IAS PARLIAMENT

TARGET 2024

ENVIRONMENT

MAY 2023 TO DECEMBER 2023

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Total number of questions directly reflected from IAS Parliament (including Target 2023 series)	22
Number of questions directly reflected from the Target Series 2023	15
Total number of questions partially reflected from IAS Parliament	20

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TARGET 2024
ENVIRONMENT

May 2023 to December 2023

1. POLLUTION

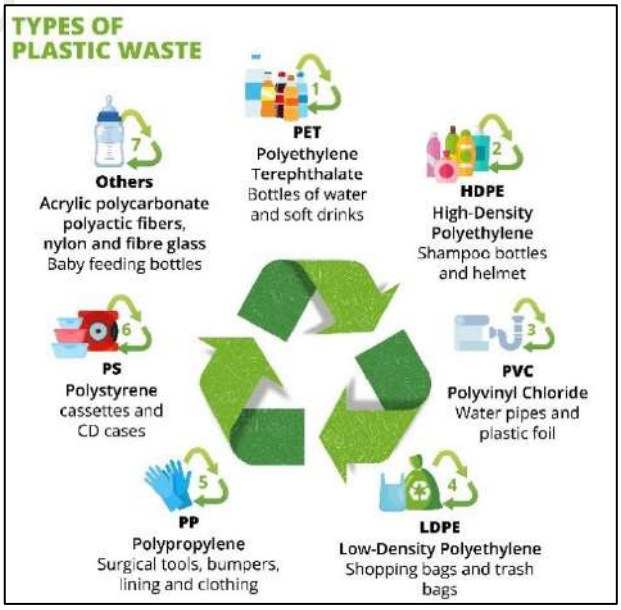
1.1 Plastic Pollution: A Glossary of Related Terms

The year 2023 celebrates the 50th anniversary of World Environment.

- **World Environment Day -** Celebrated annually on ***June 5,*** *since 1973* by the United Nations Environment Programme *(UNEP).*
- **June 5** was designated as World Environment Day, marking the first day of *1972 Stockholm Conference on the Human Environment.*
- This year's theme focuses on solutions to plastic pollution under the campaign ***#BeatPlasticPollution.***
- This year's edition is hosted by *Côte d'Ivoire (a Western African country)* in partnership with Netherlands.

Terms related to Plastic Pollution

- **Plastics -** Derived from the Greek word *plastikos*, meaning capable of being *shaped or moulded.*
- It refers to a wide range of synthetic/semi-synthetic materials that use polymers as a main ingredient with their plasticity.
- Most modern plastics are derived from fossil fuel-based chemicals like natural gas or petroleum.
- Recently, variants made from renewable materials, such as corn or cotton derivatives have also emerged.
- **Commodity plastics -** These refer to the 6 major polymer types which constitute around 70% of global plastic production.
- They can be identified by their *resin identification code (RIC)* denoted by symbols found on plastic products.
- **Resin Identification Code (RIC) -** RIC shows the consumer which type of plastic resin was used to make the chosen product.
- The symbol looks similar to recycle symbol but it explicitly does not mean the product can be recycled.



- **Decomposition rate** - It refers to the rate at which a material breaks down into its constituent parts through chemical processes.
- **Microplastics -** Officially defined as plastics ***less than 5 millimetres*** *in diameter* and categorised into two.
  - Primary microplastics are tiny particles designed for commercial use, such as in cosmetics or textiles.
  - Secondary microplastics are particles that are a product of the breakdown of larger plastic items. They are formed due to

exposure to environmental factors such as sun radiation or ocean waves.

- **Toxins -** Microplastics contain a number of toxic chemicals such as BPA which pose severe risks to human health. BPA or Bisphenol A is used to harden the plastic, contaminates food and drinks.
- **Great Pacific Garbage Patch -** It is the largest collection of marine debris in the ***North Pacific Ocean*** and is also known as the ***Pacific trash vortex***.
- The garbage patch is actually two distinct collections of debris bounded by the massive ***North Pacific Subtropical Gyre***.
- It is located between California and Japan, and formed due to converging ocean currents.

Great Pacific Garbage Patch

- **Single-use plastics -** A term which refers to any plastic items which are either designed to be used one time by the consumer before they are thrown away or recycled or used in this way.
- Many countries, including India, have passed legislation to either ban or severely restrict their use.

Polyethylene Terephthalate (PET or PETE)

- A member of the polyester family of polymers, a strong synthetic fibre and resin.
- It is produced by the *polymerization of ethylene glycol and terephthalic acid.*
- PET is the most widely recycled plastic.
- **Uses** - PET is also made into fibre filling for insulated clothing and pillows and in artificial silk and in carpets.
- Automobile tire yarns, conveyor belts, reinforcement for fire hoses and garden hoses, seat belts, etc.
- **Import** - The Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 were amended in 2021 to allow import of PET into the country including Special Economic Zones (SEZs) and Export Oriented Units (EOUs).
- Ministry of Environment has notified the Guidelines on the Extended Producer Responsibility (EPR) for plastic waste, including PET, by Plastic Waste Management Amendment Rules, 2022.

1.2 UN Treaty to End Plastic Pollution

INC, under the UN Environment Programme (UNEP), met in Nairobi for its 3rd round of negotiations to develop an international legally binding instrument to end plastic pollution worldwide.

- **Intergovernmental Negotiating Committee (INC) -** The committee is formed to develop the instrument on plastic pollution. It addresses the full life cycle of plastics, including its production, design, and disposal.
- **Zero draft text-** INC-3 was a make-or-break opportunity as countries came together to negotiate the 'zero draft' text developed by the Committee's Secretariat, with various options for core obligations and control measures.
- **UNEA Resolution 5/14**- UNEA adopted a resolution to develop an international legally binding instrument on plastic pollution, including in the marine environment.

Session	Year	Location
INC-1	2022	Punta del Este Convention and Exhibition Centre
INC-2	2023 (May-June)	Paris, France
INC-3	2023 (November)	Nairobi

- **Aim**-The resolution has the ambition to complete the negotiations to frame the instrument by end of 2024.
- The INC is responsible for delivering a global plastics treaty ***by 2025.***

Important Environment Conventions	Significance
Convention on Biological Diversity (CBD)	Aims to conserve biological diversity, use its components sustainably, and share the *benefits of genetic resources* fairly and equitably
Nagoya Protocol on access and benefit sharing	A supplementary agreement to the *Convention on Biological Diversity (CBD)* to ensure access of genetic resources and fair and equitable sharing of benefits arising from their utilization
Cartagena Protocol on Biosafety	It is a protocol to the *Convention on Biological Diversity (CBD)* and it governs the movements of living modified organisms (LMOs) resulting from modern biotechnology from one country to another.
UN Framework Convention on Climate Change (UNFCCC)	An international environmental treaty to combat dangerous human interference with the climate system, by *stabilizing greenhouse gas* concentrations in the atmosphere
Kyoto Protocol	It operationalizes the UN Framework Convention on Climate Change by committing industrialized countries to limit and reduce *greenhouse gases (GHG) emissions*
UN Convention to Combat Desertification (UNCCD)	A convention to combat desertification and mitigate the effects of drought through national action programs.
Stockholm Convention	An international environmental treaty to eliminate or restrict the production and use of *persistent organic pollutants*
Minamata Convention	An international treaty to protect human health and environment from anthropogenic emissions and *releases of mercury and its compounds*
Montreal protocol	An international treaty to *phase out the production of ozone depleting substances.* (GEF is *not formally linked* to this protocol, but supports its implementation in transitioning economies)
Kigali Agreement	An amendment to Montreal Protocol to reduce HFC consumption by 80% by 2047
Basel Convention	An international treaty on the Control of Transboundary Movements of Hazardous Wastes and their disposal
Rotterdam Convention	A treaty to designed to facilitate Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade

1.3 Plastic Credits

Plastic credits are considered as one of the tools to cut down plastic pollution.

- **Plastic credits** - It is a market based mechanism that allows companies or individuals to pay for plastic waste collection and recycling in exchange for a credit that offsets their own plastic production or use.
- It is similar to carbon credits which offset the greenhouse gas emissions of various companies.
- **Facilitation-** The exchange is facilitated by accreditors like Verra, marketplaces like the Plastic Credit Exchange (PCX), or private companies that trade in credits or organize credit-generating activities.
- When companies buy enough plastic credits to offset their plastic footprint over a set period of time, they may claim ***net-zero plastic.***

1.4 Air Quality Life Index (AQLI) Report

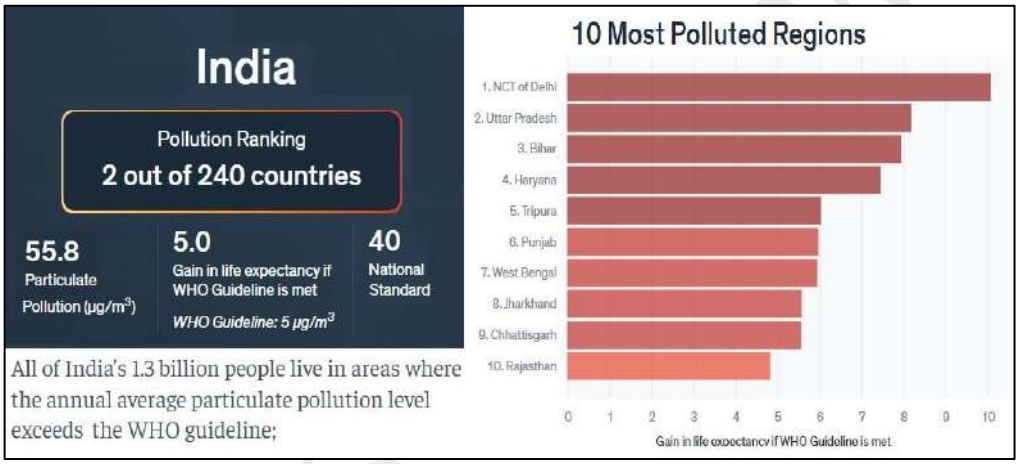
According to the University of Chicago report, the air pollution has major impact on the life expectancy.

- **Prepared by-** University of Chicago's Energy Policy Institute (UCEPI)
- **Purpose-** To quantify the relationship between long-term human exposure to air pollution and life expectancy.
- **Policies-** It illustrates how air pollution policies can increase life expectancy if pollution levels were reduced to
    - World Health Organization's (WHO) safe guideline
    - Existing national air quality standards, or
    - By user-selected % reductions.

According to the WHO, annual average concentrations of PM 2.5 should not exceed 5 µg/m3.

Key findings of the report

- **South Asia** - Air pollution is a major threat to South Asians especially for those living in Bangladesh, India, Nepal, and Pakistan.
- ***Bangladesh*** *remains the most polluted country in the world.*
- **India –** It is the *2nd most polluted nation*. Between 2020 and 2021, PM2.5 level in India *increased 10 times* more than the WHO guideline.
- Air pollution shortens the average Indian life expectancy by *6.3 years,* relative to what it would be if the World Health Organization (WHO) guideline was met



- **Most polluted**- The world's 50 most polluted regions belong to the *Northern Plains of India.*
- *Delhi* has the highest level of pollution in the country, with pollution 14 times greater than the WHO guideline.

Steps taken by Government to Curb Air Pollution

- **Air (Prevention and Control of Pollution) Act 1981-** It was inspired from the decisions made during Stockholm conference.
- **National Clean Air Program**- It was launched in 2019 as a long-term, time-bound, national level strategy to tackle the air pollution problem across the country.
- The Government of India revamped its *NCAP (National Clean Air Programme)* goal in 2022 which aims to achieve a 40% reduction in particulate pollution levels by 2026 in 131 non-attainment cities.
- **Monitor-** 'National Air Monitoring Program' (NAMP), was launched in 2009 which aims to cover a larger extent of states and cities in India.
- **National Air Quality Index**- It was launched in 2014 for effective dissemination of air quality information to the people.
- **Infrastructure**- Eastern Peripheral Expressway and Western Peripheral Expressway has been operationalized to divert non destined traffic from Delhi.
- **Ban-** 10-year-old diesel vehicles and 15-year-old vehicles in Delhi NCR has been banned.
- **Faster Adoption and Manufacturing of Electric Vehicles (FAME Scheme)** - Promotes the use of electric vehicles.
- **Extended Producer Responsibility (EPR)** - It is a framework for plastic packaging, battery waste, tyre waste and e-waste.
- **Graded Response Action Plan (GRAP)** - It was launched in 2017, for prevention, control and abatement of air pollution in NCR.
- **SAMEER app**- Air quality information is available to public along with provision for registering complaints.

1.5 Graded Response Action Plan (GRAP)

With the National Capital Region's (NCR) Air Quality Index (AQI) deteriorating to the 'severe' category, the Commission for Air Quality Management invoked measures under Stage 4 of the GRAP with immediate effect.

- **GRAP** is a set of emergency measures to be taken to reduce air pollution.
- **Formation** - The Supreme Court mandated Environment Pollution (Prevention and Control) Authority (EPCA) formulated and notified the plan in 2017 after SC approval in 2016.
- **Activation of GRAP** – GRAP does not include yearlong measures and ***only incremental actions*** which gets activated on the basis of values of AQI.
- Before imposing measures, EPCA holds a meeting with representatives from all NCR states.
- The BS-VI fuel was estimated to bring around an 80% reduction of sulphur, from 50 parts per million to 10 ppm.
- GRAP creates a step-by-step plan for the entire Delhi-NCR region and getting on board 13 different agencies of NCR regions (Delhi, Uttar Pradesh, Haryana and Rajasthan).

GRAP stages	Activation Criteria
Stage 1	When the AQI is in 'poor' category (201 to 300)
Stage 2	When AQI is in 'Very poor' category (301-400)
Stage 3	when the AQI is in 'Severe' category (401-450)
Stage 4	When AQI rises to the 'Severe +' category (>450)

Commission for Air Quality Management (CAQM)

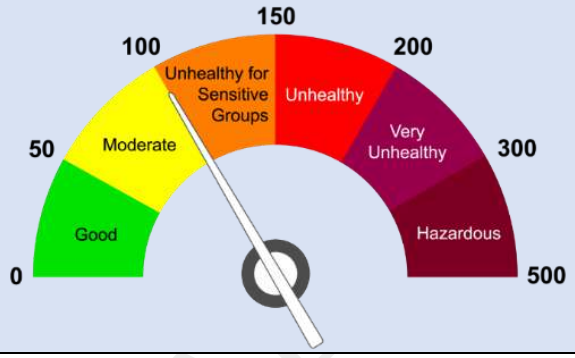
- CAQ) was setup under the **Commission for Air Quality Management in National Capital Region and Adjoining Areas Ordinance**, 2021.
- In case of any conflict, the orders or directions of the Commission will prevail over the orders of Respective state governments, Central Pollution Control Board (CPCB), State PCBs and State-level statutory bodies.
- **Functions of the Commission**
  - Co-ordinating actions taken under the Ordinance by concerned state governments (Delhi, Haryana, Punjab, Rajasthan, and Uttar Pradesh).
  - Planning and executing plans to prevent and control air pollution in the National Capital Region (NCR).
  - Preparing various action plans such as increasing plantation and addressing stubble burning.
  - Investigate, conduct research and issue directions related to environmental pollution.

1.6 Odd Even Scheme in Delhi

The Delhi government has announced the return of the odd-even road assigning scheme as the air pollution in Delhi is already in severe and severe plus category.

- **Origin**- The scheme was instituted in *US in 1979* when unstable conditions in Iraq and Iran led to a worldwide increase in oil prices.
- ***Delhi*** used the scheme for the 1st time in ***2016.***
- **About –** The scheme restricts the vehicles on the road based on their license plate numbers.
- Private vehicles with registration numbers ending with an odd digit will be allowed on roads on odd dates and those with an even digit on even dates.
- **GRAP -** The scheme is a part of ***Graded Response Action Plan (GRAP)***, a set of measures drafted by the Centre's Commission for Air Quality Management (CAQM) to tackle air pollution.
- GRAP has 4 stages depending on the severity of air quality and the odd-even scheme is invoked under *Stage IV,* the highest level of pollution alert.

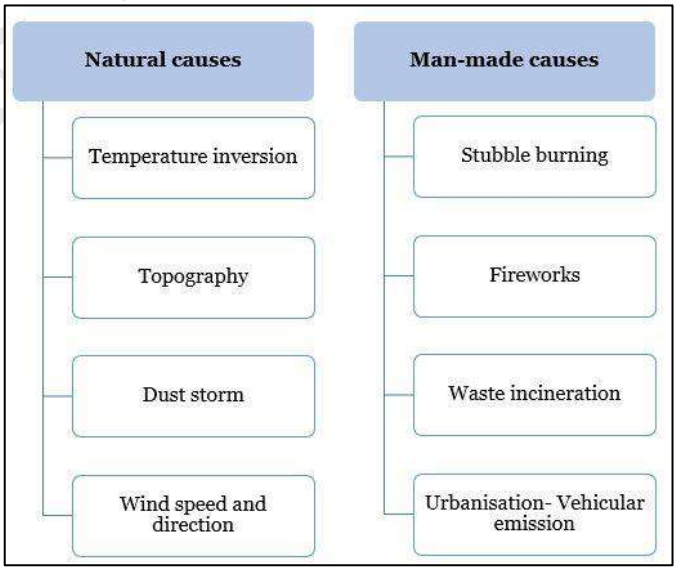
1.7 Air Quality Tools

System of Air Quality and Weather Forecasting (SAFAR)	Air Quality Index (AQI)
• A dedicated Air Quality Information Service for Indian Metropolitan Cites to make India self-sufficient in providing frontier research based scientific accredited robust Air Quality Forecasting system. • **Launched by-** Ministry of Earth Sciences • **Implementation-** Indian Institute of Tropical Metrology, Pune and Indian Meteorological Department. • **Aim-** To provide location specific information on air quality in near real time and its forecast 1-3 days in advance for the first time in India. • **Coverage-** Delhi, Pune, Mumbai, Ahmedabad.	• AQI is a number used to communicate to the public how polluted the air currently is or how polluted it is forecasted to become. 

1.8 Smog in North India

- **Smog** = Smoke + Fog
- **Photochemical smog**- It is called as a *Los Angeles smog* which is produced when sunlight reacts with nitrogen oxides and at least one volatile organic compound (VOC) in the atmosphere.
- Sunlight hits these chemicals, thus forming airborne particles and ground-level ozone or smog.
- **Sulphurous smog** -It is called as *London smog* which is caused by the high concentration of sulphur oxides in the atmosphere

Type of ozone	About
Stratospheric ozone	It is high above the Earth, acts as a barrier that protects humans and the environment from excessive amounts of solar ultraviolet radiation.
Ground level ozone	It is trapped near the ground by heat inversions or other weather conditions, it causes the respiratory distress and burning eyes associated with smog



1.9 Mercury contamination

- **Mercury contamination** – It is global as mercury emissions disperse widely in the atmosphere.
- Mercury emissions are
  - Highly **toxic** to the nervous system.
  - **Persistent** in the environment.
  - **Bioaccumulates** (higher concentrations in tissues of aquatic plants and animals than in water).
  - **Biomagnifies** (higher concentrations at increasingly higher levels in the food chain).
- It is emitted by *natural sources* like volcanoes, geothermal springs, geologic deposits, and the ocean.

- Human-related sources primarily include coal combustion, waste incineration, industrial uses, and mining.
- **Complications** – It cause neurological illness, immune diseases and reproductive failure in humans and some birds. Mercury poisoning leads to ***Minamata disease.***
- **Measures** – Minamata Convention is a global treaty to protect from the adverse effects of mercury and its compounds.
- Phytoremediation, allows plants to absorb and accumulate mercury from soil, water, or sediments.
- The **planetGOLD program**, led by UNEP seeks to eliminate mercury from artisanal gold mining.

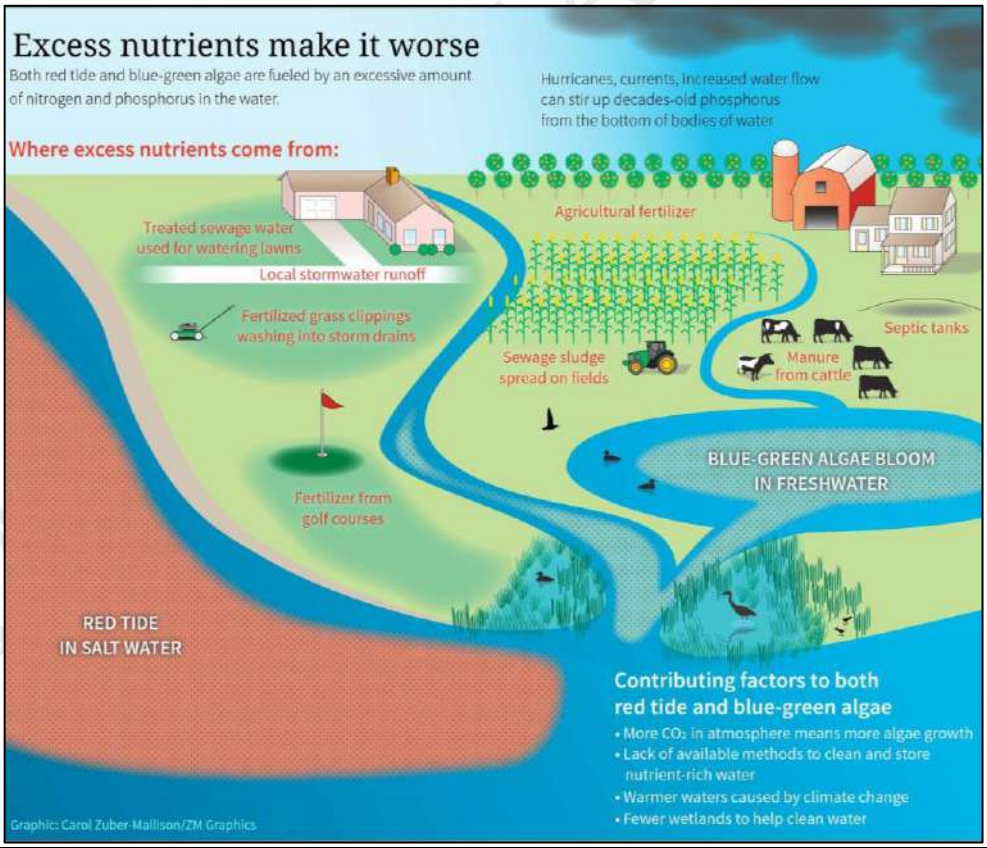
DID YOU KNOW?

Mercury (Hg) also known as 'quicksilver', is the only elemental metal that is liquid at room temperature.

1.10 Red Tide

The National Centre for Coastal Research (NCCR) has started the investigation on the issue of sea turning red in Puducherry.

- **Cause** – *Harmful algal bloom (HABs)* which are red in colour.
- Algal bloom is a rapid increase in the population of algae in freshwater or marine water systems. While most of them are beneficial, some are toxic.
- Caused by *dinoflagellates (microscopic algae)*.
- **Impact** - Produce *toxins* that kill fish and make shellfish dangerous to eat.
- Depletes levels of oxygen in the water, which can kill the living creatures.
- Block sunlight from reaching organisms deeper in the water.
- **Reason for Red Tide in Puducherry**
  - Anthropogenic influences like sewage mixing into the sea
  - Reversal of ocean currents
  - Increased concentration of nutrients in the coastal waters



National Centre for Coastal Research (NCCR)

- **Ministry** - Ministry *of Earth Sciences*
- **Origin** - In 1998, the Project Directorate 'Integrated Coastal and Marine Area Management (ICMAM-PD)' was developed in *Chennai.* In 2018, ICMAM-PD was designated as the NCCR.
- **Objective** - To develop and improve the country's capabilities in addressing the challenging problems prevailing in the coastal zone.
- To offer scientific and technical support to coastal communities for integrated and sustainable use of resources towards the socio-economic benefit of the society.

1.11 White Phosphorus

Amnesty International and Human Rights Watch have accused the Israel Defense Forces of using white phosphorus munitions in Gaza and Lebanon.

- White phosphorus is a ***pyrophoric*** substance that ignites when exposed to ***oxygen***.
- It is one among the ***most unstable*** of pyrophoric substances.
- **Properties** - It emits a distinct garlic-like odour and produces thick, light smoke with intense 815° Celsius heat.
- **Usage** - It is dispersed in *artillery shells, bombs, rockets* and via felt (textile) wedges soaked in the chemical.
- **Military applications**
  - As *smokescreen*, it hides ground troop movement
  - As an *incendiary weapon* to start fire
  - Confuses the *infrared optics* and weapons tracking systems & protects the forces from *guided missiles*.
- **Impact on Humans**
  - Can cause *burns even up to bones.*
  - Inhalation causes *respiratory damage*, harm internal organs.
- **Impact on Environment** - It can devastate infrastructure and property, *damage crops and kill livestock*.
- **Regulation** - White phosphorus is *not explicitly banned* by international conventions but their use is regulated under the ***International Humanitarian Law (IHL).***
- It is ***not*** considered a chemical weapon because its operational utility is primarily due to ***heat and smoke***, rather than *toxicity*.
- Protocol III of the 1980 Convention on Certain Conventional Weapons prohibits incendiaries or the use of other substances to attack civilian populations.
- Palestine and Lebanon have joined Protocol III, while Israel has not ratified the protocol.

> IHL is established through treaties such as the Geneva Conventions that lays down the responsibilities of states and non-state groups in an armed conflict. It is also called 'the law of war' or 'the law of armed conflict'.

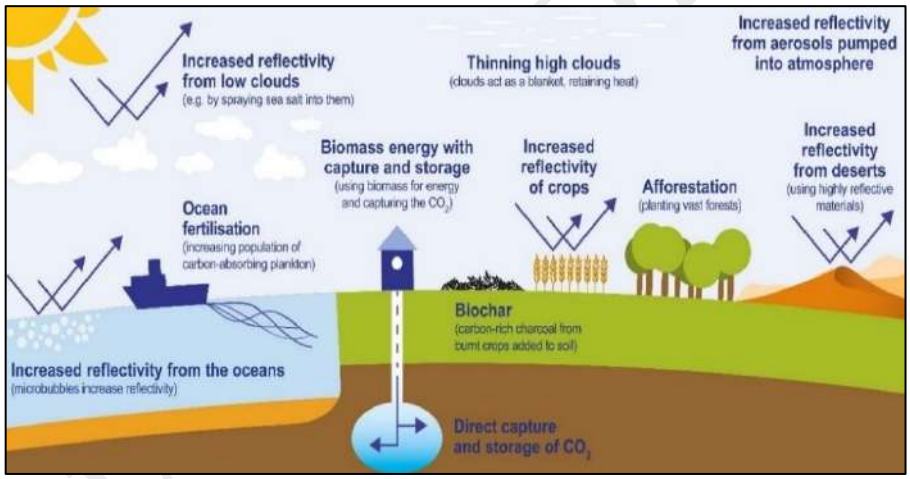
1.12 Battery Waste Management Rules, 2022

Battery Waste Management Rules 2022	
Nodal agency	Ministry of Environment, Forest and Climate Change (MoEFCC)
Coverage	All types of batteries - EV batteries, automotive batteries, industrial batteries and portable batteries
Extended Producer Responsibility (EPR)	Producers (including importers) of batteries are mandated to collect and recycle/refurbish waste batteries
Online portal	Provides for exchange of EPR certificates between producers and recyclers/refurbishers
Recovery	Minimum percentage of recovery of materials from waste batteries is mandated
Polluter pay principle	Environmental compensation will be imposed for non-fulfilment of EPR targets and obligations set out in the rules

- ***The "Fit for 55" package*** – Is a set of legislative proposals by the ***European Union (EU)*** to reduce greenhouse gas emissions by 55% by 2030.

1.13 Climate Engineering

- It is the intentional large-scale intervention in the Earth's climate system to counter climate change.
- It is also known as *geoengineering* which involves 2 techniques.
- Carbon dioxide removal (CDR) – It removes and stores the emitted CO_2 from the atmosphere. It includes
    - Direct air capture
    - Land-use management (afforestation / reforestation)
    - Sequestering carbon dioxide (CO_2)
    - Increasing the uptake of CO_2 by the ocean
    - Enhancing natural weathering processes that remove CO_2 from the atmosphere
- **Solar Radiation Modification (SRM)** – It ***reflects sunlight back to space*** to reduce the amount reaching the Earth's surface and is also known as *solar geoengineering*.
- Techniques to increase surface reflectivity of Earth includes
    - Painting structures with reflective paints
    - Planting crops with high reflectivity
    - Enhancing the reflectivity of marine clouds
    - Injecting aerosols into the lower stratosphere to mimic the cooling induced by volcanic eruptions
    - Placing reflectors or shields in space
    - Removing infrared-absorbing clouds from the atmosphere to reduce trapped heat



- **Challenges** - CDR is *expensive* and is being developed by only a very small group of countries and firms.

1.14 Deep Sea Mining

The International Seabed Authority (ISA) is preparing to resume negotiations that could open the international seabed for mining, including for materials critical for the green energy transition.

- Deep sea mining involves removing mineral deposits and metals from the ocean's seabed.
- **Types -** There are 3 types
    1. Taking deposit-rich polymetallic nodules off the ocean floor
    2. Mining massive seafloor sulphide deposits
    3. Stripping cobalt crusts from rock
- These nodules, deposits and crusts contain materials, such as nickel, rare earths, cobalt and more.

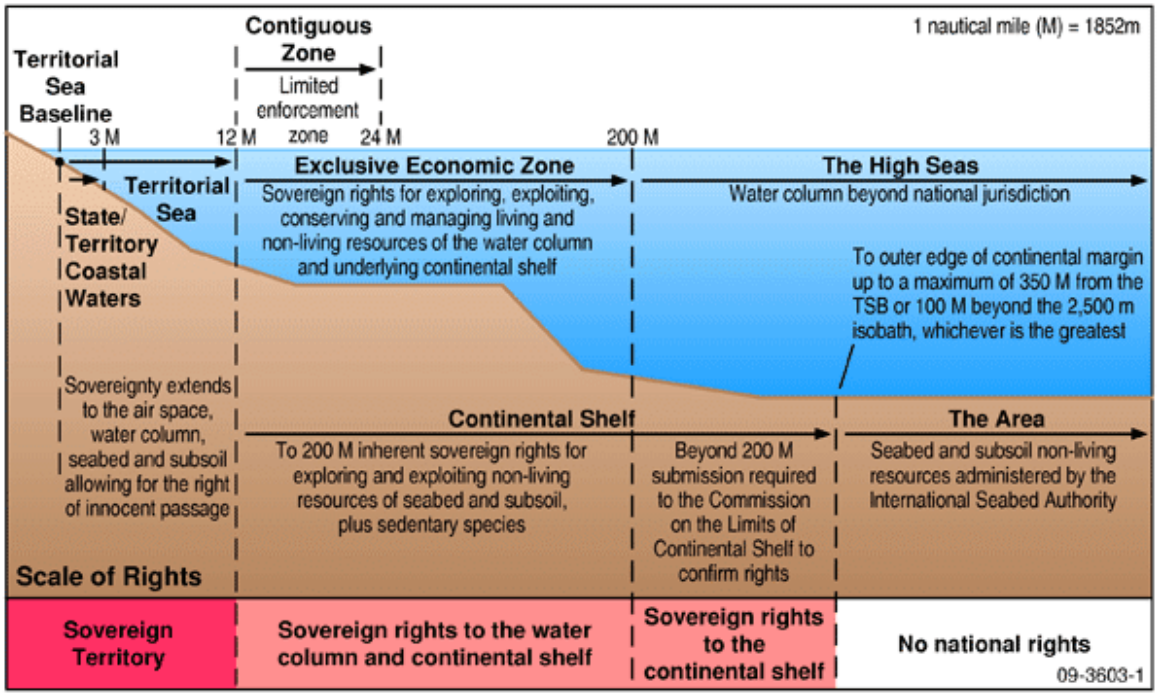
International Seabed Authority (ISA)

- An autonomous UN body established in 1994 under the 1982 United Nations Convention on the Law of the Sea (UNCLOS)
- ISA regulates the world's ocean floor and control all mineral-resources-related activities in the area
- **Headquarters -** Kingston, Jamaica
- **Members -** 168 Members

United Nations Convention on the Law of the Sea

- UNCLOS is an international agreement adopted in 1982.
- It lays down a comprehensive law and order in the world's oceans and seas establishing rules governing all uses of the oceans and their resources.
- India ratified UNCLOS in 1995.

- **Mining technology -** Vacuum materials from seafloor using massive pumps, AI-based technology to teach deep sea robots to pluck nodules off the floor, advanced machinery to mine underwater, etc. are being considered.
- **Regulation of deep sea mining -** The high seas and the international ocean floor are governed by the U***nited Nations Convention on the Law of the Seas (UNCLOS).***
- Under the treaty, the seabed and its mineral resources are considered the 'common heritage of mankind'.
- **License -** More than 30 exploration licenses have been issued so far by ISA.
- The ***Clarion-Clipperton Fracture Zone*** between Hawaii and Mexico is the most focused area of exploration.



Maritime Zones under UNCLOS

1.15 Fish Kill

Thousands of dead fish washed up on multiple beaches of southeast Texas, USA due to 'fish kill'.

- Fish kill is the sudden and unexpected death of many fish or other aquatic animals over a short period and mostly within a particular area.

Causes of fish kill

- **Low levels of dissolved oxygen -** When Sea surface temperatures rise, it becomes difficult for the fish to breathe as oxygen dissolves easily in colder water compared to warmer water.
- When many fishes get trapped in shallow water, they get warmer more quickly, leading to suffocation.
- This causes fish to act more erratically, which in turn, further depletes the oxygen from the water, ultimately leading to the death of the fish.
- **Calm Seas** - Oxygen enters the sea water by mixing with wind and waves.
- Very calm seas cause the depletion of dissolved oxygen and causes fish kill.
- **Overcast weather** – It refers to more than 95% of cloud coverage.
- Photosynthesis is driven by sunlight and it slows down on cloudy days, resulting in decreased dissolved oxygen concentration.
- **Other reasons** – Alteration in natural water chemistry, biological changes, rising temperatures of oceans, chemical pollution or miscellaneous human activity.

1.16 Parali Burning

Supreme Court asked the Punjab government why it could not fund the costs of crop residue management machines for marginal farmers.

Stubble burning	High prevalence
Rice	Punjab and Haryana
Wheat	Uttar Pradesh

- Also called as ***parali burning,*** stubble burning is a method of *removing paddy* crop residues from the field *to sow wheat*.
- It is usually done in the last week of *September to November*.
- It is usually required in areas that use the combined harvesting method which leaves crop residue behind.
- It is practised by the farmers to prepare the land for the next cultivation.
- It is practised mainly in the *Indo-Gangetic plains* of Punjab, Haryana, and UP to clear the fields for rabi crop sowing.

1.17 Green Crackers

- They are fireworks made with a reduced shell size without ash, and use additives such as dust suppressants to reduce emissions and particulate matter.
- These crackers *lack barium compounds* that is responsible for the *green hue* and noise pollution.
- The idea was introduced by the ***Council of Scientific and Industrial Research-National Environmental Engineering Research Insititute (CSIR-NEERI)*** in 2018.
- **Categories** - SWAS (safe water releaser), SAFAL (safe minimal aluminium) and STAR (safe thermite cracker)

1.18 White Goods

- White goods are large home appliances and electrical goods for the house which were traditionally available *only in white*.
- **Example -** Stoves, Refrigerators, Freezers, Washing machines, Tumble driers, Dishwashers, Air conditioners, LED lights, Water heaters, Microwave ovens, Induction cookers.
- It also refers to white fabrics, especially linen or cotton that are historically used to be made of white cloth.
- In the beverage industry, white goods are colorless spirits, such as vodka or gin.

