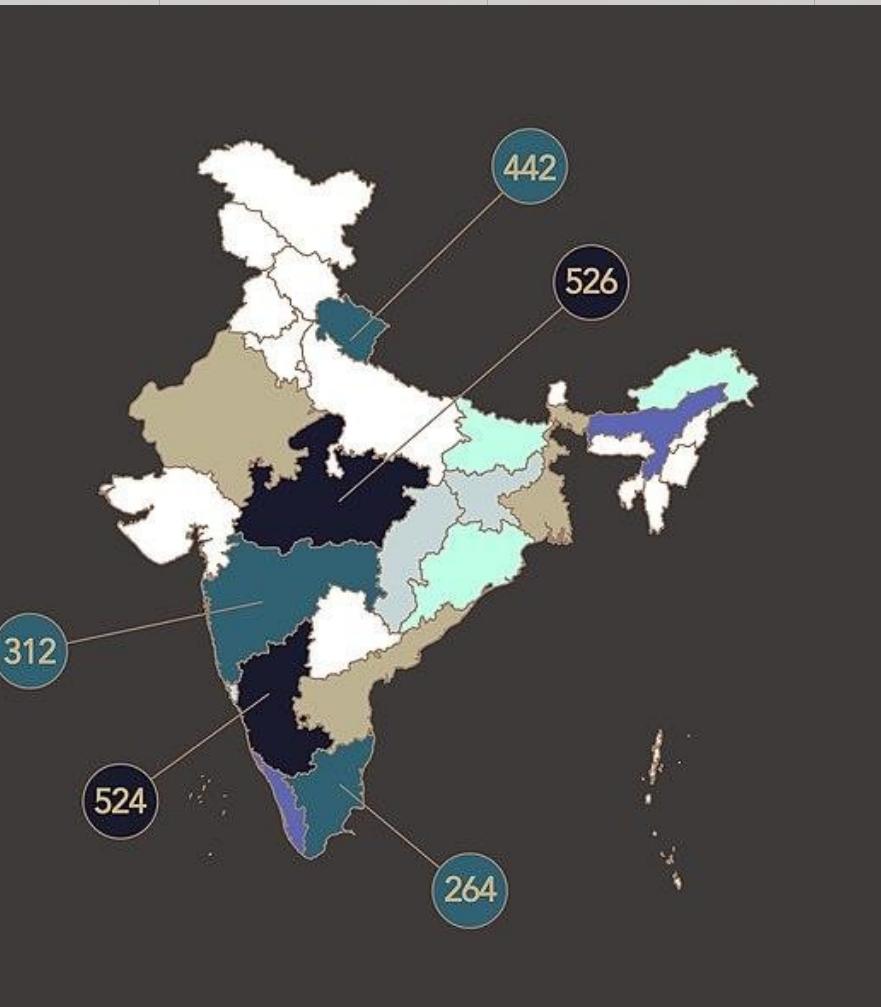
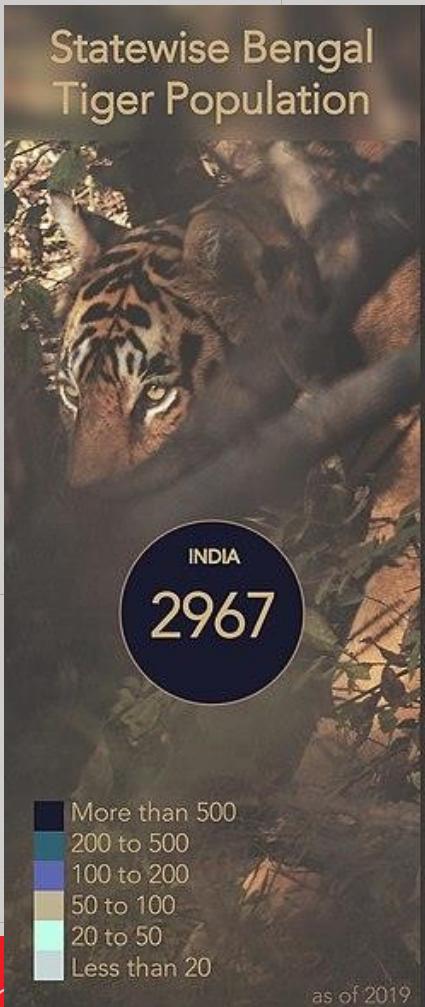
PLASTIC RESIN CODES



Coastal Regulation Zone Notification, 2018



Project Tiger



ENDANGERED

Global Conservation Efforts

Global Tiger Forum (GTF)

Global Tiger Initiative (GTI)

St. Petersburg Tiger Summit in
Russia, 2010

Global Tiger Recovery
Program (GTRP)

TX2

Conservation Assured Tiger
Standards CA|TS

Monitoring System for Tigers –
Intensive Protection and Ecological
Status (M-STrIPES)

CaTRAT (Camera Trap Data
Repository and Analysis Tool)

ExtractCompare & HotSpotter

Spatially explicit capture–recapture
(SECR)

Cytochrome-b marker

Maximum Entropy Models
(MaxEnt)



Ministry of Environment, Forest
and Climate Change

Do you know?

Project Elephant (PE) is a scheme by MoEF&CC launched in 1991-92 with the aim to



Protect elephants,
their habitat &
corridors



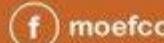
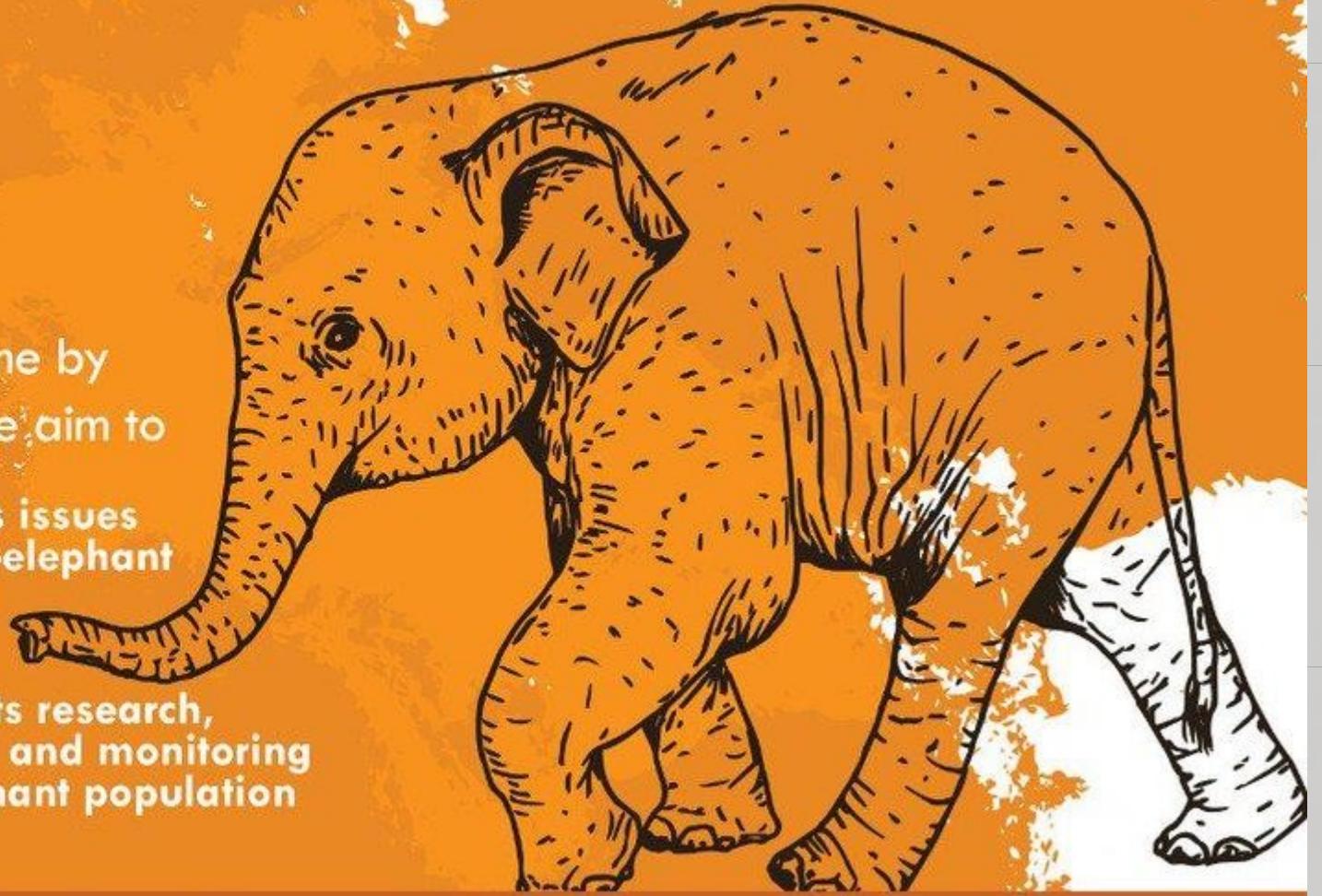
Address issues
of man-elephant
conflict



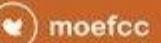
Provide welfare
of domesticated
elephants



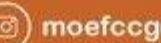
Conducts research,
training and monitoring
of elephant population



moefcc



moefcc



moefccgoi



moef.gov.in



PROJECT SNOW LEOPARD

UNCIA UNCIA

SCIENTIFIC NAME

VULNERABLE

IUCN STATUS

2009

INTRODUCTION OF PROJECT SNOW LEOPARD IN INDIA

1,28,000 SQ.KM

PROTECTED AREA UNDER PROJECT SNOW LEOPARD - INDIA

400-600

POPULATION IN INDIA

4500-7500

POPULATION IN THE WORLD



Conservation

Project Snow Leopard

Save our Snow Leopard (SOS)

Secure Himalaya

Global Snow Leopard and Ecosystem Program (GSLEP)

Snow Leopard Population Assessment in India (SLPAI)



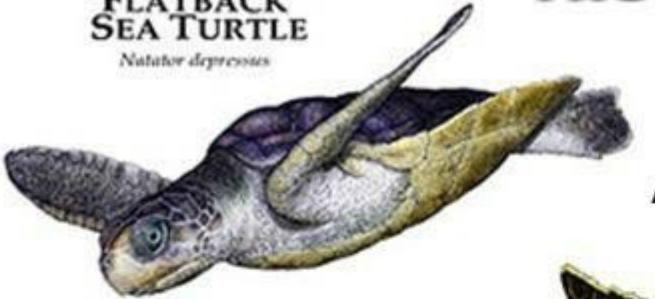
**OLIVE RIDLEY
PROJECT**

Ghost nets are nets that have been discarded, abandoned or lost in the ocean. They can continue to entangle endangered and vulnerable animals such as marine turtles, birds, sharks, rays, dugongs, dolphins and whales long after they have been discarded, abandoned or lost.

All Sea Turtle Species

The Species List

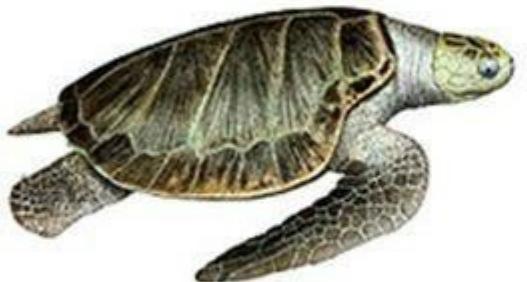
**FLATBACK
SEA TURTLE**
Natator depressus



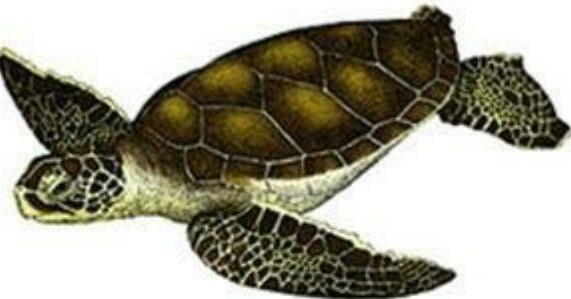
**GREEN
SEA TURTLE**
Chelonia mydas



**OLIVE RIDLEY
SEA TURTLE**
Lepidochelys olivacea



**HAWKSBILL
SEA TURTLE**
Eretmochelys imbricata



**KEMP'S RIDLEY
SEA TURTLE**
Lepidochelys kempii



**LEATHERBACK
SEA TURTLE**
Dermochelys coriacea



**LOGGERHEAD
SEA TURTLE**
Caretta caretta



Sr. No.	Name of the Vulture Species	IUCN status	Pictorial Representation
1.	Oriental White-backed Vulture (<i>Gyps Bengalensis</i>)	Critically Endangered	
2.	Slender-billed Vulture (<i>Gyps Tenuirostris</i>)	Critically Endangered	
3.	Long-billed Vulture (<i>Gyps Indicus</i>)	Critically Endangered	
4.	Egyptian Vulture (<i>Neophron Percnopterus</i>)	Endangered	

5.	Red-Headed Vulture (<i>Sarcogyps Calvus</i>)	Critically Endangered	
6.	Indian Griffon Vulture (<i>Gyps Fulvus</i>)	Least Concerned	
7.	Himalayan Griffon (<i>Gyps Himalayensis</i>)	Near Threatened	
8.	Cinereous Vulture (<i>Aegypius Monachus</i>)	Near Threatened	
9.	Bearded Vulture or Lammergeier (<i>Gypaetus Barbatus</i>)	Near Threatened	

GREAT INDIAN BUSTARD



Critically Endangered

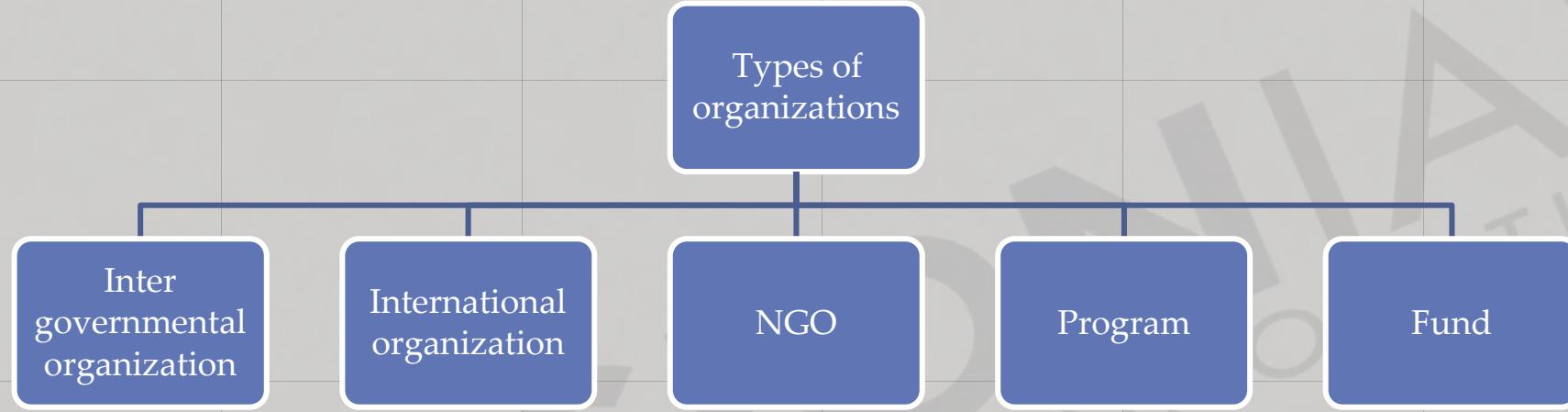
Conservation Efforts

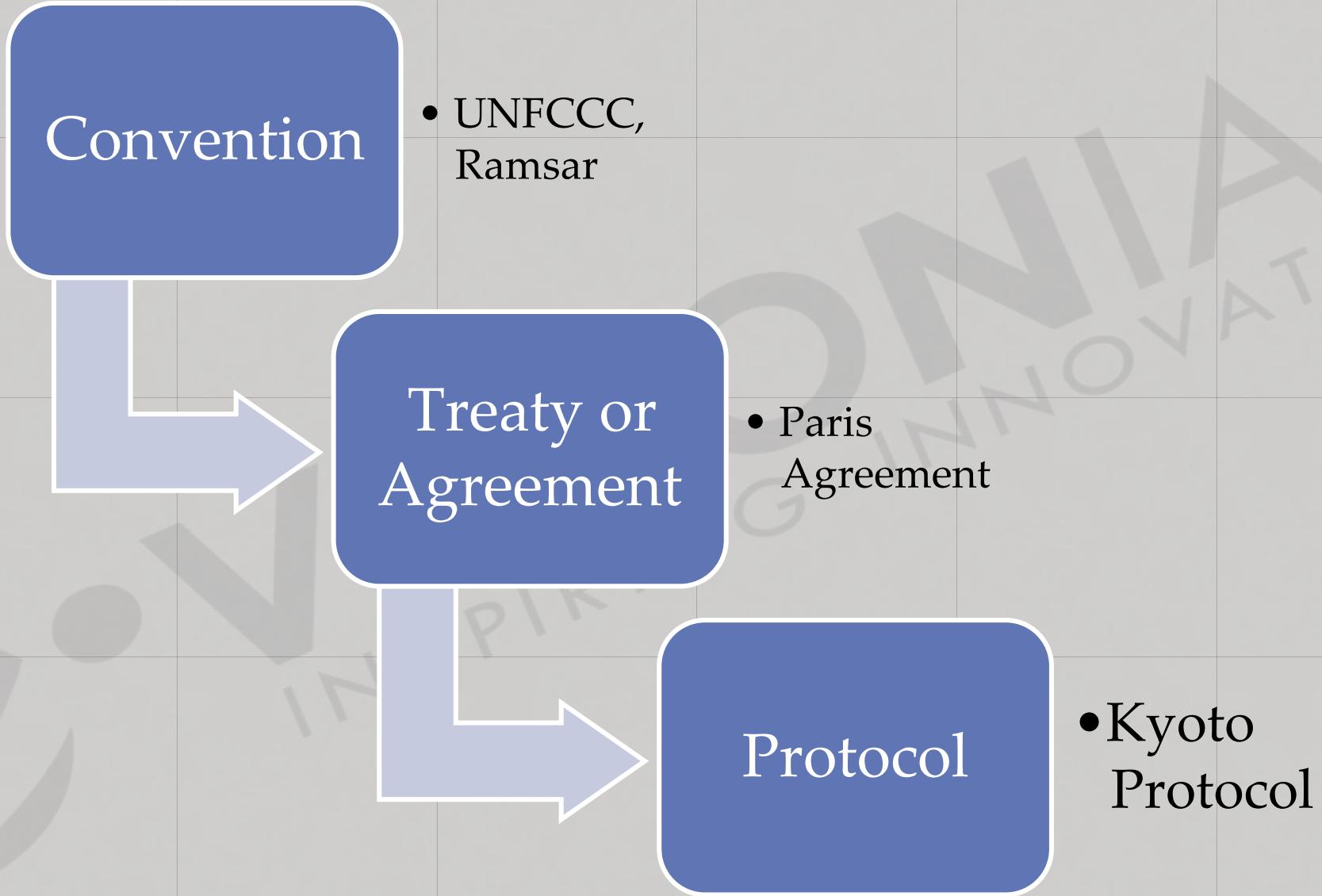
Integrated Development of Wildlife Habitats