1.19 Bartan Bank

- A panchayat in Odisha's Nuapada district recently introduces Bartan Bank to reduce plastic waste.
- The Bartan Bank will act as a repository of steel utensils as alternatives to single use plastics during community functions and social gatherings.

2. RENEWABLE ENERGY

2.1 Global Renewables and Energy Efficiency Pledge

International Energy Agency (IEA) has called for government to commit to tripling global renewable capacity by 2030 ahead of COP 28, but some key players have not signed the pledge.

Global Renewables and Energy Efficiency Pledge

- **Led by-** US, European Union and UAE.
- **Aim-** To achieve net zero emission by mid-century (2050).
- The pledge calls for "phase down of unabated coal power" and an end to financing of new coal-fired power plants.

- **Target-**
  - To triple worldwide installed renewable energy generation capacity to at least 11,000 GW.
  - To double global average annual rate of energy efficiency improvements to more than 4% by 2030.
- **Signed-** At COP 28 in Dubai.
- **Major non-signatory countries**- ***India*** and China
- Primary renewable energy sources with their share in global power generation-
  - Hydroelectric- 16.1 %, Wind- 5.6%, Solar-3.8%

- **India's status-** India is the ***3rd largest energy consuming country*** in the world.
- India has already achieved its target of 40% installed electric capacity from non-fossil fuels.
- **Renewable energy target**- India has set an enhanced target of 500 GW of non-fossil fuel-based energy by 2030, which is the world's largest expansion plan in renewable energy.
- **Carbon neutrality**-India has also pledged to achieve net-zero emissions by 2070.
- **Tripling renewables proposal**- India didn't sign the pledge as a report has found that India would need an investment of about 293 billion dollars to triple its renewable energy installed capacity by 2030.
- **Reliance on coal**- India is not comfortable with the coal phase out target as it need to focus on poverty reduction and economic growth, hence it did not sign the pledge.

As per Renewables 2022 Global Status Report, India stands

- 4th globally in renewable energy installed capacity
- 4th in wind power capacity
- 4th in solar power capacity

Steps taken by India to promote Renewable Energy

- **National Green Hydrogen Mission**- It focuses on direct and indirect employment, import substitution, and R&D for higher efficiency in renewable energy technologies.
- **PM KUSUM scheme**-It is aimed at ensuring energy security for farmers in India, along with honouring India's commitment to increase the share of installed capacity of electric power from non-fossil-fuel sources to 40% by 2030 as part of Intended Nationally Determined Contributions (INDCs).
- **Investment-** India allows up to 100% Foreign Direct Investment under the automatic route for renewable energy generation and distribution project.
- **Production Linked Incentive (PLI)** - Scheme for high efficiency solar aims to enhance India's manufacturing capabilities and exports in the solar sector.
- **Green Energy Corridors-** It is established to create intra-state transmission system for renewable energy projects.
- **International Solar Alliance-** It is a joint effort by India and France to mobilize efforts against climate change through deployment of solar energy solutions with an aim of One Sun, One World, One Grid.
- **Green carbon credits-**It is proposed by India to create carbon sinks through people's participation.

2.2 Biofuel Sustainability

India has launched the Global Biofuel Alliance in G20 summit 2023, demonstrating its commitment to climate action with global cooperation.

- Biofuels are liquid fuels produced from *renewable* biological sources, including plants and algae.

Generation	Source	Example
First generation (1G)	Conventional source or food sources - Sugarcane, corn etc.,	Bioethanol, biodiesel, biogas
Second generation (2G)	Non-food sources and the waste left from the food resources- Municipal solid waste, wood chips etc.,	Cellulose ethanol, biodiesel

Third generation (3G)	Algae- It consists of 40% of lipids which can be converted to biodiesel or synthetic petroleum.	Butanol, Gasoline, Jet fuel
Fourth generation (4G)	Produced from genetically engineered bio algae	

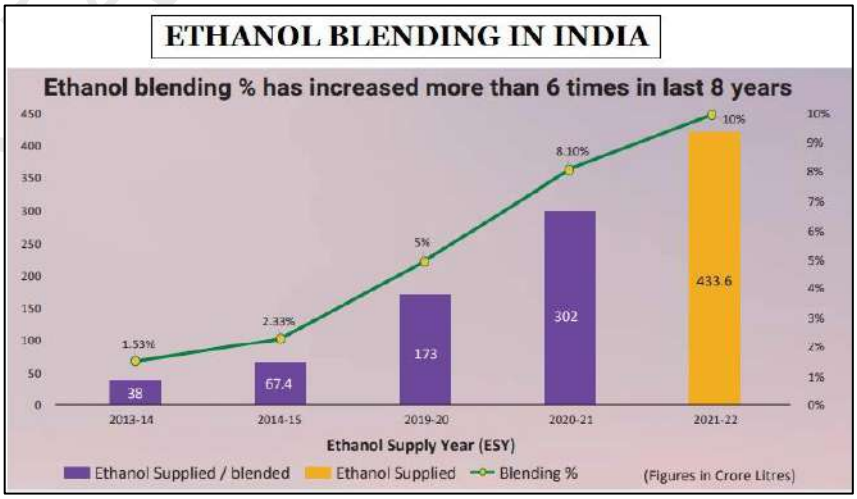
- **Global Biofuel Alliance-** It is an alliance driven by *India, the United States, and Brazil*, to accelerated adoption of biofuels, creating new biofuels, setting globally recognized standards, identifying global best practices, and ensuring industry participation.

Steps taken by India to promote Biofuel Production

- **E5 program**- It was India's pilot project of 5% ethanol blending.
- **National Biodiesel Mission**- It was formulated in 2003 to achieve 20% biodiesel blend by 2011-12.
- **National Policy on Biofuel-** It was launched in 2009, proposed a non-mandatory target of 20% blending of both biodiesel and bioethanol by 2017.
- The policy is revised in 2018 to achieve 20% bioethanol blending and 5% biodiesel blending by 2030.
- **GST**- Goods & Service Tax (GST) on ethanol meant for EBP Programme has been reduced from 18% to 5%.
- **SATAT scheme**- Sustainable Alternative towards Affordable Transportation Initiative (SATAT) encourages entrepreneurs to set up CBG plants, produce & supply CBG to Oil Marketing Companies (OMCs) for sale as automotive & industrial fuels.
- **PM JI-VAN Yojana**- It was launched in 2018 to provide Viable Gap Funding for 2G bioethanol.

2.3 Ethanol Blended Petrol Program

Ministry of Consumer Affairs, Food and Public Distribution directed all mills and distilleries not to use sugarcane juice/syrup for making any ethanol "with immediate effect".



- **Launch year**- 2003; **Aim**- To promote the use of renewable fuels.
- **Ethanol-** It is an *agro-based product*, mainly produced from a by-product of the sugar industry, namely molasses. It is 99.9% pure alcohol that can be blended with petrol.
- **Guidelines-** National Policy on Biofuels.
- **Nodal department**- *Department of Food and Public Distribution (DFPD)* is the nodal department for promotion of fuel grade ethanol producing distilleries in the country.
- **Target-**
  - **E10-**It has achieved the target of 10% ethanol blending in 2022.
  - **E20**- It has set a target of 20% blending (E20) by 2030 which was now shifted to 2025-26.
- **Price fixation**-The procurement price of ethanol is fixed by the *government*, and oil companies can purchase it from domestic sources.
- **C-heavy molasses**- Ethanol is typically made from "C-heavy" molasses, a by-product of sugarcane processing.
- **Alternative feedstocks**- It include "B-heavy" molasses, concentrated sugarcane juice, and other substrates like rice and maize.
- **Increase in ethanol production**- It happened largely after 2017-18, when mills started making it from B-heavy molasses and concentrated sugarcane juice/syrup.

Uttar Pradesh is a major sugarcane producer; Bihar is the major producer of maize.

2.4 Biochar

- Biochar is a carbon-rich material that is made from biomass through a thermochemical conversion process known as ***pyrolysis***.
- **Pyrolysis** – In this process, organic materials, such as wood chips, leaf litter or dead plants, are burned in a container with very little oxygen.
- As the materials burn, they release little to no contaminating fumes and the organic material is converted into biochar, a stable form of carbon that can't easily escape into the atmosphere.
- The energy or heat created during pyrolysis can be captured and used as a form of clean energy.

According to the UN's Intergovernmental Panel on Climate Change (IPCC), biochar could potentially be used to capture 2.6 billion of the 40 billion tonnes of CO_2 currently produced by humanity each year.

- **Physical Attribute** - Biochar is black, highly porous, lightweight, fine-grained and has a large surface area.
- Approximately 70% of its composition is carbon.
- The remaining percentage consists of nitrogen, hydrogen and oxygen among other elements.
- It is produced using a specific process to reduce contamination and safely store carbon.
- Biochar production is a ***carbon-negative process***, which means that it actually reduces CO_2 in the atmosphere.

2.5 Bharat Stage Emission Standards

Commission for Air Quality Management (CAQM) has lifted the stage III measures of Graded Response Action Plan (GRAP), allowing BS III petrol and BS IV diesel vehicles to run in Delhi and NCR.

Mashelkar Committee recommended a roadmap for implementation of Euro based on emission standards for India.

- **Objective**- To regulate the output of air pollutants from compression and spark-ignition engines equipment, including motor vehicles.

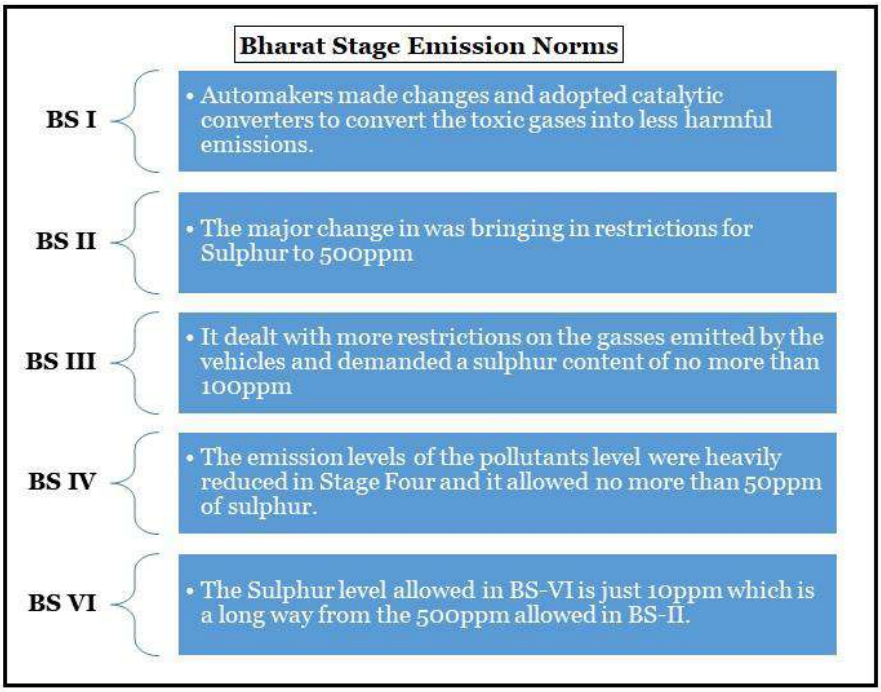
Advantages	
• Enhancing soil structure	• Improving porosity
• Improves soil quality	• Regulating nitrogen leaching
• Produces energy as a by-product	• Improving electrical conductivity
• Increasing water retention and aggregation	• Improving microbial properties
• Decreasing acidity	• Reducing nitrous oxide emissions

- They are in line with the European emission norms with a *time lag of* ***5 years.***
- **Launched by**- *Central Pollution Control Board* (CPCB) under the Ministry of Environment, Forest and Climate Change (MoEFCC).
- In 1999, Supreme Court mandated that all vehicles in India have to meet the *Euro I or India 2000* standard.

About	Europe Emission Standards	Bharat Stage Emission Standards
Origin	In Europe	Indian government-instituted emission norms
Adoption	1970	2000
Iterations	Euro 1, Euro 2, Euro 3, Euro 4, Euro 5, Euro 6	BS I, BS II, BS III, BS IV, BS V, BS VI
Exceptions	All standards are followed with Euro 6 being the latest	The government decided to leap directly from BS-IV to BS-VI, due to the time it took to move from BS-III to BS-IV

Difference between BS IV and BS VI

- **Stringent-** BS VI is more stringent and have lower limits for pollutants especially Particulate Matter (PM) and Nitrogen Oxide (NOx) than BS IV norms.
- **Presence of sulphur-** The BS-VI fuel is estimated to bring around an 80% reduction of sulphur, from 50 parts per million to 10 ppm.
- **NOx emission**- NOx is expected to come down by nearly 70% for diesel cars and 25% for cars with petrol engines.
- **Better emission control**- BS VI has new features such as Selective Catalytic Reduction, Diesel Particulate Filter, Real Driving Emission, and Onboard Diagnostics.
- **Fuel quality**- BS vehicle needs fuel that contains less sulphur hence BS IV grade fuel cannot be used as it may cause damage to the engine and increase emissions.



2.6 Green hydrogen bunks by 2035

The government said green hydrogen bunkering and refuelling facilities will be established at all major ports by 2035.

- The Ministry of Ports, Shipping and Waterways (MoPSW) launched green port guidelines, '***HaritSagar***'.
- The guidelines, 'HaritSagar' is a part of efforts to achieve zero carbon emission goal.
- The guidelines said that green ammonia bunkers and refuelling facilities shall be established at all Major Ports by 2035.
- Under this, all ports will make efforts to achieve the target of renewable energy as envisaged in Maritime India Vision (MIV) 2030/Blue Economy 2047 documents.

India's Ports

- India's coastline stretches 7,500 km and has more than 200 ports in addition to the 12 major ones.
- These ports all together accounts for 95% of its trade by volume and 65% by value.
- **12 major ports** - Deendayal (Kandla), Mumbai, Mormugao, New Mangalore, Cochin, Chennai, Ennore (Kamarajar), Tuticorin (VOC), Visakhapatnam, Paradip and Kolkata (including Haldia) and Jawaharlal Nehru Port.

- **Targets -** Share of renewable energy at Ports should exceed 60% by the Year 2030 and 90% by year 2047. The ports has to set up at least one LNG bunkering station by 2030 and e-vehicle charging stations in and around port areas by 2025.
- **Bunkering -** Bunkering operation is a procedure for transferring oil, sludge or cargo to and from a ship.
- 3 of India's 12 major ports would initially have bunker facilities for green hydrogen and ammonia. The initial ports in the effort are to be Paradip in the east, Kandla in the west, and Tuticorin in the south.
- **Related Topic -** Green Tug Transition Programme

DID YOU KNOW?

Maritime India Vision (MIV) 2030, the roadmap prepared by MoPSW for the maritime sector in the country, aims to strengthen the maritime sector through concerted interventions

2.7 Green Hydrogen Bus

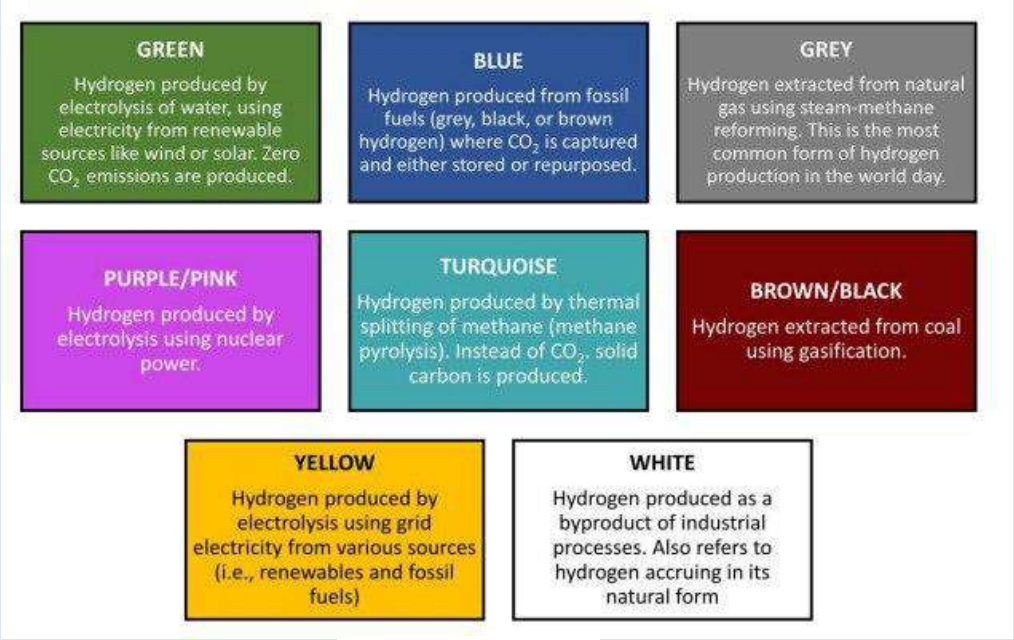
Union Minister flags-off 1st green hydrogen fuel cell bus from New Delhi.

- **Unveiled by -** Indian Oil.

- **Fuel -** Hydrogen and air to generate electricity to power the bus and the only by-product from the bus is water.
- **Advantages -** It is the most environmentally friendly mode of transportation compared to conventional buses.
- The energy density is 3 times higher and the absence of harmful emissions, hydrogen shines as a cleaner, more efficient choice to meet the energy requirements.

Green Hydrogen Mission

- **Aim -** To make India a global hub for production, usage and export of Green Hydrogen and its derivatives.
- The expected outcomes by 2030, are as follows:
    1. India's Green Hydrogen production capacity is likely to reach 5 MMT per annum, contributing to reduction in dependence on import of fossil fuels.
    2. Achievement of Mission targets is expected to reduce a cumulative Rs. 1 lakh crore worth of fossil fuel imports by 2030.
- Nearly 50 MMT per annum of CO2 emissions are expected to be averted through production and use of the targeted quantum of Green Hydrogen.



Types of Hydrogen

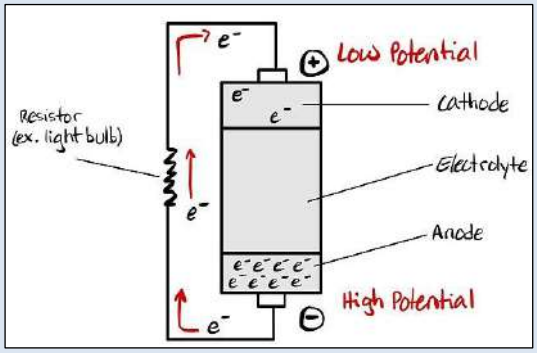
2.8 Working of Electric Battery

Electric battery, as portable sources of electric power are at the foundation of convenience and sustainability.

- **Electric cell** – A device that converts chemical energy into electrical energy.

Components of Electric Cell

- **Electrode –** It is a *metal plates* in the cell where *cathode* is the positively charged electrode, the one to which electrons arrive, while *anode* is the negatively charged electrode, which 'supplies' electrons.
- **Electrolyte** – It is a *liquid or gel that contains ions* which allows the flow of electric charge between the electrodes.
- **Separator** - It is a *barrier that prevents the 2 electrodes* from touching and shorting out the cell.
- **Wire** – The 2 metal electrodes are connected by a wire.



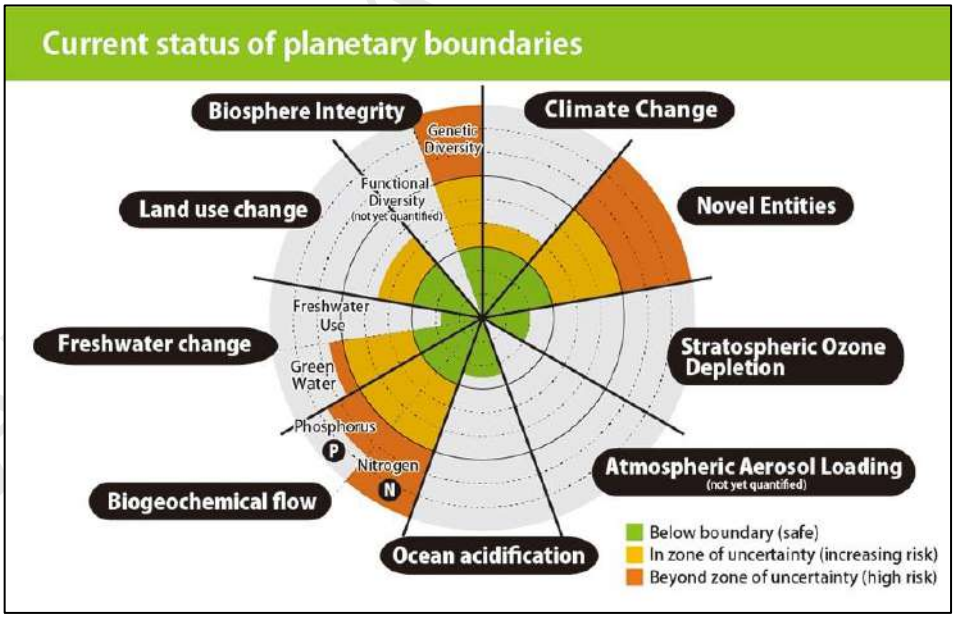
- **Principle** – It uses ***redox reactions*** to produce an electric current which is combination of both ***oxidation*** (release of electrons) and ***reduction*** (consumption of electrons) reaction.
- **Working** – A voltaic, or galvanic cell consists of 2 half-cells where each half-cell is made of a metal electrode immersed in an electrolyte of that metal.
    - For example, a zinc electrode in zinc sulphate and a copper electrode in copper sulphate.
- The ***zinc oxidises at the anode***, releases 2 electrons into the electrode and Zn2+ ions goes into the electrolyte.
- Copper ions (Cu2+) from the copper sulphate deposit onto the cathode, which now requires 2 electrons thus ***copper reduces at the cathode***.
- So, the wire connecting the electrodes ***transports 2 electrons from anode to cathode***.
- **An electric battery** is a combination of electric cells.

3. CLIMATE CHANGE

3.1 Breach of Planetary Boundaries

Earth beyond planetary boundaries, a recent study found that out of 9 planetary boundaries, humans breached 6.

- **Planetary boundaries**- They are the *thresholds* within which humanity can survive, develop and thrive for generations to come.
- It sets limits on how much humans can be allowed to impact not only the climate but also other global processes that are essential for maintaining conditions on the planet to support modern civilisations.
- **Planetary boundaries framework** – It was developed in 2009, and includes nine planet boundaries that scientists believe capture all of the processes critical for maintaining the Earth's system state.
- For each boundary, control variables are chosen to capture the most important anthropogenic influence at the planetary level of the boundary in focus.



3.2 Global Carbon Budget

Paris Agreement

- **Legally binding** international treaty on climate change.
- **Launch year-** In 2015, adopted by 196 countries.
- **Aim-** To limit the global average temperature rise to well below 2°C above pre-industrial levels, and pursue efforts to limit it to 1.5°C.
- **Nationally Determined Contributions (NDCs)** - Since 2020, countries submit national climate actions to reduce their greenhouse gas emissions in order to reach the goals of the Paris Agreement.

- **Global Carbon Budget** - It is the amount of CO_2 that humanity can emit while still having a chance to contain global warming within 1.5°Celsius compared with pre-industrial levels, as advocated by the *Paris Agreement*.
- It is taken from the atmosphere, regional carbon emissions, CO_2 emissions from land usage, carbon emissions from man-made projects in many forms.
- It is produced under the umbrella of ***Global Carbon Project (GCP).***
- It is part of the greater carbon cycle and the ways in which the Earth's reservoirs of carbon are added to and subtracted from.
- The budget is estimated to be around ***1 trillion tonnes of carbon*.**

Climate Friendly Initiatives of India

- **International Solar Alliance-** It was a joint effort by India and France to mobilize efforts against climate change through deployment of solar energy solutions launched in 2015.
- **Coalition for Disaster Resilient Infrastructure-** It is an international climate initiative by India in 2019 to promote resilient climate-proof critical infrastructure in member countries.
- **Global Biofuel Alliance-** It is an alliance driven by *India, the United States, and Brazil,* to accelerated adoption of biofuels, creating new biofuels, setting globally recognized standards, identifying global best practices, and ensuring industry participation.
- **LiFE mission-** Lifestyle for Environment is an international mass movement to protect and preserve the environment launched in COP 26 at Glasgow in 2021.

3.3 Global Cooling Pledge

Around 63 countries signed up the world's 1st ever pledge to drastically cut cooling emissions at the COP28 climate summit in Dubai.

Global Cooling Pledge

- **Joint initiative**- United Arab Emirates as host of COP28 and the *UNEP-led 'Cool Coalition'*.
- It is the world's first collective focus on energy emissions from the cooling sector.
- **Passive cooling strategies**- It outlines actions such as insulation, natural shading, ventilation and reflective surfaces, higher energy efficiency standards and a rapid phase down of climate-warming hydrofluorocarbon (HFC) refrigerants.
- **Aim-** It commits the countries to reduce their cooling emissions by at least 68% by 2050.
- **Outcome-** It could reduce the projected 2050 emissions from business-as-usual cooling by around 3.8 billion tons of CO_2 equivalent.
- ***India has not signed the pledge***; India is not willing to undertake targets above those committed to in 1992 under the multilateral Montreal Protocol to regulate production and consumption of ozone depleting chemicals and hydrofluorocarbons used in cooling

- Cooling emissions are emissions generated from refrigerants, used in appliances like ACs and refrigerators, and the energy used for cooling.
- HFC-134a, a form of Hydrofluorocarbons (HFC) most commonly used in domestic fridges, has a global warming potential of 3,400 times that of CO_2.
- **Coolants-** They allow the refrigeration process to change the state quickly and absorb and release heat to enable cooling process.
- **Chlorofluorocarbon (CFCs) -** It was most used refrigerant, the increased levels of CFCs in the atmosphere were responsible for abnormally low ozone concentrations in Antarctica.
- **Alternatives for CFC-** CFCs were largely replaced by two groups of chemicals, hydrofluorocarbons (HFCs) and hydro chlorofluorocarbons (HCFCs).

> "Montreal Protocol is an agreement signed in 1987 that led to freeze the production and consumption of *Ozone-Depleting Substances (ODS)* including CFCs."

- They don't damage ozone layer but absorb infrared radiation, trapping heat inside the atmosphere rather than letting it escape back into space, generating a greenhouse effect that warms Earth.
- As per Climate and Clean Air Coalition even relatively small amounts of HFCs contribute significantly to near-term warming as greenhouse gases which are hundreds to thousands of times more potent than carbon dioxide (CO_2) per unit of mass.
    - *HFC-134a*, a form of HFC and most commonly used in domestic fridges, has a global warming potential of 3,400 times that of CO_2.
- **Fossil fuels-** Fossil fuels such as coal, oil and gas are by far the largest contributor to climate change, accounting for over 75% of greenhouse gas emissions and nearly 90% of all CO_2 emissions.

3.4 Global Goal on Adaptation

COP28 at Dubai culminated with the adoption of Global Goal on Adaptation (GGA) framework.

- It sets the *vision for global wellbeing and resilience* to protect people and ecosystems.
- **Establishment** – ***In 2015***, a collective commitment under *Article 7.1 of the Paris Agreement* at COP 15, proposed by the African Group of Negotiators (AGN) in 2013.
- **Aim** – To enhance ***adaptive capacity, strengthen resilience and reduce vulnerability*** to climate change and thereby contributing to sustainable development.
- **Role** – It is to serve as a *unifying framework* that can drive political action and finance for adaptation on the same scale as mitigation.
- It will help in *setting specific, measurable targets and guidelines* for global adaptation action as well as enhancing adaptation finance and support for developing countries.
- **Glasgow-Sharm el-Sheikh work programme (GlaSS) –** It was created by the signatories to the Paris Agreement *at COP 26 in Glasgow in 2021* to better understand, conceptualize and achieve this goal.
- It is a *2-year programme (2022-2023)* carried out by
    - The Subsidiary Body for Scientific and Technological Advice (SBSTA), the Subsidiary Body for Implementation (SBI), the 2 technical bodies that support the CMA (Meeting of Parties to the Paris agreement)
    - With the support of the UNFCCC secretariat

	Adaptation	Mitigation
Aim	To reduce vulnerability and to enhance resilience.	To reduce the greenhouse gas emissions to slow the climate change.
Approach	Local or regional	Global
Targets	It addresses specific climate impacts like flooding or heatwaves	It addresses the overall emissions through strategies like renewable energy or reforestation.
Measurement	It is complex with no universal metric, focusing on varied local outcomes.	It is measured in CO_2 equivalents, offering a standardized metric for comparing efforts globally.

3.5 Global Stocktake (GST)

- It was mandated by the 2015 Paris Agreement, GST is an exercise aimed at assessing the progress in the fight against climate change.
- The GST helps in deciding ways and means to enhance global action to bridge the adequacy gap.
- The *Paris Agreement* says GST must be conducted *every 5 years, starting in 2023.*
- The actual meat in GST would come in at COP28, the year-ending climate conference, held in Dubai.
- The discussions just produced a short framework on the elements to be included in the stocktake exercise.

3.6 Global Warming Potential (GWP)

Some large industrialised meat and dairy companies promotes a new metric for measuring methane emissions, called GWP as a more accurate way to calculate emissions from the greenhouse gas (GHG).*

- **GWP** – It tells us how much heat a greenhouse gas (GHG) traps in the atmosphere.
- It measures the energy absorbed by 1 ton of an atmospheric gas over a specific period relative to energy absorbed by 1 ton of Carbon di-oxide (CO_2) over the same time.
    - For example, the GWP of methane (CH_4) is around 21 times greater than that of CO_2.
- Gases with a higher GWP absorb more energy, per pound, than gases with a lower GWP, and thus contribute more to warming Earth
- **Factors determining GWP** – Atmospheric lifetime, absorption spectrum, and concentration of the GHG in the atmosphere.
- The **order of most abundant GHGs** in the Earth's atmosphere is Water vapor, Carbon dioxide, Methane, Nitrous oxide, Ozone, Chlorofluorocarbons.

Greenhouse gas	Average lifetime in the atmosphere	Global warming potential of one molecule of the gas over 100 years (Relative to carbon dioxide=1)
Carbon dioxide	50-200 years*	1
Methane	12 years	21
Nitrous oxide	120 years	310
CFC-12	100 years	10,600
CFC-11	45 years	4,600
HFC-134a	14.6 years	1,300
Sulfur hexafluoride	3,200 years	23,900

	GWP 100	GWP*
Establishment	Devised under the 2015 Paris Agreement of UNFCCC	In 2016 by Oxford University and introduced in COP24 of UNFCCC in 2018
Baseline gas	Carbon di-oxide (CO_2)	Methane (CH_4)
Focus	On the absolute level of emissions.	On relative changes in emissions.
Timescales	Over a 100-year period	Over 10-year period

3.7 Climate Finance

During the 3rd Climate and Development Ministerial, Sultan bin Ahmed Al Jaber, COP28 President, has emphasized the need to address adaptation finance gaps and make climate finance more accessible to vulnerable nations.

- **Climate finance** – It refers to local, national or transnational financing, drawn from public, private and alternative sources of financing to support mitigation and adaptation actions that will address climate change.
- *UNFCCC, Kyoto Protocol and the Paris Agreement* call for financial assistance from parties with more financial resources to those that are less endowed and more vulnerable.
- **Global Environment Facility (GEF)-** GEF serves as financing mechanism for the following conventions
- Special funds set up and managed under GEF include
    - The Special Climate Change Fund (SCCF)
    - The Least Developed Countries Fund (LDCF)
- **Earth Summit**- *Common but Differentiated Responsibilities* (CBDR) is a principle that was formalized in UNFCCC of Earth Summit in Rio de Janeiro, 1992.
- **Kyoto protocol**- It is based on CBDR principle.
    - **Market based mechanisms**- Climate friendly investments like Clean Development Mechanism (CDM), Emission Trading.
    - **Adaptation fund-** *Marrakesh Accords* established this fund under CDM, which supports projects and programs that assist vulnerable communities in coping with the climate change impacts.

Common But Different Responsibilities (CBDR)

- CBDR was formalized in international law at the 1992 *United Nations Conference on Environment and Development (UNCED)* in Rio de Janeiro.
- The principle balances both the
  - need for all states to take responsibility for global environmental problems
  - need to recognize the wide differences in levels of economic development between states

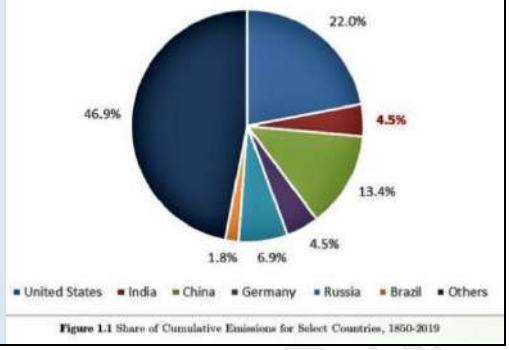


Figure 1.1 Share of Cumulative Emissions for Select Countries, 1850-2019

- **Green Climate Fund (GCF)**- It was established in 2010 as financial mechanism for UNFCCC based in *Incheon, South Korea.*
- It supports program, policies, projects, etc. through state-of-the-art funding window that involves a country owned partnership approach and flexible financing solutions and climate investment expertise.
- **Paris Agreement**- It was adopted in 2015 which reaffirms the commitment of developed countries to mobilize 100 billion dollar per year by 2020 and extends it until 2025.
- **New Quantified Collective Goal**- By 2025, climate finance will be set starting from 100 bn dollar per year.

3.8 Emission Gap Report 2023

The UN report has revealed that the world was set to become warmer by at least 3 degrees Celsius by the end of the century with the current climate policies of the countries.

Emission Gap Report 2023

- **Emission gap** –It is the difference where greenhouse gas emissions are projected to be in 2030 and where they should be to limit global warming to well *below 2°C or 1.5°C.*
- **Report** - It is an *annual assessment* that evaluates the gap between the amount of global greenhouse gas emissions now and what is necessary to meet the objectives of the *Paris Agreement.*
- Based on the latest scientific assessments and data, it explores the actions and policies needed to close the emission gap and achieve the goals of the Paris Agreement.
- **Published by**- United Nations Environment Program (UNEP)
- **Theme**- "Broken Record – Temperatures hit new highs, yet world fails to cut emissions (again)".

Key takeaways of the report

- G20 nations are responsible for three-quarters of the current warming.
- The three largest emitters are ***China, United States and India.***
- The net zero commitments made by 97 parties, covering 82% of global emissions varies widely and are insufficient.
- The world is on track to warm by at least 3°Celsius by 2100, and that 86 days in 2023 have already exceeded the 1.5-degree Celsius limit set by the Paris Agreement.

3.9 Underground Climate Change

Underground climate change is worrying scientists and engineers involved with aspects of urban planning as it could adversely affect the durability of structures and infrastructures in cities.

- **Underground climate change** is the impact due to *rising subsurface temperatures* because of human activity like

*According to **Global Climate Risk Index**, 2021 India ranks 7th among countries most affected in 2019 by climate change.*

basement parking, tunnel roads, subways, and underground rail, among others.

- It is known as ***subsurface heat islands***, an extension of urban heat islands.
- ***Urban heat islands*** are urban regions which are significantly warmer than their rural surroundings due to human activities.
- Heat diffuses from buildings and underground transportation, warming the ground at an increasingly fast rate.
- The ground underneath cities absorb and retains heat from various sources, including buildings, transport systems, industrial processes.
- It also includes waste heat from basements and other subterranean facilities.

3.10 Rapid Ice Melt in West Antarctica

A recent study has pointed out that rapid melting of West Antarctica's ice sheet due to warm waters around it, is now unavoidable, no matter how much carbon emissions are cut.