Conservation project

HPC by Supreme Court

GIB protection zone



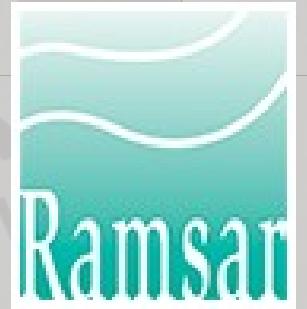


RAMSAR Convention

work towards wise use of all wetlands;

designate suitable wetlands for the list of Wetlands of International Importance (the “Ramsar List”) and ensure their effective management;

cooperate internationally on transboundary wetlands, shared wetland systems and shared species



Ramsar Convention

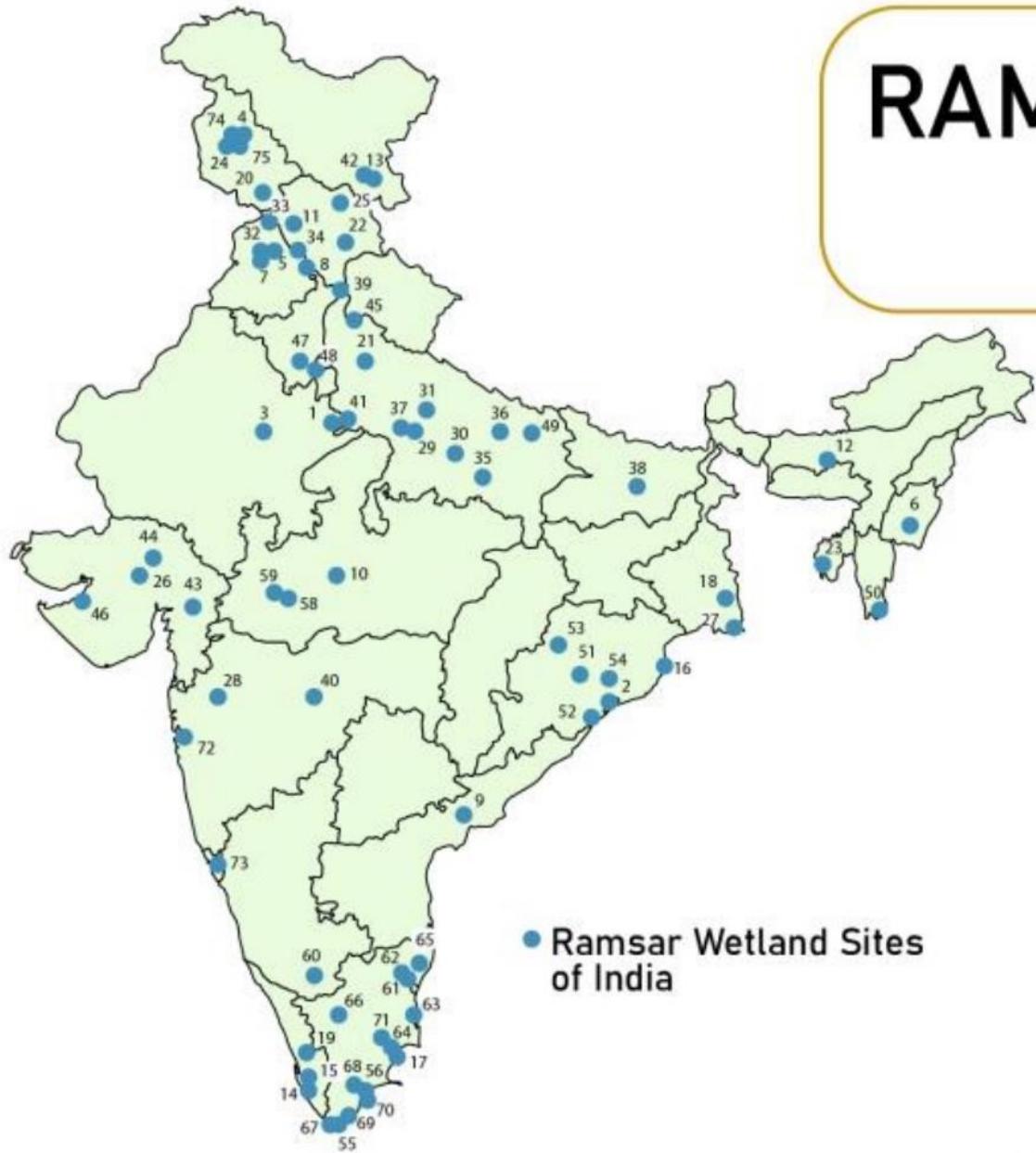
The Ramsar Convention has **6 International Organisation Partners:**

- **Birdlife International**
- **International Union for Conservation of Nature (IUCN)**
- **International Water Management Institute**
- **Wetlands International**
- **World Wide Fund for Nature (WWF)**
- **Wildfowl & Wetlands Trust (WWT)**

Nine criteria for identifying Wetlands of International Importance

1. Contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.
2. Supports vulnerable, endangered, or critically endangered species or threatened ecological communities.
3. Supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.
4. Supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.
5. Regularly supports 20,000 or more waterbirds.
6. Supports 1% of the individuals in a population of one species or subspecies of waterbird.
7. Supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.
8. Important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend. Specific criteria based on other taxa
9. Supports 1% of the individuals in a population of one species or subspecies of wetland-dependent nonavian animal species.

RAMSAR WETLAND SITES IN INDIA



S.NO	STATE LOCATION	DATE OF DECLARATION	AREA	S.NO	STATE LOCATION	DATE OF DECLARATION	AREA
1 Andhra Pradesh	Kolleru Lake	19.8.2002	901.00	39 Odisha	Tampara Lake	13.08.2022	3.00
2 Assam	Deepor Beel	19.8.2002	40.00	40 Punjab	Beas Conservation Reserve	26.9.2019	64.29
3 Bihar	Kabartal Wetland	21.07.2020	26.20	41 Punjab	Harike Lake	23.3.1990	41.00
4 Goa	Nanda Lake	06.08.2022	0.42	42 Punjab	Kanji Lake	22.1.2002	1.83
5 Gujarat	Khijadia Wildlife Sanctuary	13.04.2021	5.12	43 Punjab	Keshopur-Miani Community Reserve	26.9.2019	3.44
6 Gujarat	Nalsarovar Bird SanctuarY	24.09.2012	120.00	44 Punjab	Nangal Wildlife Sanctuary	26.9.2019	1.16
7 Gujarat	Thol Lake Wildlife Sanctuary	05.04.2021	6.99	45 Punjab	Ropar Lake	22.1.2002	13.65
8 Gujarat	Wadhvana Wetland	05.04.2021	6.30	46 Rajasthan	Keoladeo Ghana NP	1.10.1981	28.73
9 Haryana	Bhindawas Wildlife Sanctuary	25.05.2021	4.12	47 Rajasthan	Sambhar Lake	23.3.1990	240.00
10 Haryana	Sultanpur National Park	25.05.2021	1.43	48 Tamil Nadu	Chitrangudi Bird Sanctuary	13.08.2022	2.60
11 H&P	Chandertal Wetland	8.11.2005	0.49	49 Tamil Nadu	Gulf of Mannar Marine Biosphere Reserve	04.08.2022	526.72
12 H&P	Pong Dam Lake	19.8.2002	156.62	50 Tamil Nadu	Kanjirankulam Bird Sanctuary	13.08.2022	0.97
13 H&P	Renuka Wetland	8.11.2005	0.20	51 Tamil Nadu	Karikili Bird Sanctuary	04.08.2022	0.58
14 J&K	Hokera Wetland	8.11.2005	13.75	52 Tamil Nadu	Koonthankulam Bird Sanctuary	11.08.2021	0.72
15 J&K	Hygam Wetland Conservation Reserve	13.08.2022	8.02	53 Tamil Nadu	Pallikaranai Marsh Reserve Forest	04.08.2022	12.48
16 J&K	Shallbugh Wetland Conservation Reserve	13.08.2022	16.75	54 Tamil Nadu	Pichavaram Mangrove Point Calimere Wildlife and Bird Sanctuary	04.08.2022	14.79
17 J&K	Surinsar-Mansar Lakes	8.11.2005	3.50	55 Tamil Nadu	Suchindram Theroor Wetland Complex	19.8.2002	385.00
18 J&K	Wular Lake	23.3.1990	189.00	56 Tamil Nadu	Udhayamarthandapuram Bird Sanctuary	13.08.2022	0.94
19 Karnataka	Ranganathittu Bird Sanctuary	15.02.2022	5.18	57 Tamil Nadu	Vaduvur Bird Sanctuary	04.08.2022	0.44
20 Kerala	Asthamudi Wetland	19.8.2002	61.40	58 Tamil Nadu	Vedanthangal Bird Sanctuary	13.08.2022	1.13
21 Kerala	Sasthamkotta Lake	19.8.2002	3.73	59 Tamil Nadu	Sanctuary	04.08.2022	0.40
22 Kerala	Vembanad Kol Wetland	19.8.2002	1512.50	60 Tamil Nadu	Vellode Bird Sanctuary	04.08.2022	0.77
23 Ladakh	Tso Kar Wetland Complex	17.11.2020	95.77	61 Tamil Nadu	Vembannur Wetland Complex	04.08.2022	0.20
24 Ladakh	Tsomoriri Lake	19.8.2002	120.00	62 Tripura	Rudrasagar Lake	8.11.2005	2.40
25 Madhya Pradesh	Bhoj Wetlands	19.8.2002	32.01	63 Uttar Pradesh	Bakhira Wildlife Sanctuary	29.06.2021	28.94
26 Madhya Pradesh	Sakhy Sagar	01.07.2022	2.48	64 Uttar Pradesh	Haiderpur Wetland	8.12.2021	69.08
27 Madhya Pradesh	Sirpur Wetland	01.07.2022	1.61	65 Uttar Pradesh	Nawabganj Bird Sanctuary	19.9.2019	2.25
28 Madhya Pradesh	Yashwant Sagar	13.08.2022	8.23	66 Uttar Pradesh	Parvati Agra Bird Sanctuary	2.12.2019	7.22
29 Maharashtra	Lonar Lake	22.7.2020	4.27	67 Uttar Pradesh	Saman Bird Sanctuary	2.12.2019	5.26
30 Maharashtra	Nandur			68 Uttar Pradesh	Samaspur Bird Sanctuary	3.10.2019	7.99
	Madhameshwari	21.6.2019	14.37	69 Uttar Pradesh	Sandi Bird Sanctuary	26.9.2019	3.09
31 Maharashtra	Thane Creek	13.08.2022	65.21	70 Uttar Pradesh	Sarsai Nawar Jheel	19.9.2019	1.61
32 Manipur	Loktak Lake	23.3.1990	266.00	71 Uttar Pradesh	Sur Sarovar	21.8.2020	4.31
33 Mizoram	Pala Wetland	31.08.2021	18.50	72 Uttar Pradesh	Upper Ganga River	8.11.2005	265.90
34 Odisha	Ansupa Lake	13.08.2022	2.31	73 Uttarakhand	Asan Conservation Reserve	21.7.2020	4.44
35 Odisha	Bhitarkanika Mangroves	19.8.2002	650.00	74 West Bengal	East Kolkata Wetlands	19.8.2002	125.00
36 Odisha	Chilka Lake	1.10.1981	1165.00	75 West Bengal	Sunderbans Wetland	30.1.2019	4230.00
37 Odisha	Hirakud Reservoir	13.08.2022	654.00				
38 Odisha	Satkosia Gorge	10.12.2021	981.97				



CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora)

Genesis

- An international agreement between governments which was drafted as a result of a resolution adopted in 1963 at a meeting of members of IUCN . The text of the Convention was finally agreed in 1973 and entered in force in 1975 .

Objective

- To ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species

Headquarter



Membership



184 Parties

Is India a Party?

- **CITES Secretariat** is administered by UNEP and is located at **Geneva, Switzerland**.

Other key information



- Although CITES is legally binding on the Parties – in other words they have to implement the Convention – it does not take the place of national laws.
- CITES works by subjecting international trade in specimens of selected species to certain controls. The species covered by CITES are listed in three Appendices, according to the degree of protection they need.

3 APPENDICES of CITES

APPENDIX I

- Species threatened with extinction.
- International commercial trade is generally prohibited.

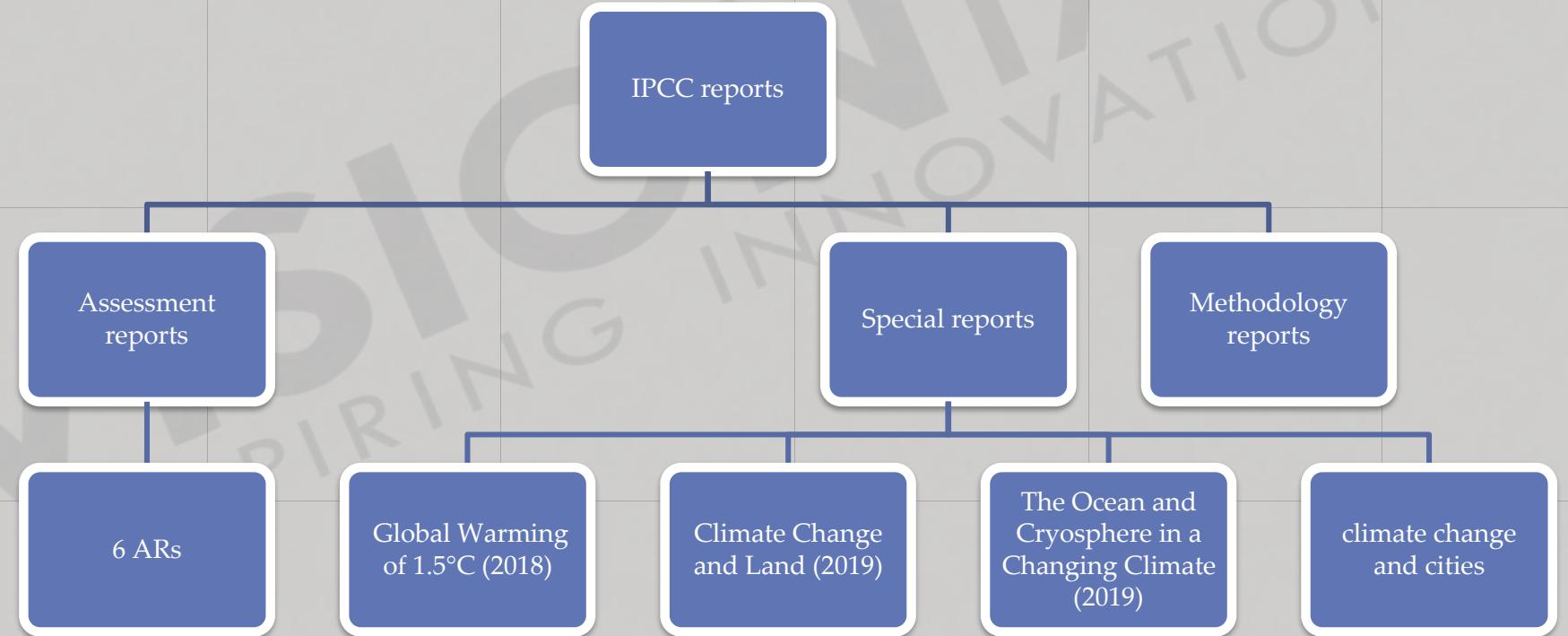
APPENDIX II

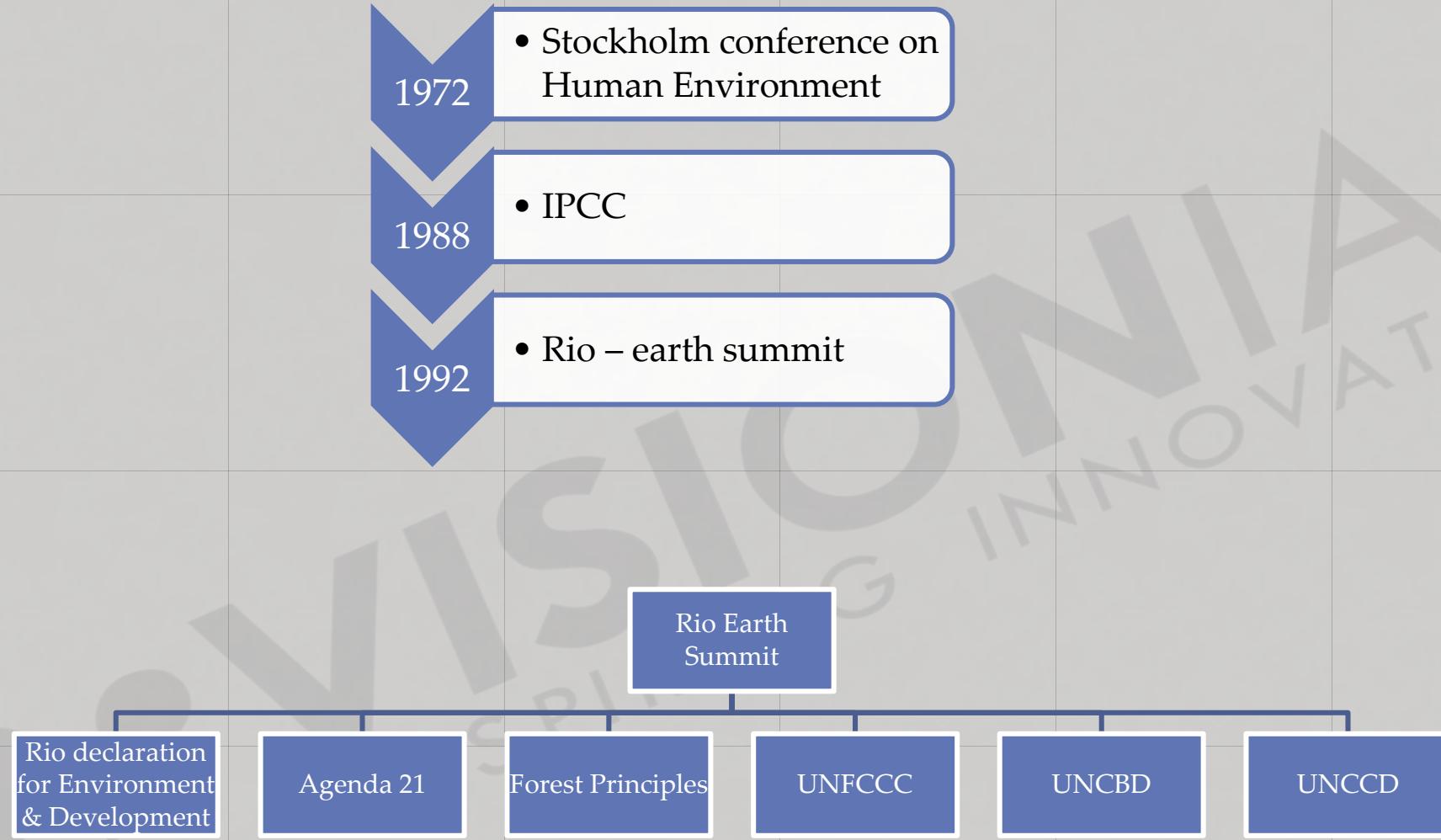
- Species not necessarily threatened with extinction but may become so unless trade is regulated.
- International commercial trade is allowed but controlled

APPENDIX III

- Species subject to regulation within the jurisdiction of a Party and for which the cooperation of other Parties is needed to control international trade.