- **Ice sheet** - An ice sheet is essentially a mass of glacial ice that covers *more than 50,000 square kilometres* of land.
- Ice sheets contain about 99% of the fresh water on Earth, and are sometimes called *continental glaciers.*
- Major ice sheets include
  - **Antarctica ice sheet**- World's largest volume of land-based ice
  - **Greenland ice sheet**
- **Ice shelf-** As ice sheets extend to the coast and over the ocean, they become ice shelves.
- **Ice cap**- A mass of glacial ice covering less area than an ice sheet is called an ice cap.
- **Ice field**- A series of connected ice caps is called an ice field.
- **Individual glaciers**- They make up the ice fields, ice caps, and eventually ice sheets.
- **Sea ice** – It is the free-floating ice that surrounds the polar regions created by sea water freezing.

India's Antarctic Programme

- Maitri
- Bharti
- Dakshin Gangotri (decommissioned)

Recent study

- The scientists have used a high-resolution computer model of the ***Amundsen Sea,*** the most vulnerable sector of the ice sheet, to provide comprehensive assessment of warming in West Antarctica.
- **Findings** - Amundsen Sea will warm roughly *3 times faster than the historical rate* through the rest of this century leading to much more rapid melting of ice shelves.
- The study worsens the outlook for ***Thwaites Glacier*** that is rapidly melting beneath its connected ice shelf.
- The processes triggered by faster ice shelf melting could lead to the collapse of the West Antarctic Ice Sheet.

3.11 A23a Iceberg

The British Antarctic Survey says that one of the world's largest icebergs is drifting beyond Antarctic waters after being grounded for more than three decades.

- **Origin** – It split from the *Antarctic's Filchner Ice Shelf in 1986* but got stuck to the ocean floor for many years in the ***Weddell Sea*****, Antarctica**
- **Size** – Around 4,000 square kilometres (1,500 square miles).
- **Movement** – It has *now ungrounded and is moving* along ocean currents to sub-Antarctic South Georgia.
- It appears to be picking up speed because of wind and ocean currents.

3.12 Otolith Rings

A new study published in 'Nature', tried to predict the effects of climate change on the physiological performance and distribution of organisms by studying the Otoliths.

- **Otolith** – They are ***small, white bio-mineralized ear stones*** in the head.
- Small ***calcium carbonate crystals*** are accumulated every day as very thin layers over a tiny core, and this forms an otolith.
- They are found in *all fishes other than sharks, rays and lampreys* but their shape and morphology is unique to each fish species.
- It contributes to both hearing and vestibular function in fish.
- **Significance** – It records the ***age and growth of a fish*** from the date of hatch to the time of death and also reveals about fish's health.
    - **Oxygen isotopes** – It indicate the ***temperature*** the fish experienced when it was alive.
    - **Carbon isotopes** – It reveal ***how quickly food was converted*** into energy.
- **Otoliths relevance in climate change** - Animals' energy needs shift with temperature and studying the otoliths can help us predict which animals are most at risk from rising temperatures.

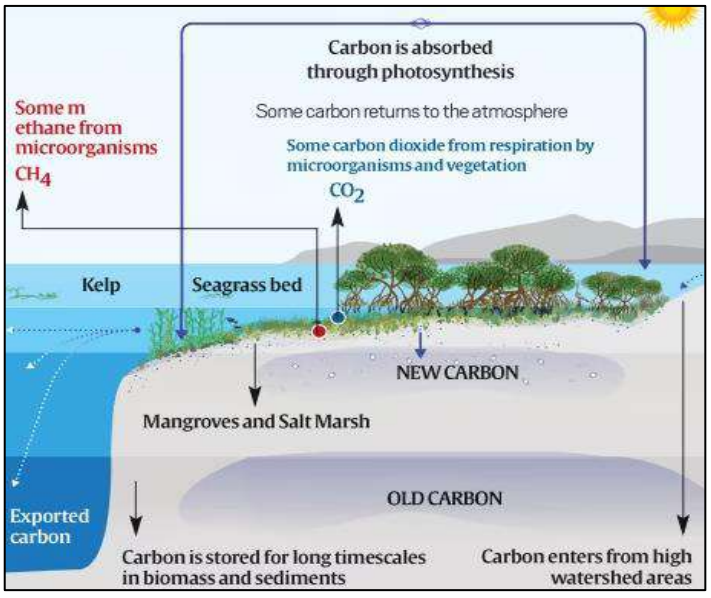
3.13 Arctic Report Card 2023

Recently the National Oceanic and Atmospheric Administration (NOAA) released the annual Arctic report card 2023.

- **Launch year**-2006
- **Released by-** National Oceanic and Atmospheric Administration**.**
- **Published-** Annually since 2006
- **About-** It is a comprehensive assessment of the current state and trends of the Arctic environment relative to the historical records.
- **Data source**- It is a peer reviewed analysis done by 82 scientists from 13 countries.
- **Significance**-It is intended for a wide audience, including scientists, teachers, students, decision-makers and the general public interested in the Arctic environment and science.

3.14 Mangroves as Carbon Sink

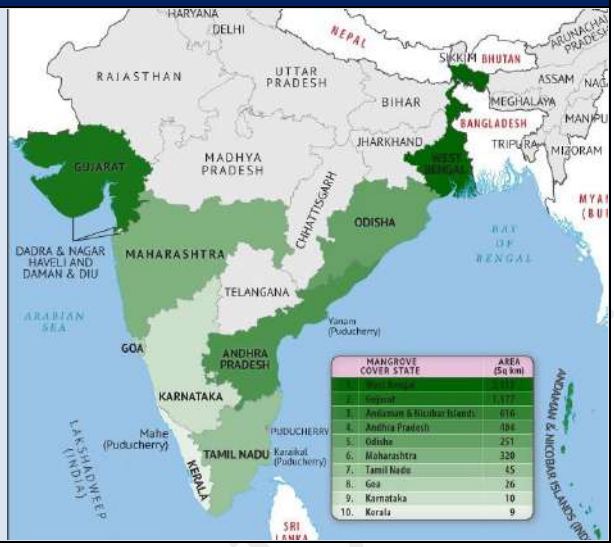
Volunteers in Chargheri village of Sunderbans help in planting lakhs of mangroves which offer a dense forest cover and a rich carbon sink.



- The Sunderbans is a complex network of islands set in the delta on the Bay of Bengal and spread across West Bengal and Bangladesh.
- Blue carbon – It is coined in 2009, a term for *carbon captured by and stored in the world's ocean and coastal ecosystems*.
- **Key ecosystems of blue carbon** - Mangroves, salt marshes and seagrass meadows
- These ecosystems sequester and store *more carbon per unit area* than terrestrial forests.
- **Mangroves as carbon sink** – After seagrass, mangroves are the most efficient carbon trapping systems which can ***remove 10 times more carbon*** from the air than other forests.
- While other trees release the stored carbon back to atmosphere when they die, *mangroves transfer the carbon to the soil*, where it stays unaffected.

India and Mangroves

- Mangroves cover 4,992 sqkm (*0.15%)* of India's total area.
- ***Sundarbans*** is the world's largest mangrove ecosystem in the world.
- Highest percentage of mangrove cover in India - ***West Bengal***, Gujarat and Andaman and Nicobar Islands.
- The mangroves are protected under ***Category I of the CRZ (Coastal Zone Regulation 1991).***



Mangrove Initiatives

- **Mangrove Initiative for Shoreline Habitats and Tangible Incomes (MISHTI) –** It was launched by India in 2023 to protect and revive mangrove ecosystems on the Indian coast.
- **Mangrove Alliance for Climate (MAC)** – It was launched at CoP-27 (Egypt, 2022) to unite countries to scale up, accelerate conserve and restore the mangrove ecosystems.
- After ***Cyclone Amphan*** in 2020, West Bengal Chief Minister had announced that 5 crore mangroves would be planted in the Sunderbans under the *Mahatma Gandhi National Rural Employment Guarantee Act.*

3.15 Climate Smart Agriculture (CSA)

Climate resilient agriculture has the potential to assure food security, empower farmers, & protect the ecosystems.

- It is a comprehensive strategy for managing farmlands, crops, livestock, and forests that ***counteracts the negative impacts of climate change*** on agricultural productivity.
- FAO in 2019 said that CSA is an approach for transforming food and agriculture systems to support sustainable development and safeguard food security under climate change.
- **Main objectives of CSA**
  - Productivity enhancement
  - Ensure Adaptation
  - Climate mitgation

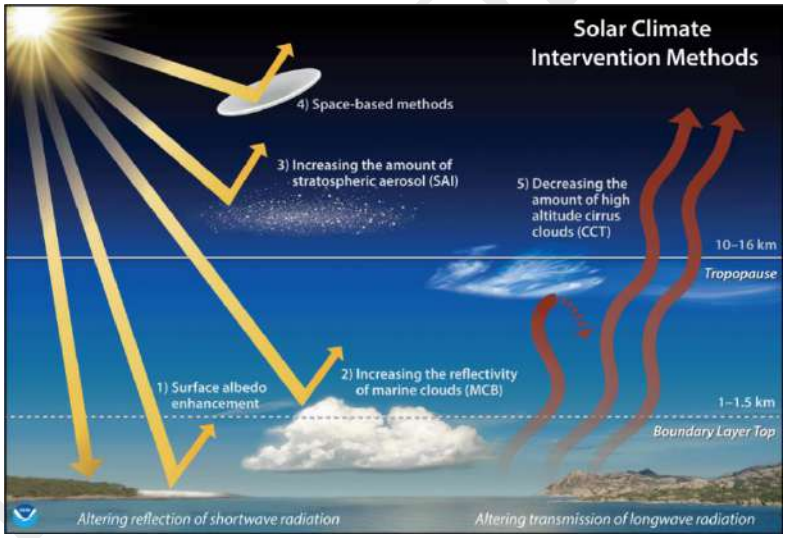
Steps taken by India to promote CSA

- **National Adaptation Fund on Climate Change**- It was launched in 2015 to support concrete adaptation activities which mitigate the adverse effects of climate change.
- **National Innovation on Climate Resilient Agriculture**- It is a network project of Indian Council of Agricultural Research (ICAR) that aims to enhance the resilience of Indian agriculture to climate change and climate vulnerability through strategic research and technology demonstration
- **National Action Plan on Climate Change**- It was launched in 2008 to mitigate and adapt to the adverse impact of climate change.
- It contains 8 national missions that cover various sectors and objectives related to climate change.

- **Soil Health Mission**- It was launched in 2015 that provides soil health cards to farmers, which contain information on soil nutrient status and fertilizer recommendations.
- **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)** - It was launched in 2015 to enhance water use efficiency and irrigation coverage in agriculture.
- **Paramparagat Krishi Vikas Yojana-** It is a sub scheme under PMKSY that promotes organic farming and certification.
- **Biotech KISAN-** It was launched in 2017 as a farmer-centric scheme that empowers small and marginal farmers through biotechnology
- **Climate Smart Village-** It was launched in 2011 as an approach that integrates various climate-smart interventions and practices at the village level to enhance farm productivity.

3.16 Marine Cloud Brightening

Australia's Reef Restoration and Adaptation Program is exploring whether cloud brightening could reduce coral bleaching.

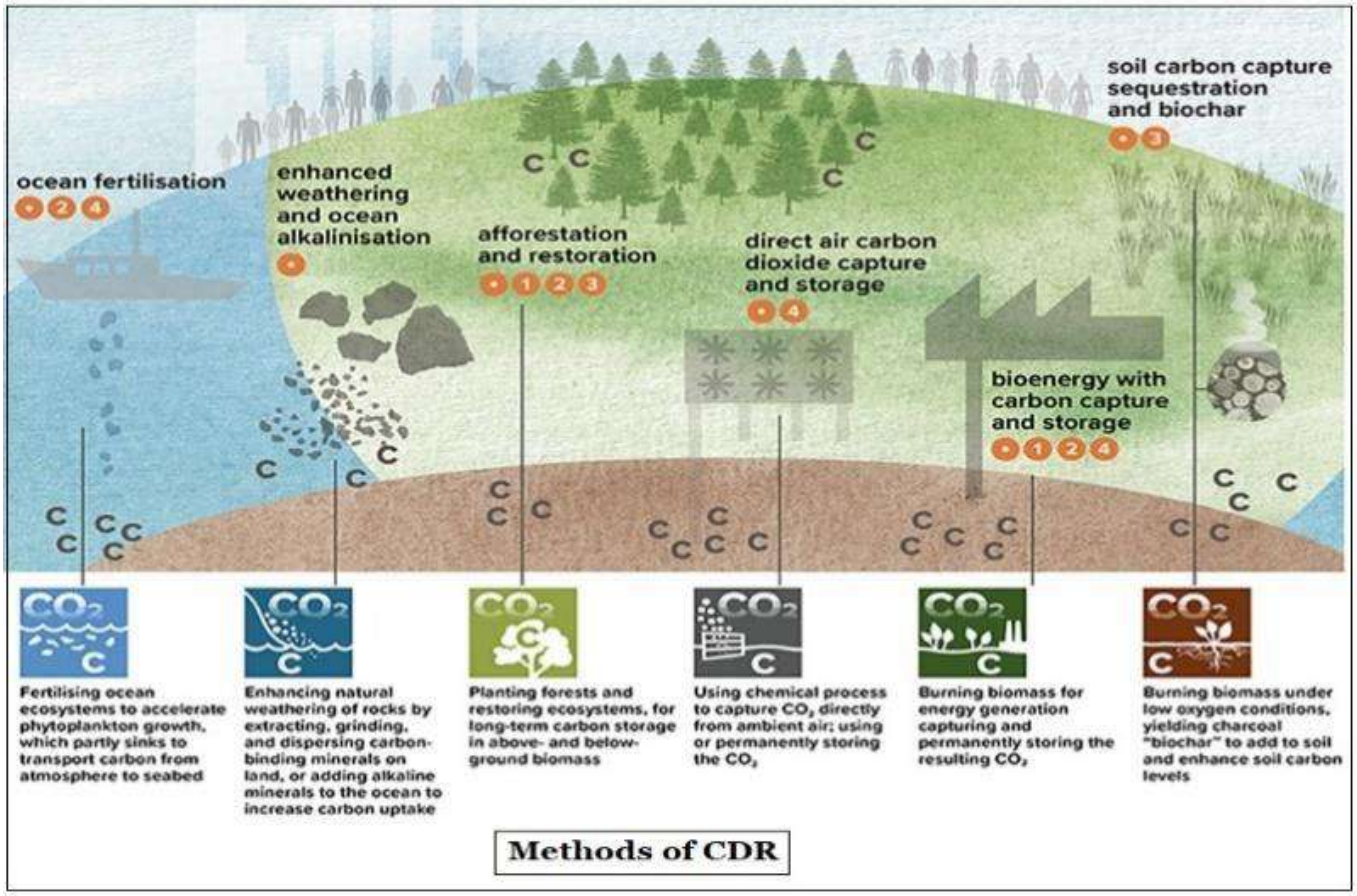


- Cloud brightening is a phenomenon that occurs when aerosols are injected into clouds by natural events such as volcanic eruptions.
- **Marine Cloud Brightening** – Also called as *cloud whitening or cloud brightening*, it was originally proposed by *John Latham* in 1990 to control global warming by altering Earth's energy balance.
- It is a solar geo-engineering technique that involves *spraying sea salt into low-lying clouds* to increase the reflectance of cloud cover that will reduce the amount of incoming solar radiation striking the surface.
- Spraying large quantities of microscopic seawater droplets will create extra droplets and make the cloud brighter. Sea salt scatters light directly and provides additional shade.
- **Significance** – shield ocean (absorbs approximately 93% of incident solar radiation) from extreme heat.
- Modelling studies suggest that it could delay the expected decline in coral cover. It will be *short-lived and reversible* as sprayed particles persist in the atmosphere for few days.

3.17 Carbon-Dioxide Removal

The World has turned its focus towards carbon capture's future role in a climate-friendly world.

- **Carbon removal**- Using technologies, practices, and approaches to remove carbon dioxide (CO_2) from our atmosphere through deliberate and intentional human actions.
- It captures CO_2 from the atmosphere and locks it away for decades or centuries in plants, soils, oceans, rocks, saline aquifers, depleted oil wells, or long- lived products like cement.
- **Process-** CDR can be done through traditional or technological processes or both.
- **Forms of CDR**- The most common form of carbon capture technology involves *capturing the gas from a point source* like an industrial smokestack.
- **Carbon storage**- It includes
    - **Carbon capture and storage (CCS)** - The carbon can be moved directly to permanent underground storage.
    - **Carbon capture, utilization & storage (CCUS)** – Carbon can be used in another industrial purpose first.



CDR method	About	Challenges
Afforestation/ Reforestation	Converts abandoned or degraded agricultural lands into forests. Additional trees can sequester more carbon dioxide from the atmosphere.	Increases the competition for land. May limit the options for food production and biodiversity conservation.
Biochar	A substance produced by *burning organic waste* from agricultural lands and forests in a controlled process called *pyrolysis.* Improve soil quality, which in turn improves soil fertility, productivity and crop yield.	Health and environmental impacts of particulate matter produced during pyrolysis. Sourcing sustainable biomass at a scale.
BECCS	Combines energy production, biological carbon removal and geological storage. Uses biomass in combustion to generate energy, then captures the emitted carbon for geological injection.	Can create competition for land use with food production, placing pressure on food security. Can increase the use of fertilisers.
DACCS	*Extracts CO2 directly* from the atmosphere, and is permanently stored in geological formation or used for other application.	Accelerates fossil fuel extraction activities, potential CO_2 leakage from storage sites
Enhanced rock weathering	Involves *pulverising silicate rocks* to bypass the conventionally slow weathering action.	Energy intensive process and generates emissions.
Ocean alkalinity enhancement	A *chemical removal method* that involves adding alkaline substances to seawater to accelerate the natural sink.	Potential for increased greenhouse gas emissions and can release by-products like trace metals.

3.18 Algae-assisted Carbon capture

IIT Jodhpur's innovative technology uses algae-assisted fuel cells to capture carbon dioxide, treat wastewater and generate power.

- It is an *indirect method for converting CO2* into carbonates and then use it for algal growth.
- **Aim** – To ***generates power, algae biomass and treats water*** by utilising algae-assisted MFC for flue gas carbon capture.
- **Working** – *CO2 from the flue gas is absorbed* by the wastewater supplemented with sodium bicarbonate and generates *flue-gas-derived bicarbonates (FGDBs)*.

Flue gas the gas produced from the flue or chimneys of thermal power stations and other industrial plants

- FGDB helps in growth of ***algae Chlorella vulgaris*** which is thermo-tolerant and can grow in wastewater.
- Algae-assisted MFC is then used to generate electricity.
- **Significance** – This indirect biochemical route of CO_2 fixation is advantageous since *more inorganic carbon can stay in the water*.
    - 1 tonne of algae captures 180 tonnes of flue gas CO_2.
    - For a cubic meter of wastewater and FGDB in MFC, they got energy of 0.0066 kWhr.
- This is the 1st time that the integration of algae MFC with flue gas carbon capture has been attempted anywhere.

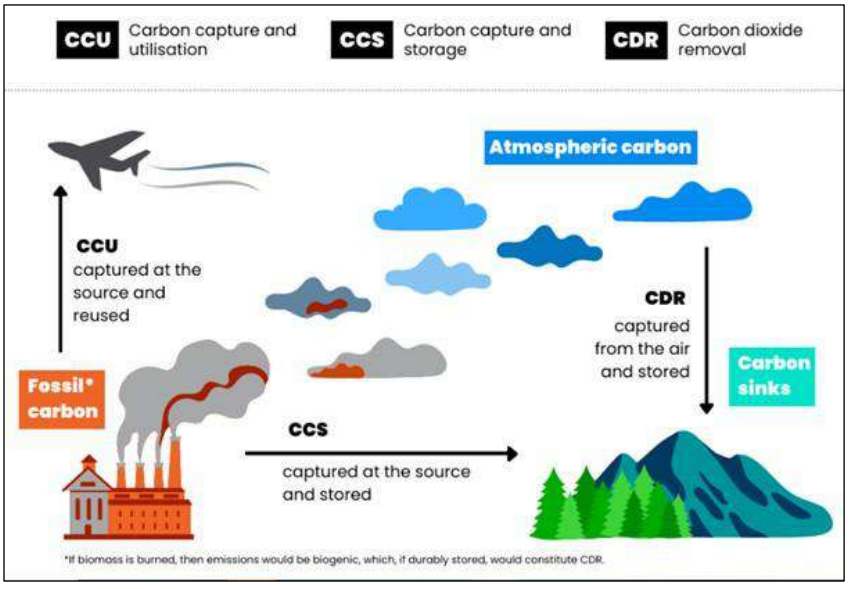
3.19 Limitations of CCS and CDR

The draft decisions taken at COP28 at Dubai have referred to the abatement and removal of carbon emissions using carbon capture and storage (CCS) and carbon-dioxide removal (CDR) technologies.

- **Unabated -** Doing nothing to reduce the carbon dioxide (CO_2) and other greenhouse gases that are released from the burning of coal, oil, and natural gas.
- According to IPCC, unabated fossil fuels are those "*without interventions* that substantially reduce GHG emissions.
- At COP28, the term "unabated fossil fuels" has come to mean the combustion of these fuels ***without using CCS technologies*** to capture their emissions.

CDR and CCS are distinct, but some CO_2 removal methods (direct air capture) may share the same capture processes or long-term storage infrastructure used for conventional CCS.

- **Abated -** Attempts to decrease the release of polluting substances to an acceptable level.
- **Carbon capture and storage (CCS)** – CCS refers to technologies that can ***capture CO_2 at a source of emissions*** before it is released into the atmosphere.
- These sources include the fossil fuel industry (where coal, oil and gas are combusted to generate power) and industrial processes like steel and cement production.
- It is a three-step process, involving:
    - Capturing the CO_2 produced
    - Transporting the captured CO_2
    - Storing it deep underground
- **Carbon-Dioxide Removal (CDR)** – Uses technologies, practices, and approaches to ***remove CO_2 from our atmosphere*** through deliberate and intentional human actions.



- *CDR* captures CO_2 from the atmosphere and locks it away for years in plants, soils, oceans, rocks, saline aquifers, depleted oil wells, or long- lived products like cement.
- It can be natural (afforestation or reforestation) or use technologies (direct air capture), where machines mimic trees by absorbing CO_2 and storing it underground.
    - Example: Enhanced rock weathering and BECCS (Bioenergy with carbon capture and storage)

4. ENVIRONMENTAL ORGANISATIONS, CONVENTIONS & TREATIES

4.1 UNFCCC COP-28

The COP-28 has been concluded in Dubai, United Arab Emirates (UAE) with the adoption of UAE Consensus.

Click here to download the special report on UNFCCC's COP 28

4.2 UAE Consensus

The COP28 was recently concluded with the UAE Consensus, a landmark text which is agreed by 198.

- UAE Consensus is a landmark text that is agreed by 198 parties in the COP 28.
- The objectives of the UAE Consensus include:
    - Parties to transition away from fossil fuels to reach net zero,
    - Encourages parties to submit economy-wide Nationally Determined Contributions (NDCs),
    - A new specific target to triple renewables and double energy efficiency by 2030,
    - To build momentum towards a new architecture for climate finance.
- Under the total Action Agenda at COP28, over USD 85 billion in funding has been mobilized and 11 pledges and declarations have been launched and received historic support.
- To achieve net-zero emissions by 2070 is one of the 5 commitments under Panchamrit.

4.3 Loss and Damage Fund

Recently, Adaptation and Loss and Damage (L&D) are in sharp focus due to intensification of climate crisis.

Adaptation	L&D
It refers to the actions taken to reduce the negative impacts of climate change	It refers to the financial support provided to the countries that suffer from the unavoidable and irreversible impacts of climate change.
It is a proactive response to cope with climate challenges	It is the irreversible consequences that cannot be avoided or mitigate.
It involves reducing emission to prevent future climate impacts	It involves investments in issues that will reduce the severity of impacts
Example: Building sea walls, planting drought-resistant crops, installing renewable energy sources.	Example- Compensation for the loss of lives, livelihoods, land or cultural heritage due to extreme weather events, sea level rise, or desertification.

4.4 ALTERRA

The United Arab Emirates recently announced the ALTERRA, a privately managed fund of USD 250 billion to catalyse private sector climate investments globally by 2030.

- It is the ***World's Largest Private Investment Vehicle for Climate Action.***
- It aims to revolutionise international climate finance by fostering a fairer system, with a focus on enhancing funding accessibility for the Global South.
- It has been established by Lunate, an independent global investment manager, and is domiciled in the Abu Dhabi Global Market.
- The 4 verticals of the ALTERRA includes:
    1. Energy Transition
    2. Industrial Decarbonisation
    3. Sustainable Living
    4. Climate Technologies

4.5 Emirates Declaration

At the recently conducted COP 28, 134 have signed Emirates Declaration for Sustainable Agriculture, Resilient Food Systems and Climate Action.

- Emirates Declaration aims to integrate foods into the Nationally Determined Contributions (NDCs) by respective countries by 2025.
- It has been signed by ***134 countries***.
- The Declaration includes references to reducing food loss and wastage that is caused by the climate crises.

4.6 COP28 Declaration on Climate and Health

The COP28 Declaration was not signed by the India which said that greenhouse gas reduction for cooling in the health sector could hinder its ability to meet the growing demands for medical services.

- The declaration aims at promoting a holistic approach to understanding and mitigating the diverse health challenges posed by a changing climate.
- It emphasises the need for swift and substantial reductions in greenhouse gas emissions.
- Objectives - commitment to combat inequalities within and among countries and promote sustainable practices within the health sector to contribute to broader climate goals.
- ***India did not sign the COP28 Declaration*** as greenhouse gas reduction for cooling in the health sector could hinder its ability to meet the growing demands for medical services.

4.7 Alliance of Champions for Food Systems Transformation

The Alliance of Champions for Food Systems Transformation was recently launched at the COP 28 to transform food systems to deliver better outcomes for people, nature and the climate.

- It is a coalition of vanguard countries united by a shared ambition to transform food systems to deliver better outcomes for people, nature and the climate.
- The 5 alliance member countries include Brazil, Cambodia, Norway, Sierra Leone and Rwanda.
- ***India is not part*** of Alliance of Champions for Food Systems Transformation.
- The alliance members must agree to update their NDCs and national climate adaptation and biodiversity strategies to integrate these food system efforts by 2025.

4.8 Coalition for High Ambition Multilevel Partnerships (CHAMP) Pledge

The CHAMP was recently taken at the COP 28 that commits for new way of working for climate action where national governments works in partnership with their subnational governments.

- It is a commitment taken by national governments on a new way of working in partnership with their subnational governments.
- It is a new way of approaching the implementation of their next Nationally Determined Contributions (NDCs) in time for COP30 in 2025.
- So far 71 countries have signed this pledge and ***India is yet to sign this pledge***.

4.9 Africa's Green Industrialisation Initiative (AGII)

- AGII aims to accelerate and scale up green industries and businesses across Africa.
- The initiative builds upon the existing $4.5 billion Africa green investment from the United Arab Emirates.
- Africa has 40% of the world's critical minerals necessary for energy transition and has the world's largest natural carbon sink.

4.10 The Global Expert Review on Debt, Nature and Climate

- The Global Expert Review on Debt, Nature and Climate is an initiative of ***Kenya, Colombia and France*** to tackle debt & climate change.
- It was established at the 2023 United Nations Climate Change Conference (COP28).
- It aids to comprehensively assess how sovereign debt impacts the ability of low- and middle-income countries to address climate change, conserve nature and decarbonize their economies.

4.11 7th GEF Summit

Recently, the 7th assembly of Global Environment Facility (GEF) was concluded in Vancouver, Canada.

- **Global Environment Facility -** It is the largest source of multilateral funding for biodiversity globally, and distributes more than 1 billion dollar a year on average to address inter-related environmental challenges.
- **Origin** - GEF was originated by *France with a 1989* proposal to formulate financing responses to mounting concern over global environmental problems.
- It was established as a pilot program in 1991 through arrangements between 3 implementing agencies,
    - World Bank
    - UN Development Programme (UNDP)
    - UN Environment Programme (UNEP)
- **Purpose-** To provide *concessionary and additional funding* for the incremental costs of achieving global environmental benefits, with an initial endowment of around USD 1 billion.
- **Evolution** - In 1992, GEF was established.
- By 1994, the GEF became a separate institution, *hosted but not administered by the World Bank,* which operates as a key mechanism for global environment
- **Functions-** It provides fund for biodiversity, climate change, international waters, land degradation, persistent organic pollutants (POPs), mercury, sustainable forest management, food security, and sustainable cities in developing countries.
- It has served as an operating entity of the financial mechanism since the *United Nations Framework Convention on Climate Change's (UNFCCC), 1994*.

- **Special Funds**- The special funds set up and managed by the GEF are
- **The Special Climate Change Fund (SCCF)** - It supports adaptation and technology transfer in all developing country parties to the UNFCCC, supporting both long-term and short-term adaptation activities in water resources management, land management, agriculture etc.,
- **The Least Developed Countries Fund (LDCF)** - It is established under the UNFCCC to address the special needs of the Least Developed Countries (LDCs) that are vulnerable to the adverse impacts of climate change.

Adaptation Fund - GEF provides the secretarial services to adaptation fund which was established under the *Kyoto Protocol* in 2001.

The Kyoto Protocol aims to limit or reduce the greenhouse gas emissions by 3 market-based mechanisms – emissions trading, clean development mechanism and joint implementation.

Financing mechanisms of GEF

- The GEF provides funding to assist developing countries in meeting the objectives of international environmental conventions. It serves as a "financial mechanism" to 5 conventions.
- **Convention on Biological Diversity (CBD)**- It is a multilateral treaty established in Rio Earth summit 1992.
- It has three main goals-
  - Conservation of biological diversity
  - Sustainable use of its components
  - The fair and equitable sharing of benefits arising from genetic resources.
- **United Nations Framework Convention on Climate Change (UNFCCC)-** It is an international environmental treaty to combat dangerous human interference with the climate system, by stabilizing greenhouse gas concentrations in the atmosphere.
- It was established in 1992 Rio Earth summit.
- Kyoto Protocol was the implementation of measures under UNFCCC.
- **Stockholm Convention**- It is an international environmental treaty, signed in 2001 to eliminate or restrict the production and use of persistent organic pollutants (POPs).
- **UN Convention to Combat Desertification**- It is a convention to combat desertification and mitigate the effects of drought through national action programs.

Organizational Structure of GEF

GEF Assembly

It is the main guiding structure for GEF, which has been convened 7 times between 1998 and 2023 comprising 185 member governments. It *meets every 4 years* and is and is responsible for reviewing and ratifying recommendations

GEF Council

It is the GEF's main governing body, comprising of 32 members appointed by constituencies of GEF member countries. It meets twice annually, develops, adopts and evaluates the operational policies and programs for GEF-financed activities.

Scientific and Technical Advisory Panel (STAP)

It was established in 1995 to provide independent advice to the GEF on its work as well as assistance in the delivery of Members' responsibilities.

Independent Evaluation Office (IEO)

It was created in 2003 and supports the improvement of accountability and learning in GEF strategies and operations through its evaluations.

Secretariat

It is based in ***Washington, D.C.,*** and reports directly to the GEF Council and Assembly.

Trustee

The *World Bank* serves as the GEF Trustee, administering the GEF Trust Fund (contributions by donors).

Agencies

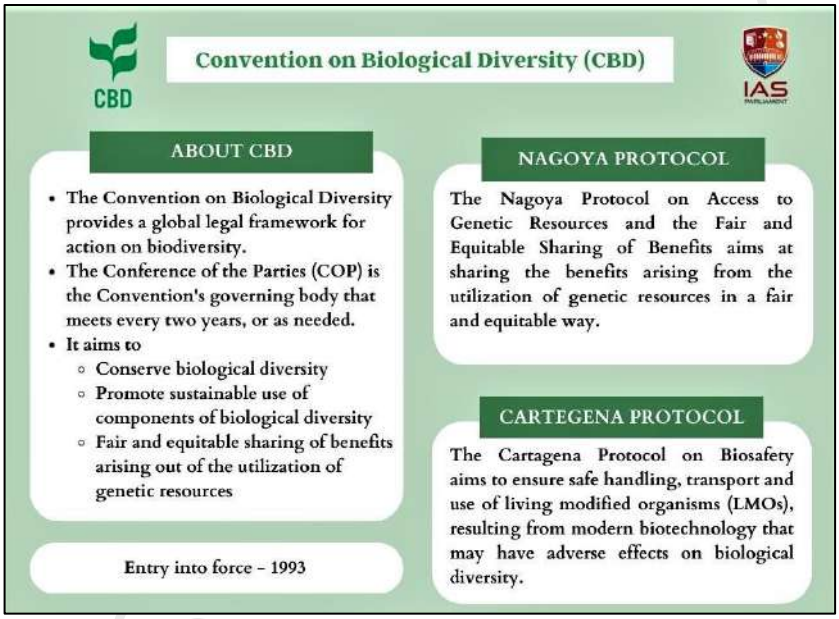
The GEF Agencies are the operational arm of the GEF that work closely with project proponents.

- It is the only convention stemming from a direct recommendation of the Rio Conference's Agenda 21, and adopted in 1994.
- **Minamata Convention on Mercury**- It is an international treaty designed to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds.

- It was adopted in 2013 at a diplomatic conference held in Kumamoto, Japan.
- **Montreal Protocol-** It is an international treaty designed to protect the ozone layer by phasing out the production of numerous substances that are responsible for ozone depletion which entered into force in 1989.
- GEF is *not formally linked* to this protocol, but supports implementation of the protocol in economies in transition.

The Green Climate Fund (GCF) which aspires to collect $100 billion financing target by 2020, was launched in 2010. It is managed independently

- **Multilateral agreements-** It is associated with many global and regional multilateral agreements that deal with international waters or transboundary water systems.
    - The Global Ship Ballast Water Treaty
    - The UN Law of the Sea Treaty
    - The MARPOL treaty for shipping (International Convention for the Prevention of Pollution From Ships)
    - The UN Agreement on conservation and management of straddling fish stocks and highly migratory fish stocks.



Key outcomes of the 7th GEF Assembly

- **Global Biodiversity Framework Fund** - It ratified the Global Biodiversity Framework Fund, a new source of funding for protecting endangered species and their ecosystems globally, which was approved by the GEF Council.
- **Youth Leaders Learning Exchange**- It stressed the importance of universal access to education for girls and boys, and engaging youth, women, and Indigenous leaders in sustainable solutions.
- **Indigenous and Local Knowledge Event-** It is organized to study the overlap between indigenous peoples' lands and biodiversity hotspots.
    - It emphasized the importance of oral history and the voices of indigenous peoples in Arctic and Amazon.
- **GEF Partnership Forum-** It is the 1st ever GEF Partnership Forum, which created a space for indigenous peoples, youth, women, and representatives from civil society to discuss ways the GEF can support their recognition and empowerment.
- **Intergenerational Fireside Chat-** This event discussed the devastation of recent and ongoing wildfires as well as the role of fire as a place for gathering, connecting, and storytelling.
- **Forum Confabs**- It is an informal gathering that were held during the Partnership Event.
    - **Intergenerational Collaboration for our Future-** It discussed how the GEF Partnership should engage youth on a long term basis.
    - **Women's Leadership in Environmental Action-** It seeks elaboration on women's leadership and gender-responsive actions in environmental programs and initiatives.
    - **Indigenous Stewardship of the Global Environment-** It discussed the GEF's support in harnessing indigenous knowledge systems and the importance of working in a holistic manner to elevate the rights of indigenous people.
- **Inclusive GEF Assembly Challenge Program**- It is a new funding initiative providing up to USD 100,000 to each of 23 winners.
- **Net Zero Nature-positive World-** It discussed the role of international finance institutions in supporting countries raising ambition in climate and nature.

4.12 Global Biodiversity Framework Fund (GBFF)

According to experts, if Global Biodiversity Framework Funds (GBFF) fails to find adequate money, countries will have to find more funds domestically.

- **Establishment** – It was launched at the 7th Assembly of the Global Environment Facility (GEF) in Canada in ***2023*** where Canada and the United Kingdom made the initial contributions.
- **Objectives -** To help countries *achieve the 23 targets set under the KMGBF* (the Kunming-Montreal Global Biodiversity Framework).
- To receive funding from all sources and quickly disburse through streamlined procedures.
- To enhance the access for indigenous peoples and local communities, according to their own priorities.
- **Finance** - Private, philanthropic and government investments unlike GEF, which relied on just 40 donors for finance. It has a cumulative budget of 5.25 billion USD for 2022-26.
- **Managed by** – Global Environment Facility (GEF) and the **Trustee of the GBFF** – World Bank
- **GBFF Council** – More representations from developing countries and decisions are to be taken by consensus.
- **Activities** – It will be used to approve projects until December 31, 2030.

4.13 Outcomes of 1st African Climate Summit 2023

The 1st Africa Climate Summit (ACS23) held in Nairobi culminated in the 'Nairobi Declaration', giving the continent a common voice ahead of upcoming key global engagements.

- **Theme-** Driving Green Growth and Climate Finance Solutions for Africa and the World
- **Location** - *Nairobi*, Republic of Kenya
- **Co-hosted by** - Republic of Kenya, African Union Commission (AUC)
- **Aim-** To position Africa in solidarity with the rest of the world for global climate action.
- **Nairobi declaration**- The summit culminated in the *Nairobi Declaration*, an eleven-point call to action proclaiming African States' unified stance on climate action.

- It will form the basis of Africa's negotiating position at *COP28* climate summit in *United Arab Emirates*.

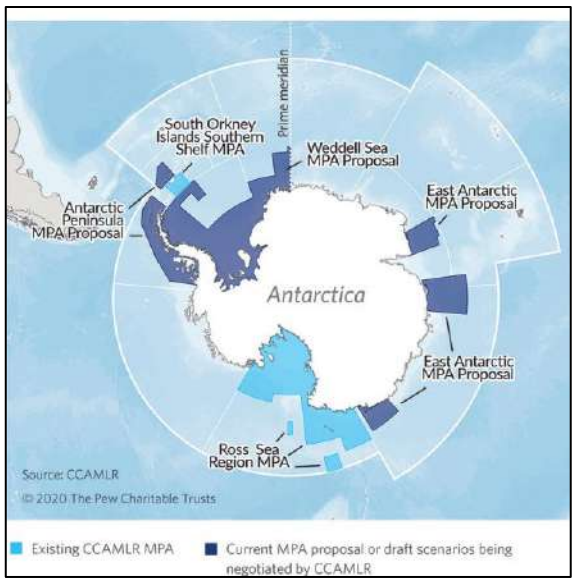
4.14 Marine Protected Areas (MPAs) in Antarctic

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) failed to agree on a roadmap for the creation of 3 new marine protected areas.

- MPA is a section of the ocean where a government has placed limits on human activity.
- Many MPAs allow people to use the area in ways that do not damage the environment. Some ban fishing and a few do not allow people to enter the area at all.

MPAs in Southern Ocean

- The Southern Ocean has 2 existing MPAs
  - Southern shelf of the South Orkney Islands
  - Ross Sea Region
- All types of fishing, other than scientific research, are prohibited within the southern shelf of the South Orkney Islands MPA.



- **New 3 MPAs -** Since 2012, the European Union and Australia have proposed an MPA in *East Antarctica*.
- An MPA was proposed in the *Weddell Sea* by the EU and Norway and in the waters surrounding the *Antarctic Peninsula* by Chile and Argentina.
- In 2021, India extended its support for designating East Antarctica and the Weddell Sea as MPA.
- **30X 30 goal -** A global target to protect 30% of the planet for nature by 2030 (known as '30x30').

Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)

- It was established by an international convention in 1982 in response to increasing commercial interest in Antarctic krill resources, a keystone component of the Antarctic ecosystem
- **Aim** – To conserve Antarctic marine life.
- **Members** - 27 Members, and a further 10 countries have acceded to the Convention.
- India is *a Member of CCAMLR*.

4.15 2023 IMO Greenhouse Gas Strategy

Recently, Maritime countries upgraded their Greenhouse House Gas (GHG) emissions strategy to reach net zero "by or around" 2050 at the UN International Maritime Organization (IMO) summit held in London.

- Member states of the International Maritime Organisation (IMO) agree to adopt the 2023 IMO strategy on the reduction of GHG emissions from ships, to mitigate harmful emissions.
- **Aim** - To limit the global temperature increase to well below 2 degrees Celsius as outlined in the 2015 Paris Agreement.

Goals of 2023 IMO GHG Strategy

- **For Ships** - Carbon intensity of the ship to decline through further improvement of the energy efficiency for new ships.
- **For Shipping** - Carbon intensity of international shipping to decline to reduce CO_2 emissions per transport work, as an average across international shipping, by at least 40% by 2030, compared to 2008.
- **Technologies** - Uptake of zero/near-zero Green House Gas (GHG) emission technologies or fuels to represent at least 5% (striving for 10%) of the energy used by international shipping by 2030.
- **Net Zero** - To peak GHG emissions from international shipping to reach net zero as soon as possible and to reach net zero emission by or around, i.e. 2050.

4.16 Montreal Protocol

Ozone Day 2023 celebrates the success of the Montreal Protocol, which has helped put the ozone layer on track to being intact again.

- **Montreal Protocol** - It is an international agreement designed to protect the stratospheric ozone layer by regulating the production and consumption of ozone depleting substances (ODS).
- **Signed** - It was originally signed in 1987 and enacted in 1989 and substantially amended in 1990 and 1992.
- The parties to the protocol meet *annually* to make a decision and review the execution of its operations to date.
- The Parties are assisted by the ***Ozone Secretariat***, which is based at UN Environment Programme headquarters in ***Nairobi, Kenya***.
- **Equal but differentiated responsibilities** - The Protocol phases down the ODS in a step-wise manner, with different timetables for developed and developing countries.
- **Kigali Amendment** - It seeks to eliminate 80-90% of the HFCs currently in use by the year 2050.
- **India -** India became a signatory to the Montreal Protocol in 1992.
- India is an Article 5 country and is entitled to assistance from the Multilateral Fund in its efforts to phase out ODSs and switch over to non-ODS technologies.

- **Multilateral Fund** - It was established in 1991 for the implementation of the Montreal Protocol under Article 10 of the treaty.
- The Fund's objective is to provide financial and technical assistance to developing country parties to the Montreal Protocol whose annual per capita consumption and production of ODS is less than 0.3 kg to comply with the control measures of the Protocol.
- The Fund's activities are implemented by ***UNEP, UNDP, UNIDO and the World Bank.***

4.17 Brazzaville Summit of the Three Basins

- **Aim** - To enhance cooperation between countries of tropical forest basins- *the Amazon, the Congo and the Borneo-Mekong.*
- The three global ecosystems account for 80% of the world's tropical forests and 2/3rd of the earth's biodiversity.

4.18 Champions of the Earth Award 2023

In 2023, UNEP's Champions of the Earth seeks innovations, solutions, actions and initiatives working to 'Beat Plastic Pollution'.

- It is the ***UN's highest environmental honour*** which is awarded *annually*.
- **Awarded by -** United Nations Environment Programme **(UNEP)** and launched in 2005.
- **Recognition** - To leaders from government, civil society and private sector for their transformation impact on the environment
- **Categories** - *4 categories*. It has *recognized 116 laureates* (27 world leaders, 70 individuals, and 9 organizations).
- **2023 Award** - It focuses on initiatives addressing plastic pollution.
- By 2040, carbon emissions associated with plastics could account for nearly one-fifth of global GHG emissions.

Categories	Reason	2023 Award	Reason
Policy Leadership	For global or national action for the environment	Josefina Belmonte (Philippines)	For using local authorities in solving global environmental problems
Inspiration and action	For taking steps to inspire positive change to protect our world	Ellen MacArthur Foundation (UK)	For driving global shift towards lifecycle approach for plastics
		José Manuel Moller (Chile)	For reusing plastic to enable economic, social and environmental benefits
Entrepreneurial vision	For challenging status quo to build a cleaner future	Blue Circle (China's largest marine plastic waste programme	For using blockchain technology for future environmental action
Science and innovation	For pushing boundaries of technology for profound environmental benefit	Council for Scientific & Industrial Research (South Africa)	For science based, data driven solutions to tackle plastic pollution

4.19 UNESCO Michel Batisse Award

- The *director of Gulf of Mannar biosphere reserve* was selected for UNESCO Michel Batisse Award for 2023.
- It is a $12,000 award given ***every 2 years*** during the Man and the Biosphere Programme (MAB) Council.
- It is awarded for management of the biosphere reserves in line with the *Seville Strategy*.
- The ***Seville Strategy*** provides recommendations for developing effective biosphere reserves and for setting out the conditions for the appropriate functioning of the World Network of Biosphere Reserves.

4.20 Airgun Surrender Abhiyan

Recently, Airgun Surrender Abhiyan was selected as a model wildlife conservation programme by UNESCO.

- An initiative *to get local residents involved* in environmental management and wildlife protection.
- **Launched in** – 2021.
- **Launched by** – Arunachal Pradesh, India
- **Aim** – To ***discourage hunting*** and raise awareness about the detrimental effects of wildlife killing.
- To encourage the ***voluntary surrender of airguns*** and licensed guns to check their use in hunting birds and other wildlife.

> *Lumdung was declared as **1st Airgun free village of Arunachal Pradesh**, where 46 air guns were surrendered.*

- **Activities** – Awareness campaign to maintain the tradition of ***hunting in the old style*** without guns and educating about the role of birds and animals in pollination and in creating forests.
- Increased ***push for poultry, piggery*** and other farm initiatives to provide alternative to bush meat.
- **People's participation** – People began *organising airgun surrender ceremonies* locally.
- **Recognition** – 'Conservation Award' at the 6th North East Green Summit of Forest Ministers of North East held in Assam in 2021.

4.21 Review of Significant Trade Process of CITES

In the recently concluded CITES Standing Committee meeting, India was removed from the Review of Significant Trade process for Red Sanders.

- Red sanders also known as red sandalwood, is a tree species with the scientific name *Pterocarpus santalinus.*
- It is **endemic to few districts in Andhra Pradesh.**
- The species is listed as **Appendix II** under Convention on International Trade in Endangered Species of wild fauna and flora (CITES) since 1994.
- The Red sanders species was listed for Review of Significant Trade (RST) process of CITES since 2004.

RST Process

- The CITES RST process enables disciplinary action in the form of trade suspensions directed at countries that do not meet their obligations.
- This is a process through which the CITES Standing Committee places increased scrutiny on the exports of a species from a country to determine if the Convention is being properly implemented.

4.22 Funga

United Nations Biodiversity has urged people globally to use the word 'funga' whenever they say 'flora and fauna', in order to highlight the importance of fungi.

- Funga refers to the fungal diversity of a given place. It is the Fauna and Flora equivalent to the kingdom of Fungi.
- Fungi, along with Animalia (animals), Plantae (plants), Protista, Archaea/Archaebacteria, and Bacteria or Eubacteria form the six 'kingdoms' of biology.
- The ***Species Survival Commission*** of the International Union for Conservation of Nature announced that it would use mycologically inclusive language in its internal and public-facing communications.

Importance of Fungi

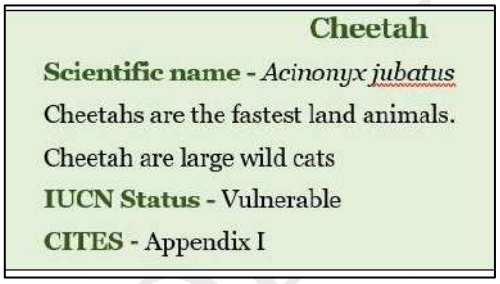
- There would be no life on Earth without fungi: the yeasts, molds and mushrooms.
- They are critical to decomposition and forest regeneration, mammalian digestion, carbon sequestration, the global nutrient cycle, antibiotic medication, and the bread, beer and chocolate we consume.
- Trees would not be able to live on land without fungi.

5. GOVERNMENT INTERVENTIONS

5.1 Cheetah Reintroduction Project

Following the death of two cheetahs in three days at Kuno National Park in Madhya Pradesh wildlife officials suggested to remove radio collars from 10 free ranging cheetahs.

- Project Cheetah is India's cheetah relocation programme and the 1st intercontinental reintroduction of a wild, large carnivore species.
- The project is to bring in 5-10 animals every year, over the next decade, until a self-sustaining population of cheetahs is established.
- Asiatic Cheetahs were once abundant in India but the last cheetah in the country died in 1952.
- The animals brought from Namibia and South Africa are the Southeast African cheetahs.



- **Location -** Under Project Cheetah, the animals are translocated from the forests of South Africa and Namibia to *Kuno National Park in Madhya Pradesh*.
- **Authorities -** The National Tiger Conservation Authority (NTCA) is the apex body entrusted with the implementation of Project Cheetah.
- **Assisted by** - The Cheetah Conservation Fund (CCF)
- Cheetahs are a low-density species, existing at best at 1-2 per 100 sq km and with a unique spatial ecology.

National Tiger Conservation Authority (NTCA)

- NTCA, a statutory body under the Ministry of Environment, Forests and Climate Change was established in 2005.
- It has been constituted under Section 38 L (1) of ***Wildlife (Protection) Act, 1972.***
- It is headquartered in ***New Delhi.***
- The Union Minister of Environment, Forests and Climate Change is its Chairperson.

5.2 Merger of Project Tiger & Project Elephant

Centre has merged Project Tiger and Project Elephant into a new division called 'Project Tiger and Elephant Division'.

Project Tiger	Project Elephant

• Launched in 1973 by the central government.
• **Ministry -** Centrally Sponsored Scheme of the Ministry of Environment, Forests and Climate Change.
• **Objective -** Conservation of tiger and ensures the preservation of their natural habitat.
• The Project Tiger has 53 tiger reserves spread over 75,000 km.
• This year 2023 observed Project Tiger's 50th commemorative year.
• It is one of the most successful species conservation programmes in the world.
• The NTCA was created to provide statutory backing to the project.
• **Tiger - IUCN Status - Endangered**
	• Launched in the year 1992 as a Centrally Sponsored Scheme.
	• **Objectives**
	  ○ To protect elephants, their habitat & corridors
	  ○ To address issues of man-animal conflict
	  ○ Welfare of captive elephants
	• **Ministry -** Ministry of Environment, Forest and Climate Change provides financial and technical support to major elephant range states in the country.
	• There are 33 elephant reserves in India, latest being Terai Elephant Reserve in Uttar Pradesh.
	• Project Elephant completed 30 years in 2022.
	• **Elephant - IUCN Status - Endangered**

5.3 Increase in Tiger Population

The all-India figures published by the National Tiger Conservation Authority (NTCA) indicate that the number of big cats has grown in the State.

Conservation Status of Tiger

- IUCN – **Endangered**
- Wildlife (Protection) Act, 1972 - **Schedule I**
- CITES - **Appendix I**

- **Ecological balance**- Tigers serve as top predators in their ecosystems, playing a pivotal role in maintaining ecological balance by regulating prey species' populations.
- **Ecological integrity**- They prevent over-grazing by limiting herbivore numbers.
- **Keystone species-** Tigers have a profound impact on their environments, making their preservation crucial for overall ecosystem health and diversity.
- **Conservation icon-** It is a flagship species; tiger conservation is a litmus test that ensures the well-being of our forested ecosystems and the biodiversity they represent
- **Umbrella species-** Tigers are solitary and have large home range providing space for variety of other species to flourish.

Status of tiger population in India

Tiger reserve	Location
Corbett tiger reserve	Uttarakhand
Bandipur tiger reserve	Karnataka
Nagarhole tiger reserve	Karnataka

- The 2022 all-India tiger estimation revealed a notable increase in tiger occupancy from 2,967 in 2018, and 3,167 in 2022.
- India harbours almost *75% of the global tiger population* and has honour of the ***largest tiger range country*** in the world.
- More than 3/4th of the tiger population is found within protected areas.
- **States**- The largest tiger population is in Madhya Pradesh (785), followed by Karnataka (563) & Uttarakhand (560), and Maharashtra (444).
- **Tiger reserve**- There are 55 tiger reserve in the country with the highest population of tiger in
- **Increase in numbers -** Central India and the Shivalik Hills and Gangetic Plains witnessed a notable increase in tiger population, particularly in the states of Madhya Pradesh, Uttarakhand, and Maharashtra.
- **Decline -** There is a dip in tiger numbers in Telangana, Chhattisgarh, Jharkhand, Odisha, parts of Northeast India and the *Western Ghats.*
- Approximately 35% of the tiger reserves urgently require enhanced protection measures, habitat restoration, ungulate augmentation, and subsequent tiger reintroduction.

Initiatives to Conserve Tiger Population

Global level

- **St Petersburg tiger summit**- It was conducted in 2010, the tiger range countries resolved to double the tiger population in the wild with popular slogan "T*2".
- Global Tiger Day is celebrated on July 29th. It was founded in 2010, when 13 tiger range countries came together to create Tx2 – the global goal to double the number of wild tigers by 2022.
- **Global Tiger Forum-** It was founded by World Bank which is the only inter-governmental platform of tiger range countries since 1993 consolidating Tiger Action Plans of the range countries.

National level

- **MSTrIPES** (Monitoring System for Tigers: Intensive Protection and Ecological Status) - It creates database from the field using Global Positioning System (GPS), General Packet Radio Services (GPRS), and remote sensing.
- **National Tiger Conservation Authority** -It is a statutory body constituted under *Wildlife (Protection) Act, 1972.*
- It conducts country level assessment of tiger population, co-predators, prey and habitat.

- **International Big Cats Alliance-** It was launched by India in 2023 at Mysore, Karnataka, to commemorate 50 years of Project Tiger.
- It aims to conserve 7 big cats namely Tiger, Lion, Leopard, Snow Leopard, Cheetah, Jaguar and Puma
- **T*2 Award**- It was given to *Pench tiger reserve* spread across Maharashtra and Madhya Pradesh and to *Satpura Tiger reserve* in Madhya Pradesh for doubling the tiger population.
- **Project Tiger** – It was first launched at the *Jim Corbett National Park* on *April 1 1973.*
- It is a Centrally Sponsored Scheme that focuses on the conservation of big cats and ensures the preservation of their natural habitat as tigers are at the top of the food chain.
- The ***tiger census*** is held once in every 4 years by National Tiger Conservation Authority (NTCA) in association with state forest departments and the Wildlife Institute of India.

5.4 Wildlife Protection (Amendment) Act, 2022

Excessive number of species have been included in the new schedules of the Wildlife Protection (Amendment) Act, 2022, with no consultation or process.

- The Act amends the Wild Life (Protection) Act, 1972 which regulates the protection of wild animals, birds and plants.
- **Align with CITES-** It seeks to increase the species protected under the law, and implement the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
- The Convention requires countries to regulate the trade of all listed specimens through permits.

In 42nd Amendment Act, the subject of "Forests and Protection of Wild Animals and Birds" was transferred from State to Concurrent List.

- **Rationalising schedules**- It seeks to reduce the number of schedules from *VI to IV* whereby *Schedule V for vermin* or animals that destroy food crops will be done away with.
- **Obligations under CITES-** The Act provides for the Central government to designate a
  - **Management Authority**- The authority grants export or import permits for trade of specimens,
  - **Scientific Authority**- The authority gives advice on aspects related to impact on the survival of the specimens being traded
- **Invasive alien species**- The Act empowers the Central government to regulate or prohibit the import, trade, possession or proliferation of invasive alien species.
- **Control of sanctuaries-** The Act entrusts the *Chief Wild Life Warden* to control, manage and maintain all sanctuaries in a state. They are appointed by respective *State government.*

Invasive alien species refers to plant or animal species which are not native to India and whose introduction may adversely impact wild life or its habitat.

- **Surrender of captive animals**- It provides for any person to voluntarily surrender any captive animals or animal products to the *Chief Wild Life Warden.*
  - *No compensation* will be paid to the person for surrendering such items.
  - The surrendered items become *property of the State* government.
- **Special areas**- For sanctuaries falling under special areas, the management plan must be prepared after due consultation with the concerned *Gram Sabha.*
- **Conservation reserves**- The State governments may declare areas adjacent to national parks and sanctuaries as a conservation reserve, for protecting flora and fauna, and their habitat.
- It empowers the Central government to notify a conservation reserve.

Special areas include a Scheduled Area or areas where the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 is applicable.

***Scheduled Areas** - Economically backward areas with predominant tribal population, notified under the Fifth Schedule to the Constitution.*

5.5 New Community Forest Resource Guidelines

Ministry of Tribal Affairs has released new guidelines for conservation, management and sustainable use of community forest resource (CFR) but it is criticized as a move that disempowers Gram Sabhas.

- **Community forest resource (CFR) -** CFR is the common forest land that has been *traditionally protected and conserved for sustainable use* by a particular community.
- Each CFR area has a customary boundary with identifiable landmarks recognised by the community and its neighboring villages.
- It may include *forest of any category* such as revenue forest, classified & unclassified forest, deemed forest, reserve forest, protected forest, sanctuary and national parks etc.,

> ***Saxena committee*** *was formed in 2019 to prepare a draft for the CFR guidelines but, the draft of the guidelines was never accepted.*

Community Forest Resource Rights

- **Forest Rights Act, 2006-** It provides for recognition of the right to "protect, regenerate or conserve or manage" the community forest resource.
- **Section 5**- These rights allow the community to formulate rules for forest use by itself and others and thereby discharge its responsibilities
- **Community rights-** It is provided under FRA which include nistar rights and rights over non-timber forest products.
- **Significance**- Both CFR and community rights ensure sustainable livelihoods of the community.
- These rights give the authority to Gram Sabha to adopt local traditional practices of forest conservation and management within the community forest resource boundary.
- **New CFR guidelines-** The guidelines have provided for the formation of District Level Committee (DLC) that entrusts Gram Sabhas or the community about who has rights over forest resources.

Forest Rights Act (FRA) 2006

- FRA is also known as the *Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.*
- **Objectives-**
  - To undo the historical injustice occurred to the forest dwelling communities
  - To ensure land tenure, livelihood and food security of the forest dwelling Scheduled Tribes and other traditional forest dwellers
  - To strengthen the conservation regime of the forests by including the responsibilities and authority on Forest Rights holders for sustainable use, conservation of biodiversity and maintenance of ecological balance.
- **Individual rights**- Self-cultivation and Habitation
- **Community Rights**- Grazing, Fishing and access to Water bodies in forests, Intellectual property and traditional knowledge
- **Habitat Rights**- It is provided for Particularly Vulnerable Tribal Groups (PVTGs),
  - Traditional seasonal resource access of nomadic and pastoral community,
  - Access to biodiversity,
  - Recognition of traditional customary rights
- **Sustainable use-** The right to protect, regenerate or conserve or manage any community forest resource for sustainable use.
- **Development purpose**- It also provides rights to allocation of forest land for developmental purposes to fulfil basic infrastructural needs of the community.
- **Rehabilitation-** It is in conjunction with the *Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Settlement Act, 2013*
- **Gram Sabha-** It is the highly empowered body under the Act, enabling the tribal population to have a decisive say in the determination of local policies and schemes impacting them.

5.6 Legality of possessing wildlife articles

Big Boss Kannada contestant has been recently arrested for allegedly wearing a tiger claw pendant.

- Under the ***Wildlife Protection Act of 1972,*** killing wild animals and selling or *possessing animal articles* such as their claws, skin or horns is a ***criminal offence.***
- Animal articles or animal trophy refers to any artefact which is made with a part or a whole of a wild animal listed under the *Wildlife Protection Act of 1972.*
- **Ownership certificate** - It provides custodianship of animal artefact and neither grants absolute ownership nor gives the right to gift, buy or sell a wildlife article.

> ***Taxidermy*** *- The art of preserving an animal's body by mounting or stuffing, for the purpose of display or study*

- Ownership certificate will be issued by the ***Chief Wildlife Wardens*** of each state.
- The transportation of the possessed material from one location to another requires permission from the Chief Wildlife Warden.
- Legal possession of an animal article is allowed only in the following ways that too with a mandatory ownership certificate:
    - A person holding *custody before the enactment* of the 1972 law
    - If article is *declared during the moratorium* given by various State Governments
    - If a person *inherited* the article from a blood relative or spouse.
- **Inheritance rights -** A husband who has an article and an ownership certificate cannot gift it to his wife while he is alive, but she can *inherit it after his death*.

5.7 Green Credit Programme (GCP)

The Union Ministry of Environment, Forests and Climate Change has notified draft rules for 'Green Credit Programme'.

- Green credit is a singular unit of an incentive provided for a specified activity, delivering a positive impact on the environment.
- It can be earned by individuals, farmer-producer organisations (FPO), industries, rural and urban local bodies, among other stakeholders for their environment positive actions.
- **Programme** - The Green Credit Programme (GCP) launched, was first announced in the ***2023-24 budget*** under Mission LiFE.

Tree plantation	Water	Sustainable agriculture	Waste management
Air pollution reduction	Eco mark	Mangrove conservation & restoration	Sustainable building and infrastructure

8 sectors for Green Credit

- The Ministry of Environment issued the draft '*Green Credit Programme Implementation Rules 2023*' under the Environment Protection Act of 1986.
- **Trade Market -** The green credits will be tradable and be made available for trading on a domestic market platform.
- The Trading Service Provider accredited by the GCP administrator will establish the trading platform for the exchange of Green Credit Certificates.
- **Implementation -** A steering committee headed by the environment secretary.
- It also approves its rules and regulations and make recommendations to the central government for issuance of Green Credit Certificate.
- The steering committee will not only approve procedures for institutionalising the GCP.
- **Administrator -** The Indian Council of Forestry Research and Education (ICFRE)
- The institute will develop guidelines, processes and procedures for implementation of the programme.

5.8 Green Deposits

RBI has unveiled a framework for banks and NBFCs to accept green deposits that are meant for investing in eco-friendly climate projects.

- A green deposit is a fixed-term deposit for investors looking to invest their surplus cash reserves in *environmentally friendly projects.*
- It indicates the increased awareness of the importance of *ESG (Environmental, social and governance)* and sustainable investing.
- Many lenders like HSBC and HDFC have launched green deposits in India *for corporates as well as individuals.*
- Common themes for green deposits are renewable energy, clean transportation, pollution prevention and control, green building, sustainable water, wastewater management, and others.

Green deposits vs Normal deposits

- **Projects** - Normal deposits cannot be allocated for specific projects, whereas green deposits are carved out specifically towards green financing.
- **Interest rate on green deposits** – It is at the prerogative of the lender and currently the rates on these deposits aren't significantly different from regular deposits.

RBI framework

- **Deposits** - As per the RBI framework, banks will offer the deposits as cumulative/ non-cumulative deposits.
- On maturity, the green deposits would be renewed or withdrawn at the choice of the depositor.
- The green deposits shall be denominated in **rupees only**.
- **Application** - The framework applies to all scheduled commercial banks and small finance banks (except for regional rural banks and local area banks) and non-banking finance companies (including housing finance companies).
- **Investors -** Both corporate and individual customers can invest in green deposits.
- Banks and NBFCs shall put in place a comprehensive board-approved policy on green deposits, and a copy of the policy shall also be made available on their websites.
- **Sectors eligible to receive green deposits** – The sustainable and eligible sectors include renewable energy, waste management, clean transportation, energy efficiency, and afforestation.
- Banks will be barred from investing green deposits in business projects involving fossil fuels, nuclear power, tobacco, etc.
- **Review** - The allocation of funds raised through green deposits during a financial year shall be subject to an independent Third-Party Verification (TPV) on an annual basis.
- **Impact assessment by lenders** - Lenders must annually assess the impact associated with the funds lent for or invested in green finance activities and submit a review report before their Board.
- **Penalty -** There are no penal provisions when the bank doesn't utilise the deposits.

5.9 Indian Forest & Wood Certification Scheme

India have launched its 1st Indian Food and Wood certification scheme.

- **Launched by** – MoEFCC
- **Aim** – To offer ***voluntary 3rd party certification*** to promote sustainable forest management and agroforestry in the country.
- To ***incentivise entities*** like State forest departments, individual farmers, or Farmer Producer Organizations, farm forestry and other wood-based industries in the value chain.
- **Certification Types**
  - Forest management (FM) certification
  - Tree outside forest management certification
  - Chain of custody (CoC) certification
- **Overseen by** – Indian Forest and Wood Certification Council.

Forest Management certification is based on the Indian Forest Management Standard, an integral part of the National Working Plan Code 2023 which consists of 8 criteria, 69 indicators and 254 verifiers.

- **Operating agency** – Indian Institute of Forest Management in Bhopal, responsible for overall management.
- The National Accreditation Board for Certification Bodies under the Quality Council of India (QCI) will accredit the certification bodies.
- **Certification bodies** – It will carry out independent audits and assess entities on their adherence to the prescribed standards.

Indian Forest and Wood Certification Council

- It will act as a multi-stakeholder advisory body.
- **Composition** – Representatives from Indian Council of Forestry Research and Education, FSI, QCI, IIFM, Union Ministry (Agriculture and Commerce), State Forest Departments, Forest Development Corporations and Wood-based industries

Forest certification *seeks to authenticate the origin, legality, and sustainability of forest-based products.*

Chain of custody (CoC) certification *is meant to guarantee the traceability of a forest product like timber throughout the supply chain from origin to market.*

5.10 Environmental Information, Awareness, Capacity Building and Livelihood Programme (EIACP)

The Ministry of Environment, Forest and Climate Change (MoEF&CC), envisages to celebrate the World Environment Day 2023 with a thrust on the Mission LiFE.

- The Environmental Information System (ENVIS) came into existence as a plan programme in 1983.
- ENVIS has been subsumed within the revamped scheme of Environment Education, Awareness, Research and Skill Development.
- ENVIS is renamed as EIACP (Environmental Information, Awareness, Capacity Building and Livelihood Programme).
- EIACP serves as a one stop platform for dissemination of environmental information, policy formulation on environment and facilitation of alternate livelihoods through green skilling.
- The programme is one of the Central Sector sub-scheme being implemented in alignment with Mission LiFE.
- EIACP Hub on Status of Environment Related Issues is hosted by the Indian State Level Basic Environmental Information Database (ISBEID).
- The ISBEID is a centralised database maintained by the Ministry of Environment, Forest and Climate Change, 5Government of India for all the States.
- EIACP conducts Environmental Awareness Programs to School Children, Colleges and Universities on Environmental Important Days like, World Environment Day, World Earth Day, etc.

5.11 Accredited Compensatory Afforestation (ACA) Program

The success of the Jamuna Open Cast Project (OCP) in Madhya Pradesh exemplified the success of Accredited Compensatory Afforestation (ACA) Program.

Compensatory afforestation is a program to ensure that the forest land diversion to non-forest purposes shall be accompanied by afforestation on an equal area of land, a ***legal requirement*** *under the Compensatory Afforestation Fund Act of 2016.*

- A proactive afforestation program proposed in accordance with ***Forest (Conservation) Rules, 2022***.
- **Initiated by** – Union Ministry of Coal
- **Objective** – To **obtain prior approval** under section 2 (ii) of the Forest (Conservation) Act 1980 for raising of advance afforestation over non-forest land.
- To minimize the ecological footprints of coal mining and a commitment to sustainable coal mining practices.
- **Benefits** – It will prevent delays due to fund flow or administrative/technical procedures and will open a new area for investment in the forest sector.
- It will expedite afforestation works and encourage afforestation over fallow lands, thereby increase the total carbon sequestered.

- **Significance** – Sets a precedent by demonstrating that economic activities can coexist with environmental preservation.
- It ensures that land, once utilized for coal mining can become a green haven to restore biodiversity and also aligns with the larger environmental conservation objectives.

5.12 Resource Efficiency Circular Economy Industry Coalition (RECEIC)

The Resource Efficiency and Circular Economy Industry Coalition (RECEIC) was launched by Union Minister for Environment, Forest and Climate Change.

- Resource Efficiency Circular Economy Industry Coalition (RECEIC) is an industry-driven and a self-sustaining initiative which would continue to function beyond India's G20 presidency.
- RECEIC was launched on the sidelines of 4th G-20 Environment and Climate Sustainability Working Group meeting.
- **Aim -** It is aimed at promoting resource efficiency and circular economy practices globally.
- **Members -** 39 companies headquartered in 11 different countries have joined the coalition as its founding members.
- The MNCs pledged to adopt resource efficiency and circular economy principles to address environmental challenges rising from waste.
- **Headquarters of RECEIC -** Will be located at Federation of Indian Chambers of Commerce and Industry (FICCI) in New Delhi.
- **Functions -** It will enhance resource efficiency and accelerate circular economy transition.
- The coalition will facilitate knowledge-sharing, best practice sharing, and sustainable practices among the participating industries.

5.13 National Frameworks for Climate Services (NFCS)

Recently, a stakeholder consultation for establishing the National Framework for Climate Services in India (NFCS–India) was organized by the India Meteorological Department (IMD).

- **NFCS** – A mechanism for coordinating, facilitating and strengthening collaboration among national institutions
- **Aim** - To bring a seamless working platform to integrate users of climate information and services and mitigate climate risks.
- It is based on *Global Framework for Climate Services (GFCS).*
- **Activities -** To strengthen the observational network on land & seas.
- To improve the data inflow and eventually use it to run weather and climate models for deriving climate predictions.
- **Nodal Agency** – Indian Meteorological Department (IMD)
- NFCS-India will facilitate state and central government agencies to collaborate and complement their efforts for timely exchange of climate information tailored to decision making.

> *IMD, which is providing high-quality weather services for the country & its South Asian neighbours, enters 150th year of its establishment in 2023.*

Global Framework for Climate Services (GFCS)

- **Established** – In 2009 at the World Climate Conference-3, Geneva, organised by the WMO in collaboration with UNESCO, UNEP, FAO, the International Council for Science.
- **Vision** – To enable better management of the risks of climate variability and change, and adaptation to climate change.
- **Spearheaded by** – *World Meteorological Organization* (WMO).
- **Partnership** - Governments and Organisations at a global level.

Components	Priority areas
Observations and Monitoring	Water
Research, Modelling and Prediction	Energy
Climate Services Information System	Health
User Interface Platform	Disaster risk reduction
Capacity Building	Agriculture & food security

5.14 Compulsory Blending Obligation (CBO) of CBG

The National Biofuels Coordination Committee (NBCC) gave its nod to mandatory blending of compressed biogas (CBG) with compressed natural gas (CNG) and piped natural gas (PNG) from 2025-26.

- **Biogas** - It is an *energy-rich gas produced by anaerobic decomposition of biomass*.
- Sources Agriculture residue, cattle dung, sugarcane press mud, municipal solid waste, sewage treatment plant waste.
- It can be burnt directly as a fuel, or purified and upgraded by removing carbon dioxide, hydrogen sulfide, and then compressed to make compressed Biogas (CBG).

Sustainable Alternative Towards Affordable Transportation (SATAT) scheme was launched in 2018, under which 5,000 CBG plants were envisaged by 2023 to produce 15 million tonnes of CBG.

- **CBG** – It has ***more than 90% of methane***, which is similar to commercially available natural gas in composition and energy potential.
- **Compulsory blending obligation** – It will be 1 % of total CNG and domestic PNG consumption for FY26, 3 % for FY27, 4 % for FY28, 5 % blending from FY29
- **A Central Repository Body (CRB)** will be responsible for monitoring and implementing the blending mandate.