About IPCC





UNFCCC

- Signed -1992
- Into force - 1994
- COP 1 – Berlin

Kyoto protocol

- Adopted in 1997
- into force – 2005
- 1st period – 2008 to 2012
- 2nd period – 2013 to 2020

Paris Agreement

- COP 21 - 2015
- Into force – 2016
- Starts from 2020

PANCHAMRITA: INDIA'S CLIMATE COMMITMENTS AT COP26 SUMMIT IN GLASGOW



Achieve the target of Net Zero by the year 2070



Increase non-fossil energy capacity to 500 GW by 2030



Meet 50 percent of its energy requirements from renewable energy by 2030



Reduce the total projected carbon emissions by one billion tonnes from now till 2030



Reduce the carbon intensity of its economy by less than 45 percent by 2030



Questions??



- Online query (For faster reply)
- Read and revise what is taught
- Read the reference material
- Mentoring sessions

If Dil Maange beyond MORE...

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ENVIRONMENT

Sections – Environment (Prelims + Mains)

Ecology

Environmental Degradation

Biodiversity

Conservation efforts

Sustainable Development

EIA & Environmental ethics

Sustainable Development

Sustainable Development – Concept

Sustainable Development Goals

Energy

Other concepts related to sustainability

MODERNE MAN



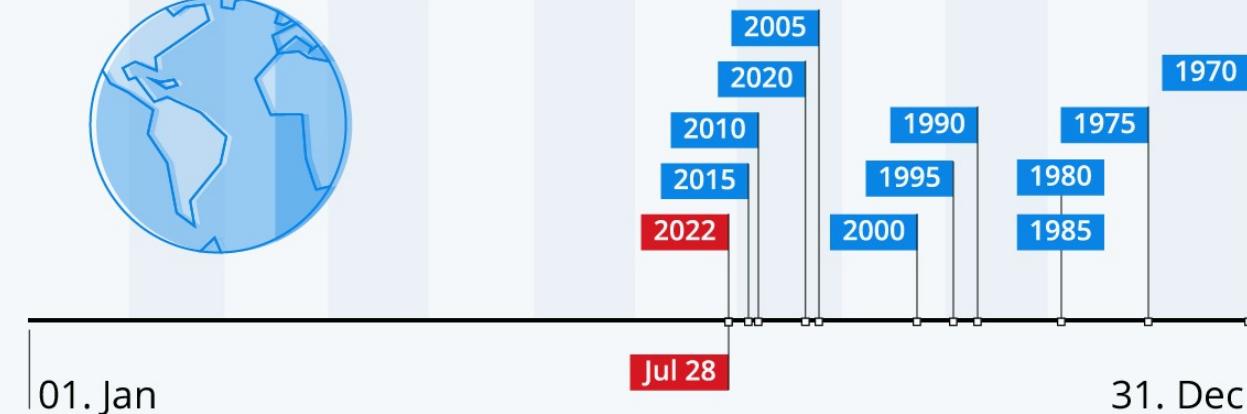




EARTH OVER SHOOT DAY

Earth Overshoot Day Is Coming Sooner and Sooner

Historical dates of Earth Overshoot Day



Earth Overshoot Day marks the date when humanity's demand for ecological resources in a given year exceeds what Earth can regenerate in that year.

Source: Global Footprint Network





Earth provides enough to satisfy
every man's needs, but not every
man's greed.

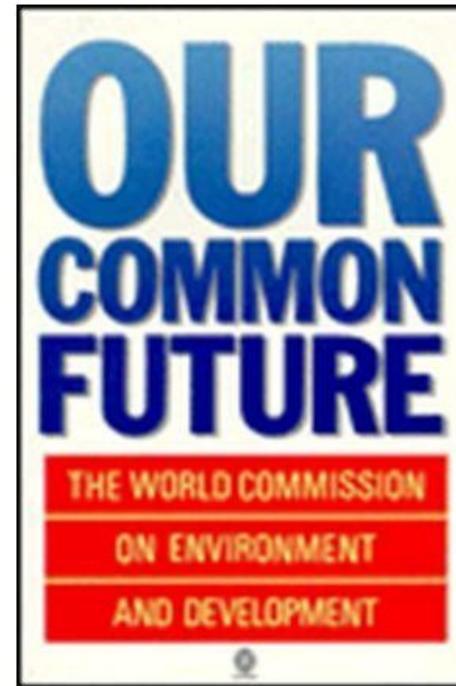
— *Mahatma Gandhi* —



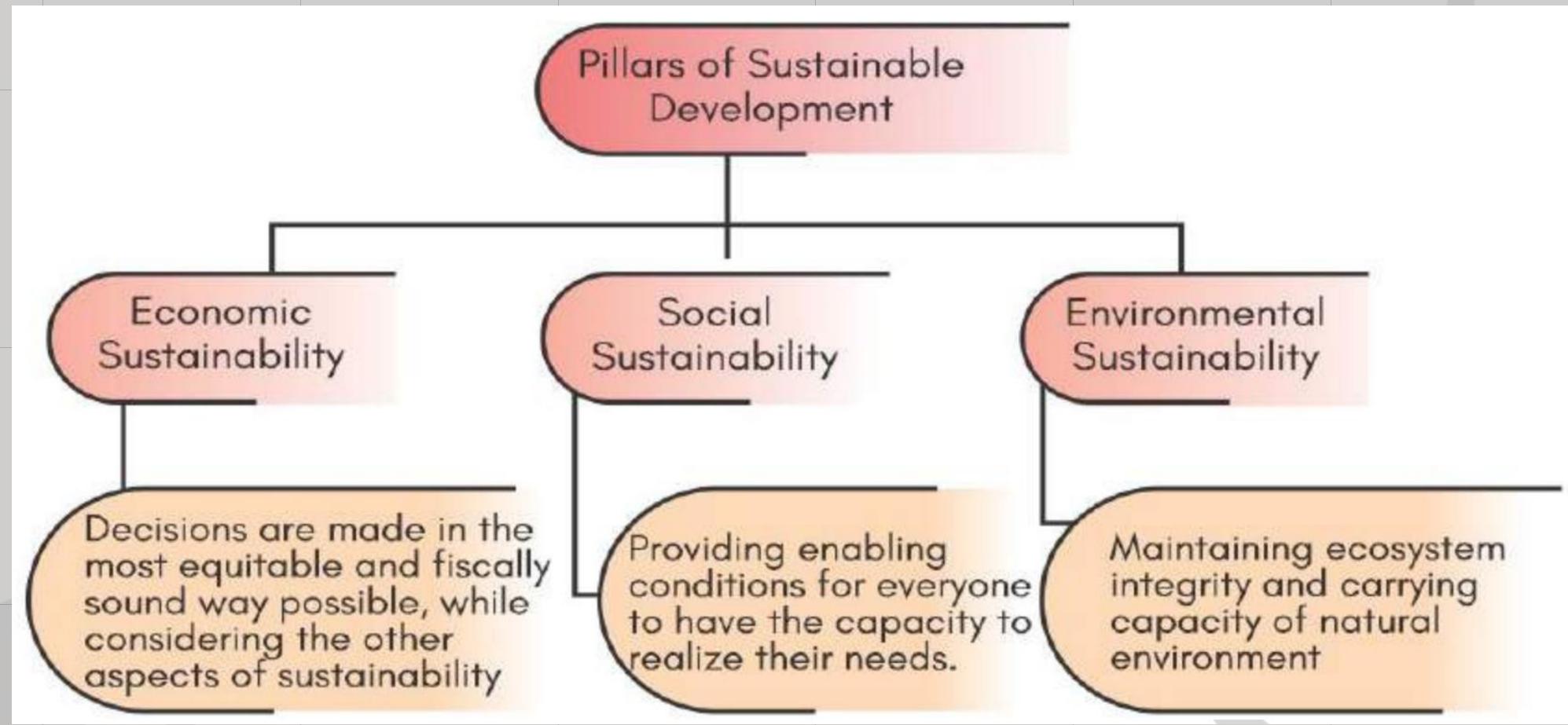
Sustainable Development

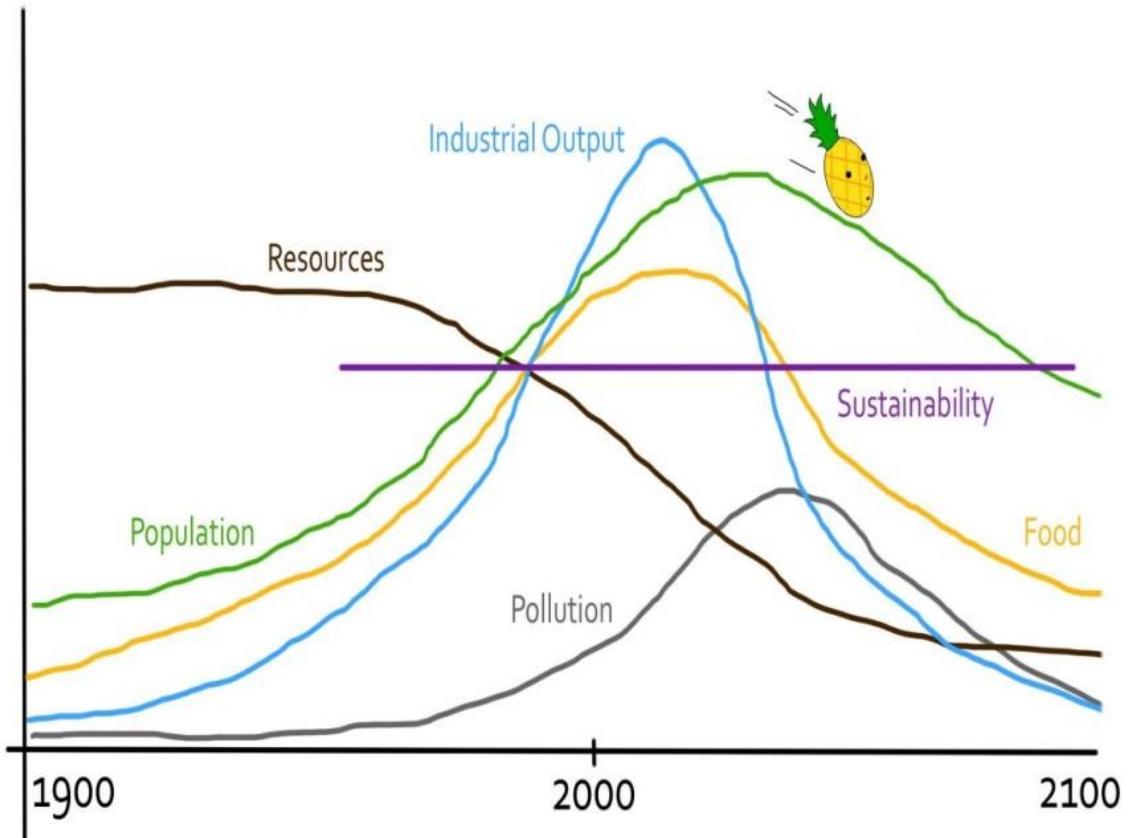
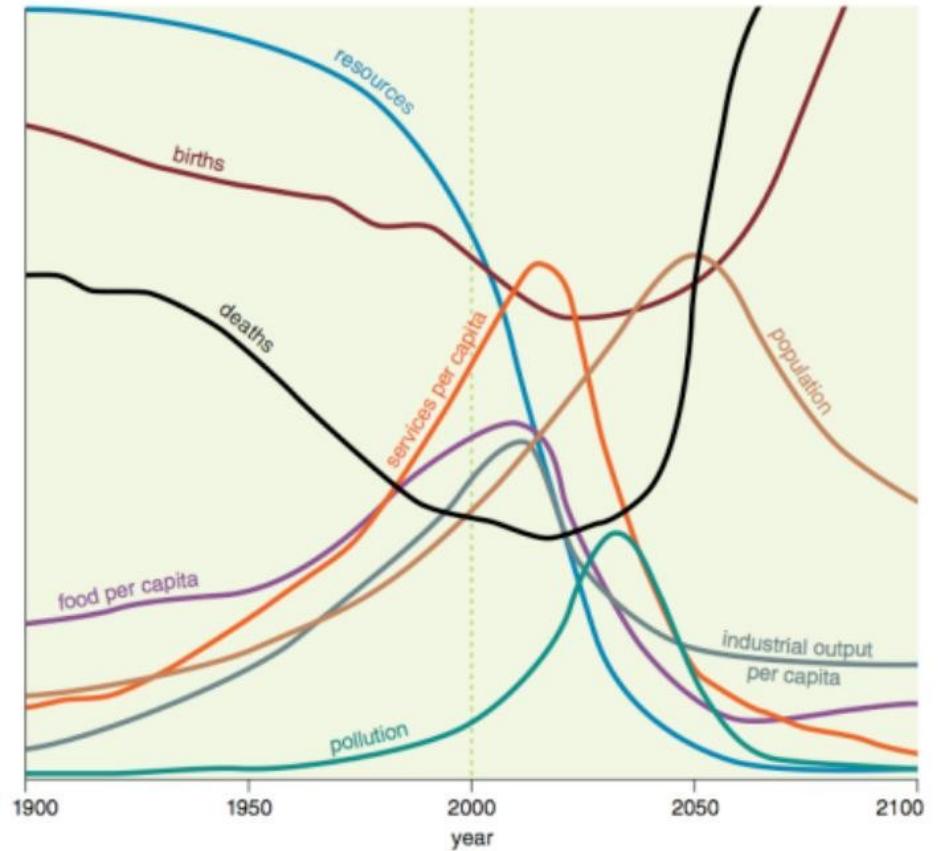
“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs”

Brundtland Commission
“Our common future” 1987



**Brundtland Commission
(WCED 1987)**





Donella Meadows at Massachusetts Institute of Technology, and published in 1972 in the book **Limits to Growth**

Later Meadows group at Massachusetts Institute of Technology, published a book **Beyond the Limits** in 1992



Goal 1: Eradicate Extreme Hunger and Poverty



Goal 2: Achieve Universal Primary Education



Goal 3: Promote Gender Equality and Empower Women



Goal 4: Reduce Child Mortality



Goal 5: Improve Maternal Health



Goal 6: Combat HIV/AIDS, Malaria and other diseases



Goal 7: Ensure Environmental Sustainability



Goal 8: Develop a Global Partnership for Development

MDGs and Target-Summary of progress achieved by India

GOAL 1: ERADICATE EXTREME POVERTY AND HUNGER

TARGET 1: Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day

Achieved

TARGET 2: Halve, between 1990 and 2015, the proportion of people who suffer from hunger

In progress

MDG 2: ACHIEVE UNIVERSAL PRIMARY EDUCATION

TARGET 3: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling

In progress

MDG 3: PROMOTE GENDER EQUALITY AND EMPOWER WOMEN

TARGET 4: Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015

Achieved

MDG 4: REDUCE CHILD MORTALITY

TARGET 5: Reduce by two-thirds, between 1990 and 2015, the Under - Five Mortality Rate

Nearly achieved.

MDG 5: IMPROVE MATERNAL HEALTH

TARGET 6: Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio

In progress

MDG 6: COMBAT HIV/AIDS, MALARIA AND OTHER DISEASES

TARGET 7: Have halted by 2015 and begun to reverse the spread of HIV/AIDS

Achieved

TARGET 8: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases

Achieved

MDG 7: ENSURE ENVIRONMENTAL SUSTAINABILITY

TARGET 9: Integrate the principle of sustainable development into country policies and programmes and reverse the loss of environmental resources.

In progress

TARGET 10: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation

Achieved for the indicator of drinking water. In progress for the indicator of Sanitation

TARGET 11: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers

The pattern not statistically discernible

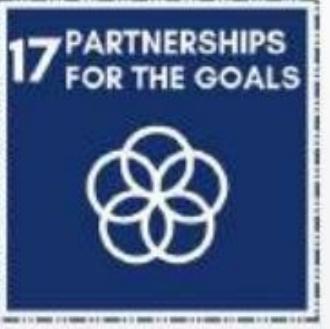
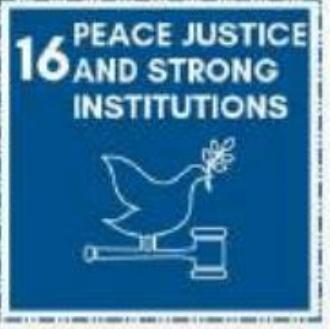
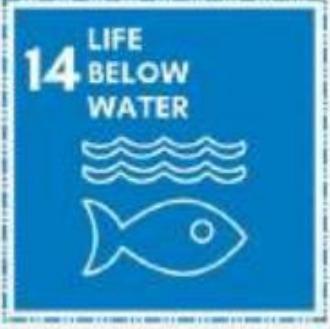
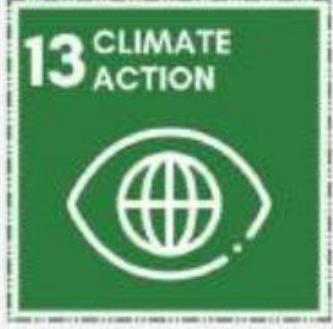
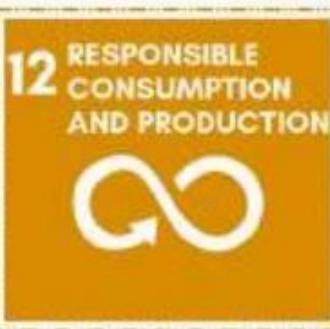
MDG 8: DEVELOP A GLOBAL PARTNERSHIP FOR DEVELOPMENT