India's Gas Sector

- India is a major consumer of natural gas and depends on imports to meet around half of its requirement.
- It aims to increase the share of natural gas in the primary energy mix to 15% by 2030 from a little over 6% at present.

5.15 National Adaptation Fund for Climate Change

Despite India's focused approach to fighting the climate crisis, the National Adaptation Fund for Climate Change (NAFCC) sees drastic cut.

- The NAFCC was created in 2015 to fund the states in fighting this global challenge.
- **Aim -** To support concrete adaptation activities which mitigate the adverse effects of climate change.
- **Implementation -** NABARD is the National Implementing Entity (NIE).
- **Projects eligible for funding -** Adaptation projects in sectors such as agriculture, animal husbandry, water, forestry, tourism etc.
- **Eligibility -** The States/UTs are to be prepared the project proposal in consultation with NIE (NABARD) and to be approved by the State Steering Committee on Climate Change.
- **Funding -** Central Sector Scheme
- The grants under NAFCC released to different states and Union territories have drastically declined over the years.

5.16 IWIS and CITIS

Recently held 8th India Water Impact Summit (IWIS) & 1st Climate Investments and Technology Impact Summit (CITIS) were included in the G20 India events in 2023.

India Water Impact Summit (IWIS)

- **Launch** –***2012***, it evolved as an ***annual event*** since 2nd summit in 2017.
- **Objective** – To bring clarity to the scientific, technological, socio-cultural, legal, policy and governance issues ***pertaining to river basin management in India***.
- **Organised by**
  - **National Mission for Clean Ganga (NMCG)** – The implementation wing of National Ganga Council which was setup in 2016 under the River Ganga Authority order 2016 under the aegis of Ministry of Jal Shakti
  - **Centre for Ganga River Basin Management and Studies (cGanga)** – A think tank and a centre of excellence formed under the aegis of NMCG is headquartered at IIT Kanpur.
- **8th IWIS 2023 –** To unite various stakeholders to address challenges and opportunities in India's water sector.

- **Theme** – Development vis-à-vis Land, Water and Rivers.
- **Focus** - Samarth Ganga on lines of productive land and lifestyle for rivers.

Climate Investments and Technology Impact Summit (CITIS)

- **Objectives** – To bind potential investors with technology providers.
- To review, test and implement new technologies that will significantly improve India's river and land management scenario.
- To adopt suitable financing mechanisms.
- To collaborate within multiple sectors that are linked with climate, air, land, rivers and water management.

Global Coalition for River Science and Management - Platform for hosting the best practices for monitoring and managing different aspects of river systems around the world.

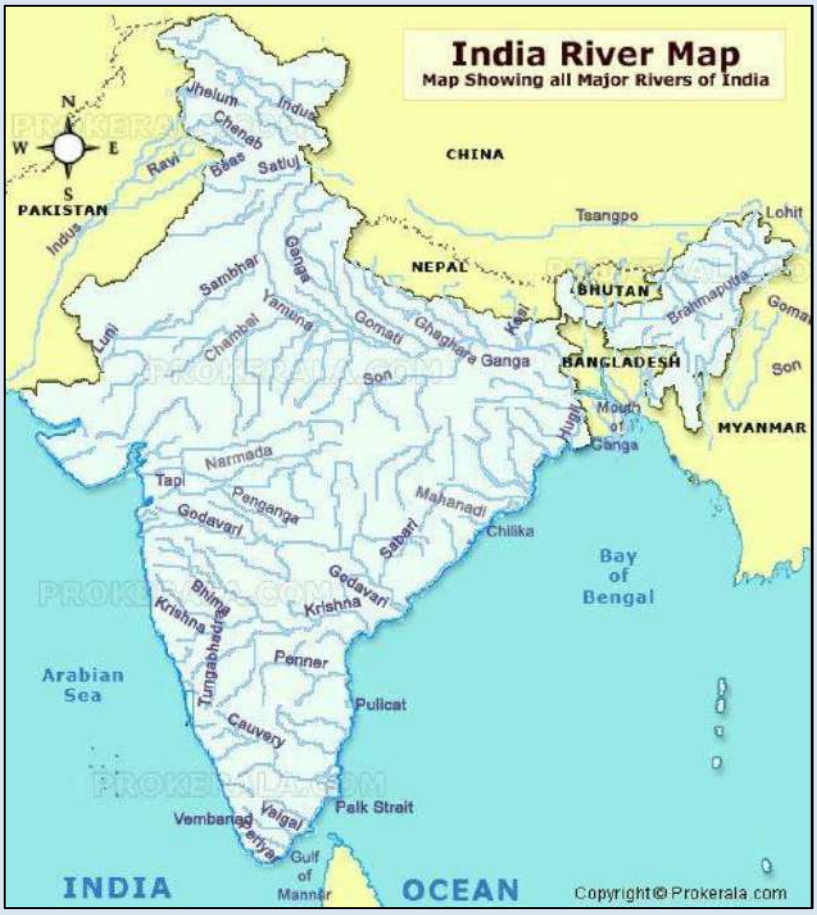
5.17 Cleaning our Rivers

As many of the Indian rivers are reported to be polluted, it is essential to ramp up the conservation initiatives.

Measures taken for Conservation of Rivers

Constitutional and Legal Provisions

- **Article 262**- It gives the power to the Union to establish and adjudicate the inter-state water disputes prevailing in the country.
- **Right to Clean Water**- It is interpreted by judiciary as a *Fundamental Right under Article 21.*
- **Water Prevention and Control of Pollution Act, 1974 -** It was enacted to prevent water pollution and cater to the maintenance of water bodies and carry out activities to promote restoration of water.
- It established two institutions to control water pollution
    - **Central Pollution Control Board (CPCB) -** It has implemented several charters aimed at water recycling and pollution prevention for industrial sectors such as textile, pulp and paper, sugar, etc.
    - **State Pollution Control Board (SPCB)**
- **Indian Penal Code**- Section 277 of IPC states that fouling of a public reservoir or a public spring voluntarily shall be liable to be punished with imprisonment of 3 months or with a fine of 500 rupees or both.



- **Water Prevention and Control of Pollution Cess Act, 2003-** It was enacted to levy and collect a cess on water consumed by certain types of industrial activities.
- **River Boards Act, 1956-** An Act to provide for the establishment of River Boards for the regulation and development of inter- State rivers and river valleys.

Schemes Introduced
• **National River Conservation Plan (NRCP)**- It is a Centrally Sponsored Scheme launched din 1995 for abatement of pollution in identified stretches of rivers in the country, excluding those in Ganga basin. • **National Mission for Clean Ganga (NMCG)**- Under the initiative of Namami Gange programme being implemented by NMCG, Integrated River Basin Management (IBRM) approach is being followed. • The mission also includes promotion of sustainable agriculture, river hazard management, basin protection against disasters, etc. • **Amrit Sarovar Mission**- It was launched in 2022 for developing and rejuvenating 75 water bodies in each district of the country. • **Mission Water Conservation**- It was launched to develop actionable framework for gainful utilization of funds. • **National Water Mission-** It is a component under *National Action Plan for Climate Change* which ensure integrated water resource management helping to conserve water, minimize wastage and ensure more equitable distribution both across and within states.

5.18 Conservation of Small Rivers

Government of India has taken steps for conservation of water and rejuvenation of small rivers.

Initiatives taken to conserve small rivers

- **Jal Shakti Abhiyan (JSA) –** It was launched in 2019 to promote water conservation and water resource management.
- **Five-fold intervention-**
  - Rainwater harvesting & water conservation
  - Enumerating, geo-tagging & making inventory of all water bodies;
  - Preparation of scientific plans for water conservation
  - Setting up Jal Shakti Kendras in all districts
  - Intensive afforestation
  - Awareness generation.

JSA Series	Theme	Focus
2023	Source Sustainability for Drinking Water	Special focus on 150 Water Stressed Districts (WSDs) of the country

- **Amrit Sarovar Mission**- It was launched in 2022, aimed at developing and rejuvenating 75 water bodies in each district of the country as a part of celebration of Azadi ka Amrit Mahotsav.
- **Namami Gange programme**-It was launched in 2014 for integrated rejuvenation of National River Ganga.
- Its tributaries and large numbers of smaller tributaries have been mapped along with their catchment area/ watershed and wetlands.
- A GIS based inventory of small rivers has also been created with additional district wise information.
- **National River Conservation Plan (NRCP)** – It is the Centrally Sponsored Scheme implemented for abatement of pollution in identified stretches of rivers in the country, excluding those in Ganga basin.
- It provides financial and technical assistance to the States/Union Territories (UTs) on cost sharing basis.
- **Small River Rejuvenation & Conservation plan**- In this, 19 rivers have been identified & successfully taken up by Uttar Pradesh government.
  - Example- River Manorama, River Varuna, River Tedi etc.,
- **Mission Water Conservation**- It is launched to develop actionable framework for gainful utilization of funds.
- It strives to ensure synergies in Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) etc.,
- **Mass awareness programs**- To promote water conservation initiatives including rain water harvesting and artificial recharge to ground water various.

- **National Water Awards**- It is constituted under Ministry of Jal Shakthi to recognize the efforts of people and organizations working in water conservation.
- **Weekly Water Heroes Contest**- The objective of the contest is to promote value of water, in general, and for supporting country-wide efforts on water conservation and sustainable development of water resources.

5.19 Dam Safety in India

Bhakra dam & other dams in the Sutlej basin were blamed for contributing to the flood in Himachal Pradesh in 2023.

- **Dam Safety Act 2021** – It aims to prevent dam failure related disasters and provide for institutional mechanisms for surveillance, inspection, operation and maintenance of the specified dams.
- **Central Water Commission (CWC)** - Provides technical expertise and guidance on matters related to dams.
- **Dam Rehabilitation and Improvement Project (DRIP)-** It was launched in 2012 with World Bank assistance to improve the safety and operational performance of selected dams, coupled with institutional strengthening through a system wide management approach.

Status of Dams in India

- India has the *3rd largest number of dams* in the world, after China and the USA.
- However, its per capita storage capacity is only *225 cubic meters*, far less than China's 1,200 cubic meters.

- **National Centre for Earthquake Safety of Dam** – Located in Malaviya National Institute of Technology (MNIT), Jaipur, Rajasthan, it is an initiative of Ministry of Jal Shakti towards effective implementation of Dam Safety Act 2021.
- **Efforts of States** - *Bihar* was the 1st State to enact the *Dam Safety Act in 2006.*

Water and water storage is a State subject

Key provisions of Dam Safety Act 2021

- **Applicability-** Applies to all specified dams in India with
  - height - more than 15 metres or
  - storage capacity - more than 1 million cubic metres or
  - pose potential hazards to human life, property or environment

National level	
Institution	**About**
National Committee on Dam Safety (NCDS)	To oversee dam safety policies and regulations
National Dam Safety Authority (NDSA)	To implement and enforce the provisions of the Act It is headed by the Chairman of the Central Water Commission (CWC) and provides secretarial assistance to NCDS
State level	
Institution	**About**
State Committee on Dam Safety (SCDS)	To assess potential implication of failure of a specified dam in the state on any downstream state, and coordinate mitigation measures
State Dam Safety Organisation (SDSO)	To carry out the functions assigned to them under the Act

- **Role of States-** The Act mandates that states shall classify the dam based on the hazard potential, conduct regular inspections, prepare an emergency action plan, establish an emergency flood warning system, and undertake safety reviews and periodic risk assessment studies.
- **Role of NDSA-** NDSA, the supreme body for dam safety has been entrusted to inspect any specified dam and issue directions for proper maintenance and operation of the dam.

- **Emergency response-** It is the obligation of dam owner to
  - Prevent the development of harmful situations
  - Issue warnings
  - Limit the damage and adverse consequences
- **Fund-** The Act provides for the establishment of a *National Dam Safety Fund and a State Dam Safety Fund* for financing the activities related to dam safety.
- **Penalty**- Offences are punishable with imprisonment up to 2 years or fine up to 1 crore rupees or both.

CWC Guidelines on Hazard Classification of Dams

- It is based on 4 major categories
  - Class I- Capital value of the project
  - Class II- Potential for loss of life
  - Class III- Potential for property damage
  - Class IV- Potential for environmental & cultural impact
- Class IV - The most vulnerable and hazard-prone

5.20 Artificial Reef (AR)

Department of Fisheries is promoting Artificial Reef (AR) under Pradhan Mantri Matsya Sampada Yojana (PMMSY) for rejuvenating coastal fisheries.

- An artificial reef is a manmade structure that may mimic some of the characteristics of a natural reef.
- **Aim** - To restore coral reefs around the globe.
- **Made of -** They are made from a variety of natural or synthetic materials, and come in an infinite number of shapes and styles.
- **Goal -** To provide a stable growing area for corals, and habitat for fishes and all the other organisms that would find on a natural reef.
- **Initiative -** Department of Fisheries has sanctioned 732 artificial reef units for *10 coastal states* as a sub-activity under Integrated Modern Coastal Fishing Villages of the PMMSY.
- **Funding -** 60% funding from the Centre and 40% from the State governments.
- **Implemented by -** Fishery Survey of India (FSI) and ICAR-Central Marine Fisheries Research Institute (CMFRI).

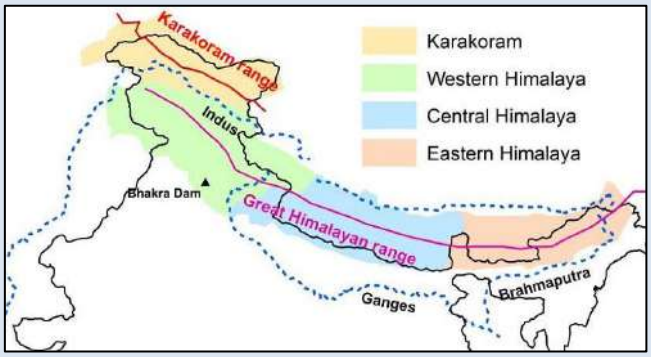
Pradhan Mantri Matsya Sampada Yojana promotes blue revolution through sustainable and responsible development of fisheries sector.

5.21 EIA in Indian Himalayan Region

Recent Teesta dam breach in Sikkim and the flood and landslides in Himachal Pradesh are stark reminders for the need for a different set of environmental standards and clearances in Indian Himalayan Region.

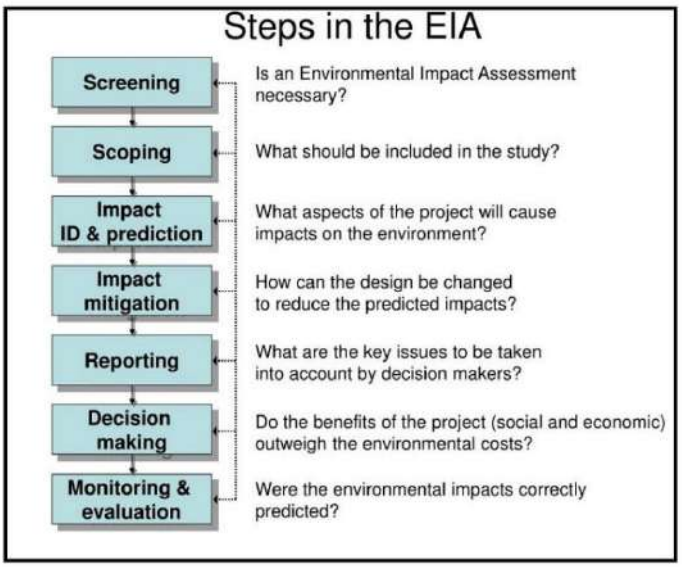
Significance of Indian Himalayan Region (IHR)

- The Himalayas, geologically young and structurally fold mountains run in a west-east direction from the Indus to the Brahmaputra.
- Their name translates from Sanskrit as "abode of the snow", with the highest concentration of glaciers outside the Polar Regions.
- **Coverage**- 13 states and Union Territories
  - States- Himachal Pradesh, Uttarakhand, Sikkim, West Bengal, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, Assam, and Arunachal Pradesh.
  - Union Territories- Ladakh, Jammu & Kashmir

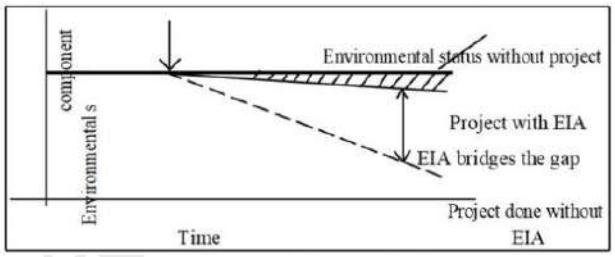


- **Water tower of Asia-** The region is responsible for providing water to a large part of the Indian subcontinent and contains various flora and fauna.
- **Third pole-** IHR is the part of *Hindu Kush-Karakoram-Himalayan system (HKKH),* a mountainous region west and south of the Tibetan Plateau.

Environment Impact Assessment (EIA)

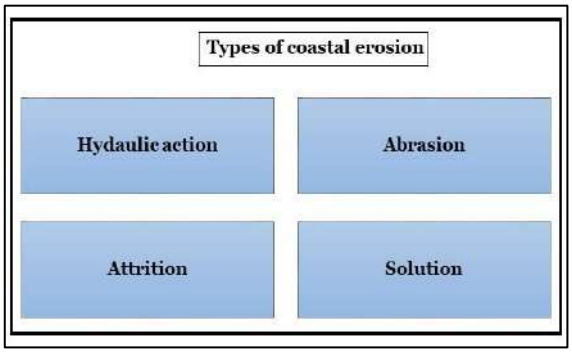


- The United Nations Environment Program (UNEP) defines EIA as a tool used to identify the environmental, social and economic impacts of a project prior to decision-making.
- It compares various alternatives for the proposed project and analyses all possible environmental repercussions in various scenarios
- **Evolution in India** - In 1978 with respect to river valley projects.
- The EIA in India is statutorily backed by the **Environment Protection Act, 1986.**
- In 2006, State governments were also given powers to issue EC in certain cases.
- Only projects enumerated in the schedule attached to the notification require prior EC.
- **Categorisation-** The projects categorised into mining, extraction of natural resources and power generation and physical infrastructure.
- **2020 draft**- MoEFCC introduced a draft EIA in 2020 for public comments which created a controversy as it was perceived to be pro industry and compromising the ecological concerns.



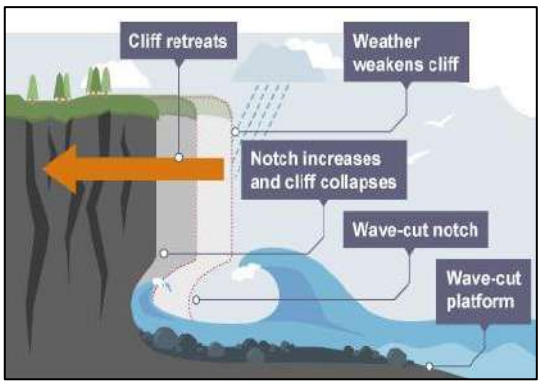
5.22 Coastline Erosion

Recently, Union Minister cited that over one-third of India's coastline is vulnerable to erosion as per the study of National Centre for Coastal Research.



- **Shoreline retreat**- It is the loss of coastal lands due to the net removal of sediments or bedrock from the shoreline.
- **Hydraulic action -** This type of erosion is more effective in areas where the rock has many cracks or joints, such as limestone or chalk.
- It can also create features such as blowholes, geysers, and sea caves.
- **Abrasion-** It is also known as corrosion or sandpapering. It can create smooth and polished surfaces on the rock, such as wave-cut platforms.
- It can also erode softer rocks faster than harder ones, creating differential erosion2.
- **Attrition-** This type reduces the size and shape of the rock fragments carried by the waves.
- It can also increase the efficiency of abrasion, as smaller and rounder particles can act as more effective tools for erosion.
- **Solution-** It is also known as corrosion or dissolution. It depends on the chemical composition of the rock and the water.
- Some rocks, such as limestone and chalk, are more soluble than others, such as granite and basalt.
- It can create features such as karst landscapes, sinkholes, and stalactites.
- **Factors causing coastal erosion -** Waves, Sea level rise, Sediment loss, Human interference

Goa & Maharashtra have the most stable coastlines in India.



India's initiatives for coastal management

Indian coast is about 7500 km long and characterized by varied landforms and ecosystems.

- **Integrated Coastal Zone Management (ICZM)**- It is a study and a planning initiative under *World Bank*, with the first phase for Enhancing Coastal Ocean Resource Efficiency (ENCORE)
- **Society of Integrated Coastal Management-** It launches the ICZM under four components - National Coastal Management Program, ICZM- West Bengal, ICZM- Orissa, ICZM- Gujarat
- **National Centre for Sustainable Coastal Management**- It is set up in Chennai to undertake studies and research in the area of Coastal Zone Management including coastal resources and environment.
- **National Action Plan on Climate Change**- It outlines a strategy that aims to enable the country to adapt to climate change and enhance the ecological sustainability of our development path.
- **Coastal Regulation Zone**- It is notified by the Ministry of Environment under the ambit of Environment Protection Act 1986, sets guidelines to strike balance between economic growth and environmental conservation.

National Centre for Coastal Research (NCCR)

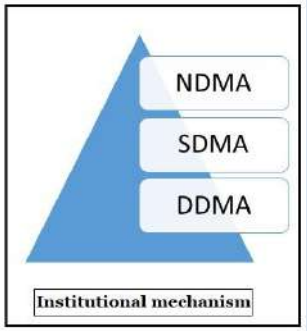
- **Ministry** - Ministry of Earth Sciences
- **Origin** - In 1998, the Project Directorate 'Integrated Coastal and Marine Area Management (ICMAM-PD)' was developed in Chennai.
- In 2018, ICMAM-PD was designated as the NCCR.
- **Objective**-
  - To develop and improve the country's capabilities in addressing the problems prevailing in the coastal zone.
  - To offer scientific and technical support to coastal communities for integrated and sustainable use of resources
- **Multi-disciplinary research**-Marine Pollutions, Coastal processes and Hazards, Coastal Habitats and Ecosystem and Capacity Building and Training.
- **Technical support**- It provides support to the coastal states and stakeholders for sustainable coastal management.

5.23 National Disaster Status

Himachal Pradesh Chief Minister has requested Prime Minister to declare the destruction caused by heavy rains in the State as a national disaster.

Assistance for States during natural disaster

- **Disaster Management Act 2005**- It defines a "disaster" as "a catastrophe, mishap, calamity or grave occurrence in any area, arising from *natural or manmade causes*, or by accident or negligence which results in substantial loss of life, property or damage to environment, and is of such a nature or magnitude as to be *beyond the coping capacity of the community* of the affected area".
- **Disaster Management**- India envisions the development of an ethos of Prevention, Mitigation, Preparedness and Response.
- **National Disaster Response Force**- It has several battalions or teams, which are responsible for on-ground relief and rescue work in several states.

Institutional Mechanism	Authority	Head
	National Disaster Management Authority (NDMA)	Prime Minister
	State Disaster Management Authority (SDMA)	Respective Chief Ministers
	District Disaster Management Authority (DDMA)	Either District Magistrate or District Collector

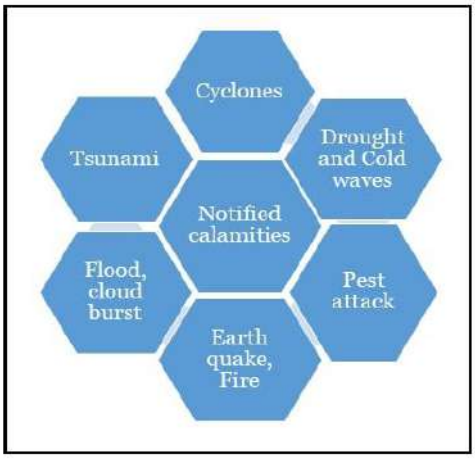
Disaster Response Fund

- **Fund mechanism-** The funds for the NDRF and SDRFs are allocated by the Government as a part of budgetary allocations.
  - **NDRF**- National Disaster Response Fund is mentioned in the Disaster Management Act 2005.
  - **SDRFs**- State Disaster Response Fund are the primary funds available to State governments to be used *only for providing immediate relief to the victims* of notified calamities.

- **Role of Finance Commission**- Funds for immediate relief are recommended by the Finance Commission (FC).
    - The 15th FC adopted a new methodology for state-wise allocations, based on factors like past expenditure, risk exposure hazard and vulnerability of states.
- **Fund contribution**- The Central Government contributes *75%* to the SDRF in general States and *90%* in North Eastern and Himalayan States.
- Annually, it is released in *2 equal instalments*.
- **Primary responsibility**- The *State government* is primarily responsible for undertaking rescue, relief and rehabilitation measures in the event of a disaster.
- **Severe calamity**- If the fund requirement for relief operation is beyond the funds available in SDRF account, additional central assistance is provided from NDRF.

Severe calamity

- A calamity is declared to be of "rare severity"/"severe nature" based on undefined criteria, but factors such as the intensity and magnitude of the calamity, level of assistance needed, etc. are looked at.
- **Classification-** The *State government* needs to submit a memorandum indicating the sector-wise damage caused by a disaster and its requirement of funds.
- An *inter-ministerial central team* will assess the damage and requirement of funds and submit its report.
- A *high level committee* must approve the quantum of immediate relief to be released from NDRF.
- The *Disaster Management Division of the Ministry of Home Affairs* will then provide support and monitor the utilisation of funds.



- **Benefits of such a declaration**-
    - **Calamity Relief Fund (CRF)**- The CRF is set up, with the corpus shared *3:1* between Centre and state.
    - **National Calamity Contingency Fund (NCCF)-** When resources in the CRF are inadequate, additional assistance is considered from this fund, *funded 100% by the Centre.*
    - **Cocessional loans**- The relief in repayment of loans or for grant of fresh loans to the persons affected on concessional terms, too, are considered once a calamity is declared "severe".

5.24 Community-based initiative for Hornbills

A community-based conservation initiative, involving the Kadar tribal community, has restored the dwindling hornbill population.

- **Initiative -** The Hornbill nest tree monitoring programme was started in 2005 to address the declining hornbill population and restore their vanishing nesting habitat
- It involved the Kadars, an indigenous community, in the Vazhachal forest division, Kerala.
- The programme had technical support of the Western Ghats Hornbill Foundation for the conservation processes.
- The Athirappilly - Vazhachal areas is the only location where all the four south Indian species of hornbills are seen.
    1. The Great Hornbill (State bird of Kerala)
    2. Malabar Pied Hornbill
    3. Malabar Grey Hornbill
    4. Indian Grey Hornbill

Kadar Tribal Community

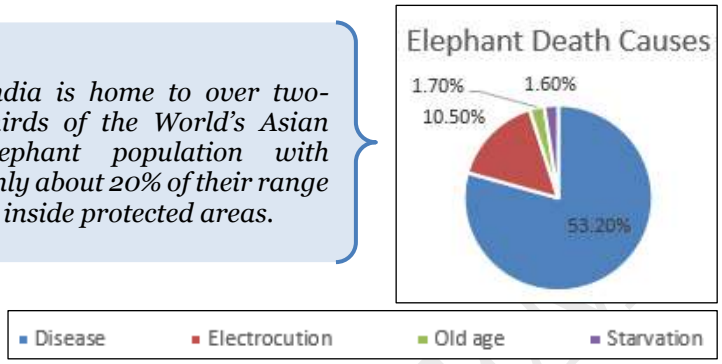
- Kadar, small tribe of southern India residing along the hilly border between Cochin in Kerala and Coimbatore in Tamil Nadu.
- Kadar live in the forests and do not practice agriculture.
- They are specialized collectors of honey, wax, sago, cardamom, ginger.

5.25 Elephant Death Audit Framework (EDAF)

According to the recent Elephant Death Audit Framework, electrocution major cause of elephant deaths in Tamil Nadu.

- **Initiative by** – State of Tamil Nadu, the *1st of its kind initiative in the country*.
- **Objectives** – Prescribe a Systematic Standard Protocol (SSP) for conducting post-mortem to determine cause of death.
- Formulate remedial measures for prevention of unnatural and preventive deaths by conducting periodical death audits and monitoring this over time.

India is home to over two-thirds of the World's Asian elephant population with only about 20% of their range is inside protected areas.



5.26 Carbon Border Adjustment Mechanism (CBAM)

The talks on the Carbon Border Adjustment Mechanism (CBAM) at the WTO's dispute settlement body has brought to the forefront the inter-linkages between trade and the environment.

- The Carbon Border Adjustment Mechanism (CBAM) is an initiative of *European Union (EU)* to prevent carbon leakage from extremely carbon intensive imports.
- Under CBAM, *duties will be imposed* on imported goods based on the carbon expended in producing them.
- Under the CBAM, imports of certain carbon-intensive products, will have to bear the same economic costs borne by EU producers under the ETS.
    - Cement, electricity,iron & steel, fertilizers, aluminium, and hydrogen are few carbon-intensive sectors to be covered under CBAM.
- The price to be paid will be linked to the *weekly average of the emissions* priced under the ETS.
- However, where a carbon price has been explicitly paid for the imported products in their country of origin, a reduction can be claimed.
- India has criticized CBAM as being *protectionist and discriminatory* policy.

To know more about India's Concerns on CBAM, Click here.

5.27 Silvopasture Systems

In light of the global deterioration of natural resources and forests, silvopasture systems offer a relevant solution to deforestation trends.

- Silvopasture is an ancient and proven practice that harmoniously integrates *trees, forage and livestock on the same land.*
- **Deforestation** – Silvopasture can play a vital role in reversing the negative trend of deforestation for pasture land.
- **Carbon Sinks** – The trees on silvopasture lands act as natural carbon sinks, sequestering significantly five-10 times more carbon then pastures without trees.
- **Climate conditions** – Silvopasture systems also regulate local climatic conditions, buffering against temperature and wind extremes, providing a favorable living environment for livestock.
- **Nutrition cycle** – The extensive root systems of trees within silvopasture plots contribute to nutrient cycling, improved soil stability and quality, while effectively combating erosion.
- **Soil infiltration rates** – Soil infiltration rates in silvopasture systems surpass those of open pastures, enhancing water storage potential.

5.28 Radio collar

Recently, in Kuno Palpur national park 3 cheetahs have died and serious infection in another 6 animals have been attributed to injuries, possibly caused by ticks festering under their radio collars.

- Radio Collars are basically radio transmitters (which transmits light waves in the range of radio frequency (RF) waves), that can be used to detect the movement of a person or an animal.
- The collar consists a multiplicity of radio signal receivers each having a receiving antenna.
- The system transmitter continuously transmits a RF signal and a mobile receiver assembly mounted in the collar unit on the person/animal.
- The receiver assembly receives the RF signal and measures the intensity of the received signal.
- The transmitter emits a signal at a specific frequency that can be tracked from ***up to 5 kms*** away.

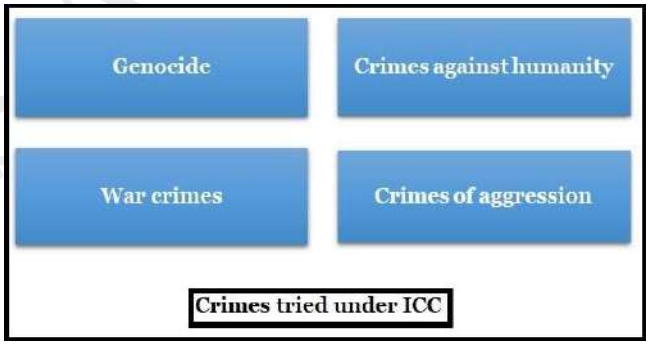
5.29 Ecocide

Recently, the Tribunal for the Rights of Nature said Mexico's Maya train project has caused "crimes of ecocide and ethnocide".

- Ecocide is defined as "extensive loss, damage or destruction of ecosystems such that the peaceful enjoyment by the inhabitants has been or will be severely diminished."
- "Inhabitants" here applies to all living creatures, not limiting crime to an anthropogenic legal view.
- **Destruction**- It destroys environment which include
    - Deforestation
    - Illegal sand mining
    - Polluting rivers with untreated sewage etc.,
    - Port expansion projects that destroy fragile marine life and local livelihoods

Ecocide, derived from Greek and Latin, translates to 'killing one's home' or 'environment'

- **Crime-** In 1970, Biologist *Arthur Galston* is credited be the first to link environmental destruction with genocide, which is recognised as an international crime.
- It referred to the use of U.S. military's use of ***Agent Orange*** (a herbicide) during the Vietnam War.
- **1972-** Swedish Prime Minister Olof Palme, used the term in a speech at the United Nations, warning that unchecked industrialisation could cause irreversible damage to the environment.



- **2010-** British lawyer Polly Higgins urged the United Nations' International Criminal Court (ICC) to recognise ecocide as an international crime.
- **ICC-** At present *Rome Statute of the ICC* deals with *4 atrocities.*
- **War crime provision** is the *only statute* that can hold a perpetrator responsible for environmental damage.

5.30 Rat Hole Mining

Rat hole mining is being done to rescue the workers in collapsed Silkyara-Barkot tunnel in Uttarakhand.

- **Rat hole** – It refers to the narrow pits dug into the ground, typically just large enough ***for 1 person*** to descend using ropes or bamboo ladders to reach the coal seams.
- **Rat hole mining** – It is a ***method of extracting coal*** from narrow, horizontal seams, typically around 3-4 feet depth.
- They are prevalent in ***Meghalaya*** due to challenging terrain and the coal seam here are very thin (less than 2 m) in most cases.
- **Types** – There are 2 types of rat hole mining.
    - **Side cutting** – Narrow tunnels are excavated into the hill slopes and workers enter these openings to locate the coal seam.
    - **Box cutting** – Rectangular openings are created, ranging in size from 10 to 100 square metres
- **Issues -** They lack safety measures such as proper ventilation, structural support, or safety gear for the workers.

- The mining process can cause land degradation, deforestation, and water pollution.
- **Ban** - The National Green Tribunal (NGT) has *banned rat-hole mining in **2014*** citing concerns about its unscientific nature and the safety risks posed to the workers.
- However, in 2019, the Supreme Court set aside the NGT ban and allowed coal mining in Meghalaya through scientific mining methods.

5.31 Operation Kachchhap

Directorate of Revenue Intelligence (DRI) saves 955 live Gangetic turtles in a crackdown on illegal wildlife trade in multicity Operation Kachchhap.

- **Operation Kachchhap -** This operation is part of a series of determined efforts by the DRI to combat illegal wildlife trafficking and preserve the environment.
- **Rescued turtles -** Indian Tent Turtle, Indian Flapshell Turtle, Crown River Turtle, Black spotted/Pond Turtle and Brown Roofed Turtle.

5.32 Ban on Manjha threads

- Manjha threads refers to kite flying threads made of nylon, plastic or any other synthetic material which causes severe injury or even death of people and animals.
- The contravention of the ban shall be penalized under provisions of the Environment (Protection) Act, 1986.
- The National Green Tribunal in 2017 had imposed a total ban on Manjha threads and other synthetic threads.

5.33 Conocarpus Plant

The Gujarat government has banned the planting of ornamental Conocarpus trees in "forest or non-forest areas" citing adverse impacts.

- **Characteristics** - Conocarpus is a fast-growing *exotic mangrove* species.
- **Native** - It is native to tropical regions, mostly in parts of North & South America as well as Africa.
- **Usage in India** - For *landscaping of road medians* and in public gardens.
- **Effect on Humans** - It *flowers in winter* and spread pollen in nearby areas, thus causing diseases like cold, cough, asthma, allergy etc.
- **Effect on Infrastructure** - Roots of this species go deep inside the soil and damages telecommunication lines and drainage lines.
- **Effect on Environment** - Damages the freshwater systems and unpalatable to plant-eating animals.