TARGET 18: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications

Achieved



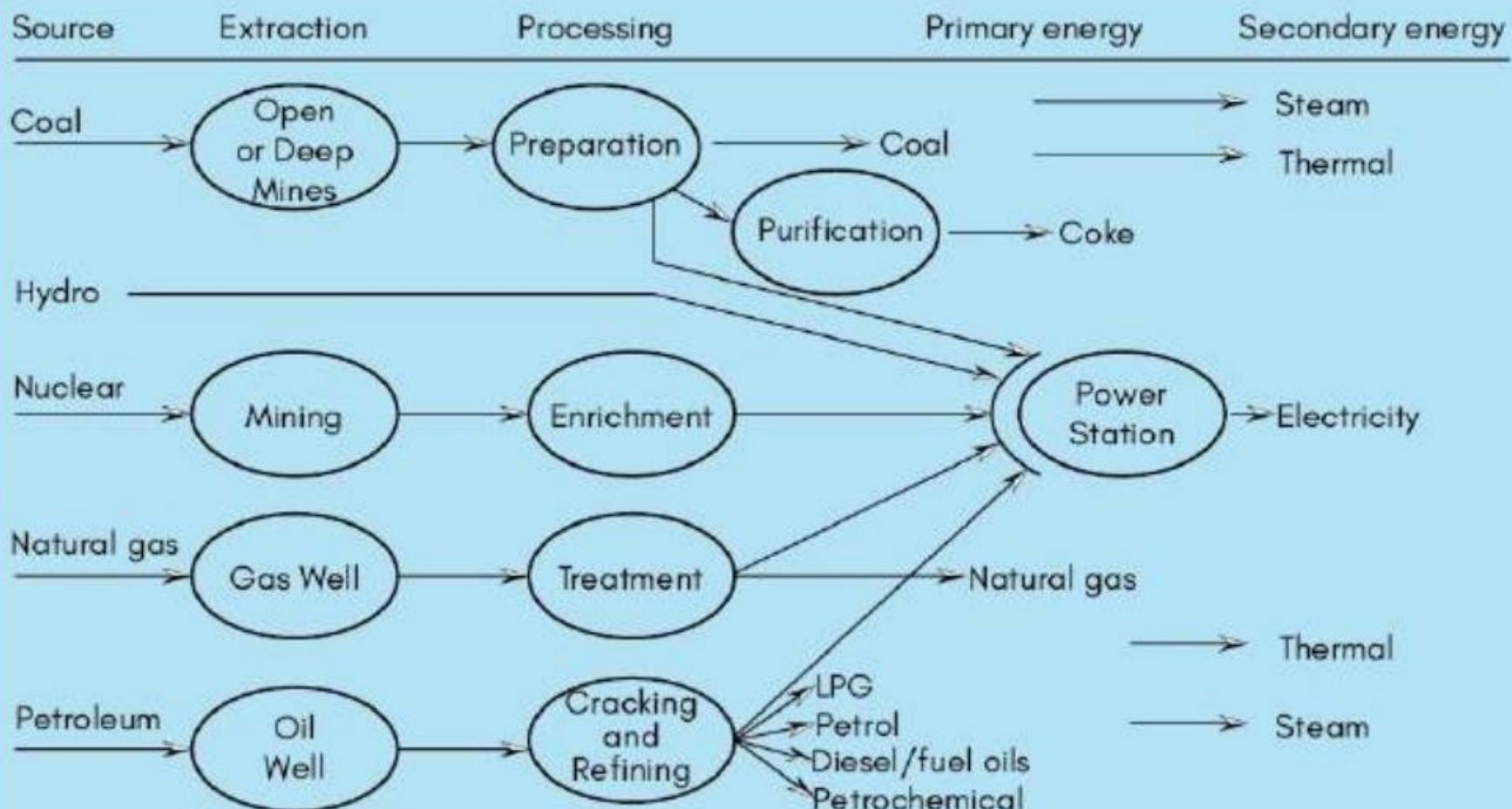
SUSTAINABLE DEVELOPMENT GOALS



Interconnectedness among SDGs



MAJOR PRIMARY AND SECONDARY SOURCES



Power Sector at a Glance ALL INDIA

Updated on 13-01-2023

Source: OM SECTION

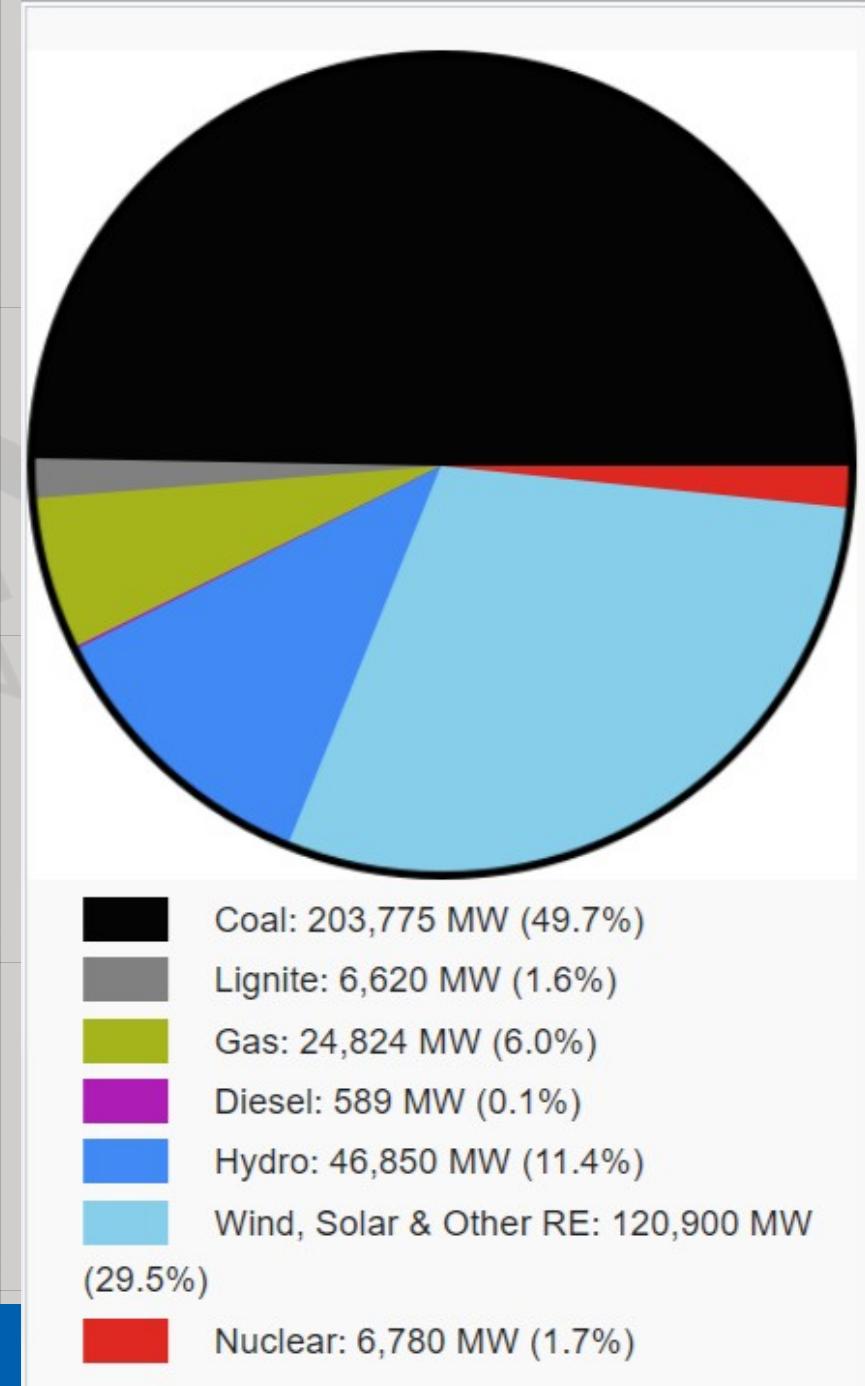
1. Total Installed Capacity (As on 31.12.2022) - Source : Central Electricity Authority (CEA)

INSTALLED GENERATION CAPACITY (SECTOR WISE) AS ON 31.12.2022

Sector	MW	% of Total
Central Sector	98,795	24.2%
State Sector	1,04,918	25.6%
Private Sector	2,06,627	50.4%
Total	4,10,339	

Installed GENERATION CAPACITY(FUELWISE) AS ON 31.12.2022

CATAGORY	INSTALLED GENERATION CAPACITY(MW)	% of SHARE IN Total
Fossil Fuel		
Coal	203,775	49.7%
Lignite	6,620	1.6%
Gas	24,824	6.1%
Diesel	589	0.1%
Total Fossil Fuel	2,35,809	57.5 %
Non-Fossil Fuel		
RES (Incl. Hydro)	167,750	40.7%
Hydro	46,850	11.4 %
Wind, Solar & Other RE	120,900	29.5 %
Wind	41,930	10.2 %
Solar	63,302	15.1 %
BM Power/Cogen	10,210	2.5 %
Waste to Energy	522	0.1 %
Small Hydro Power	4,936	1.2 %
Nuclear	6,780	1.7%
Total Non-Fossil Fuel	174,530	42.5%
Total Installed Capacity	410,339	100%
(Fossil Fuel & Non-Fossil Fuel)		

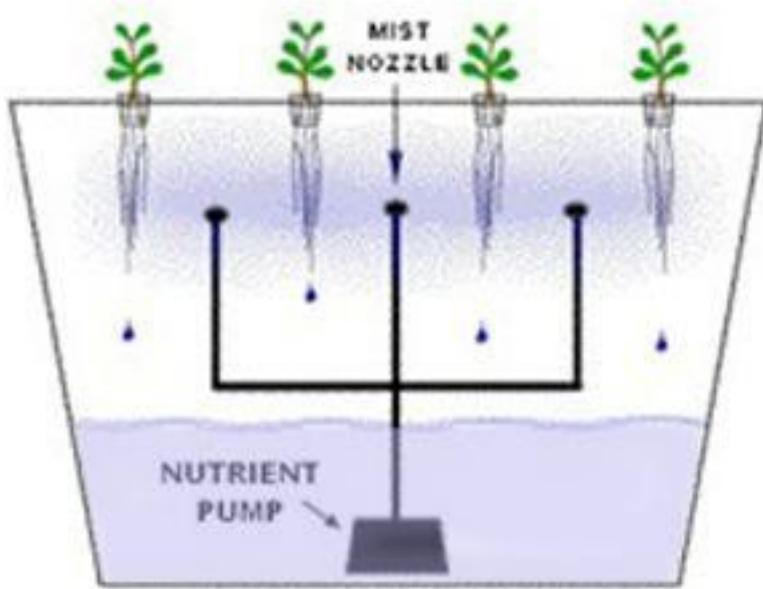


Source of energy/Fuel	Production	Advantages	Limitations
Solar energy	From natural sunlight	Environment friendly Ample or unlimited availability.	<ul style="list-style-type: none"> Limited capacity for storage of sunlight. Cloud cover may limit usefulness. Collecting equipment expensive
Wind energy	Windmills with Fans for directing winds	No pollution Available for free Not available everywhere or intermittently available.	Fans of wind mills visual hazards for flying birds and aeroplanes (visual pollution).
Tidal energy	Harnessing tidal power by suitable structures	Free and clean	<ul style="list-style-type: none"> Structures (plant) used for harnessing energy expensive. Plant disrupts natural flow of estuary and concentrate pollutants in the area
Hydel power or Hydropower	Dams built on river for electricity generation	World's hydroelectricity capacity high	<ul style="list-style-type: none"> Ecosystems behind dams disturbed. Human settlements up rooted for building dam. Habitat loss and consequent biodiversity loss. Developmental cost high. Fertile farmland lost and amount of nutrient rich silt on down river agricultural fields reduced.

Source of energy/Fuel	Production	Advantages	Limitations
Nuclear energy	Nuclear fission (splitting of atom) and Nuclear fusion	No air pollution Fuel efficient	<ul style="list-style-type: none"> • High cost of construction of nuclear plant. • Fear of security and nuclear accidents.
Geothermal energy	Wells drilled to trap steam which powers electrical generators. Steam naturally produced from underground water which gets heated due to very high temperature that region.	Environment friendly	<ul style="list-style-type: none"> • Problem of safe disposal of nuclear waste. • Steam contains Hydrogen Sulphide (H₂S) having odour of rotten eggs. • Minerals in the steam corrosive to pipe lines and equipment causing maintenance problems. • Minerals in the water toxic to fish.

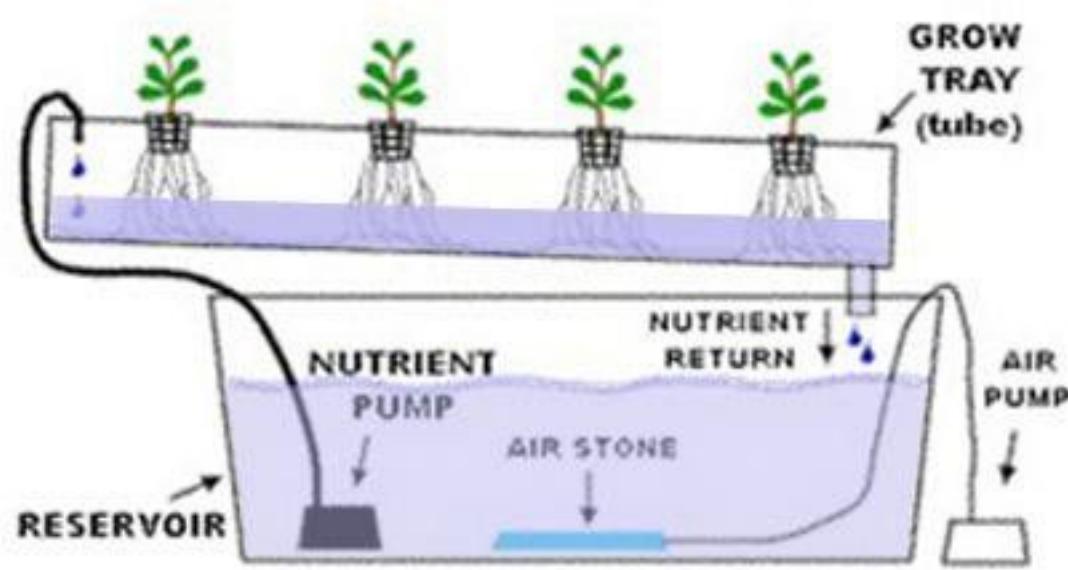
Source of energy/Fuel	Production	Advantages	Limitations
Biomass (1) Fuel wood	Cutting trees for fuel wood and burning them straight away	Cheap so popular in under developed and developing countries	<ul style="list-style-type: none"> • Comparatively low level of energy. • Bulky so difficult to transport. • Burning wood causes air pollution. • Destruction of forests to obtain fuel wood and so desertification. • Release lot of fly ash.
(2) Biomass conversion	Obtaining energy from chemical energy stored in biomass (or live material). Burned directly for cooking or to produce electricity converted to ethanol or methane (biogas)	Renew able energy	<ul style="list-style-type: none"> • May lead to food shortage because nutrients not returned to soil from biomass. • Growing maize for ethanol requires more energy expenditure than the amount of energy in the form of alcohol retrieved. • Land for growing food used for growing biomass for conversion into fuel.
Solid waste	Waste sorted and burnable material separated	<ul style="list-style-type: none"> • Decreases cost of fresh disposal • Reduces need for land fill sites 	<ul style="list-style-type: none"> • Causes air pollution for burning releases CO₂ and other gases. • Waste such as bleached paper and plastics have chlorine containing compounds which form dioxins which are highly toxic and suspected to be carcinogenic.

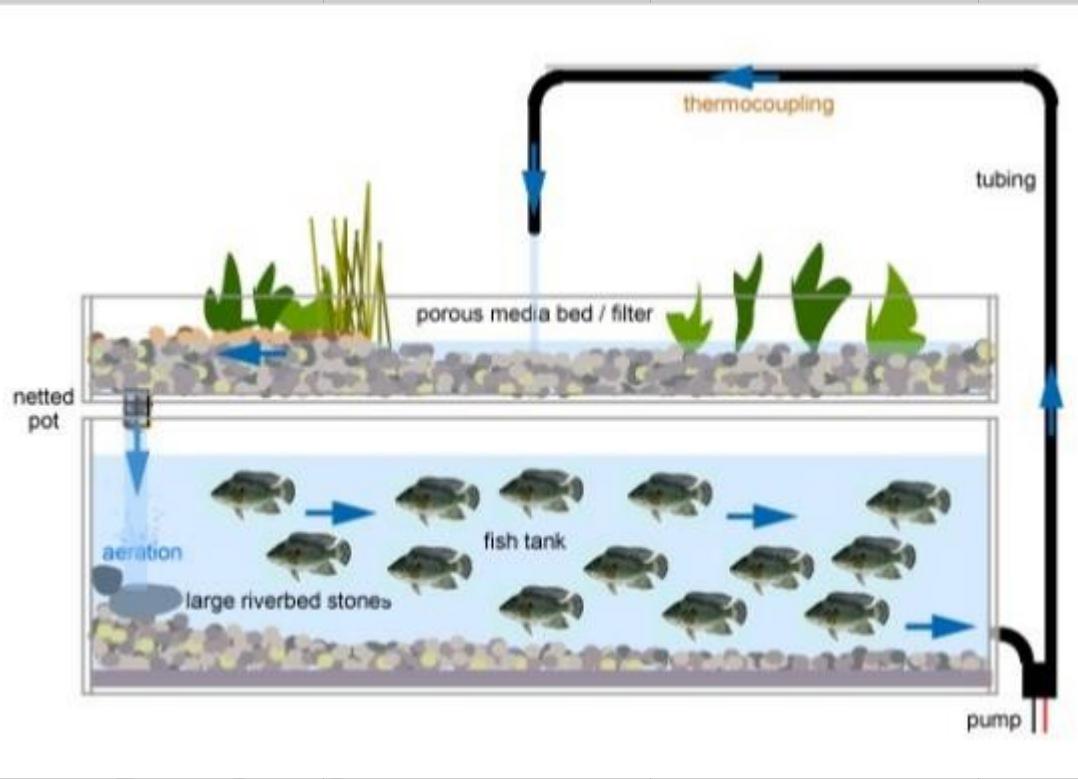
Aeroponics



VS

Hydroponics





Environmental Impact Assessment & Environmental Ethics

What is EIA?

Benefits of EIA

Principles of EIA

EIA process

EIA in India

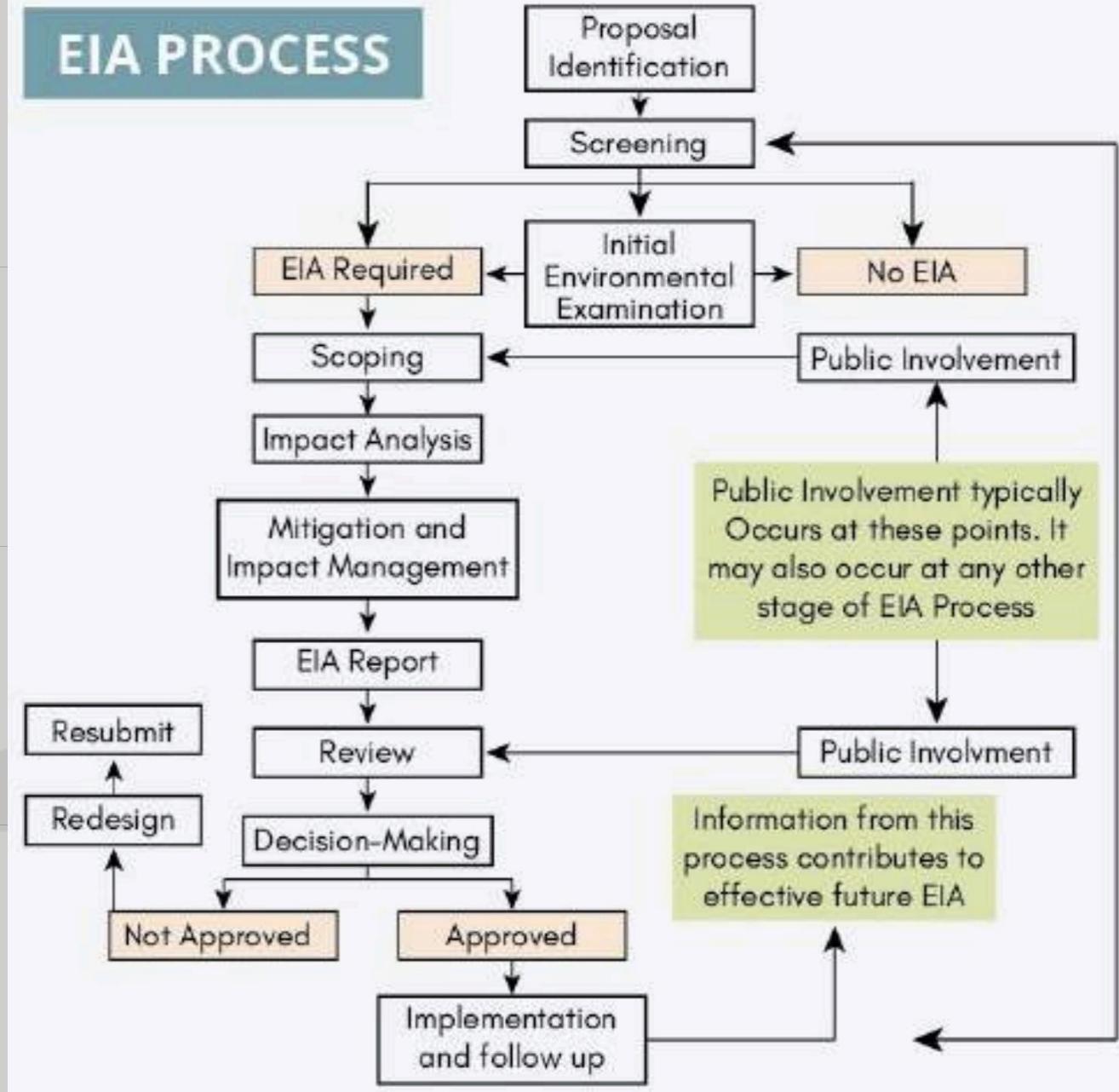
Criticism

Environmental Ethics



ENVIRONMENTAL IMPACT ASSESSMENT

EIA PROCESS



3.6.1. INDIA STATE OF FOREST REPORT (ISFR) 2021

By FSI under
the ministry
of MOEFCC

Biennial
survey

Since 1987

Forest Cover

- All lands more than one hectare in area, with a tree canopy density of more than 10%

Recorded Forest Area (RFA)

- Recorded as 'Forests' in government records.

Tree Cover

- Outside recorded forest areas exclusive of forest cover and less than the minimum mappable area of one hectare.

Carbon Stock



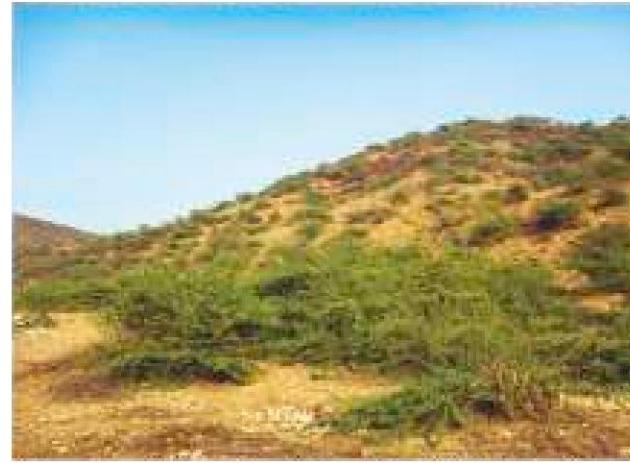
Very Dense Forest



Moderately Dense Forest



Open Forest



Scrub

Table 2.2 Forest cover classified in terms of canopy density classes

Class	Description	Open Forest	Scrub
Very Dense Forest	All lands with tree canopy density of 70 percent and above.		
Moderately Dense Forest	All lands with tree canopy density of 40 percent and more but less than 70 percent.		
Open Forest	All lands with tree canopy density of 10 percent and more but less than 40 percent.		
Scrub	Degraded forest lands with canopy density less than 10 percent.		
Non-forest	Lands not included in any of the above classes. (includes water)		

TABLE 1 Forest and Tree cover of India in 2019

Class	Area (sq km)	Percentage of Geographical Area
Forest Cover		
Very Dense Forest	99,278	3.02
Moderately Dense Forest	3,08,472	9.38
Open Forest	3,04,499	9.26
Total Forest Cover*	7,12,249	21.67
Tree Cover	95,027	2.89
Total Forest and Tree Cover	8,07,276	24.56
Scrub	46,297	1.41
Non-Forest#	25,28,923	76.92
Total Geographic Area	32,87,469	100.00

Table 1 Forest and Tree Cover of India in 2021

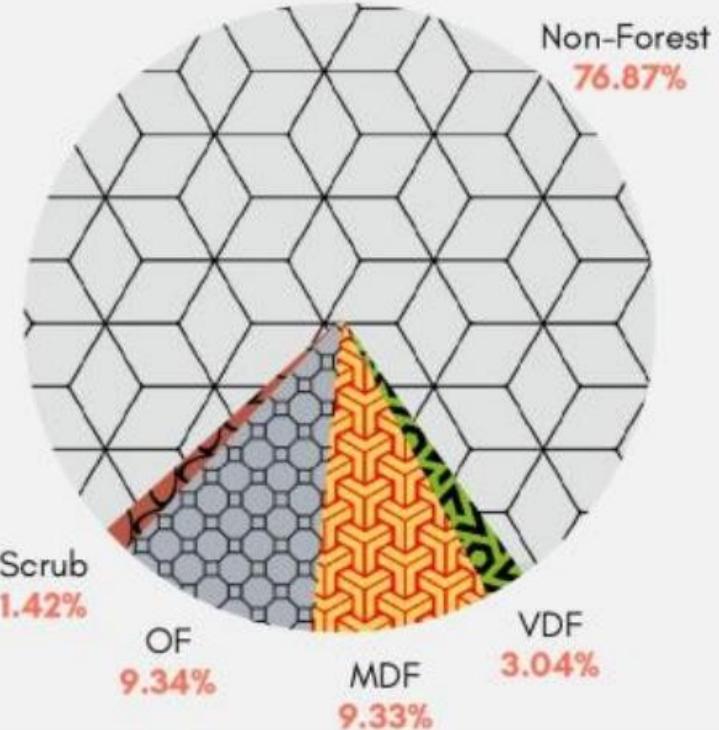
Class	Area (sq km)	Percentage of Geographical Area
Forest Cover		
Very Dense Forest	99,779	3.04
Moderately Dense Forest	3,06,890	9.33
Open Forest	3,07,120	9.34
Total Forest Cover*	7,13,789	21.71
Tree Cover	95,748	2.91
Total Forest and Tree Cover	8,09,537	24.62
Scrub	46,539	1.42
Non Forest#	25,27,141	76.87
Total Geographical Area	32,87,469	-

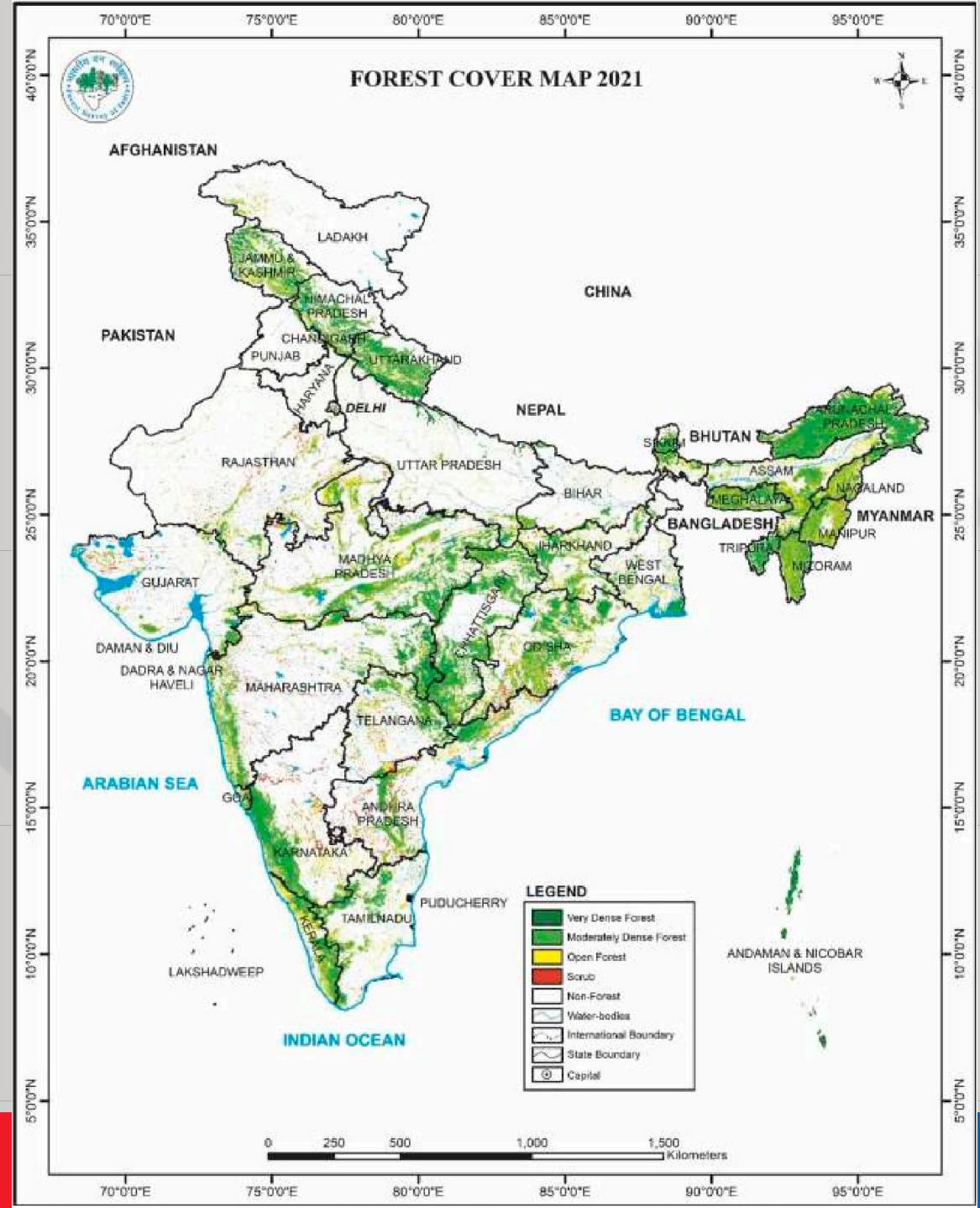
* Includes 4,992 sq km under Mangrove Cover

Non-forest includes Tree Cover (Percentage rounded off)

Total forest cover	↑ Increase of 1,540 sq km (0.22%)
Very Dense Forest (VDF)	↑ Increase of 501 sq km
Moderately Dense Forest (MDF)	↓ Decrease of 1,582 sq km
Open Forest (OF)	↑ Increase of 2,621 sq km
Scrub (not included in forest cover)	↑ Increase of 242 sq km

COMPOSITION OF FOREST COVER IN INDIA





No change wrt 2019

Forest cover
(by area)

MP

ArP

Chh

Od

MH

Forest cover
(percentage)

Miz – 84.5

ArP – 79

Megh

Mani

Naga

Increase in
forest cover
– top states

TG

AP

OD

KA

JhK

Loss in
forest cover
– top states

Arp

Mani

Megh

State with Maximum Tree cover: Maharashtra

36.18% of the total forest and tree cover of India – Trees Outside Forests (TOF)

40.17% of the total geographical area - Forest cover in the hill districts - decreasing

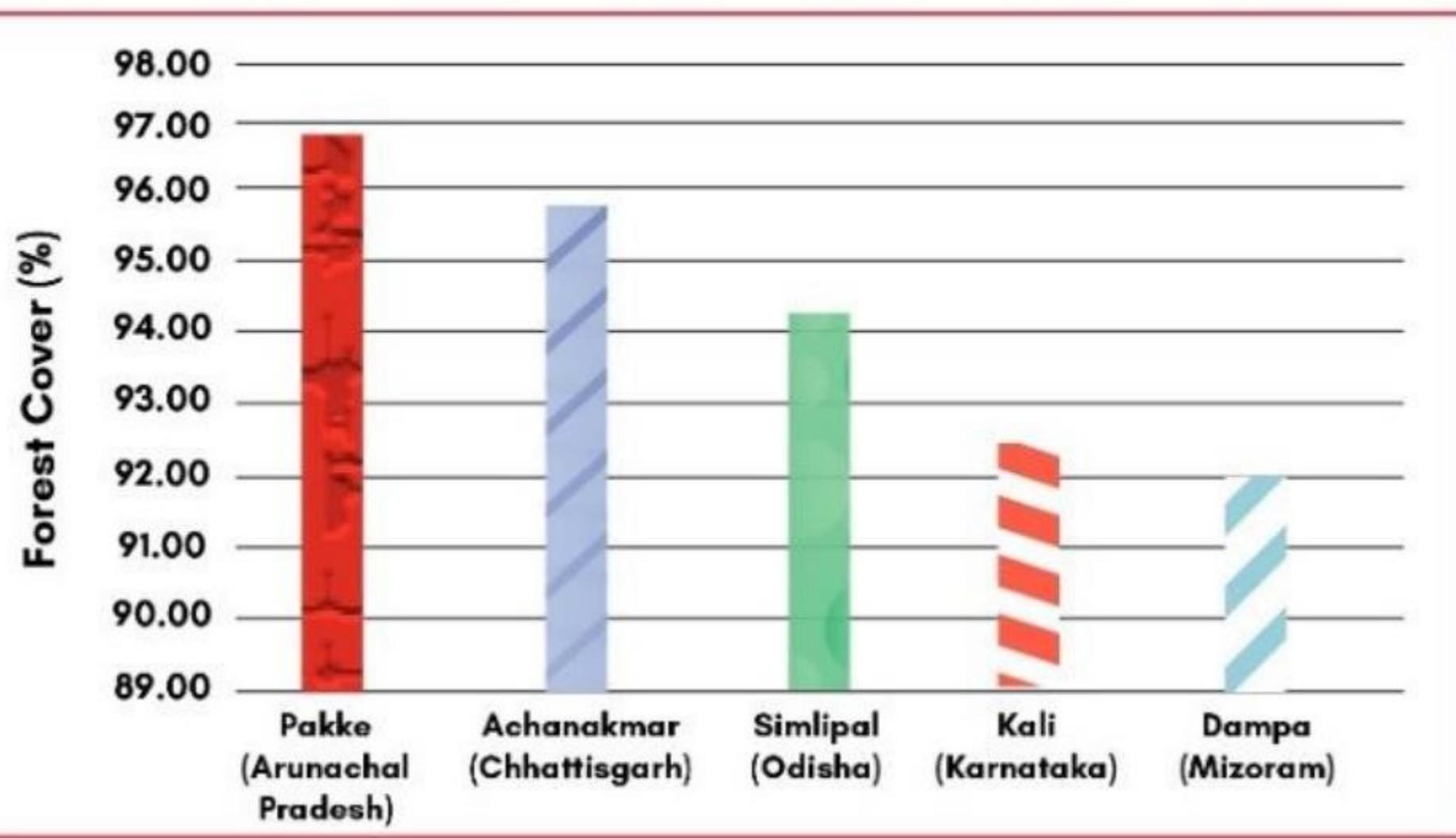
Northeastern region - Total forest cover: 64.66% of its geographical area - decreasing

7.80% of the country's total forest cover - in the TR (decreasing). Largest Forest Cover: NagarjunasagarSrisailam Tiger Reserve

TR with Highest Gain in Forest cover: Buxa, West Bengal.

TR with Highest Losses in Forest cover: Kawal, Telangana

Top Five Tiger Reserves in terms of forest cover as % of the area of the Tiger Reserve.



Mangrove: 4992 sq km (0.15% of country's geographical area). Increased by 17 sq km (0.34%)

Mangrove Cover: West Bengal, Gujarat, A&N Islands, Andhra Pradesh, Maharashtra, Odisha.

The total bamboo bearing area of the country is estimated as 1,49,443 sq km. There is a decrease of 10,594 sq km .

Top state in terms of Bamboo Bearing Area (%): Madhya Pradesh.

22.27% of the forest cover of the country is highly to extremely fire prone.

Top 3 States: Odisha, Madhya Pradesh and Chhattisgarh.

Climate hotspots



Questions??



- Online query (For faster reply)
- Read and revise what is taught
- Read the reference material
- Mentoring sessions

If Dil Maange beyond MORE...

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BIO-MEDICAL WASTE MANAGEMENT RULES, 2016

- Bio-medical waste has been classified in to 4 categories instead 10 to improve the segregation of waste at source:
 1. Red Bin for plastic waste such as bottles, syringes, etc.
 2. Yellow Bin for infectious wastes such as cotton, bandage, placenta, etc.
 3. Blue Bin for glass bottles like discarded medicines
 4. Black Bin for needles without syringes, metal articles, etc.
- Phase-out the use of chlorinated plastic bags, gloves and blood bags within two years.
- Ambit of the rules has been expanded to include vaccination camps, blood donation camps, surgical camps or any other healthcare activity.
- Pre-treatment of the laboratory waste, microbiological waste, blood samples and blood bags through disinfection or sterilisation on-site in the manner as prescribed by WHO or NACO.
- State Government to provide land for setting up common bio-medical waste treatment and disposal facility
- No occupier shall establish on-site treatment and disposal facility, if a service of `common bio-medical waste treatment facility is available at a distance of seventy-five kilometer.
- The new rules prescribe more stringent standards for incinerator to reduce the emission of pollutants in environment;
- Establish a Bar-Code System for bags or containers containing bio-medical waste for disposal
- Training to all its health care workers and immunise all health workers regularly

SOLID WASTE MANAGEMENT RULES, 2016

- These rules replace the Municipal Solid Wastes (Management and Handling) Rules, 2000, are now applicable beyond municipal areas and have included urban agglomerations, census towns, notified industrial townships etc.
- They focus on segregation of waste at source, responsibility on the manufacturer to dispose of sanitary and packaging wastes, user fees for collection, disposal and processing from the bulk generator.
- Responsibilities of Generators have been introduced to segregate waste into three streams:
 - o Wet (Biodegradable),
 - o Dry (Plastic, Paper, metal, wood, etc.) and
 - o Domestic hazardous wastes (diapers, napkins, empty containers of cleaning agents, mosquito repellents, etc.)
- Manufacturers or brand owners of sanitary napkins are responsible for awareness for proper disposal of such waste by the generator and shall provide a pouch or wrapper for disposal of each napkin or diapers (EPR – only for sanitary napkins & packaging wastes).

- It has also been advised that the bio-degradable waste should be processed, treated and disposed of through composting or bio-methanation within the premises as far as possible and the residual waste shall be given to the waste collectors or agency as directed by the local authority.
- The rules promote the use of compost, conversion of waste into energy, revision of parameters for landfills location and capacity.
- Generator will have to pay ‘User Fee’ to waste collector and for ‘Spot Fine’ for Littering and Non-segregation.
- The government has also constituted a Central Monitoring Committee under the chairmanship of Secretary, MoEF&CC to monitor the overall implementation of the rules.
- The Rules for the Safe Treatment of Legacy Waste prescribe bio-remediation and bio-mining in all open dumpsites and existing operational dumpsites in India.
- mandate all industrial units using fuel and located within 100 km from a solid waste-based Refuse-Derived Fuel (RDF) plant to make arrangements within six months from the date of notification of these rules to replace at least 5 per cent of their fuel requirement by RDF so produced.
- EPR - only for sanitary napkins & packaging wastes
- Burning of solid waste is prohibited.
- Waste processing facilities to be setup by all local bodies with population of 1 million or more landfill site shall be 100 metres away from a river, 200 metres from a pond, 500, 200 metres away from highways, habitations, public parks and water supply wells and 20 km away from airports/airbase.

E-WASTE (MANAGEMENT) RULES, 2022

- These rules will replace E-waste (Management) Rules, 2016 and will be effective from 1st April, 2023.
- These rules will launch a new Extended Producer Responsibility (EPR) regime for e-waste recycling.
- Applicable to every manufacturer, producer, refurbisher, dismantler and recycler who are required to register on portal developed by CPCB.
- Producers of notified Electrical and Electronic Equipment (EEE), have been given annual E-Waste Recycling targets. Target starting from 60% for the year 2023-2024 and 2024-25; 70% for the year 2025-26 and 2026-27 and 80% for the year 2027-28 and 2028-29 and onwards.
- Management of solar PV modules /panels/ cells added in new rules.
- Provision for generation and transaction of EPR Certificate has been introduced.
- Provisions for environment compensation and verification & audit has been introduced.
- Provides for recognition and registration, skill development, monitoring and ensuring safety and health, of workers involved in dismantling and recycling of e-waste.