Earlier, Telangana had banned the plantation of Conocarpus plants

Other banned Species	
Vilayati Kikar (Prosopis juliflora) in New Delhi	• It was brought in by the British during 1930s. • **Significance** – It grows fast even in arid conditions and quickly *increases the green cover*, and can also be used as *firewood*. • **Impact**– It destroys the *native trees* like acacia, dhak, kadamb, amaltas, flame-of-the-forest, etc. • Birds, butterflies, leopards, porcupines and jackals were also disappeared along with the trees. • It also *depletes the water table* of the area it is planted in.
Acacia & Eucalyptus in Kerala	• British introduced the Eucalyptus tree in Munnar, Kerala. • **Impact**- The foreign invasive plants had *reduced the availability of fodder* in forests, forcing animals to foray into settlements resulting in *man-animal conflict*.

5.34 Mithuns

Northeast's Mithun gets 'food animal' tag recently.

'Soulung' festival is observed annually by the Adi tribes of Arunachal Pradesh to commensurate the birth and arrival of mithun on this earth.

- It is a semi-domesticated ruminant (large group of herbivores with a 4-chambered stomach) species found in Arunachal Pradesh, Nagaland, Manipur and Mizoram.
- **Scientific name -** Bos frontalis. **Family –** Bovidae.
- **State Animal -** ***Arunachal Pradesh and Nagaland***.
- Since the soil in these parts is acidic and low in salt content, mithuns have an affinity for salt.
- **Recognized by -** ***Food Safety and Standards Authority of India (FSSAI)*** recognised the bovine as a 'food animal' to help tribal communities benefit commercially from the sale and processing of mithun meat.
- Food animals are those that are raised and used for food production or consumption by humans.
- **Other animals having food animal tag** - Himalayan yak.

5.35 Ghol fish

Ghol fish was declared as State fish of Gujarat owing to its economic value and its uniqueness.

Gujarat has a coastal belt of over 1600 km and contributes the largest share in fish production in the country.

- **Scientific name** – *Protonibea diacanthus.*
- It is also called as ***black-spotted croake***.
- **Habitat** –Indo-Pacific region (Persian Gulf to Pacific Ocean).
- In India, this fish is found mostly in Gujarat and Maharashtra.
- **Threat** – Pollution and relentless fishing have pushed its population to deep sea which makes it hard to catch.
- **Usage** – It has nutritional and medicinal properties.
    - It is used in *pharmaceutical and cosmetic industry.*
    - To make threads used for making *dissolvable surgery stitches*
    - Its air bladder is used in the *production of wine and beer*.
- **Fisherman's lottery** – It is also known as ***'Sea Gold'*** for its high market value.

5.36 Pink Bollworm

Recently, the Rajasthan government declared relief for farmers whose cotton crops have been affected due to pink bollworm infestations.

- *Pectinophora gossypiella* is a major pest of cotton that feeds on the seeds and destroy the fibers of cotton, reducing quality and crop yield.
- **Challenges** - Bt cotton which are toxic to the American bollworm has lost its efficacy against PBW.
- This is because PBW is a monophagous pest that feeds mainly on cotton unlike American bollworm that is polyphagous, with alternative hosts.

Control measures

- **Spraying insecticides** – Such as profenofos, chlorpyrifos, indoxacarb, and cypermethrin.
- **Mating disruption** – It involves deploying Gossyplure, a pheromone signalling chemical which attracts the male adult moths into lures and prevent from mating with females.
- The Central Insecticides Board & Registration Committee under the Agriculture Ministry has approved
    - **PBKnot** – It is a dispenser having a 20-cm hollow polyethylene pipe, into which Gossyplure is impregnated and gets released from over 90 days and reducing the scope for infestation.

- **SPLAT-PBW** - A flowable emulsion formulation technology for delivering Gossyplure.

- **Refuge crop** - To plant *non-Bt cotton as a refuge crop* on the sides of the Bt cotton field.
- This will delay the process of the PBW developing resistance and prolonged the life of Bt cotton.

5.37 National Transit Pass System (NTPS)

The Union Minister for Environment, Forest and Climate Change recently launched National Transit Pass System (NTPS) to facilitate the seamless transit of forest produce across the country.

- It is a ***One Nation-One Pass*** to facilitate the seamless transit of timber, bamboo and other forest produce across the country.
- The QR coded transit permits generated under NTPS will allow check gates across various states to verify the validity of the permits and allow seamless transit.

5.38 Rubber Board

- A statutory body constituted under the Rubber Act 1947, for the overall development of the rubber industry in the country. Head Office - ***Kottayam, Kerala.***
- The Rubber Board is under the administrative control of the ***Ministry of Commerce and Industry.***

Board	Ministry	Headquarters
Tobacco	Ministry of Commerce & Industry	Guntur, Andhra Pradesh
Coffee	Ministry of Commerce & Industry	Bengaluru, Karnataka
Tea	Ministry of Commerce & Industry	Kolkata, West Bengal
Spices	Ministry of Commerce & Industry	Kochi, Kerala
Rubber	Ministry of Commerce & Industry	Kottayam, Kerala
Turmeric	Ministry of Commerce & Industry	-------
Coconut	Ministry of Agriculture & Farmer's Welfare	Kochi, Kerala
Coir	Ministry of MSME	Kochi, Kerala
Silk	Ministry of Textiles	Bengaluru, Karnataka

6. PROTECTED AREAS

Protected Areas of India

- Protected areas - Human occupation or at least the exploitation of resources is limited and it includes
  1. National Parks
  2. Wildlife Sanctuaries
  3. Conservation Reserves
  4. Community Reserves
  5. Marine Protected Areas

1. National Park

- An area, whether within a sanctuary or not, can be notified by the state government.
- No human activity is permitted inside the national park except for the ones permitted by the Chief Wildlife Warden of the state.

2. Wildlife Sanctuaries

- Any area other than area comprised with any reserve forest or the territorial waters can be notified by the State Government to constitute as a sanctuary.
- Some restricted human activities are allowed inside the Sanctuary area.

3. Conservation reserves and Community reserves

- It was first introduced in the Wildlife (Protection) Amendment Act of 2002.
- They act as buffer zones to or connectors and migration corridors between established national parks, wildlife sanctuaries and protected areas.
- **Conservation Reserves** – Such migration corridors if uninhabited and completely owned by the Government of India but used for subsistence by communities are called Conservation reserves.
- **Community Reserves** – Such migration corridors if privately owned are called community reserves.

4. Marine Protected Areas

- A space in the ocean where human activities are more strictly regulated than the surrounding waters.
- These places are given special protections for natural or historic marine resources.

- Tiger Reserves - 55
- Elephant Reserves - 33
- Biosphere Reserves - 18
- World Network of Biosphere Reserves - 12
- RAMSAR Wetland Sites - 80
- World Heritage Sites
  - Natural World Heritage Sites - 7
  - Cultural World Heritage Sites - 34
  - Mixed World Heritage Sites - 1

Protected Areas of India	Numbers
National Parks	106
Wildlife Sanctuaries	573
Conservation Reserves	123
Community Reserves	220
Marine Protected Areas	129

List of national parks in India

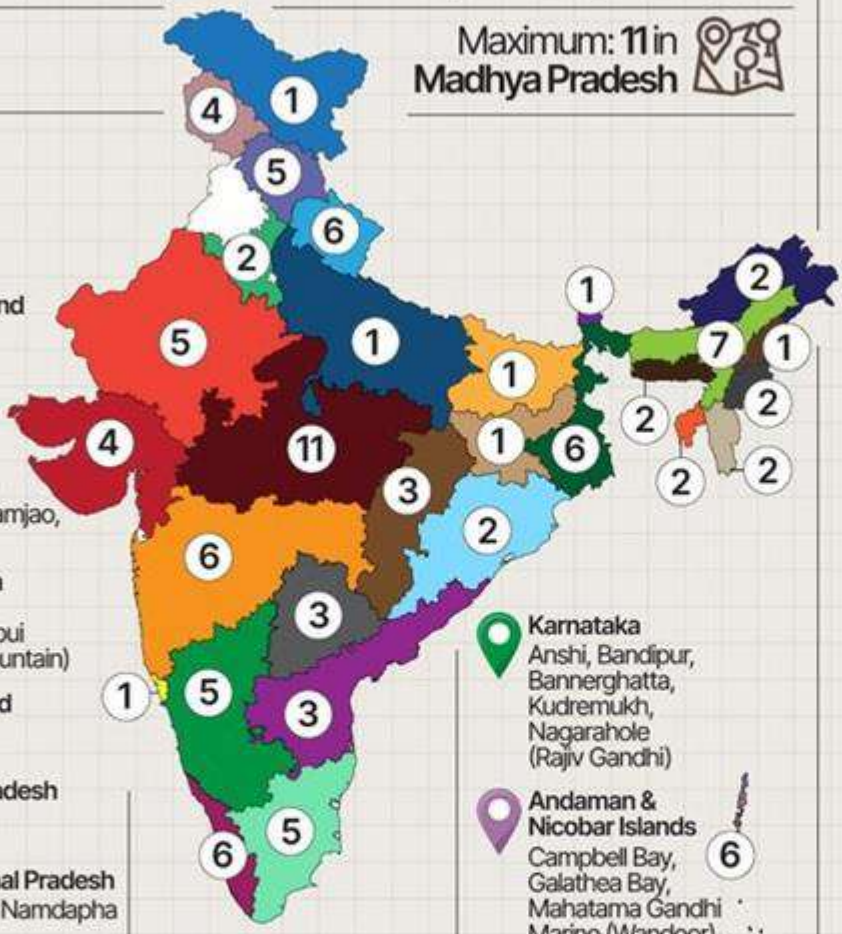
Total: 106 national parks

Coverage: 1.23% of country

Largest: Hemis, Ladakh 3,350km2

Oldest: Corbett

Maximum: 11 in Madhya Pradesh



Goa
Mollem

Jharkhand
Betla

Ladakh
Hemis

Manipur
Keibul-Lamjao, Shiroi

Mizoram
Murlen, Phawngpui (Blue Mountain)

Nagaland
Intanki

Uttar Pradesh
Dudhwa

Arunachal Pradesh
Mouling, Namdapha

Meghalaya
Balphakram, Nokrek Ridge

Bihar
Valmiki

Sikkim
Khangchendzonga

Haryana
Kalesar, Sultanpur

Orissa
Bhitarkanika, Simlipal

Uttarakhand
Corbett, Gangotri, Govind, Nanda Devi, Rajaji, Valley of Flowers

Gujarat
Blackbuck (Velavadar), Gir, Marine (Gulf of Kachchh), Vansda

Tripura
Clouded Leopard, Bison (Rajbari)

Jammu & Kashmir
City Forest (Salim Ali), Dachigam, Kazinag, Kishtwar High Altitute

Karnataka
Anshi, Bandipur, Bannerghatta, Kudremukh, Nagarahole (Rajiv Gandhi)

Andaman & Nicobar Islands
Campbell Bay, Galathea Bay, Mahatama Gandhi Marine (Wandoor), Mount Harriett, Rani Jhansi Marine, Saddle Peak

Madhya Pradesh
Bandhavgarh, Dinosaur Fossils, Fossil, Pench, Kanha, Kuno, Madhav, Panna, Sanjay, Satpura, Van Vihar

West Bengal
Buxa, Gorumara, Jaldapara, Neora Valley, Singalila, Sunderban

Chattisgarh
Guru Ghasidas (Sanjay), Indravati (Kutru), Kanger Valley

Telangana
Kasu Brahmananda Reddy, Mahaveer Harina Vanasthali, Mrugavani

Kerala
Anamudi Shola, Eravikulam, Mathikettan Shola, Pambadum Shola, Periyar, Silent Valley

Maharashtra
Chandoli, Gugamal, Nawegaon, Pench (Jawaharlal Nehru), Sanjay Gandhi (Borivili), Tadoba

Rajasthan
Desert, Keoladeo Ghana, Mukundra Hills, Ranthambhore, Sariska

Tamil Nadu
Guindy, Gulf of Mannar Marine, Indira Gandhi (Annamalai), Mudumalai, Mukurthi

Andhra Pradesh
Papikonda, Rajiv Gandhi (Rameswaram), Sri Venkateswara

Himachal Pradesh
Great Himalayan, Inderkilla, Khirganga, Pin Valley, Col. Sherjung Simbalbara

Assam
Dibru-Saikhowa, Dihing Patkai, Kaziranga, Manas, Nameri, Rajiv Gandhi (Orang), Raimona

Source: National Wildlife Database Centre, Wildlife Institute of India

Design: Angshuman Maity

No. of tiger reserves in India

Project Tiger began in 1973 at the Corbett national park.

Tiger reserves spread over 75,000 sq km area.

India has more than 3,000 Tigers in 55 tiger reserves.

India accounts for 70% of the world's wild tiger population.

Maharashtra
Melghat,
Tadobha Andhari
Pench, Sahyadri
Navegaon Nagzira,
Bor

Karnataka
Bandipur
Bhadra, Kali
Nagarhole
Biligiri Ranganatha
Temple

Rajasthan
Ranthambore
Sariska, Mukundara
Ramgarh Vishdhari

Odisha
Simlipal
Satkosia

West Bengal
Sunderban
Buxa

Uttarakhand
Corbett
Rajaji

Bihar
Valmiki

Assam
Manas, Nameri
Kaziranga
Orang

Uttar Pradesh
Dudhwa, Pilibhit,
Ranipur

Andhra Pradesh
Nagarjunsagar Sagar

Tamil Nadu
Kalakad Mundanthurai
Anamalai, Mudumalai
Sathyamangalam
Srivilliputhur Megamalai

Madhya Pradesh
Pench, Bandhavgarh
Panna, Satpura
Sanjay Dhubri, Kanha

Arunachal Pradesh
Namdapha
Pakke, Kamlang

Chattisgarh
Indravati, Udanti
Sitanadi, Achanakmar

Telangana
Kawal, Amrabad

Kerala
Periyar, Parambikulam

Jharkhand
Palamau

Mizoram
Dampa

Recent addition - Veerangana Durgavati Tiger Reserve of Madhya Pradesh and Dholpur – Karauli Tiger Reserve of Rajasthan

6.1 Protected Areas in news

Protected Areas in news	State	Features
Chinnar Wildlife Sanctuary	**Kerala**	*The tribal settlements in Chinnar Wildlife Sanctuary are reviving cultivation of millets and endemic crops through Punarjeevanam scheme.* • Chinnar WLS is home to the Great Grizzled Squirrel of India. • Punarjeevanam (revival or resurrection) scheme was launched in 2016 by Kerala Forest and Wildlife Department to revive farming of millets and endemic crops in the tribal settlements.
Kaliveli Bird Sanctuary	**Tamil Nadu**	*The Southern Bench of National Green Tribunal (NGT) withholds green nod granted for fishing harbours near Kaliveli bird sanctuary.* • **Species** – Home to migratory birds such as black-tailed godwits, Eurasian curlew, white stork, ruff and dunlin. • *Chilka is the largest brackish water lagoon in Asia.*
Shettihalli Wildlife Sanctuary	**Karnataka**	*Recently the National Green Tribunal have set a dead line of 6 months in issuing Eco-Sensitive Zone tag, which may resolve the confusion over the boundaries of the sanctuary.* • The sanctuary is divided into 3 zones, namely- core zone, buffer zone and tourism zone. • The **Tunga Anicut Dam** is situated within the sanctuary and provides shelter for otters and water birds. • The **Mandagadde Bird Sanctuary** is also a part of the Shettihalli Wildlife Sanctuary. • The hilly area forms the catchment basin for **Kumadwathi River.**
Mhadei Wildlife Sanctuary	**Goa**	• It was established in the forests spread within the Mhadei River basin in the year 1999 with an objective to protect Bengal Tigers living in this area.
Kasu Brahmanandha Reddy National Park	**Telangana**	• Located in the Jubilee Hills area of Hyderabad • The park is also known as 'jungle amidst the concrete jungle' and was declared as a National Park in 1998.
Nugu Wildlife Sanctuary	**Karnataka**	• The NTCA has recommended the Nugu Wildlife Sanctuary bordering the Bandipur Tiger Reserve be declared as a core critical tiger habitat. • Nugu River is a tributary of the River Cauvery.
Bannerghatta National Park	**Karnataka**	• It is situated in Bengaluru***, Karnataka*** and borders with Cauvery Wildlife Sanctuary in the South and with Javalagiri Reserved Forests in the Tamil Nadu State on its South-Eastern boundaries. • It was declared in 1974 and there are 4 ranges in the national park - Anekal, Bannerghatta, Harohalli and Kodihalli wildlife ranges. • Bannerghatta's Sloth Bear Rescue Centre completes 18 years.
Bandipur Tiger Reserve	**Karnataka**	• The Bandipur Tiger Reserve holds the 2nd highest Tiger population in India. • It was established in the year 1974 as a forest tiger reserve under the Project Tiger. • It is part of the Nilgiri Biosphere Reserve. • 3 rivers flow through the main area of the Reserve - Nugu River, Moyar River and Kabini River.

Asola Bhatti Wild Life Sanctuary	**New Delhi**	• It is a protected area in ***New Delhi*** and is a part of the Aravalli Mountain Range. • It is a part of the Sariska-Delhi Wildlife Corridor, which runs from the Sariska Tiger Reserve in Rajasthan to Delhi Ridge.
Palamu Tiger Reserve	**Jharkhand**	• It is located in, established in 1973 as part of Project Tiger. • It is one of the first 9 tiger reserves created in the country at inception of 'Project Tiger'. • It is the only tiger reserve in Jharkhand. It forms part of Betla National Park and Palamau Wildlife Sanctuary.
Valmiki reserve	**Bihar**	• Valmiki Tiger Reserve lies in the West Champaran district of ***Bihar.*** • Rivers Gandak, Pandai, Manor, Harha, Masan and Bhapsa flow through various parts of the reserve.
Nandankanan Zoological Park	**Odisha**	• It is a zoo and botanical garden established in 1960 in ***Bhubaneswar, Odisha.*** • It is India's first zoo to join the World Association of Zoos and Aquariums (WAZA) in 2009. • Nandankanan is the first zoo in the World to breed White tiger and Melanistic tiger. • It is the only conservation breeding centre of Indian Pangolins in the world.

7. BIODIVERSITY

7.1 Biosphere Reserves

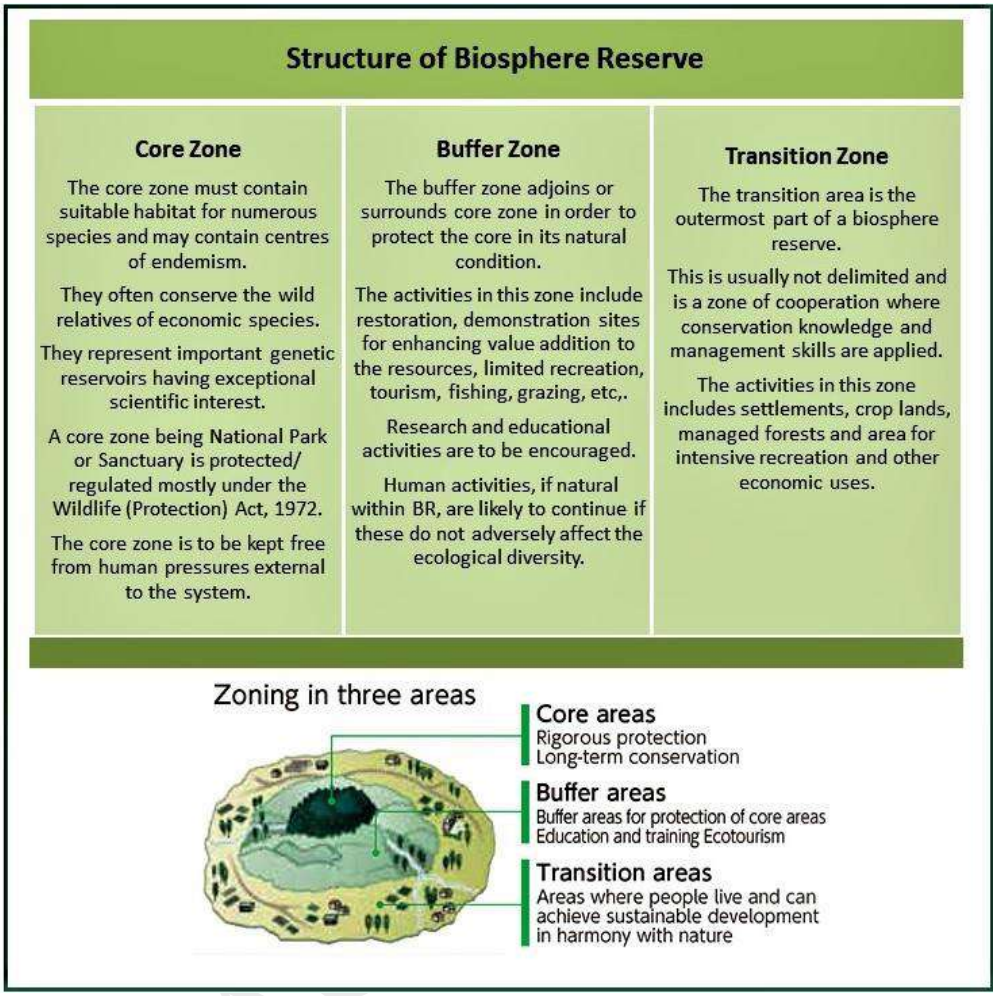
It is important to reflect on the progress made in conserving and sustainably using the biosphere reserves.

- It is an international designation for representative parts of *natural and cultural landscapes* extending over large area of terrestrial or coastal/marine ecosystems or a combination thereof.
- BRs are living examples of how human beings and nature can co-exist while respecting each other's needs.
- **Designated by-** United Nations Educational, Scientific and Cultural Organization (UNESCO)
- **Function**
  - *Conservation* of biodiversity and cultural diversity
  - *Economic development* that is socio culturally and environmentally sustainable
  - *Logistic support* underpinning development through research, monitoring education and training
- **Supported by** - Other UN agencies and International Union for Conservation of Nature (IUCN)
- **Criteria for designating biosphere reserves** - The site must contain an *effectively protected and minimally disturbed core area* of value of nature conservation.
- The core area should be typical of a *bio-geographical unit* and large enough to *sustain viable populations* representing all trophic levels in the ecosystem.
- The management authority to ensure the *cooperation of local communities* while managing and containing the conflicts.
- Areas potential for *preservation of traditional tribal or rural modes of living* for harmonious use of environment.

World Biosphere Reserve Day is celebrated on November 3 to raise awareness on the importance of biosphere reserves & to promote its conservation & sustainable use.

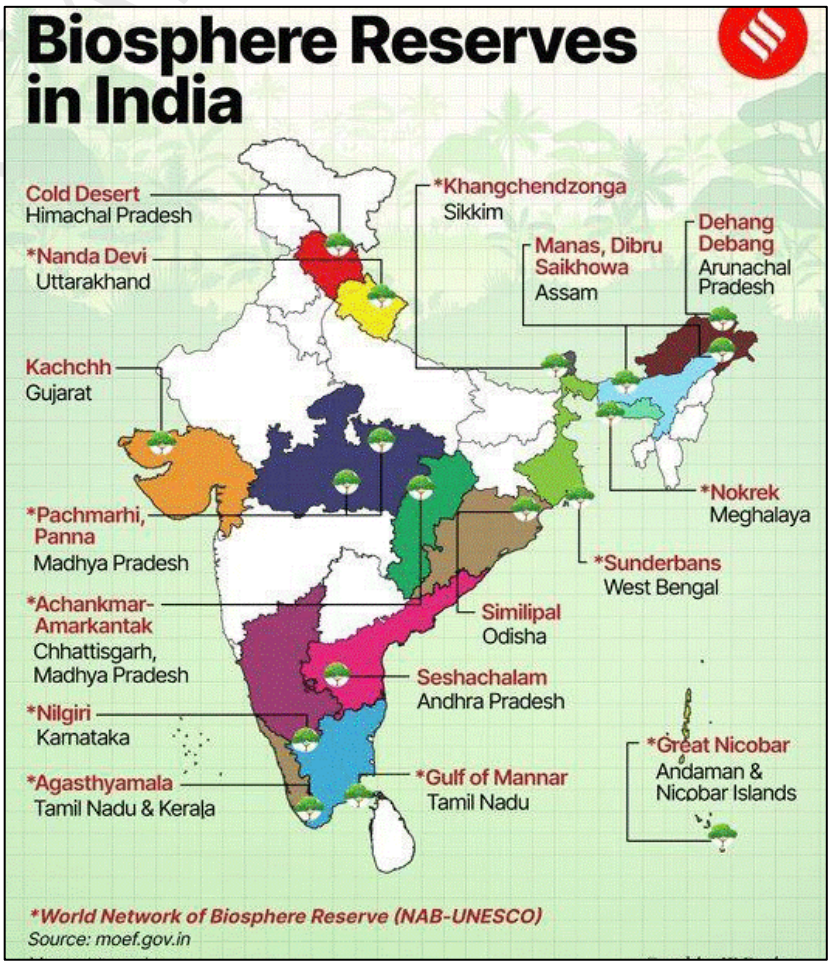
World Network of Biosphere Reserves (WNBR)

- The WNBR of the MAB Programme consists of a dynamic and interactive network of sites of excellence.
- **Launch year-**1971
- **Aim**- To establish a scientific basis for the improvement of relationships between people and their environments.
- **Role** - It proposes interdisciplinary research, demonstration and training in natural resources management.
- It helps national governments with the planning and implementation of research and training programmes with technical assistance and scientific advice.
- **Picture of WNBR**
    - **Leading WNBR country** - Spain, with 53 properties
    - **1st biosphere reserve in South Asia** - Hurulu Biosphere Reserve, Sri Lanka.
    - **No Biosphere Reserves** - Bangladesh, Bhutan, and Nepal
    - **India-** Signatory to the landscape approach supported by UNESCO's MAB programme



Status of biosphere reserves in India

- **Status-** There are 18 biosphere reserves in India, out of which 12 are recognized internationally under the MAB programme.
- **1st biosphere reserve** - Nilgiri Biosphere Reserve, Tamilnadu, Kerala, Karnataka
- **Largest Biosphere reserve** - Great Rann of Kutch, Gujarat
- **Smallest biosphere reserve** - Dibru- Saikhowa, Assam



UNESCO's Man and the Biosphere Programme

- UNESCO's Man and the Biosphere Programme (MAB) is an intergovernmental scientific programme that was launched in *1971*.
- It aims to establish a scientific basis for the improvement of relationships between people and their environments.
- It proposes interdisciplinary research, demonstration and training in natural resources management.

South and Central Asian Biosphere Reserve Network Meeting (SACAM)

- In partnership with the Ministry of Environment, Forests and Climate Change and the National Centre for Sustainable Coastal Management, 10th SACAM was concluded in Chennai.
- **Theme**- "Ridge to Reef"
- **Role-** A platform for exchanging knowledge and fostering collaborations in the realm of sustainable environmental practices.

- MAB helps national governments with the planning and implementation of research and training programmes with technical assistance and scientific advice.
- ***India is a signatory*** to the landscape approach supported by UNESCO's MAB programme.

7.2 Ramsar convention on Wetlands

CONVENTION

- It is an *intergovernmental treaty* that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.
- Adopted in *1971 (Ramsar, Iran)* and enforced in 1975. It is the only global environmental treaty that deals with a particular ecosystem.
- The convention defines wetlands as areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed 6 meters.
- The Indian government's definition as per the Wetlands (Conservation and Management) Rules, 2017 excludes river channels, paddy fields and other areas where commercial activity takes place.
- Ramsar Convention is *not affiliated with the United Nations system of Multilateral Environmental Agreements*.
- Every year, *2nd February was celebrated as World Wetlands Day*.

INDIA & RAMSAR SITES

- Ramsar list is a list of wetlands of International Importance mentioned under the Ramsar convention.
- It confers upon the prestige of international recognition and commitment to ensure the maintenance of the ecological character of the site. India became a contracting party in 1981.
- ***Chilika Lake (Odisha) and Keoladeo National Park (Rajasthan)*** - 1st two Ramsar sites in India.
- India presently has ***80 sites*** designated as Wetlands of International Importance.
- India has the highest number of Ramsar sites among Asian countries.

MONTREUX RECORD

- Maintained as a part of Ramsar list, it listed wetlands where changes in ecological character have occurred, are occurring, or are likely to occur as a result of technological developments, pollution or other human interference.
- The Record was adopted by the Conference of the Contracting Parties in Brisbane, 1996.
- Montreux sites in India
    - ***Keoladeo National Park, Rajasthan (1990)***
    - ***Loktak Lake, Manipur (1993)***
    - *Chilika Lake, Odisha was included in 1993 and was* ***removed in 2002***

7.3 Biodiversity sites in News

Biodiversity sites	Location	Significance
Ennore Creek	**Tamil Nadu**	• The Ennore Creek is a backwater located in Thiruvallur District, ***Tamil Nadu.*** • As an arm of the Kosathalaiyar River, the Creek meets the Bay of Bengal at Mugathwara Kuppam, while the northern channel of the creek connects to the Pulicat Lake. • This creek has been demarcated as ***Coastal Regulation Zone IV*** (Water Body) in the coastal zone management plan by the Tamil Nadu State Coastal Zone Management Authority. • Undertaking any reclamation, bunding, construction or altering the water bodies is illegal under ***Water (Prevention and Control of Pollution) Act 1974 & Environment Protection Act, 1986.***
Kawar Lake	**Bihar**	*Bihar's only wetland of international importance under the Ramsar Convention lies neglected and is on the brink of drying up.* • It is also known as *Gokhur lake*; • **Location** – Begusarai in Bihar • **Ramsar Status** – 2020 • **Source of water** – It draws water from the *confluence of the Gandak, the Bia and the Kareh river.* • ***Vikramshila Dolphin Sanctuary in Bihar*** serves as a haven for endangered dolphins which has the issue of hunting and illegal dredging of Ganga River.
Kole Wetlands	**Kerala**	*Kole wetlands of Kerala face threat of alien plants recently.* • It is an internationally important ***Ramsar site*** of high value biodiversity situated in ***Kerala.*** • The wetland gets its name from its high productivity Kole literally translates to ***bumper crop*** in Malayalam. • It is one of the largest brackish, humid tropical wetland ecosystem on the southwest coast of India. • The wetlands are fed by 10 rivers and is a typical large estuarine systems on the western coast. • One of the specialties of this wetland cultivation is its dewatering scheme, the process of removing groundwater and superficial water from a construction site. • Each year, before the season starts, all farming clusters, known as ***padasekharams***, have to follow dewater their land before sowing. • This collaborative ritual or ***kootaima reeti*** is what protects Kole as a wetland.
Dhanauri Wetland	**Uttar Pradesh**	• Dhanauri Wetland is to be notified as *Balmiki Ramsar Wetland and Sarus Sanctuary/Conservation Reserve* whose proposal is pending before the Uttar Pradesh Wetland authority. • **Location** - Greater Noida, Uttar Pradesh • **Importance** – It is home to over 217 species of birds and possibly the largest roosting site for Sarus cranes in north India.

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- **Recognition** – It has been recognised as an ***Important Bird Area*** by Bird Life International and so recorded by the BNHS (Bombay Natural History Society).

Sarus Crane

- Sarus Crane is the *State Bird of Uttar Pradesh.*
- It is the *tallest flying bird* in the world.

Act/List	Status
IUCN	Vulnerable
WPA, 1972	Schedule I
CITES	Appendix I

Ramsar sites in UP – Bakhira Sanctuary, Nawabganj Bird Sanctuary, Saman Bird Sanctuary, Sandi Bird Sanctuary, Sur Sarovar, Haiderpur Wetland, Upper Ganga, Sarsai Nawar Jheel, Samaspur Bird Sanctuary and Parvati Arga Bird Sanctuary.
</td></tr>
<tr><td>Caravan Park</td><td>Kerala</td><td>

First Public Sector Caravan Park in Kerala to come up at Bekal in Kasaragod.

- It is a place where people with *recreational vehicles can stay overnight, or longer*, in allotted spaces known as *"sites" or "campsites"*.
- It will be developed under *cinema tourism project* that seeks to showcase prime locations to attract tourists.
- **Tourist Facilitation centre (TFC)** - The TFC shall be constructed providing appropriate facilities and infrastructure for the tourists /campers.
- Responsible Tourism-friendly policy shall be adopted for sustainable growth which also benefits the local community and does not adversely affect the local environment.

Bekal Fort

- It is 17th century fort built by ***Shivappa Nayaka of the Keladi dynasty*** in Kasaragod, Kerala.
- It later came under the control of the Kingdom of Mysore.
- It is the *largest fort in Kerala.*
- The fort's prime features are the grand laterite walls, observation towers, bastions, and a well-preserved moat.

- **Types of Caravan Parks** - State-of-the-art-park, Day Parks, Hybrid Caravan Park
- At present, there is only 1 Caravan Park in Kerala (Wagamon)
</td></tr>
<tr><td>Valparai Plateau</td><td>Tamil Nadu</td><td>

- The Valparai plateau is situated in the Coimbatore district of ***Tamil Nadu.***
- It is surrounded on all sides by protected areas Anamalai Tiger Reserve, Parambikulam Tiger Reserve and Eravikulam National Park.
</td></tr>
<tr><td>Miniature Eastern Ghats</td><td>Andhra Pradesh</td><td>

A forest arena titled 'Miniature Eastern Ghats' (MEG) will come up in about 30 acres of reserve land in Visakhapatnam.

- It is a *one-stop place for the flora* found in the Eastern Ghats which will be opened for public from November, 2023.
- **Umbrella program** – Eastern Ghats Biodiversity Centre project.
- **Funding** – Around Rs 2.5 crore from government funds and from corporate social responsibility (CSR) funds of private organisations.

Eastern Ghats

- It is a *discontinuous range of mountains* along India's eastern coast.
- An ancient orogenic belt formed from the collision of crustal rocks during the Archean Era.
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		• The Eastern Ghats are older than the Western Ghats. • **Geographical location** – Odisha, Andhra Pradesh, Tamil Nadu, Karnataka and Telangana. • **Major rivers** - Godavari, Mahanadi, Krishna, and Kaveri • **Highest point** – Arma Konda or Seethamma Konda in (1,680 metres or 5,510 ft) • **Rocks** – Made up of charnockite, granite gneiss, khondalite, granite and quartzite • **Minerals found**– Limestone, bauxite and iron ore • **Madhurawada Dome** – It was formed by a tectonic arrangement with the khondalite suite and quartzite Archean rocks north of Visakhapatnam.
Myristica Swamps	**Kerala**	*Climate change and human intervention threaten the Myristica swamps of Kerala.* • Myristica swamps are freshwater swamps. The evergreen trees have evolved to live in the waterlogged conditions of the swamps. • They have two types of roots, knee roots (**pneumatophores)** and stilt root. • They have evolved over millions of years and are comprised of old-growth trees. • **Location –** In India, these unique habitats occur in the Western Ghats and a smaller distribution exists in the Andaman and Nicobar Islands.  • They help in retaining water and act as a sponge, ensuring perennial water availability. • **Important Species –** Gymnocranthera canarica and Myristica fatua — belonging to Myristicaceae family.

OTHERS

7.4 State of India's Bird Report

A large number of bird species in India are either currently declining or projected to decline in the long term, according to a report.