PLASTIC WASTE MANAGEMENT (AMENDMENT) RULES, 2021

- Manufacture, import, stocking, distribution, sale and use of single-use plastic, including polystyrene and expanded polystyrene, commodities shall be prohibited with effect from the 1st July, 2022
- Single use plastic include: ear buds with plastic sticks, plastic sticks for balloons, plastic flags, candy sticks, ice-cream sticks, polystyrene [Thermocol] for decoration; plates, cups, glasses, cutlery such as forks, spoons, knives, straw, trays, wrapping or packing films around sweet boxes, invitation cards, and cigarette packets, plastic or PVC banners less than 100 micron, stirrers.
- From 30th September, 2021, the thickness of plastic carry bags has been increased from 50 microns to 75 microns and to 120 microns with effect from the 31st December, 2022. This will also allow reuse of plastic carry bags.
- Plastic packaging waste, which is not covered under the phase out of identified single use plastic items, shall be collected and managed in an environmentally sustainable way through the EPR.
- A National Level Taskforce has also been constituted by the Ministry for taking coordinated efforts to eliminate identified single use plastic.
- In development of alternatives to identified single use plastic items and digital solutions to plastic waste management, the India Plastic Challenge – Hackathon 2021, has been organized for students of Higher Educational Institutions and startups recognized under Startup India Initiative.

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT RULES 2016

- Applies to everyone who generates construction and demolition waste.
- Every waste generator shall segregate construction and demolition waste and deposit at the collection center or handover it to the authorized processing facilities.
- Shall ensure that there is no littering or deposition.
- Large generators (who generate more than 20 tons or more in one day or 300 tons per project in a month) shall submit waste management plan and get appropriate approvals from the local authority.
- Concerned department in the State Government dealing with the land shall provide suitable sites for setting up of the storage, processing and recycling facilities for construction and demolition waste.
- The Central Pollution Control Board shall prepare operational guidelines related to environmental management of construction and demolition waste.
- SPCB shall grant authorization

HAZARDOUS AND OTHER WASTES (MANAGEMENT & TRANSBOUNDARY MOVEMENT) RULES, 2016

- Solid plastic waste has been prohibited from import into the country including in Special Economic Zones (SEZ) and by Export Oriented Units (EOU).
- Exporters of silk waste have now been given exemption from requiring permission from the Ministry of Environment, Forest and Climate Change.

- Electrical and electronic assemblies and components manufactured in and exported from India, if found defective can now be imported back into the country, within a year of export, without obtaining permission from the Ministry of Environment, Forest and Climate Change.
- Industries which do not require consent under Water (Prevention and Control of Pollution) Act 1974 and Air (Prevention and Control of Pollution) Act 1981, are now exempted from requiring authorization also under the Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016, provided that hazardous and other wastes generated by such industries are handed over to the authorized actual users, waste collectors or disposal facilities.

COASTAL REGULATION ZONE NOTIFICATION, 2018

Diluted by design

Hotels, resorts and temporary tourism facilities can now be built closer to the shore; mangroves to make way for ports, harbours

Coastal Regulation Zone Notification, 2011

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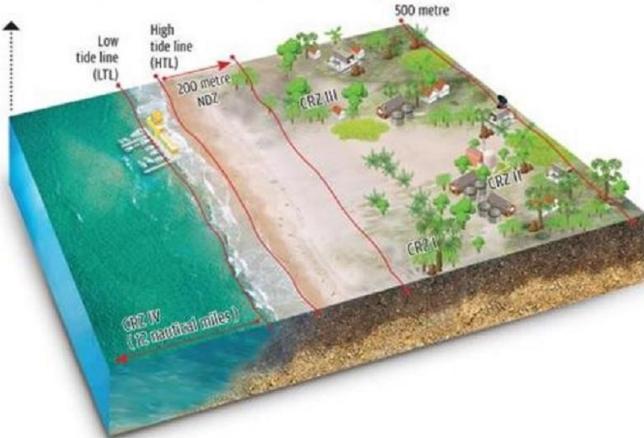
CRZ I: Eco-sensitive and intertidal areas

CRZ II: Areas which have been developed up to or close to the shore

CRZ III: Areas that are relatively undisturbed and do not fall under CRZ-I or CRZ-II

CRZ IV: Area between Low Tide Line and 12 nautical miles into the sea/ tidal influenced waterbodies

NDZ: No development zone that extends up to 200 m from High Tide Line towards land in CRZ-III area



Coastal Regulation Zone Notification, 2018



GRAPHICS: RAJ KUMAR SINGH / CSE

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CRZ I A: Eco-sensitive areas

CRZ I B: Intertidal areas

CRZ II: Areas which have been developed up to or close to the shore

CRZ III A: CRZ-III areas, where the population density is more than 2,161 sq km as per 2011 Census

CRZ III B: Areas with population density of less than 2,161 per sq km, as per 2011 Census

CRZ IV A: 12 nautical miles from the Low Tide Line towards the sea

CRZ IV B: Tidal influenced waterbodies

NDZ: 50 metres from High Tide Line in CRZ III A areas, 200 m from HTL in CRZ-III B areas

- Densely populated rural areas to be afforded greater opportunity for development:** For CRZ-III (Rural) areas, two separate categories have now been stipulated as below:
 - CRZ-III A** - These are densely populated rural areas with a population density of 2161 per square kilometre as per 2011 Census. Such areas shall have a No Development Zone (NDZ) of 50 meters from the HTL as against 200 meters from the High Tide Line stipulated in the CRZ Notification, 2011.
 - CRZ-III B** - Rural areas with population density of below 2161 per square kilometre as per 2011 Census. Such areas shall continue to have an NDZ of 200 meters from the HTL.
- Tourism infrastructure in coastal areas:** Temporary tourism facilities such as toilet blocks, change rooms, drinking water facilities etc. have now been permitted in Beaches. However, a minimum distance of 10 m from HTL should be maintained for setting up of such facilities.

- **CRZ Clearances streamlined:** Only such projects/activities, which are located in the CRZ-I (Ecologically Sensitive Areas) and CRZ IV (area covered between Low Tide Line and 12 Nautical Miles seaward) will be required to be cleared by Ministry of Environment, Forest and Climate Change. For, the CRZ-II (urban) or CRZ III (rural) areas, the CRZ clearance will be considered at the state level by the Coastal Zone Management Authority (CZMA).
- **No Development Zone (NDZ) of 20 meters for Islands:** For islands close to the mainland coast and for all Backwater Islands in the mainland, NDZ of 20 m has been stipulated.
- **Pollution abatement:** In order to address pollution in Coastal areas treatment facilities have been made permissible activities in CRZ-I B area (the area between the Low tide line and High tide line) subject to necessary safeguards.
- **Defense and strategic projects are exempted** from regulations.

WETLANDS (CONSERVATION AND MANAGEMENT) RULES, 2019

- National Wetland Authority acts as an advisory and monitoring body.
- **Nodal authority:** As per the Wetlands Rules, the State Wetlands Authority is the nodal authority for all wetland-specific authorities in a state/UT. It shall be headed by the state minister for Environment.
- **Functions of the authority:**
 1. Preparing a list of all wetlands in the state/UT and recommending wetlands for regulation under the Rules
 2. Developing a comprehensive list of activities to be regulated and permitted within the notified wetlands, and
 3. Issuing necessary directions for the conservation and sustainable management of wetlands to the respective implementing agencies
- **Wetlands:** All wetlands, irrespective of their location, size, ownership, biodiversity, or ecosystem services values, can be notified under the Wetlands Rules, except:
 - river channels, paddy fields, human-made waterbodies specifically constructed for drinking water, aquaculture, salt production, recreation, irrigation purposes,
 - wetlands falling within areas covered under the Indian Forest Act, 1927, Forest (Conservation) Act, 1980, Wildlife (Protection) Act, 1972 and the Coastal Regulation Zone Notification, 2011.
- **Prohibited activities:** as per the guidelines following activities are prohibited on wetlands. These include:
 1. Setting up any industry and expansion of existing industries
 2. Dumping solid waste or discharge of untreated wastes and effluents from industries and any human settlements, and
 3. Encroachment or conversion for non-wetlands uses.
- **Integrated Management Plan:** The guidelines recommend the state/UT administration to prepare a plan for the management of each notified wetland.

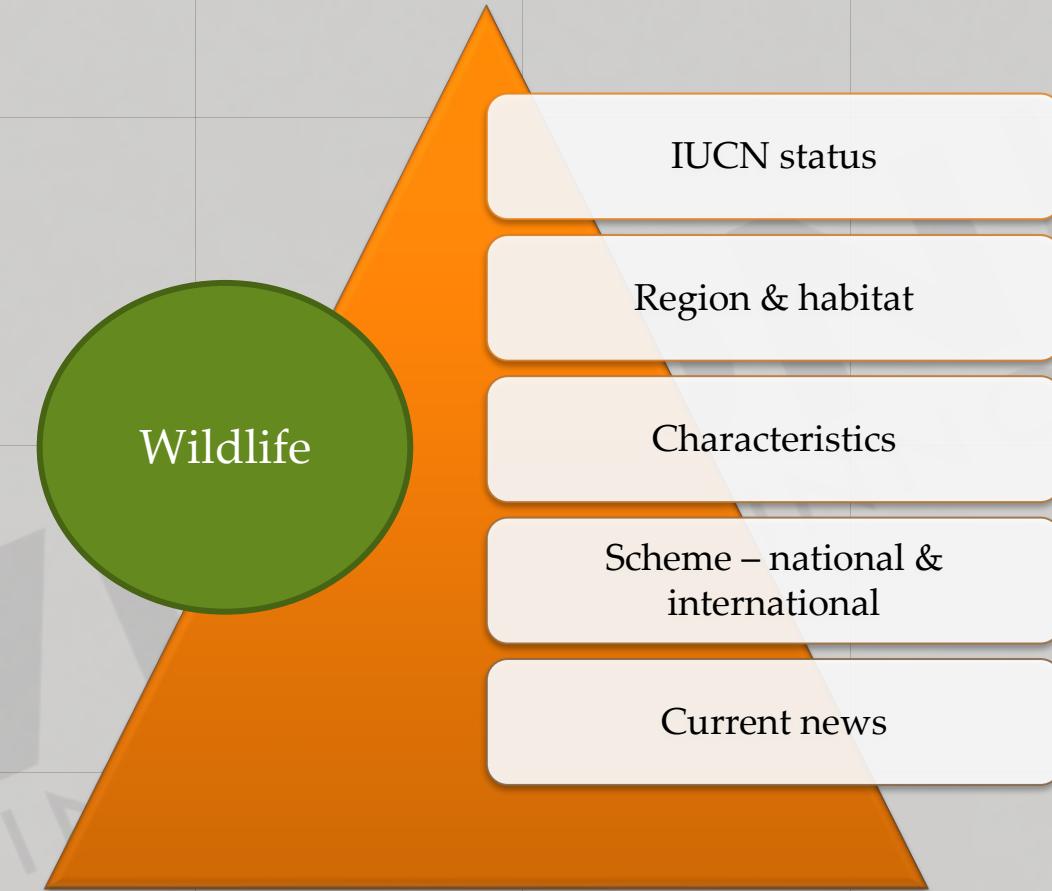
- **Enforcing the rules:** The Wetlands Authorities are responsible for ensuring the enforcement of the Wetlands Rules and other relevant acts, rules and regulations.
- **Penalties:** For undertaking any prohibited or regulated activities beyond the thresholds (defined by the state/UT administration) in the wetlands.

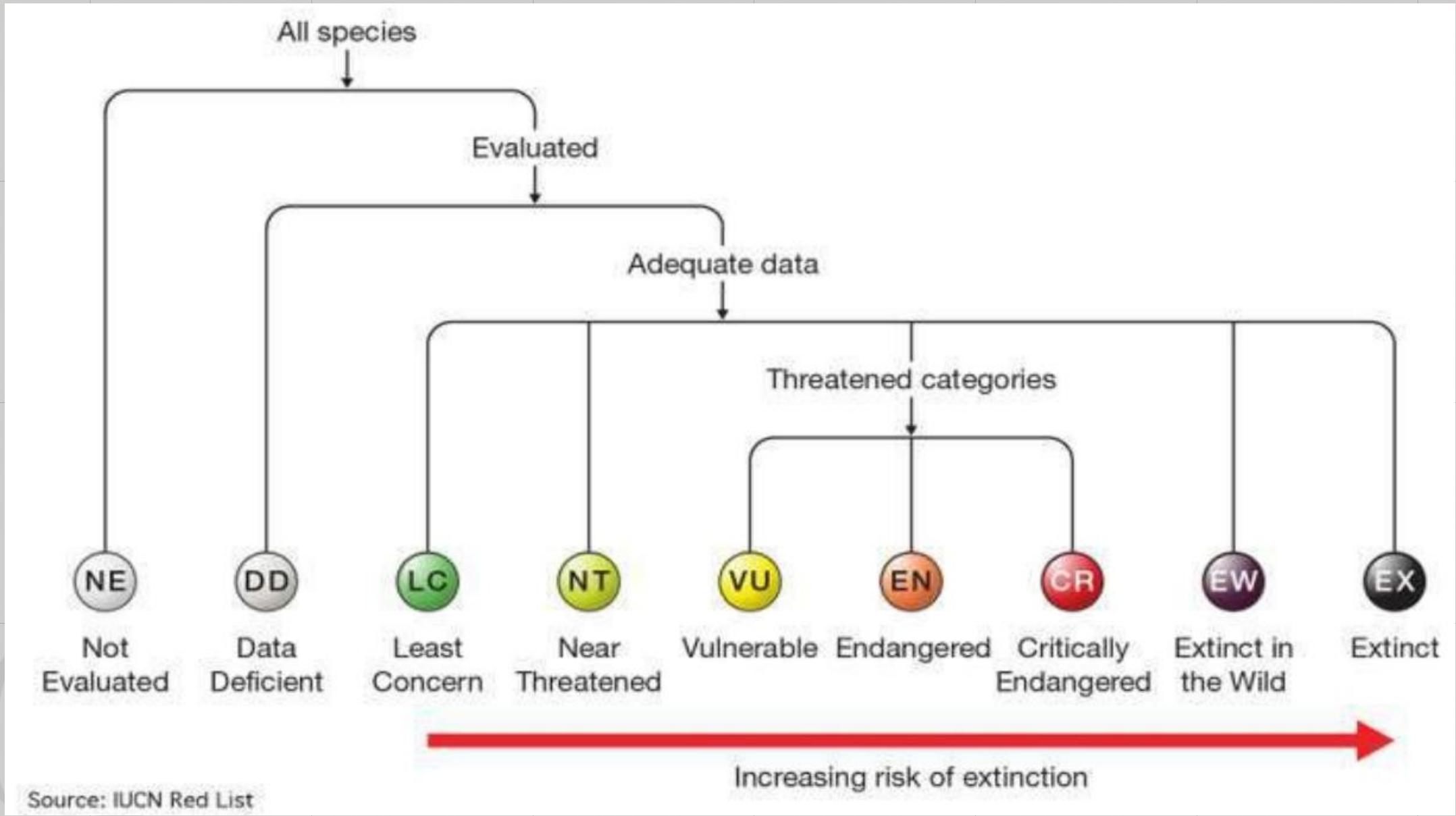
GUIDELINES FOR GROUNDWATER REGULATION, 2020

- Mandatory requirement of applying for NOC for new and existing industries, group housing societies, and private water supply tankers.
- NOC holders to pay groundwater charges based on quantum extraction unlike old provision where they had to pay a nominal lump-sum.
- No NOC to industries in over exploited areas.
- Installation of Sewage treatment plants; rooftop rainwater harvesting and recharge systems and wells for groundwater level monitoring in NOC areas.
- Categories exempted from NOC requirements include Domestic consumers; rural drinking water supply schemes; Armed Forces Establishments and Central Armed Police Forces; agricultural activities; MSMEs drawing 10 cubic metre/day.
- Penalty between Rs 50,000 and Rs 10 lakh for non-compliance.



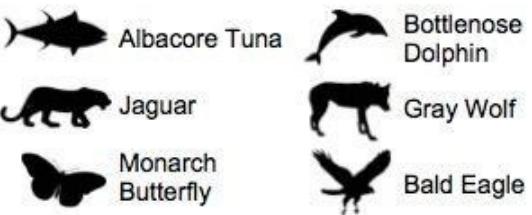
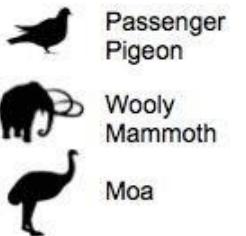
ENVIRONMENT





Source: IUCN Red List

Threatened (encompasses CR, EN, and VU)



Extinct



Extinct in the Wild

Out of all species that have ever lived, 99.9% of them are now extinct. The IUCN has documented 830 species known to have gone extinct since 500 AD.

Currently the IUCN has 69 species listed as extinct in the wild. These species have been extirpated from their natural range and now exist only in captivity.



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Critically Endangered



Endangered



Vulnerable

To be listed as threatened, a species must fit one of the following qualifications

A projected population decline of greater than ___ over the next 10 years or three generations

80%

50%

30%

A global range of less than ___ km²

100

5,000

20,000

A stable global population size of less than ___ individuals

50

250

1000

*Two other categories exist, although they have more complicated thresholds: small population size AND decreasing population, or quantitative scientific analysis that shows a high likelihood of extinction.



Near Threatened



Least Concern

Near threatened species are in danger of becoming threatened. Species with least concern listings may still have declining populations or face threats, but not to the level required for a threatened listing.

Out of the RedList's 77,000 listed species, 35,000 are listed as least concern and 5,000 are listed as near threatened.



For species that have yet to be sufficiently evaluated, two additional classifications exist: data deficient (DD) and not evaluated (NE).



ovindaraj

Tiger

ENDANGERED

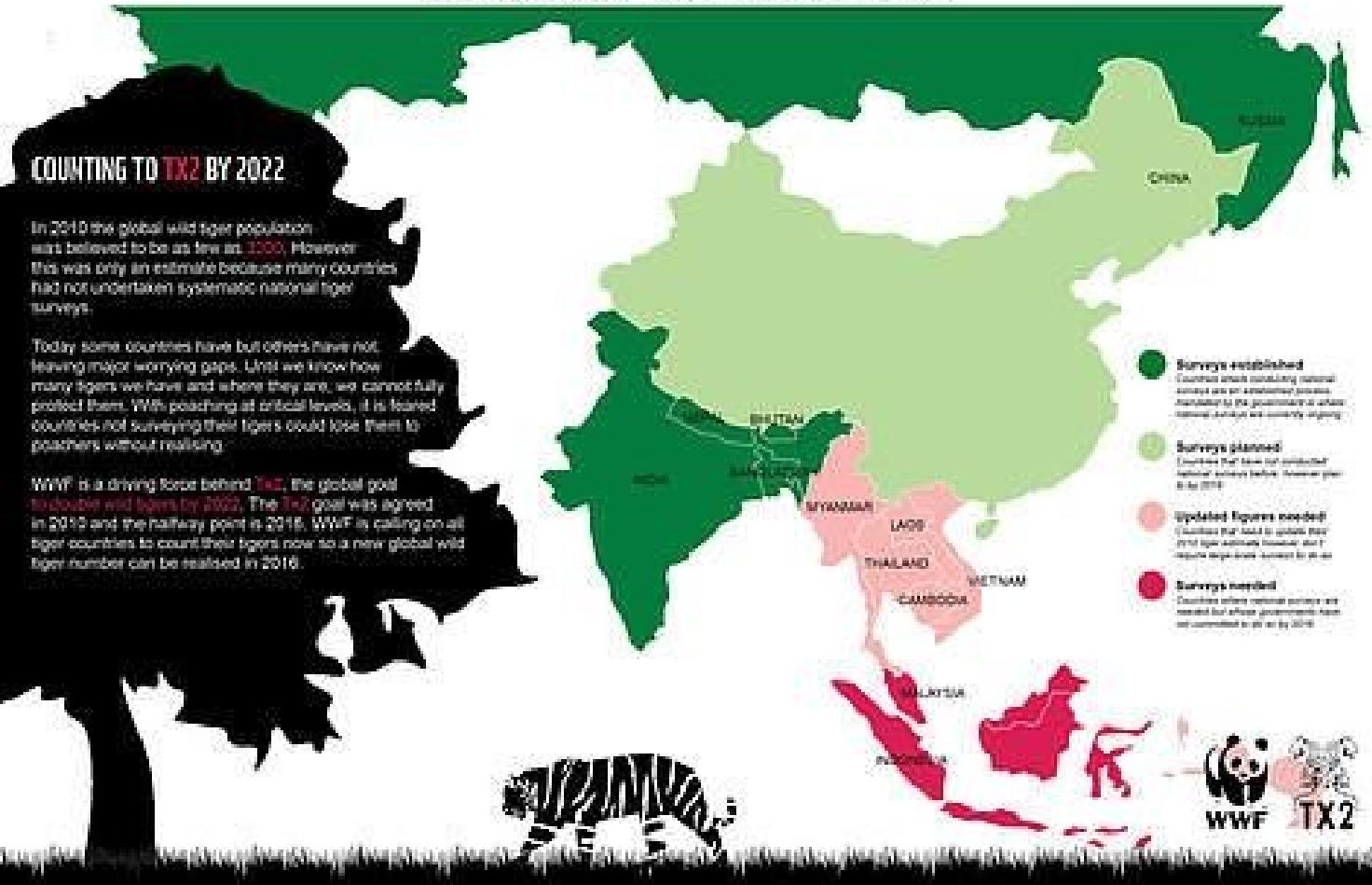
WILD TIGER SURVEY STATUS

COUNTING TO TX2 BY 2022

In 2010 the global wild tiger population was believed to be as few as 3300. However this was only an estimate because many countries had not undertaken systematic national tiger surveys.

Today some countries have but others have not, leaving major worrying gaps. Until we know how many tigers we have and where they are, we cannot fully protect them. With poaching at critical levels, it is feared countries not surveying their tigers could lose them to poachers without realising.

WWF is a driving force behind **TX2**, the global goal to double wild tigers by 2022. The TX2 goal was agreed in 2010 and the halfway point is 2016. WWF is calling on all tiger countries to count their tigers now so a new global wild tiger number can be realised in 2016.



Asiatic Lion



ENDANGERED

CHEETAH



African Cheetah



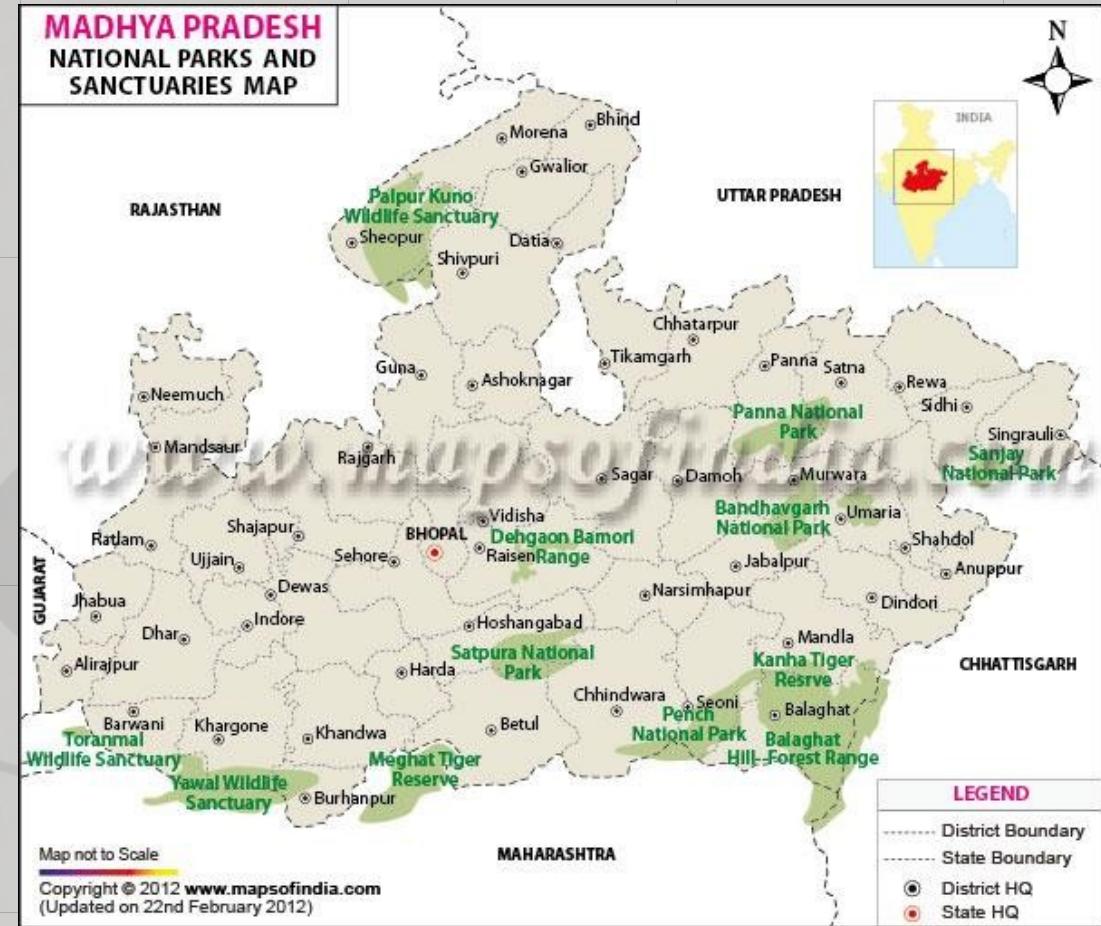
Asiatic Cheetah

Vulnerable

Critically
Endangered



MADHYA PRADESH NATIONAL PARKS AND SANCTUARIES MAP



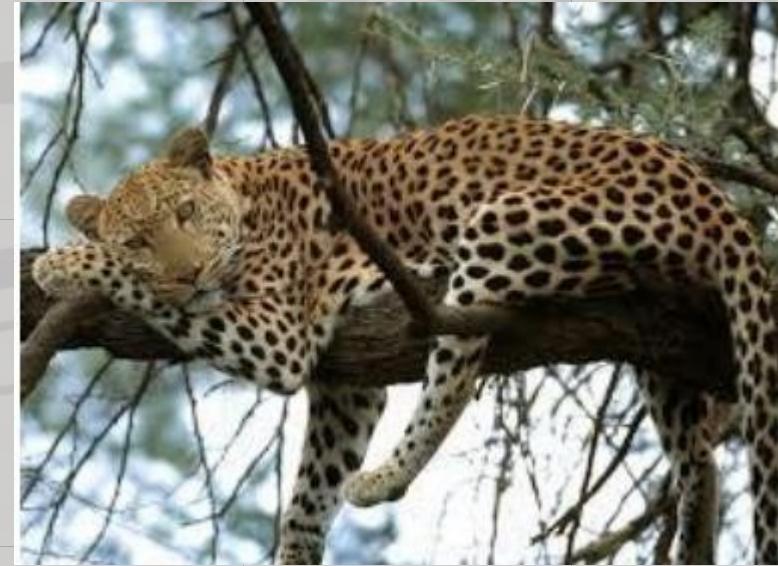
SNOW LEOPARD



Vulnerable



Leopard



Vulnerable

Clouded Leopard



Vulnerable

Fishing Cat



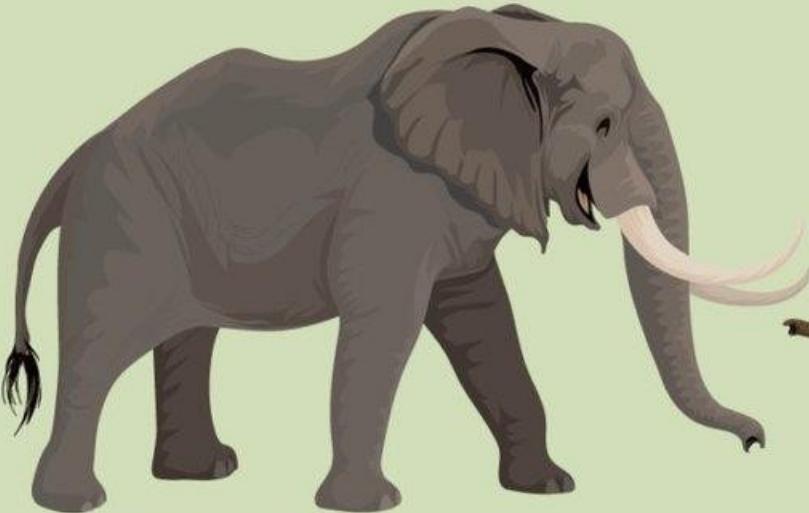
Vulnerable

Asiatic Elephant



ENDANGERED

KNOW YOUR ELEPHANTS



Savanna/Bush Elephant

(*Loxodonta africana*)

VULNERABLE

ENDANGERED

- Largest elephant species; tallest at shoulders, 11-13 ft. (3.35-3.96 m)
- Large ears, resemble the shape of the continent of Africa
- Single bump on forehead that curves smoothly
- Back dips in the middle
- Tusks curve upwards and grow outward or away from each other
- 4 front toenails and 3 back toenails
- Two finger-like lobes on the tip of the trunk

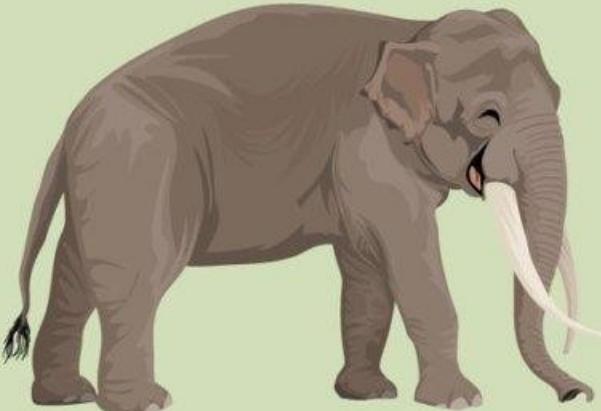


Forest Elephant

(*Loxodonta cyclotis*)

DATA DEFICIENT CRITICALLY ENDANGERED

- Smallest elephant species; 8 ft. (2.44 m) tall
- Darker in color
- Rounder ears and smaller mandible
- Straighter and downward pointing tusks that grow towards each other
- Tusk ivory is particularly hard and has a pinkish tinge
- Found in dense forests of Africa's Congo Basin
- 5 front toenails and 4 back toenails
- Two finger-like lobes on the tip of the trunk
- Once thought to be a subspecies of the Bush/Savanna Elephant, until DNA evidence revealed it was unique species. It is as different from the Bush/Savanna Elephant as that species is distinctly different from the extinct Woolly Mammoth.

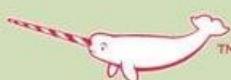


Asian Elephant

(*Elephas maximus*)

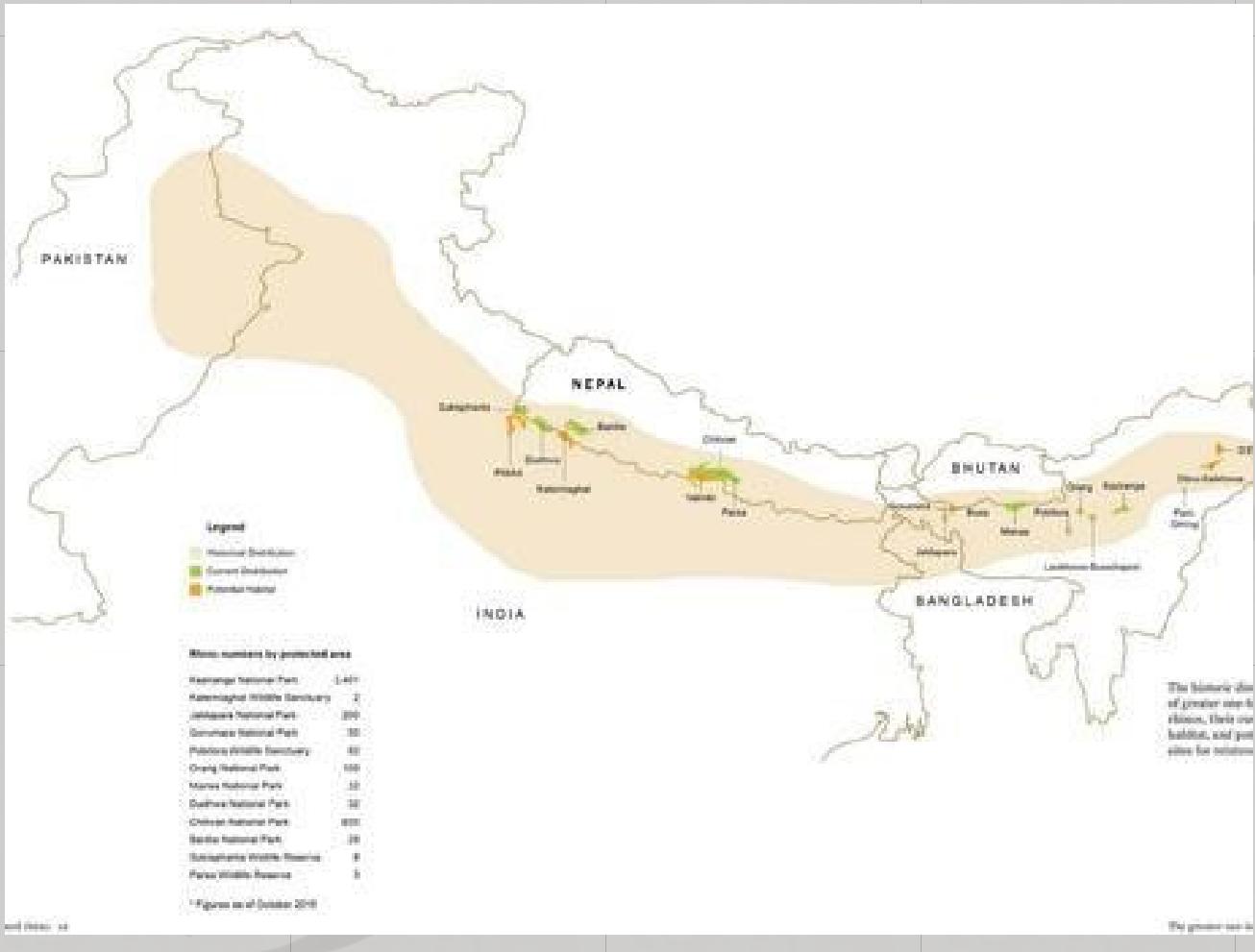
ENDANGERED

- Tallest at arch of back, 10' tall
- Small ears
- Two bulbous bumps on forehead
- 5 front toenails and 4 back toenails
- Single lobe on the tip of the trunk
- The "pygmy" Asian Elephant of Borneo is a smaller morph of the Asian Elephant



World Elephant Day - August 12

GREAT ONE - HORNED RHINOCEROS (INDIAN RHINO)



Vulnerable

GREAT INDIAN BUSTARD



Critically Endangered

Bengal Florican (Bengal Bustard)



Lesser Florican



Critically Endangered

Critically Endangered

LESSER FLORICAN

IUCN Red List: Critically Endangered

Scientific name: *Sypheotides indicus*

Population:

approximately 730 mature individuals
declined by nearly 80% between 2000 to 2018



Protection:

- Schedule I of the Wildlife (Protection) Act, 1972
- Declared as a priority species for recovery by MoEFCC in 2009



Threats:

- Hunting
- Grassland conversion to agriculture
- Use of chemical fertilizers and pesticides
- Overgrazing
- Industrialization
- Mining and quarry activities
- Disturbance due to unethical photography
- Trampling of eggs from farming activities
- Collision with energy infrastructure
- Chick predation by feral dogs
- Lack of awareness



Courtship Display:

- Impressive aerial courtship displays
- Male leaps vertically in the air as many as 500 times a day
- Emits a frog-like rattle to attract a female



Sexually Dimorphic:

- Male - black neck and belly, gold-spangled back, and white in the wing
- Female - brownish, larger