- **CMS COP 13 -** In 2020, at the Conference of Parties to the Convention on Migratory Species joined the set of countries that regularly assess the status of their birds. They then launched the 1st state of birds' report.
- **Data -** The State of India's Birds report is a periodic assessment of the distribution range, trends in abundance, and conservation status for most of the bird species that regularly occur in India.
- **IUCN data -** Based on IUCN Red List of global threat status, this report places Indian species into three categories – Low, Moderate and High.
- **Key highlights of the 2023 report - Decline -** India's birds are facing a significant decline in numbers revealing a silent, gradual change in birds' population.
- **High Conservation priority -** A large number of species that are thought to be common and widespread find themselves as of High Conservation Priority
- It means their abundance continues to decline after a considerable drop in the number over the years.
- **Migratory birds -** The number of long-distance migrants has declined 50%, with those that breed in the Arctic but winter in India seeing a decline of 80%.
- **Overall analysis -**Decline in raptors, migratory shorebirds, and ducks. Increase in Indian Peafowl and Asian Koel.

7.5 Best Tourism Village 2023

Dhordo village in Gujarat made it to the UN World Tourism Organisation's (UNWTOs) best villages list for its rich cultural heritage and natural beauty.

- A global initiative to highlight those villages where tourism preserves cultures and traditions, celebrates diversity, provides opportunities and safeguards biodiversity.
- **Recognition to** – Outstanding rural tourism destinations with accredited cultural and natural assets based on 9 *key evaluation criterias*.
- **Best Tourism Village 2023** – It is the 3rd edition where 54 villages from all regions were selected.

Best Tourism Village Initiative	
Launched In	2021
Nodal Agency	UN WTO
Umbrella Program	UNWTO Tourism for Rural Development Programme.

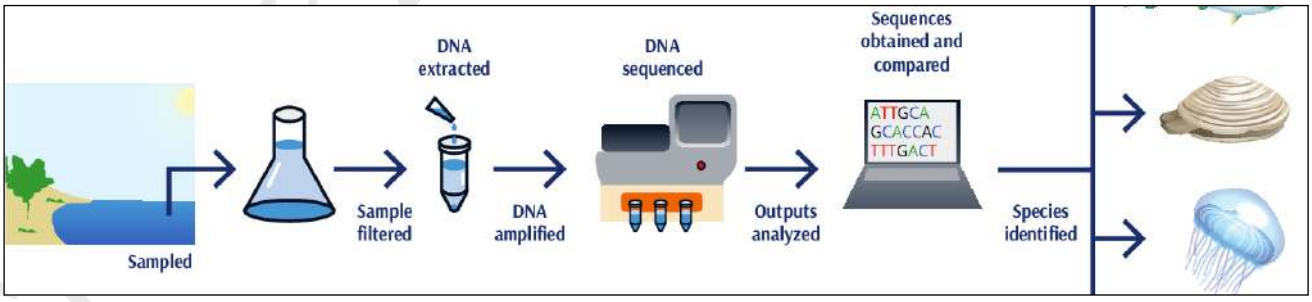
- A further 20 villages have joined the Upgrade Programme. All 74 villages are part of the UNWTO Best Tourism Villages Network.

Dhordo village *is nestled in the Great Rann of Kutch in* ***Gujarat*** *which hosts the annual cultural festival Rann Utsav that showcases the region's traditional art, music, and crafts. It also hosted the 1st Tourism Working Group Meeting of the G-20 held under India's presidency in 2023.*

7.6 Environmental DNA (eDNA)

Recently, scientist estimated that the total taxonomic diversity of Chilika lagoon in Odisha is about 1,071 families across the tree of life using environmental DNA (eDNA) method.

- **eDNA** – It is the **nuclear or mitochondrial DNA** that is released from an organism into the environment through natural processes during their lifetime or after death.
- **Sources of eDNA**- Secreted feces, mucous, and gametes; shed skin and hair; and carcasses.
- **eDNA method** - A non-invasive method to assess the total biodiversity of any ecosystem by sequencing the DNA found in the environments.
- **Developed by** – Laboratory for the Conservation of Endangered Species (LaCONES), a CSIR-Centre for Cellular and Molecular Biology (CCMB) laboratory headquartered in Hyderabad.
- **Sample size** – Just a few litres of water, soil, or even air.



- **Working mechanism** – A molecular approach is applied to filter out eDNA from environmental samples, read their sequences, and thus, identify the source of the eDNA.
- *Polymerase chain reaction (PCR)* is used to amplify DNA for sequencing while quantitative PCR (qPCR) is typically used to detect and quantify DNA.
- **Significance** – It is cheaper, faster, and highly scalable to large freshwater and marine ecosystems which can help in monitoring and conserving the rich biodiversity of our country.
- It can detect all kinds of organisms, including viruses, bacteria, archaea, and eukaryotes as well. eDNA can also reveal the presence of human remains.

7.7 CATCH DNA

Researchers used CRISPR to engineer bacteria to detect colorectal cancer in mice.

- Researchers working at the frontiers of advanced biological sensors have engineered bacteria that can detect the presence of tumour DNA in a living organism.
- This new technology, which detected cancer in the colons of mice, can pave the way for new biosensors that can be used to detect cancers, infections and other diseases.
- In the past, researchers have used bacteria for many medical purposes, but this is the first time they have engineered it to identify specific DNA sequences and mutations outside of cells.
- **CATCH** - Cellular Assay for Targeted CRISPR-discriminated Horizontal gene transfer has been described in a research article published in the journal Science.
- **Tumours –** They often disperse their DNA into their surroundings.
- This DNA can be purified and analyzed in labs but it is difficult to detect in the environments where it is released.
- To develop CATCH, the researchers engineered bacteria using CRISPR technology to test free-floating DNA sequences and compare them with predetermined cancer sequences.

Acinetobacter baylyi

- The researchers employed Acinetobacter baylyi, a bacterium with this skill, to detect cancer.
- A.baylyi was engineered using CRISPR technology to detect a mutated KRAS gene which helps colorectal cancer grow.
- **Resistance Gene –** When the engineered bacteria detect any of the mutated tumour DNA, it turns on an antibiotic resistance gene, which makes them resistant to a specific drug.
- Once researchers find bacteria that are resistant to the drug, they know that cancer has been detected.

7.8 E-Soil

Researchers have developed a new electronics soil that was found to increase the growth of barley seedlings by 50%.

- It is a novel method of ***soilless gardening or hydroponics*** using an electrically conductive growing medium.
- eSoil is being derived from cellulose and a conductive polymer called ***PEDOT.***
- In hydroponic environments, eSoil is a low-power bioelectronics growth substrate that can electrically stimulate the root system and growth environment of plants.

Hydroponics is the technique of growing plants using a water-based nutrient solution rather than soil, and can include an aggregate substrate, or growing media, such as vermiculite, coconut coir, or perlite

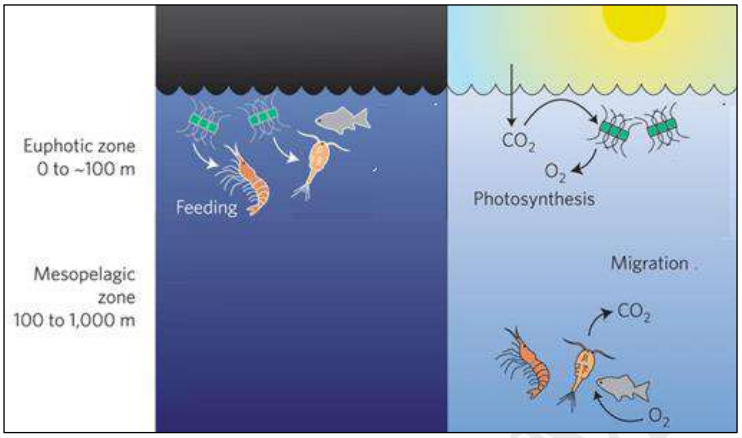
- This novel substrate is not only environmentally friendly, but also offers a low energy, safe alternative to previous methods that required high voltage and non-biodegradable materials.
- When the roots of barley seedlings were electrically stimulated for 15 days, they showed a 50% increase in growth using eSoil.

7.9 Miyawaki Plantation Method

- It is an initiative of creating mini forests in urban areas for the afforestation programme.
- Named after Japanese botanist Akira Miyawaki, this method involves planting 2 to 4 different types of ***indigenous trees*** within every square metre.
- In this method, the trees become self-sustaining don't require regular manuring and watering and they grow to their full length within 3 years.

7.10 Diel Vertical Migration (DVM)

Deep sea organisms play a crucial role in the earth's carbon cycle through the process of diel vertical migration.



- It is a ***synchronised vertical movement*** of billions of animals, mostly zooplankton (e.g., smallish animals, including fish, various shrimp, and jellies) in the ocean.
- DVM is the largest migration on the planet by biomass which occurs daily in all oceans.
- **Principle** – A delicate balance between the need to feed and to avoid becoming prey.
- **Timing of migration** – In tune to the ***natural rhythms of sunrise and sunset***.
- **During the night** – They ***ascent*** from the mesopelagic layer to the epipelagic layer to graze on the microscopic phytoplankton while avoiding their daytime predators.
- **During day** – They ***descent*** into deeper, darker levels of ocean to escape from the predators.
- **Role in carbon sequestration -** They remove carbon from the upper ocean as they feed on surface-dwelling plankton and carry the carbon to deeper waters while returning.
- When they are consumed by predators, the carbon is passed to them. The carbon-rich wastes produced by the predators then sinks to the ocean floor, where it remains trapped for millennia.

7.11 Selfing Syndrome

In the first evidence of rapid evolution, scientists have discovered a flower growing in Paris, France is producing less nectar and smaller flowers to attract fewer pollinators.

- Selfing syndrome refers to plants that are autogamous and display a complex of characteristics associated with self-pollination.
- The flowers of self-fertilizing plants are typically smaller and have little distance between reproductive organs.

Autogamous species are those whose ovules are (predominantly) fertilized by pollen from the same flower.

Parisian pansies (*Viola arvensis)*

- **Habitat -** It is a self-pollinating flower, native to Europe, Western Asia, and North Africa.
- It is an herbaceous annual plant with serrated leaves, and usually flowers with white all over, except the bottom petal and dehiscent capsules.
- Recent studies have found that the ongoing convergent evolution of a Selfing Syndrome threatens plant pollinator interactions.

7.12 Forest Fire in Maui Island

Recently there has been a deadly wildfire in Hawaii's Maui Island due to strong winds from Hurricane Dora.

- A wildfire is an uncontrolled fire in an *area of combustible vegetation*.
- Wildfires can burn in vegetation located both in and above the soil.
- **Ground fires-** It ignite in soil, thick with organic matter that can feed the flames, like plant roots.
- **Surface fires**- It typically burn in dead or dry vegetation that is lying or growing just above the ground. Parched grass or fallen leaves often fuel surface fires.
- **Crown fires** – It burn in the leaves and ***canopies*** of trees and shrubs.
- **Cause of the fire in Hawaii**
  - Drought
  - Hurricane Dora
  - Climate change
  - flammable non-native species of grasses

Benefits of Wildfire

- It is essential to the **continued survival** of some plant species.
- Some tree cones need to be heated before they open and release their seeds. Example- Chaparral plants
- **Healthy ecosystem-** They can kill insects and diseases that harm trees.
- By clearing scrub and underbrush, fires can make way for new grasses, herbs, and shrubs that provide food and habitat for animals and birds.
- **Low intensity flames-** It can clean up debris and underbrush on the forest floor, add nutrients to the soil, and open up space to let sunlight through to the ground.

Hawaii Island

- It is the largest island in the United States. It is the only U.S. state that is not geographically located in North America.
- It is a chain of volcanic islands in the North Pacific Ocean. Hawaii is the only U.S. state completely made up of islands.
- **Mountain-** Mauna Kea is Hawaii's tallest mountain. If the height of this mountain is considered from its base, which lies in the Pacific Ocean, it is taller than Mount Everest.
  - **Pineapple Island-**Lanai is home of the world's largest plantation of pineapples.
  - **Maui-** It is an island in the Central Pacific, part of the Hawaiian archipelago.
  - **National Park-** Hawaii volcanoes national park (Hawaii), Haleakala National Park (Maui)

Approaches in addressing forest fires

- **Controlled burning -**The British introduced a system of controlled burning of undergrowth in safe seasons (winter), so that by summer there would be nothing left to burn.
- This is an extremely destructive practice, since it wipes out insects, small reptiles, seeds, herbs and bushes.
- **Fire Line-** This method contain the fire in compartments bordered by natural barriers such as streams, roads, ridges, and fire lines along hillsides or across plains.
- Once the blaze has burnt out all combustibles in the affected compartment, it fizzles out and the neighbouring compartments are saved.
- **Counter fire approach -** The counter fire rushes towards the wildfire, leaving a stretch of burnt ground, as soon as the two fires meet, the blaze is extinguished.
- **Combination method -**This is practised in combination with fire lines and counter fire.
- This is the most practical and most widely used method.
- **Technological approach -** In this, Helicopters or ground-based personnel, spray fire retardant chemicals, or pump water to fight the blaze.
- These are expensive methods and are usually not practised in India.

7.13 Zombie fires (Arctic Soil Fires)

The blanket of wildfire smoke spread across large parts of the U.S. and Canada in 2023 due to zombie fires.

- Zombie fires also known as ***overwintering fires***, happen as a result of wildfires, they're called zombie fires as they seem to *come back from the dead*.
- After a wildfire has been extinguished on the surface, some of it can still burn belowground in secret, fuelled by ***peat and methane*.**
- These fires can continue to burn all through winter, hidden under a layer of snow.
- In spring as the temperature rises, the snow melts and the soil dry out, the wildfires can re-ignite and spread once again.

7.14 Vegetated canopies

As Europe battles scorching temperatures and wildfires, vegetated canopies were introduced in Spain for creating green spaces.

- Vegetated canopies are sail-like structures that have been anchored to the frontages of surrounding buildings.
- They *mimic natural canopies* found in forests and various plant species.

- They can be placed in streets, where planting trees may not be feasible owing to the lack of space.
- The plants grow hydroponically, with a water supply point and water outlet for draining purposes.
- **Advantages** – It reduces the temperature both in their surroundings and under the cover.
- The plants chosen belong to species that are optimized for the absorption of gases such as carbon monoxide.
- The substrate also absorbs sound waves, reducing noise pollution.
- It could contribute to urban biodiversity, creating a healthier ecosystem that supports a variety of wildlife.

7.15 Black Summer

A new report from the New South Wales (NSW) authorities in Australia said that they are facing worst bushfire risk since 'Black Summer'

- The ***bushfire season of 2019-20 in Australia*** is known as Black Summer.
- **Impacts –** It burnt 5.5 million hectares of land across NSW and displaced 3 billion vertebrate animals across southeast Australia.
- **Factors that led to black summer –** Dryness of the fuel and its availability to burn, weather conducive to fire spread (high temperatures, low humidity and wind) and ignition sources.
- The suspected, immediate cause of ignition was lightning, often in remote, rugged and/or inaccessible terrain
- **Other causes –** Ember spotting, power lines, deliberate or accidental human activity, machinery and arson.

7.16 Silk

Researchers in China, proposed a model to explain how different combinations of mutations give rise to the different colours of the cocoons.

- Silk is reeled from cocoons of the silk moth (Bombyx mori) and they based on feed they are classified.
- **Wild' silks** like the muga, tasar, and eri silks were obtained from other moth species namely, Antheraea assama, Antheraea mylitta, and Samia cynthia ricini.
- **Mulberry silks** have long, fine, and smooth threads and **Non-mulberry silks** have shorter, coarser, and harder threads.

Mulberry Silk		
	Ancestral Species	**Domesticated Species**
Spread	China, Korea, Japan, & Russia	All around the world including India
Size	Small	Larger
Fibre length	Small	Longer, up to 900 metres
Cocoon colour	Brown-yellow	Yellow-red, gold, flesh, pink, pale green, deep green or white.
Flying ability	Exists	Lost
Pigmentation	Observed	Lost

- **Silk Colour -** Mulberry leaves have colouring chemical compounds called ***carotenoids and flavonoids*** which are absorbed by silkworms when they feed it.
- It is then transported to the *silk glands, where they are bound to the silk protein*.

India is the world's 2nd largest producer of raw silk after China and non-mulberry silks comprise about 30% of all silk produced in India.

- Currently, domesticated cocoons possess water soluble colour that gradually fade away and so silk colours are derived from chemical compounds made by the mulberry leaves.
- The *differently coloured cocoons arise from mutations in genes* responsible for the uptake, transport, and modification of carotenoids and flavonoids.

7.17 Forest Fringe Villages

- They are villages that are located near forests and often depend on them for their daily needs and biomass.
- As per India State of Forest Report- 2019, published by Forest Survey of India, approximately 300 million people are dependent on forests.

7.18 Mahua Liquor

Mahua, a traditional liquor, once banned by the British now finds relevance in modern India

- Mahua flowers are one of the top 5 minor forest products (MFP) in terms of volume produced in the nation each year.
- **Mahua liquor** – It is a traditional s*weetened liquor with strong floral notes* that has been made for ages by the tribal people of India.
- It is a *pungent, potent drink* that is usually brewed in unorganised, small-scale backyard stills.

> *Country Liquor (CL) label is bound by the antiquated laws of 1878 and 1892, which forbid non-Adivasis from consuming or producing it and restrict Adivasis from producing it within a certain limit.*

- It is the *only* pot-distilled and fermented spirit in the world made from naturally sweet flowers.
- Mahua tree is found largely in the central, northern and southern Indian forests.
- **Ban** – British Raj banned production of liquor along with collection & storage of Mahua flowers through *Bombay Abkari Act, 1878 and Mhowra Act, 1892*
- **Measures taken** - Madhya Pradesh declared Mahua as a ***heritage liquor*** and organised *National Mahua Conclave in 2023*.

7.19 Sea weed Park

Minister of Fisheries, Animal Husbandry & Dairying has recently laid down the foundation stone for the establishment of Multi-Purpose Seaweed Park recently in Tamil Nadu.

- **Introduced** – India's 1st Fisheries Aquapark in form of 'Multipurpose Seaweed Park in ***Tamil Nadu'*** was announced in the Union Budget 2021.
- **Objective** - To promote the cultivation and conservation of seaweed.

7.20 Dragonfly Festival, 2023

The 6th edition of the Dragonfly Festival is being conducted across 11 States in India.

- The festival has been running for the *past 5 years* and celebrates Dragonfly and Damselfly's role in keeping our environment healthy.
- The tag for this year's festival is *Dragonflies in Focus: Inspire Wetland Champions'.*
- **Organised by** - WWF India
- **Partnership** - Bombay Natural History Society, India Biodiversity Portal, Indian Dragonfly Society and others
- **Odonates** - It is an order of flying insects that includes dragonflies and damselflies.

Feature	Dragonfly	Damselfly
Size	Larger and bulkier	Relatively smaller
Wings	2 sets	2 sets
Front & rear wings	Different size	Same size
Wings at rest	Like an aeroplane	Fold closed over their back

7.21 Zombie Deer Disease

Experts have termed the zombie deer disease a slow-moving disaster and have urged governments to prepare for the possibility of it spreading to humans.

- The deadly and infectious ***chronic wasting disease (CWD)***, also known as zombie deer disease, affects cervids, which are deer, elk, caribou, reindeer, and moose.
- The neurological symptoms of the disease, which include weight loss, lack of coordination, lethargic behavior, listlessness, and drooling.
- It is brought on by a protein called a **prion** that is flawed and builds up in the brain and other tissues, leading to emaciation, behavioral and physiological abnormalities, and finally death.
- **Transmission -** Animals can contract it directly from one another or indirectly by coming into contact with infected particles that linger in the environment, such as soil, plants, or excrement.
- They can also become infected if prions carrying the infection contaminate an animal's feed or pasture.
- **Treatment -** There is currently no vaccination or cure for the zombie deer disease.
- **In humans -** There has never been a reported case of zombie deer disease in a human.

> ***Mad Cow Disease*** *or Bovine Spongiform Encephalopathy (BSE) is a neurological disorder of cattle that results from infection by prion.*

7.22 Petermann Glacier, Greenland

Glaciologists have found the grounding line of Petermann Glacier in northwest Greenland to shift substantially during tidal cycles.

- Grounding line of a glacier is where the ice detaches from the land bed and begins floating in the ocean.
- The shifting of grounding line substantially during tidal cycles, allows warm seawater to intrude and melt ice at an accelerated rate.
- Exposure to ocean water causes the ice to slide more quickly to the sea in two ways -
  - Melts the ice vigorously at the glacier front.
  - Erodes resistance to the movement of glaciers over the ground.
- **Petermann Glacier -** Located in the coast of Greenland.
- It is the longest floating glacier in the Northern Hemisphere.
- In 2010 and in 2012, large pieces of the Petermann glacier broke off its end and floated out to sea.

8. SPECIES IN NEWS

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

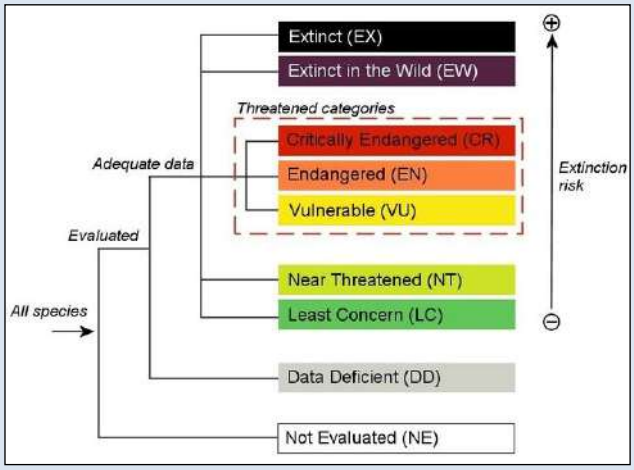
- CITES, also known as ***Washington Convention***, is an international agreement between governments and is ***legally binding*** on the Parties. **India is a Party to the CITES** since 1976.
- **Aim** - To ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species.
- It has 3 appendices to protect threatened and vulnerable species.
  - **Appendix I** - For species currently threatened with extinction.
  - **Appendix II** - For species not necessarily threatened with extinction but demands intervention to keep a check on trade and avoid its utilisation that may threaten their survival.
  - **Appendix III** – For a given species, when a specific country wants to regulate trade.

International Union for Conservation of Nature and Natural Resources (IUCN)

- **Founded** in October 1948 as the International Union for the Protection of Nature (IUPN) following an international conference in Fontainebleau, France.
- It was later known as the *World Conservation Union.*
- The organization changed its name to the International Union for Conservation of Nature and Natural Resources in 1956
- **Headquarters** - Gland, Switzerland
- **Vision** - Just world that values and conserves nature
- **Functions** - It provides public, private, and non-governmental organizations with the knowledge and tools to achieve sustainable development.

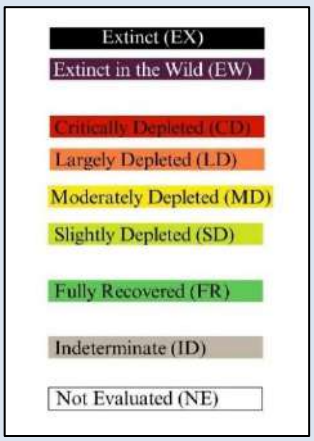
IUCN Red List of Threatened Species

- World's most comprehensive information source on the global extinction risk status of animal, fungus and plant species.
- Provides information about species' range, population size, habitats and ecology, use and trade, threats, and conservation actions.
- The IUCN unveiled this assessment system in 1964.
- Species are classified into one of ***nine Red List Categories***
- Criteria to assess the extinction risk of a given species includes
    - The rate of population decline
    - The geographic range
    - Whether the species already possesses a small population size
    - Whether the species is very small or lives in a restricted area
    - Whether the results of a quantitative analysis indicate a high probability of extinction in the wild



IUCN Green Status of Species

- Introduced by the IUCN in the World Conservation Congress, 2012, held in Jeju, South Korea.
- It called for the development of 'Green Lists' of *Species, Ecosystems and Protected Areas* to measure conservation success in these three areas.
- The IUCN *Red List assess the risk of extinction of a species* whereas the IUCN *Green status tracks the recovery of species' populations* and measure its conservation success.
- The Green status comprises of a *Green Score* ranging from 0–100%.
- A species that is Extinct in the Wild would have a Green Score of 0%, and a species that is not threatened with extinction would have a Green Score of 100%.
- The GSS became an *optional part* of Red List assessments in 2020.



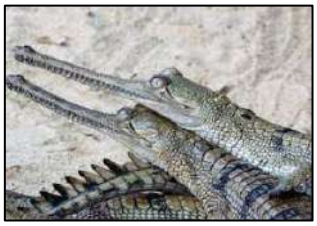
Endangered Species: Categories and Criteria

	Population Reduction Rate	Geographic Range		Population Size	Population Restrictions	Extinction Probability (in the wild)
		Extent of Occurence	Area of Occupancy			
Least Concern	A species that has a widespread and abundant population					
Near Threatened	A species that is likely to qualify for a threatened category in the near future					
Vulnerable Species	30-50% population decline	<20,000 km^2	<2,000 km^2	<10,000 mature individuals	<1,000 mature individuals or an area of occupancy of <20 km^2	at least 10% within 100 years
Endangered Species	50-70% population decline	<5,000 km^2	<500 km^2	<2,500 mature individuals	<250 mature individuals	at least 20% within 20 years or 5 generations
Critically Endangered	≥80-90% population decline	<100 km^2	<10 km^2	<250 mature individuals	<10 mature individuals	at least 50% within 10 years or 3 generations
Extinct in the Wild	Only survives in cultivation (plants), in captivity (animals), or as a population well outside its established range					
Extinct	No remaining individuals of the species					

CRITICALLY ENDANGERED

8.1 Gharial

A gharial (Gavialis gangeticus) has been seen in Pakistan's Punjab province for the first time after three decades.



- Gharials had become extinct years ago in the Punjab region of both India and Pakistan.
- They were reintroduced to the Beas River to bring back the species to its rivers.
- The gharials found in the Pakistan's Punjab is possibly moved from India during floods last year and stayed in the Sutlej River.
- **Gharials -** Gharials are fish-eating fresh water crocodiles characterised by narrow and bulbous nasal snout.
- **Habitat -** Gharials live in clear freshwater river systems and are a good indicator of clean river water.
- **Distribution -** Gharial were historically found in the river system of India, Pakistan, Bangladesh and southern part of Bhutan and Nepal.
- The surviving population can be found within the tributaries of the Ganges river system.
- Girwa (Uttar Pradesh), Son (Madhya Pradesh), Ramganga (Uttarakhand), Gandak (Bihar), Chambal (Uttar Pradesh, Madhya Pradesh and Rajasthan) and Mahanadi (Orissa).

Protection	Status
Wild Life Act, 1972	Schedule I
IUCN	Critically Endangered
CITES	Appendix I

- The largest and most populous location, the protected ***National Chambal Sanctuary.***
- **Diet -** They are largely piscivorous (eats fish).
- **Threats -** Dams and Barrages, irrigation, sand mining, illegal fishing and bycatch of young ones.

8.2 Pygmy Hogs

The conservation of pygmy hogs is crucial to India's wildlife protection goals.

- Pygmy hogs are smallest and rarest wild piggy.
- **Distribution -** Native to alluvial grasslands in the foothills of the Himalayas.
- Now their population is confined to Assam and southern Bhutan.
- **Diet -** They are omnivores and feed on roots, insects, rodents, and small reptiles.
- **Significance -** They are an indicator species. They live only in the wet high grasslands at the foothills of the Himalayas.
- Their presence ensures a healthy habitat for other rarities such as the one-horned rhinoceros, hog deer, Eastern barasingha, tiger, water buffalo, lesser florican and the hispid hare.
- **Threats -** loss and degradation of habitat due to agricultural encroachments, human settlements, livestock grazing, etc.
- **Conservation Efforts -** Pygmy Hog Conservation Programme in 1995.

Conservation Status	
IUCN	Critically Endangered
CITES	Appendix I

8.3 Vulture species in India

THREATS TO VULTURE POPULATION

Diclofenac – The use of some Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) to treat cattle, such as diclofenac, nimesulide, ketoprofen has affected the vulture populations. Diclofenac was banned for veterinary use in India and Nepal in 2006 and in Bangladesh in 2010.

Slow breeding - Vultures are slow breeding birds, laying only one egg a year and have a longer immaturity duration after fledging.

ROLE OF VULTURES IN ECOSYSTEM

Vultures feed on carrion, the remains of dead animals, and act as the 'rubbish collectors' of the natural world.

Since vultures feed on animal remains, they help in eliminating potentially harmful bacteria from the environment, limiting the spread of diseases such as anthrax and rabies.

Vultures are having considerable cultural and religious significance in India where humans have laid out their dead to be consumed by scavengers. Of these, the best known and documented are the Parsees.

Status of Vulture in India

Nine species of vultures are recorded from India and out of these, five belong to the genus Gyps and the rest four are monotypic.

Gyps	Monotypic
• The Oriental White-backed Vulture (OWBV) Gyps bengalensis, • The Long-billed Vulture (LBV) G.indicus, • Slender-billed Vulture (SBV) G. tenuirostris, • The Himalayan Vulture (HV) Gyps himalayensis and • The Eurasian Griffon (EG) Gyps fulvus	• The Red-headed Vulture (RHV) Sarcogyps calvus, • Egyptian Vulture (EV) Neophron percnopterus, • Bearded Vulture (BV) Gypaetus barbatus and • Cinereous Vulture (CV) Aegypius calvus

A total of 9 species of vultures are found in India	
Resident species (Conservation Status)	**Migratory species (Conservation Status)**
1. White–rumped vulture (CR) 2. Indian Long billed vulture (CR) 3. Slender-billed vulture (CR) 4. Red-headed vulture (CR) 5. Bearded vulture (NT) 6. Egyptian vulture (EN)	1. Cinereous vulture (NT) 2. Eurasian Griffon vulture (LC) 3. Himalayan Griffon vulture (NT)

8.4 White-rumped Vulture

Despite protective measures, the future of white-rumped vulture remains extremely perilous in the Sigur plateau in the Nilgiris.

- **Sigur plateau**, Nilgiris is the last southernmost viable breeding population for the White-rumped vulture in India.
- It is one of the most vital wildlife corridors linking the western and eastern ghats.
- It is bounded to the northwest by the Bandipur National Park, to the east by the Sathyamangalam Wildlife Sanctuary, and to the west by the Wayanad Wildlife Sanctuary.
- It is a part of the World Network of Biosphere Reserves of UNESCO.
- The corridor is critical for preserving the genetic diversity of the region's tigers and elephants.
- The Sigur plateau is home to Irular tribals.

White-rumped Vulture

- **Scientific name** - Gyps bengalensis.
- **Conservation Status**
  - **IUCN Red List Status** - Critically Endangered
  - **CITES** – Appendix II
- **Habitat** – Forest, Savannah, shrub land and grassland
- **Spread** – Indian Sub-continent and southeast Asia
- **Distribution in India** – Found throughout India.
- They occur in temperate areas, mostly in plains and occasionally in hilly regions.
- Vultures in India | Threats to Vultures

8.5 Oriental white-backed vulture

India's tiger reserves and other wild spaces give conservationists hope that the captive-bred the Oriental white-backed vulture will thrive again.

- Oriental white-backed vulture (*Gyps bengalensis*) is also known as White-rumped vulture.
- They have blackish plumage, a white neck-ruff, and a white patch of feathers on the lower back and upper tail.
- **Habitat -** Forest, Savanna, Shrubland and Grassland.
- **Distribution -** Bangladesh, Bhutan, Cambodia, India, Myanmar, Nepal and Pakistan.

IUCN status	Critically Endangered
CITES	Appendix II

- **Threat -** Veterinary drugs Aceclofenac and Ketoprofen
- **Conservation Efforts -** In 2020, 8 captive-bred White-rumped vultures were released into the wild for the first time ever in India from the JCBC in Pinjore, Haryana.
- After that, 31 Oriental white-backed vultures were released in batches in West Bengal in 2021.
- The BNHS and Royal Society for Protection of Birds (RSPB) have been managing 4 JCBCs in partnership with the State governments of Haryana, Madhya Pradesh, West Bengal, and Assam.

Jatayu Conservation Breeding Centre

- It is a joint project of Haryana Forest Department and Bombay Natural History Society (BNHS).
- It is located at village Jodhpur on the edge of the ***Bir Shikargaha Wildlife Sanctuary***.
- It is a collaborative initiative to save the 3 species of vultures from looming extinction - White-backed, Long-billed and Slender-billed.

8.6 Gyps himalayensis

Researchers have recorded the first instance of captive breeding of the Himalayan vulture (Gyps himalayensis) in India at the Assam State Zoo, Guwahati.

- **About** - The Himalayan vulture is also known as Himalayan griffon vulture and belongs to Accipitrade family.

- **Geographical Range** - Indigenous to the uplands of central Asia, ranging from Kazakhstan and Afghanistan in the west to western China and Mongolia in the east.
- **Habitat** - It is native to the Himalayas and the adjoining Tibetan Plateau.
- It is one of the two largest *Old-World vultures* and true raptors.
- It is similar and sympatric species of ***Eurasian griffon vulture*** (Gyps fulvus).
- **Food** - The carcasses of livestock, large wild herbivores, and humans.
- **Conservation Status**
  - **IUCN Red List** - Near Threatened.
  - **CITES** - Appendix II
- **Threats** - In parts of Asia and Africa, the use of veterinary ***diclofenac*** has had a devastating impact on ***Gyps vultures*** especially in the lowland regions of the Indian subcontinent.
- ***Diclofenac***, a nonsteroidal anti-inflammatory drug, causes visceral gout in vultures that have consumed contaminated carcasses ultimately resulting in renal failure.

Conservation breeding of other vultures

- The White-rumped vulture (Gyps bengalensis), Slender-billed vulture (Gyps tenuirostris), and the Indian vulture (Gyps indicus).
- The unprecedented scale and speed of declines in vulture populations has left the entire three resident Gyps vulture species categorised '***Critically endangered'.***

8.7 Manis Mysteria

Scientists discovered a new pangolin species named Manis Mysteria.

- Previously it was believed that there are 8 species of pangolin (4 Asian and 4 African varieties).
- **Manis Mysteria -** This species bears similarities to the Asian branch of the pangolin family, known as Manis.
- Most of the Asian pangolins are thought to have originated in South-East Asia.
- **Pangolins** - They are also called as scaly anteater.
- Pangolins are nocturnal and have the ability to swim.
- Pangolins feed mainly on termites but also eat ants and other insects.
- **Threats -** All pangolin species have been hunted for their meat, and the organs, skin, scales, and other parts of the body are valued for their use in traditional medicine.

- All 8 species have fallen to the point that they became *threatened with extinction* during the early 21st century.
- **IUCN status**
  - **Critically Endangered -** Philippine Pangolin, Sunda Pangolin, Chinese Pangolin.
  - **Vulnerable -** Temminck's Pangolin.
  - **Endangered -** Indian Pangolin, White-bellied Pangolin.
- **Indian Pangolin -** Listed in Schedule I of Wildlife (Protection) Act 1972 and as Endangered on IUCN Red List.

8.8 Namdapha Flying Squirrel

- It is a nocturnal species, meaning they are active at night. Flying squirrels are omnivores.
- **Northern flying squirrels** (Glaucomys sabrinus) and **southern flying squirrels** (Glaucomys volans) - North America.
- **Namdapha flying squirrel** (Biswamoyopterus biswasi) - India and parts of Asia
- They have a special membrane between their front and back legs that allows them to glide through the air between trees.

- The Namdapha flying squirrel was last described in 1981 based on a single individual found in the Namdapha Tiger Reserve in **Arunachal Pradesh.**
- **IUCN – Critically Endangered**

8.9 Himalayan Brown Bear (Ursus arctos isabellinus)

Encroachment pushes Himalayan brown bears into Kashmir's villages.