HABITAT:
GRASSLANDS AND CROPLANDS
LOCAL MIGRANT, MOVEMENT DEPENDENT ON RAINFALL



WILDLIFE SOS

SARUS CRANE

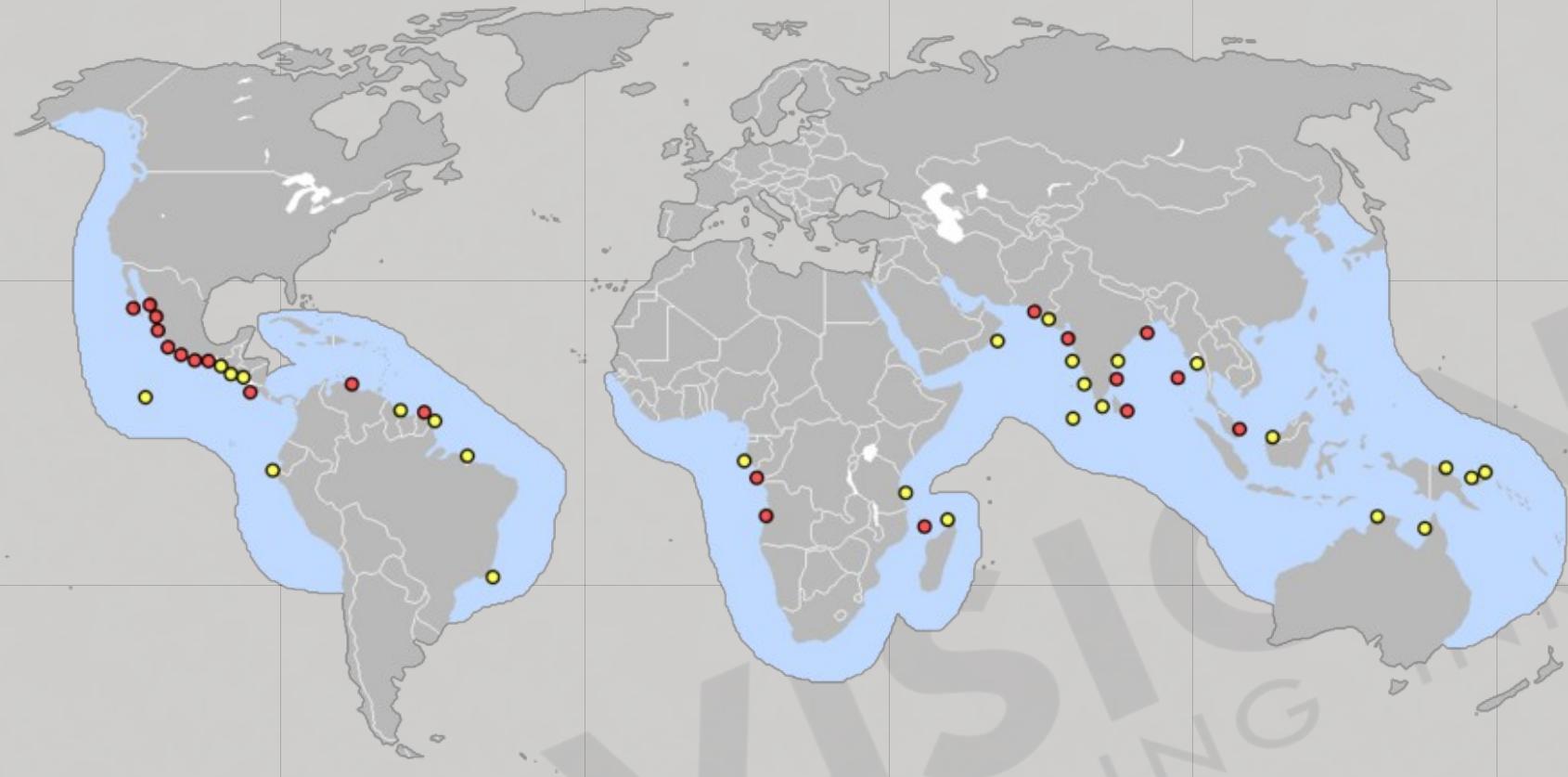


Vulnerable

OLIVE RIDLEY TURTLES



Vulnerable



Operation
Oliva

Operation
Save kurma

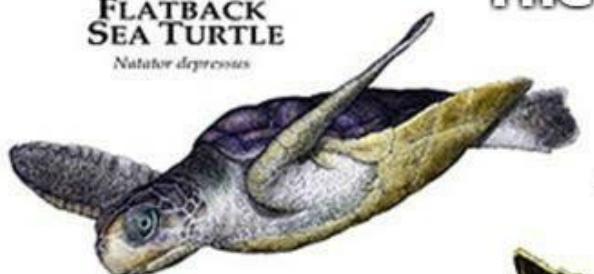
Sea turtle
project



All Sea Turtle Species

The Species List

**FLATBACK
SEA TURTLE**
Natator depressus

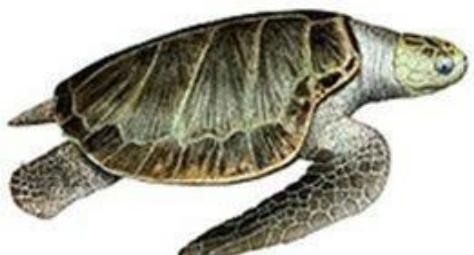


**GREEN
SEA TURTLE**
Chelonia mydas

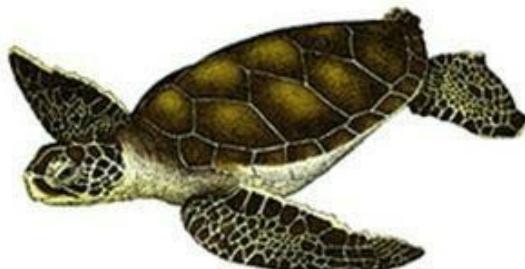


All

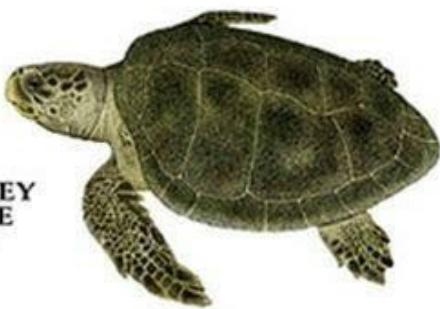
**OLIVE RIDLEY
SEA TURTLE**
Lepidochelys olivacea



**HAWKSBILL
SEA TURTLE**
Eretmochelys imbricata



**KEMP'S RIDLEY
SEA TURTLE**
Lepidochelys kempii

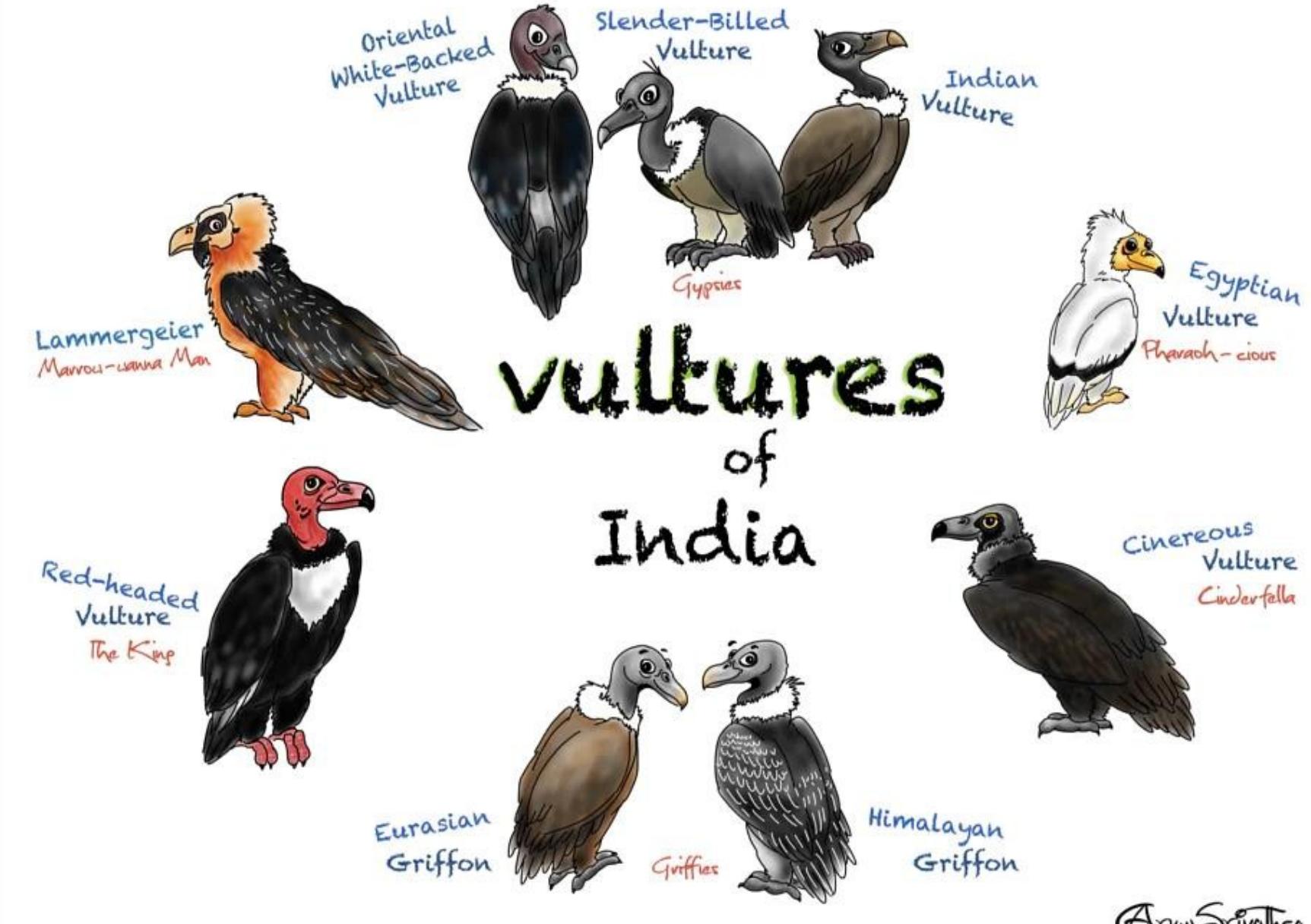


**LEATHERBACK
SEA TURTLE**
Dermochelys coriacea

**LOGGERHEAD
SEA TURTLE**
Caretta caretta



Vultures



Sr. No.	Name of the Vulture Species	IUCN status	Pictorial Representation
1.	Oriental White-backed Vulture (<i>Gyps Bengalensis</i>)	Critically Endangered	
2.	Slender-billed Vulture (<i>Gyps Tenuirostris</i>)	Critically Endangered	
3.	Long-billed Vulture (<i>Gyps Indicus</i>)	Critically Endangered	
4.	Egyptian Vulture (<i>Neophron Percnopterus</i>)	Endangered	

5.	Red-Headed Vulture (<i>Sarcogyps Calvus</i>)	Critically Endangered	
6.	Indian Griffon Vulture (<i>Gyps Fulvus</i>)	Least Concerned	
7.	Himalayan Griffon (<i>Gyps Himalayensis</i>)	Near Threatened	
8.	Cinereous Vulture (<i>Aegypius Monachus</i>)	Near Threatened	
9.	Bearded Vulture or Lammergeier (<i>Gypaetus Barbatus</i>)	Near Threatened	

MAHSEER



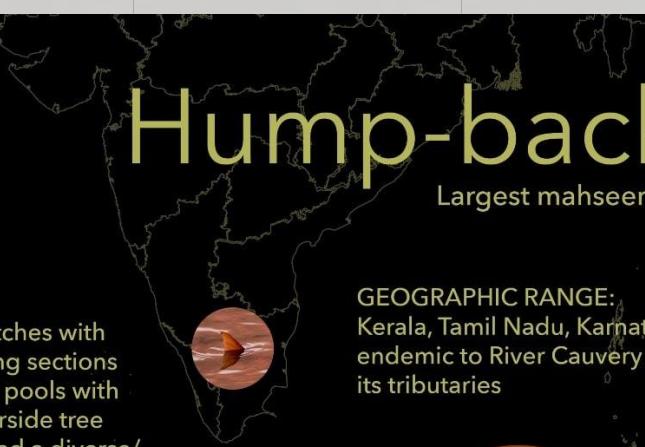
Golden Mahseer

ENDANGERED



Blue finned Mahseer

LC



Hump-backed Mahseer

(*Tor remadevii*)

Largest mahseer species in India. Omnivorous. Apex predator

HABITAT:
River stretches with fast-flowing sections and deep pools with good riverside tree cover. Need a diverse/complex riverine habitat to ensure survival.

Large scales and mouth with barbels (hair-like sensory organs)



EAT:
Fish, aquatic insects
frogs, crabs, fruits and seeds – especially riverside mangoes, leaves, worms

PHOTOS: PINDER ET AL, CC BY 4.0 (MAIN), NAKUL SHETTY (ANGLER), JOSHUA BARTON (FIN).
TEXT: NISARG PRakash, DESIGN: DIVYA MEHTA

GEOGRAPHIC RANGE:
Kerala, Tamil Nadu, Karnataka – endemic to River Cauvery and its tributaries



BREEDING:

- Believed to swim up tributaries during breeding season which coincides with the arrival of the monsoon
- Might spawn multiple times a year

POPULATION: DRASTICALLY DECLINING

THREATS:

- Sand mining • Pollution from agrochemicals and sewage • Poaching
- Destructive fishing methods like dynamite fishing, gill netting and use of poisons • Dams • Displacement due to introduction of blue-finned mahseer, which is not native to Cauvery

PROTECTION STATUS: CRITICALLY ENDANGERED on the IUCN Red List

Critically Endangered

CROCODILES OF INDIA

WILDLIFE SOS



GHARIALS

Gavialis gangeticus

Male gharials are easily distinguished due to the presence of a bulb on their snouts, like earthenware pots called gharas. They are used to vocalise and blow bubbles to attract females.

Habitat: They are found in clear freshwater river systems, congregating at river bends.

Threats: Illegal poaching, egg collection, fishing nets, sand mining, prey base depletion, and habitat loss and degradation.



MUGGER CROCODILE

Crocodylus palustris

Also called marsh crocodiles, Mugger Crocodiles are one of the most adaptable crocodilian species in India. With the broadest snout of all, they are keystone species of their habitat.

Habitat: They are found in freshwater habitats including rivers, lakes, marshes, and estuarine.

Threats: Illegal poaching, egg collection, fishing nets, and habitat loss and degradation.

GLOBAL POPULATION

of mature individuals

Gharials  650

Mugger Crocodiles   5700-8700

Saltwater Crocodiles    500,000

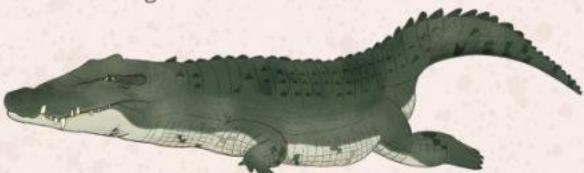
SALTWATER CROCODILE

Crocodylus porosus

The Earth's largest living reptile, saltwater crocodiles have the greatest bite pressure of any animal. Males are much larger than females, weighing even upto 1,000 kilograms!

Habitat: They inhabit coastal brackish mangrove swamps and river deltas.

Threats: Illegal hunting and habitat loss and degradation.



IUCN STATUS

LC

Least Concern
Saltwater Crocodile

NT

Vulnerable
Mugger Crocodile

EN

Critically Endangered
Gharial

CR

EW

EX

Black Buck



LC

Brow-antlered Deer



ENDANGERED

Chinkara or India Gazelle



LC

Kashmir Stag



Critically Endangered

Musk Deer



ENDANGERED

Swamp Deer



Vulnerable

Tibetan Antelope



NT

Capped Langur

ENDANGERED



Lion-tailed Macaque

ENDANGERED



Nilgiri Langur



Vulnerable

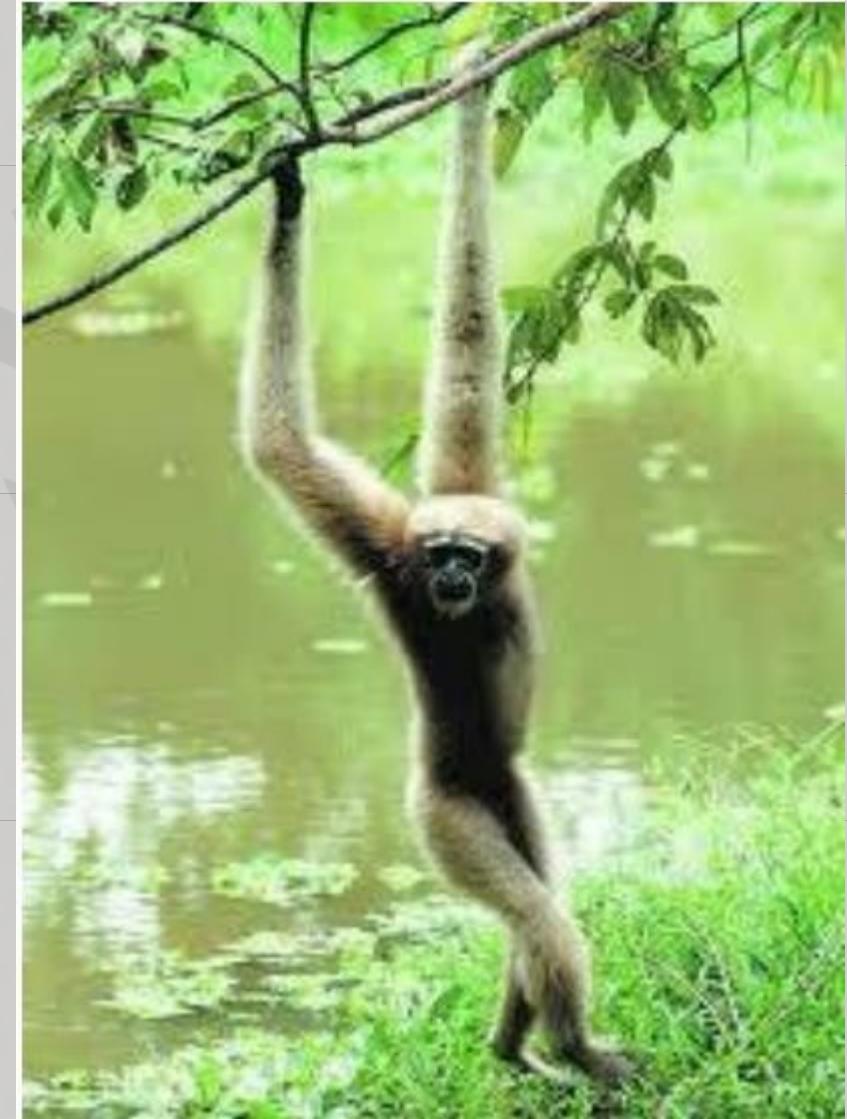
Gee's Golden Langur

ENDANGERED



Hoolock Gibbon

ENDANGERED



Indian Pangolin



ENDANGERED

Dugong (Sea cow)



Vulnerable

Ganges river dolphin



ENDANGERED

Indian bison or Gaur



Vulnerable

Indian Wild Ass



NT

Red Panda



ENDANGERED

Malabar Civet



Critically Endangered

Nilgiri Tahr



ENDANGERED

Markhor



NT

Himalayan Tahr



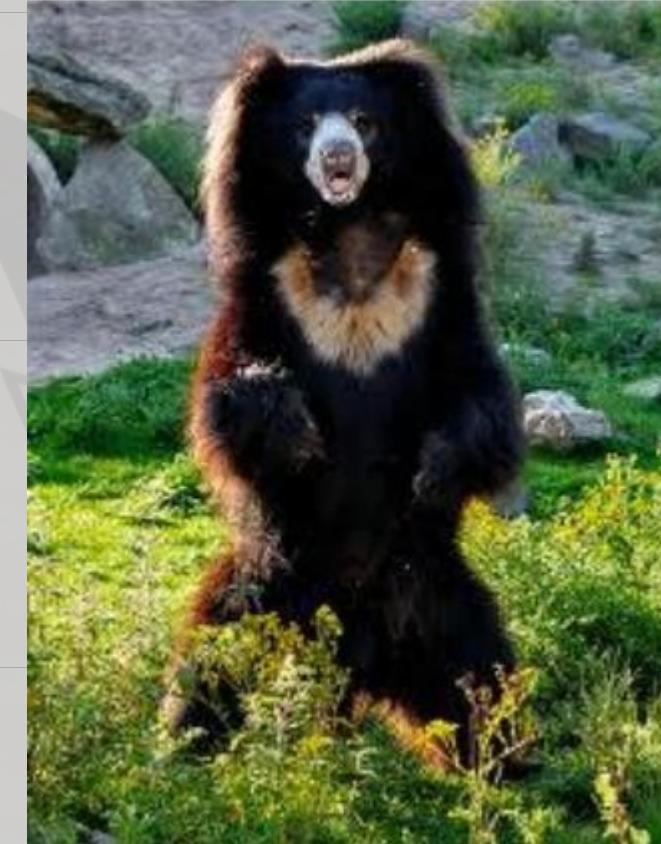
NT

Pygmy Hog



ENDANGERED

Sloth Bear



Vulnerable



Questions??



- Online query (For faster reply)
- Read and revise what is taught
- Read the reference material
- Mentoring sessions

If Dil Maange beyond MORE...

Mail: rajesh@visionias.in
Twitter: [@naturiousoul](https://twitter.com/naturiousoul)