- **Description** – The Himalayan brown bear is the largest mammal found in Kashmir.
- It is considerably smaller than the Grizzly and the Kodiak bears.
- **Behaviour** – This is the least arboreal (living in trees) bear and is largely terrestrial as an adaptation to life in the rolling uplands above the tree line.

Protection Status	
IUCN Status	Critically Endangered
Wildlife Protection Act, 1972	Schedule I
CITES	Appendix I

Himalayan Brown Bear

- It hibernates in winter. ***Hibernation*** is the condition or period of an animal or plant spending the winter in a dormant state.
- **Distribution** – Through the Western Himalayan states of Jammu & Kashmir Himachal Pradesh and Uttarakhand (3000-5000 m).
- It is found from northern Afghanistan, northern Pakistan, northern India, west China and Nepal.
- Populations are present in the ***Great Himalayan National Park (Himachal Pradesh) and the Deosai National Park, Pakistan.***
- They may also be present in south and western Ladakh, in the upper Suru and Zanskar valleys.
- **Habitat** – It is not primarily a forest animal and inhibits alpine scrub and meadows above the tree line although it is occasionally found in subalpine forests.
- **Threats** – They are threatened by habitat destruction due to various anthropogenic pressures such as habitat encroachment, tourism, and grazing pressure.
- The Himalayan brown bear population has been steadily declining in the past century with only an estimated 500-750 bears left in India.

8.10 Vaquita Porpoises

The plight of the Vaquita forces International Whaling Commission to issue first extinction alert.

- Vaquita porpoise is the *world's rarest and the smallest marine mammal*.
- It is also known as the *panda of the sea* for the distinctive black circles around its eyes.
- It is unique among the porpoises as it is the only species of that family found in warm waters, and the size of the dorsal fin is believed to be an adaptation to that, allowing for extra body heat to dissipate.
- **Habitats** – Found only in the northern Gulf of California (Sea of Cortez) in Mexico. Found most commonly seen in shallow waters up to 50 metres deep.
- **Threats** – They are caught and drowned in gillnets set up by poachers to catch totoaba, an endangered species of marine fish sought by Chinese buyers on the black market for its prized swim bladders.
- **IUCN Status** – Critically Endangered

International Whaling Commission

- It was established under the 1946 International Convention for the Regulation of Whaling.
- It provides or the proper conservation of whale stocks and orderly development of the whaling industry.
- The Commission meets this mandate in part by reviewing and, as necessary, revising the measures outlined in the ***legally binding*** Schedule included in the Convention.
- The Commission also conducts activities related to cetacean (e.g., whale, dolphin) conservation.

8.11 Saurauia Punduana

The Saurauia Punduana were recorded for the first time in Manipur during a recent Rapid Biodiversity Assessment (RBA) field survey.

- **IUCN status**- Critically endangered plant species.
- **Native range**- Bhutan, India, Bangladesh, Bhutan, Myanmar and Tibet.
- Its fruits are spherical shining white, and are used in veterinary medicine.
- **India-** It is distributed across *Sikkim, Arunachal Pradesh and Assam*.

8.12 Axolotl (Ambystoma mexicanum)

Ecologists from Mexico's National Autonomous University recently relaunched a fundraising campaign to bolster conservation efforts for axolotls.

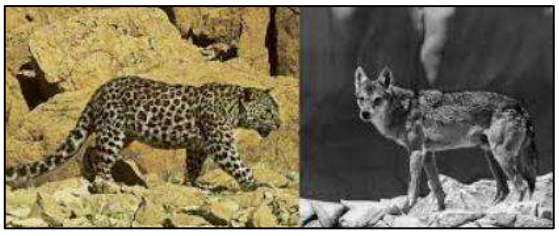
- Axolotls are ***paedomorphic or neotenic aquatic salamanders***.
  - Neoteny is a process in which there is a slowing down of the development of an organism.
  - The ability to retain juvenile or larval traits by an adult is called pedomorphosis.
- They are *amphibians* (can live both in water and on land) with feathery gills and lungs.
- It is also called as ***Water Monster***.
- **Habitat -** Only found in ***Lake Xochimilco***, near Mexico City.
- **Characteristics -** Axolotls are made of cartilage instead of bone.

Lake Xochimilco is a UNESCO World Heritage site.

- It is renowned for its *ability to regenerate* its spinal cord, heart and limbs and also readily make new neurons throughout their lives.
- They are over 1,000 times more resistant to cancer than mammals.
- **Reason for its larval form** - In axolotls, there is a surge in thyroxine release when the animal is in its early larval stage.
- However, the enzyme that makes it active is not present in the larvae, which *blocks the metamorphosis* (the process by which the young form of insects, frogs, etc., develops into the adult form).
- **Conservation Status –** IUCN – ***Critically Endangered***
- **Threats -** Encroaching water pollution, a deadly amphibian fungus and non-native rainbow trout.

8.13 Dhib and Nimr

In light of recent Israel-Palestine conflicts, the status of Arabian wolf and leopard becomes endangered in the region.



- Dhib is world's smallest wolf and Nimr is the world's smallest leopard
  - **Dhib** – Arabian wolf (Canis lupus arabs)
  - **Nimr** – Arabian leopard (Panthera pardus nimr)
- Arabian wolves suppress smaller canids like jackals and foxes in this region and thus play an important ecological role in the desert ecosystem.
- **Geographical Range** – Whole of the Arabian Peninsula.
- Both are *critically endangered in the northern half* of their range.
- **Status of Nimr** - It has *lost as much as 98% of its historical range* and is *extinct in its entire northern range* like Sinai Peninsula, the Negev, and the Judaean Desert.
- Remnant nuclei are Oman, Yemen and southern Saudi Arabia.

Negev desert extends from southern Israel till Gulf of Aqaba

Judaean desert is between Israel & West Bank

Arava Valley forms the border between Israel & Jordan

- **Status of Dhib** - It remains the *sole apex predator* across most of its range.
- Their stable population is confined to the Arava Valley and Negev Desert in Israel.

8.14 Sumatran orangutans (Pongo abelii)

- It is a species of orangutan that lives in the northern part of the Indonesian island of Sumatra.
- They are the largest non-human primates in Asia and the largest arboreal primates.
- **Conservation Status** - IUCN - Critically Endangered, CITES - Appendix I

ENDANGERED

8.15 Nilgiri Tahr

Tamil Nadu has allotted Rs 25 crores to Project Nilgiri Tahr which was launched in 2022 to conserve the animal.

- **Scientific name -** *Nilgiritragus hylocrius*
- It is the *only mountain ungulate* (large mammals with hooves) in southern India amongst the 12 species present in India.
- **Population estimates** - 3,122 individuals in the wild (as per a report released by WWF India in 2015)
- **Habitat** – It is a sure-footed (not likely to slip) ungulate that inhabits the *open montane grassland habitats* at elevations from 1200 to 2600 m of the South Western Ghats.
- **Distribution** – It is ***endemic to Western Ghats*** but currently large populations are found only in Nilgiris and Anamalais.
- Palani hills, Srivilliputtur, and the Meghamalai and Agasthiyar ranges holds smaller population.
- **Threat** – Habitat loss and occasional hunting for its meat and skin.
- **Conservation status, IUCN status-** Endangered, **Wildlife (Protection) Act of India, 1972-** Schedule I.

- *Nilgiri Tahr is **Tamil Nadu's State Animal** and the State celebrates October 7 as Nilgiri Tahr Day to honour hunter-turned-conservationist ERC Davidar.*
- *Nilgiri Tahr finds mention in one of earliest Tamil epic Silapathikaram as '**varai aadu'.***
- ***The Eravikulam National Park in Kerala** is home to the largest population of the Nilgiri tahr, with more than 700 individuals.*

8.16 Sangai Deer

The recent proposal of hydro-electric modernisation plan in the Manipur's famous Loktak Lake could be detrimental to the endangered species of Sangai deer.

- Sangai Deer is also called as Manipur Brow-antlered deer and Dancing Deer.
- It is a unique and rare species found exclusively in ***Manipur's Keibul Lamjao National Park (KLNP)***.
- **Phumdi**- It is the most important and unique part of Sangai's habitat.
- **State animal**- Manipur
- **Conservation Status**-
  - **IUCN** - Endangered
  - **Schedule-1** - Wildlife (Protection) Act, 1972.

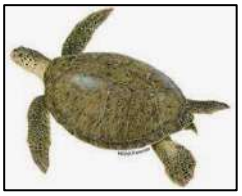
8.17 Dholes

- They are also known as Asiatic wild dogs, native to Asia and genetically similar to African wild dogs.
- **India**- Found in 3 clusters (Western and Eastern Ghats, central Indian landscape and North East India).
- Conservation Status - CITES – Appendix II, IUCN - Endangered.
- It has made a rare appearance in ***Debrigarh Wildlife Sanctuary of Odisha*** recently.

8.18 White-Cheeked Macaque (Macaca leucogenys)

- It is a species of macaque found only in Medog County in southeastern Tibet and Arunachal Pradesh in northeastern India.
- **Conservation status** – Endangered (IUCN Red List)
- It is not covered by the Wildlife Protection Act of India.
- Along with White-Cheeked Macaques and Arunachal Macaque, Assamese Macaque (Macaca assamensis) and Rhesus Macaque (Macaca mulatta) reported from the same landscape.

8.19 Green turtle (Chelonia mydas)



- It is the largest hard-shelled sea turtle and are found in temperate and tropical waters around the world. In India, they can be found on the west and east coasts, Andaman & Nicobar Islands and Lakshadweep.
- Green sea turtles are mainly herbivorous and eat sea grass.
- **Conservation Status** - IUCN – Endangered, Schedule I of the Indian Wildlife (Protection) Act.

8.20 Gangetic Dolphin

- Uttar Pradesh has made the Gangetic Dolphin as the ***state's aquatic animal*** recently.
- The dolphin has already recognized as the national aquatic animal.
- These dolphins are found in rivers like Ganga, Yamuna, Chambal, Ghaghra, Rapti, and Gerua.
- **Conservation Status** - IUCN - Endangered species, Schedule –I of the Wild Life (Protection) Act, 1972.
- **Project Dolphin** - Launched in 2016 by the National Mission for Clean Ganga.

8.21 Black Tigers

- Black tigers are a rare color variant of the Bengal tiger and not a separate species or subspecies of tiger.
- Their all-black color is due to pseudo-melanism, a condition that causes thick stripes that make the tawny background barely visible.
- Black tigers are only found in India's ***Similipal Tiger Reserve, Odisha,*** a part of the UNESCO world network of Biosphere Reserve.

8.22 Humpback Whale

- The humpback whale (Megaptera novaeangliae) is a species of baleen whale.

- Humpbacks use a unique method of feeding called ***bubble-netting,*** in which bubbles are exhaled as the whale swims in a spiral below a patch of water dense with food.
- They travel great distances every year and have one of the l*ongest migrations* of any mammal on the planet.
- The IUCN status is ***Endangered***.

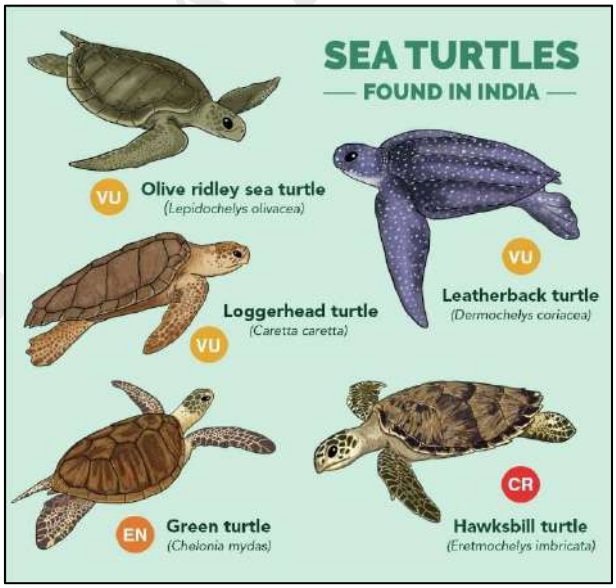
VULNERABLE

8.23 Leatherback Turtles

The nesting site of leatherback turtles is threatened by a massive infrastructure plan of great Nicobar Island.

Conservation Status	
IUCN	Vulnerable
CITES	Appendix I
CMS	Appendices I and II

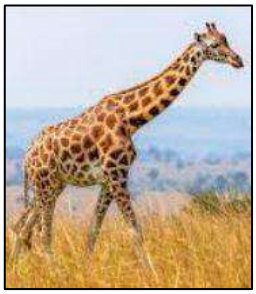
- Leatherback turtle (*Dermochelys coriacea*) are marine turtles found worldwide.
- Leatherback turtles are the *largest* turtles on Earth. They can grow up to 2 meters long and weigh as much as 700 kilograms.
- **Diet -** They feed almost exclusively on jellyfish.
- **Nesting Sites -** Tropical sandy beaches, **Forage Sites -** Temperate coastal waters and sub-polar latitudes.
- The Great Nicobar Island is a globally important nesting site of leatherback turtles in India. They also nest at ***Galathea Bay*** in the Great Nicobar Island.
- **Threats -** Fisheries bycatch, marine pollution, habitat loss due to climate change, egg collection and coastal development affecting critical turtle habitat.



Great Nicobar Island
• A remote archipelago at the southernmost tip of India spanning about 1,000 square kilometres.
• Home to indigenous Shompen and Nicobarese.

8.24 Giraffe

Giraffes could go extinct soon as there are now fewer than 70,000 mature individuals left in the wild.



- **Scientific Name** - *Giraffa camelopardalis*
- **Habitat** – They use both semi-arid savannah and savannah woodlands in Africa.
- They can live as long as 25 years and eat a very wide variety of trees and shrubs.
- Giraffes are the **world's tallest mammals** and an African icon.
- **Status** – IUCN Red List currently recognises 1 species of giraffe and 9 subspecies which is **vulnerable** as a whole while **some are Critically Endangered**.
- **Threat** – They have declined by 40% in the last 30 years and there are **5 biggest threats** in recent times.
- Habitat loss outside protected areas is the main reason for the recent decline.
- Traditional pastoralists like the Maasai in northern Tanzania maintain large spaces of natural savannah.
- There is high illegal hunting (poaching) for bush meat markets.

- Development activities disrupt the natural movement patterns, affects their food availability and mobility.
- Increased seasonal rainfall is associated with lower giraffe survival due to disease and lower food quality.
- They are often overlooked and underrepresented in wildlife research, funding and policy.

8.25 Sloth Bear

- A Sloth Bear (Melursus ursinus) is an omnivorous mammal that can live up to 40 years.
- Sloth bears are the only bears to routinely carry their young on their backs.
- **Native region**- India, Sri Lanka and Nepal.
- **Conservation Status –** IUCN- Vulnerable, CITES - Appendix I, Wildlife (Protection) Act, 1972 - Schedule I (Highest Protection)

8.26 Mugger Crocodile

- Also called as marsh crocodile (Crocodylus palustris), it is an apex predator.
- It is listed as **vulnerable** by IUCN. It lives in Indian subcontinent as well as other countries in southern Asia.
- Muggers are primarily carnivorous, eating mostly fish, frogs, crustaceans, insects, mammals, birds and sometimes monkeys and squirrels and also scavenge on dead animals.
- ***The Moyar River*** is home to one of the largest mugger populations in Tamil Nadu.

8.27 Yellow-spotted Amazon River turtle (Podocnemis unifilis)

- It is one of the largest river turtles in South America, also known as the yellow-headed sideneck turtle and the yellow-spotted river turtle.
- It is diurnal (most active in mid-morning and afternoon turtle) and native to the Amazon River basin.
- It can be found in the Amazon and Orinoco Rivers and are locally known as Taricayas.
- **Conservation status -** IUCN - Vulnerable.

8.28 Bonnet macaque (Macaca Radiata)

- It is a species of Old-World monkey that is native to southern India. They are also known as Zati.
- They are highly arboreal and most abundant on the outskirts of human settlements.
- **Conservation Status** - IUCN – Vulnerable, CITES – Appendix II.

8.29 Koala (Phascolarctos cinereus)

- Koala (Phascolarctos cinereus) is a marsupial which is a mammal with a pouch for the development of offspring.
- They are endemic to Australia and are found in the eucalyptus forests of eastern Australia.
- They have grey fur with a cream-coloured chest, and strong, clawed feet, perfect for living in the branches of trees.
- It is listed as '***Vulnerable'*** as per the IUCN Red List of Threatened Species. There are now fewer than 500,000 left in the wild.
- Threats - Climate change, Habitat destruction and loss, increased disturbance by humans, disease and most of all, bushfires as well as forest and wildfires.

- ***Chlamydia***, a bacterial disease, has wrought havoc on koala populations by forming cysts inside breeding adults, leading to infertility.
- But the biggest culprit has been the bushfire season of 2019-20, known in Australia as '***Black Summer'***.

8.30 Polar Bears

- **Habitat -** They occur in 19 subpopulations throughout the Arctic
- **Food -** scavenge carcasses or settle for small mammals, birds, eggs and vegetation. They are the ***only bear species*** to be considered ***marine mammals***.
- Polar bears can swim for long distances and steadily for many hours to get from one piece of ice to another.
- **Threats -** The oil and gas industry in arctic comes with the potential risks of habitat destruction of polar bears from oil exploration work.
- Polar bears can also be exposed to toxic chemicals such as pesticides through their prey, which can affect a bear's biological functioning and ability to reproduce. **IUCN – Vulnerable**

NEAR THREATENED

8.31 Red Sand Boa

A report by the Wildlife Conservation Society (WCS)-India has pointed out 172 incidents of seizures of red sand boa (Eryx johnii) between the years 2016-2021.

- The sand boa is a small burrowing snake. The nine species inhabit arid lands in Africa, southeastern Europe, the Middle East, and India.

- Red Sand Boa (*Eryx johnii*), commonly called the *Indian Sand Boa*, is a *non-venomous species* found throughout the dry parts of the Indian subcontinent.
- Unlike most snakes, the tail is almost as thick as the body and gives the reptile the appearance of being double-headed.
- They are the *largest of the sand boas* in the world.
- The red sand boa is now acknowledged as one of the most traded reptile species in the illegal trade market, due to its demand in the pet trade, as well as for use in black magic.
- They are ovoviviparous and nocturnal and spends the majority of its time under the ground.
- **Protection status**
  - Wildlife (Protection) Act, 1972 – Schedule IV
  - CITES – Appendix II
  - UCN Status – Near Threatened.

Ovoviviparous species are the once that hatch eggs. Nocturnal species are the species that sleep during the day and stay active at night.

8.32 Nicobar Pigeon

- **Habitat -** Native to the Andaman and Nicobar Islands, the Malay Archipelago and some islands of Micronesia.
- **Features -** It is draped in a colorful plumage, with hues of green, blue, yellow and copper that explode into a bomb of colors in the sunlight.
- The feathers are iridescent due to the many layers of keratin air sacs in the feathers.
- **Extinct birds -** DNA studies have shown that it is also the only living cousin of extinct birds like the **dodo**, the **Rodrigues solitaire** of Madagascar and the **spotted green pigeon** of the Pacific Islands.
- **Subspecies -** There are two subspecies of Nicobar Pigeon, one is endemic to Palau Island in the Pacific Ocean, and the other subspecies is found in all other parts of its range.
- **IUCN status -** Near Threatened in the IUCN Red List, Appendix 1 of CITES

8.33 Jaguar (Panthera Onca)

- It is the largest wild cats and the umbrella species found from northern Mexico southward to northern Argentina.
- Jaguars are the largest of South America's big cats and the third largest cats in the world.
- **Conservation Status** -IUCN - Near Threatened, CITES - Endangered.

8.34 Eurasian otter (Lutra Lutra)

- Eurasian otter discovered for the 1st time in the ***Chinnar Wildlife Sanctuary, Kerala*** recently.
- It is a semiaquatic carnivorous mammal that is native to Eurasia.They are shy and nocturnal and are distributed through Europe, Asia, and Africa.
- **Conservation Status** - IUCN - Near Threatened; CITES - Appendix I, Wildlife Protection Act- Schedule II

8.35 Wisent (European wood bison)

Ukraine war could wreck efforts to save and rewild Europe's great wild bovid.

- The wisent once roamed across Europe at the end of the last ice age was almost wiped out by 1927 from Europe but the last remaining strongholds include *Ukraine and Russia*.
- **Threats** - Rapid environmental change and hunting by humans.
- The European bison is a priority species for conservation because it serves an important role as an ***ecosystem engineer.*** restoring grassland habitat.
- **IUCN -** Moved from Vulnerable to **Near Threatened** in the IUCN Red list.

8.36 Saiga Antelope

Saiga Tatarica was changed from Critically Endangered to Near Threatened by the International Union for Conservation of Nature (IUCN).

- The Saiga antelope has roamed the earth since the last Ice Age. They are medium sized hoofed mammal that belongs to the family Bovidae.
- They lives in herds in treeless steppe country.
- **Sub-species -** The Saiga has two sub-species
  - **Saiga tatarica** (found in most of the range) and
  - **Saiga tatarica mongolica** (found only in Mongolia).
- Today, the animal is found in fragmented populations within Kazakhstan, Mongolia, the Russian Federation and Uzbekistan, according to the Saiga Conservation Alliance (SCA).

Hoofed mammal are animals with a hard, nail-like case called a hoof covering each toe on their feet.

- Since 2002, the Saiga has been considered by the International Union for Conservation of Nature (IUCN) to be critically endangered.
- **Steppes** - A steppe is a dry, grassy plain which occur in temperate climates, which lie between tropics and Polar Regions.

LEAST CONCERN

8.37 Budgett Frog

Researchers from the Indian Institute of Science's (IISc) have identified that peptides (short protein) produced from Budgett's frog can combat enzymes of disease causing pathogens.

- Other common names are ***Hippo Frog*** and the ***Freddie Kruger Frog.***
- **Scientific name** - *Lepdibatrachus laevis*
- **Habitat** – In inland waters in Paraguay, Argentina and Bolivia.
- **Characteristics** –Being ***carnivorous***, they feed on other frogs, snails and insects.
- During dry season, it remains in burrows and they will shed skin layers from to ***form a waterproof cocoon*** to keep them moist. In rainy season, it will go back into the water to breed and feed.
- They are ***highly intelligent*** and very aggressive.
- When frightened, they inflate themselves, stand up on their short legs and attack the potential with an open huge mouth followed up by a *high-pitched scream*.
- They do not have teeth, but have 2 sharp-edged structures in the jaws.
- **Protection status** - ***Least Concern*** in the IUCN Red List.

Frogs *are the 1st vertebrates to conquer the land and have developed a defensive mechanism through their skin to combat microorganisms and other harmful things.*

8.38 Reticulated Python

Recently, a juvenile of world's longest snake species sighted inside IIT Madras.

- **Scientific name** – *Malayopython reticulatus*
- World's *longest* and *3rd heaviest* snakes, *Non-venomous*, *slow-moving* reptile
- **IUCN status** - *Least concern* (LC).
- **Habitat** – Commonly found in Southeast Asia includes Burma through Indochina and Borneo, Sulawesi, Ceram & Timor in Malay Archipelago.
- In India, they are found in the wild only in ***Nicobar Islands***.
- **Growing Condition -** Tropical environments, Heavily dependent on water

Irula Tribes

- **Irula tribes**, also known as Iruliga, are a Dravidian ethnic group inhabiting the Indian states of Tamil Nadu, Kerala and Karnataka who are famously called as **Snake Catchers**.
- ***Vadivel Gopal and Masi Sadaiyan*** from the Irula community were granted Padma Shri in 2023 for expert snake catchers guiding and teaching people across the globe.

8.39 Alligator Gar Fish

A non-native alligator gar fish was found in one of Kashmir's dal lake, raising fears about its impact on the native fish species.

- Alligator gar, the largest of the gar is a fish species with crocodilian head and razor-sharp teeth.
- It is a close relative of the bowfin species.
- **Family** - Belonidae.
- **Habitat** – Central America and North America. They are found in freshwaters - Rivers, lakes, and estuaries.
- It is a ray-finned Euryhaline fish and is one of the biggest freshwater fish in North America.
- It is listed as ***Least Concern*** in the IUCN's Red data list.
- Gars have the ability to gulp air in response to low-oxygen conditions that often occur in sluggish waters.
- They can even sustain in the cold water temperatures of 11-23 degrees Celsius.
- Alligator gars are oviparous (lay eggs).
- It is considered an *alien fish species* (***invasive species)*** in India as it occurs here outside of its native habitat.
- The alligator gar's fossil records date back to nearly 100 million years ago, hence they are referred as ***"living fossil fish".***

8.40 Indian Tent Turtles

- The Indian tent turtle (Pangshura tentoria) is a species of turtle that is native to India, Nepal, and Bangladesh.
- Indian tent turtles are mainly omnivorous and live in freshwater rivers and swamps.
- **Conservation-** IUCN - Least concern, CITES - Appendix II, Schedule 1 of Wild Life (Protection) Act.

8.41 Aardvark (Orycteropus afer)

- The aardvark is a burrowing, nocturnal mammal native to Africa. It means "earth pig" that hunts termites and ants at night.
- Aardvarks are found in sub-Saharan Africa, except for Namibia, Ivory Coast, Ghana, and Madagascar. **Conservation Status** - IUCN - Least Concern.

8.42 White Bellied Sea Eagles

Coastal raptors make power towers their home, which poses risk to the species and also points to the lack of suitable nesting sites near the sea.

- The white-bellied sea eagle (Haliaeetus leucogaster) is a *resident raptor* belonging to the family Accipitridae.
- **Distribution**- sea coast of India from Mumbai to the eastern coast of Bangladesh, and Sri Lanka in southern Asia, through all coastal south-eastern Asia, southern China to Australia.
- The raptor, a *diurnal monogamous bird of prey*, is categorised as being of '*least concern*' on the Red List of the International Union for Conservation of Nature.
- Feeding mainly on sea snakes and fish, the bird is occasionally seen in inland waters along tidal rivers and in freshwater lakes.

8.43 Indian eagle owl

The Indian eagle owl was classified as a separate species recently, distinguishing it from the Eurasian eagle owl.

- It is a large horned owl species native to hilly and rocky scrub forests in the Indian Subcontinent.
- **Other names –** Rock eagle owl or Bengal eagle owl; **Scientific name –** Bubo bengalensis
- **Characteristic features –** It is splashed with brown and grey, and has a white throat patch with black small stripes.
- It was earlier treated as a subspecies of the Eurasian eagle owl. It is usually seen in pairs.
- **Female –** The slightly larger female can reach a total length of two and a half feet, with a wingspan of six feet.
- Prominent ear tufts that look like horns are seen to project from its head.
- **IUCN – Least Concern**

NEWLY DISCOVERED SPECIES

8.44 Badis limaakumi

Scientists have recently discovered a new fish species 'Badis limaakumi' from the river Milak in Nagaland.

- **Taxonomy** – A small *freshwater fish*, under the family Badidae having *26 recognised fish species*.
- It also belongs to the *Badis assamensis Sub-group (SG)*.
- It is also *known as chameleon fish*, for their *ability to change colour* that helps them blend with the surroundings when under stress.
- **Habitat** - Streams with slow or moderate water flow and Ditches and stagnant water bodies.
- **Location -** India, Bangladesh, Nepal, Pakistan, Thailand and Myanmar.
- **Uniqueness** – It differs from other members of the Badis badis SG due to its *larger size* and other physical characterises.
- It has a distinct *dark opercular blotch* at the base of its *opercular spine*, a bone series that serves as a facial support structure and a protective covering for the gills.
- The spots on the sides and more lateral line scales are absent.
- Badis in India were found in the rivers of Brahmaputra, Kaladan and Sharavati and Milak.

Milak River flows through Mokokchung in Nagaland and its main tributary is Tsurong.

8.45 Demaorchestia Alanensis

Researchers at Berhampur University, Odisha have discovered a new species of marine amphipod found in Chilika Lake.

- **Amphipods** - Commonly called Scuds or side swimmers, they are found in both surface and subterranean freshwater habitats.
- Amphipods are a significant group in the marine ecosystem and play a vital role in the marine food chain.
- They also serve as indicators for studying the impact of climate change and health of coastal ecosystems.
- **Demaorchestia alanensis** - It is a shrimp-like crustacea white in colour and less than 15 millimetres in length and has 13 pairs of legs.
- While three pairs are used for swimming in the water, eight pairs are used for walking on land.
- The other two pairs are used for capturing prey and feeding.

Other amphipods found in India are Quadrivisio Chilikensis from the seaweeds near Nalaban and the Talorchestia buensis from the West Bengal.

8.46 Dollfus' Stargazer

- Hirodai ohtsukai is a new genus and species of crustacean parasite discovered recently in the Dollfus' Stargazer (Uranoscopus guttatus) fish species off the coast of India.
- Dollfus' stargazer (Uranoscopus dollfusi) is a marine fish in the family Uranoscopidae.
- It is widespread in the Western Indian Ocean, including the Gulf of Suez, Gulf of Oman, and Persian Gulf. It can be found at depths ranging from 300-550 m.
- The stargazers are a family of perciform fish that have eyes on top of their heads.

8.47 Red-rumped Hawklet

A new dragonfly species has been discovered in the verdant landscapes of Wayanad.

- **Scientific name** – *Epithemis wayanadensis*
- **Habitat -** Wayanad's forested terrain and parts of the Nilgiri Coorg landscapes
- **Features** - Darker pigmentation, A restricted red coloration on the abdomen, Absence of the yellow ante humeral stripe
- **Growing conditions** – It is *profoundly seasonal* which is observed in during the month of October in skies. It spends the remainder of the year in the aquatic larval stage.
- **Significance**– A 2% genetic variance indicates the presence of a new species. In this case, an astonishing 12% genetic difference was observed.
- This marks the 1st instance of an Indian dragonfly being documented with genetic evidence substantiating morphological distinctions.

8.48 Armageddon reedtail

Damselfly species found in Western Ghats named after climate impact on insects.

- They are a group of predatory, aerial insects that are in the order Odonata.
- Damselflies are found mainly near shallow, freshwater habitats and are graceful fliers with slender bodies and long, filmy, net-veined wings.
- Damselflies are generally smaller, more delicate, and fly weakly in comparison with dragonflies.
- Damselflies can usually be distinguished from dragonflies by their thinner, needlelike abdomens and by the way they hold their wings when at rest.

8.49 Nidirana Noadihing (Musical Frog)

*Scientists have discovered a new species of 'music frog', Nidirana noadihing in **Arunachal Pradesh** recently.*

- **Specialty**- Both the male and female are vocal.
- **Habitat -** Swamps, ponds and paddy fields, and they often construct nests to lay eggs.
- Nidirana species are known in Japan, Taiwan, China, Vietnam, Laos and Thailand.
- The new species was named after the ***Noa-Dihing River***, a tributary of Brahmaputra, originates in Arunachal Pradesh and flows through Assam and joins the Brahmaputra at Dihingmukh.

8.50 Pancorius Sebastiani

- It is a new species of jumping spider, discovered from ***Shendurney Wildlife Sanctuary, Kerala.***
- The Pancorius genus of Asian jumping spiders is primarily distributed in South East Asia.
- While its distribution was hitherto limited to the east and northeastern regions in India, the new species is the first to be reported from the south.

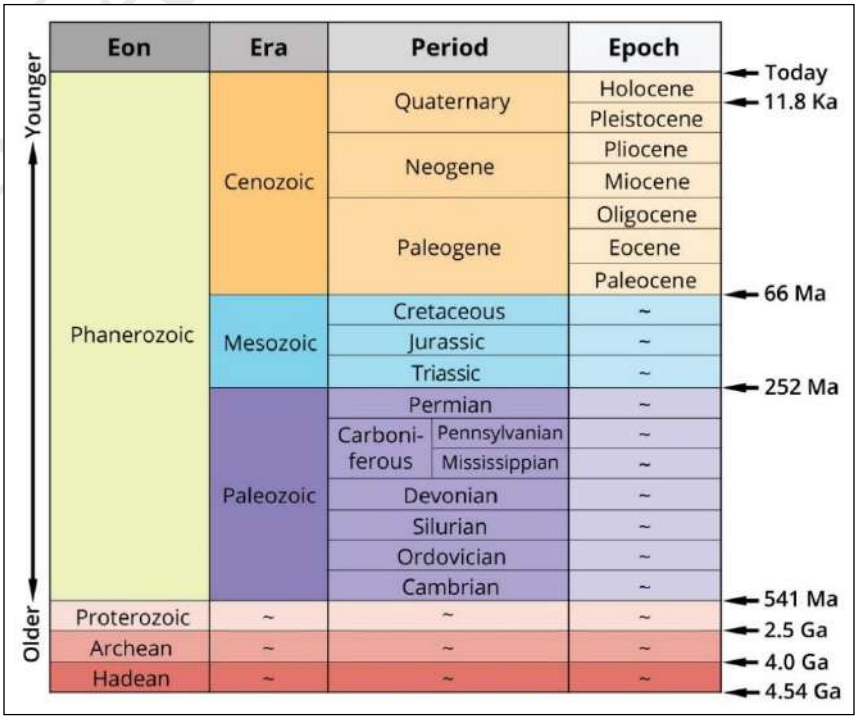
8.51 Farlowichnus rapidus

Brazil's geological service scientists identify new dinosaur species from footprints in Brazil recently.

- It is a new ***dinosaur species*** that has been identified in ***Brazil*** based on footprints found in the city of Araraquara.
- The name Farlowichnus rapidus denotes "*Fast Farlow's track.*"
- It was a small carnivorous animal about the size of a modern-day seriema bird, or about 60-90 cm tall.
- It was a fast animal that lived in the desert during the early *Cretaceous period* (100 to 145 million years ago).

Cretaceous period

- It was a geological period that lasted from about ***145 to 66 million years ago.***
- It was the *last and longest period of the Mesozoic Era*.
- It is named after the chalk formations that cover much of northwestern Europe.
- The Cretaceous Period came after the ***Jurassic Period*** and before the ***Paleogene Period.***
- The Cretaceous Period began with Earth's land assembled essentially into 2 continents - *Laurasia* in the north and *Gondwana* in the south.
- During this period, the 1st flowering plants appeared and the Rocky Mountains began to rise from the Cretaceous Interior Seaway.



8.52 Impatiens Karuppusamyi

Researchers have recently discovered a new plant species of Impatiens and named it Impatiens Karuppusamyi.

- Impatiens is a genus of more than 1,000 species of flowering plants widely distributed throughout tropical Africa, Madagascar, India, Sri Lanka and China.

- **Characteristics-** They bear simple leaves that are usually alternately arranged along the stem.
- **Garden balsam (Impatiens balsamina)-** It is native to the **tropics of Asia** but has long been cultivated in temperate regions of the world.

- **Impatiens Karuppusamyi** – It is the new plant species in the genus 'Impatiens' (Balsaminaceae)
- **Discovery**- In Kalakkad Mundanthurai Tiger Reserve, Tirunelveli,Tamil Nadu
- The plant is found only in the Agasthyamalai region in the Southern Ghats.
- The plant belongs to the scapigerous group (stemless group) is seen only during monsoon for a few weeks.

INVASIVE SPECIES

8.53 Invasive Mussels

The National Green Tribunal (NGT) has ordered the government authorities to file a detailed report on the removal of invasive mussel species from Ennore-Pulicat wetland of Tamil Nadu.

- A small sea creature that has a black shell with two parts that close tightly together.
- **Scientific name** - *Mytella strigata*, **Local Name** - Kakka aazhi
- **Native** - South America
- **Reasons for spread -** Discharge of ballast waters from ships.
- Human interference in the wetlands and pollution
- After *Cyclone Vardah in 2016*, they began to intensify and spread far north towards the Pulicat waters.
- The firm, ash-covered riverbed is also helping to expand its territory.
- **Threats -** It prevents prawns from grazing or burying themselves in the sediment.

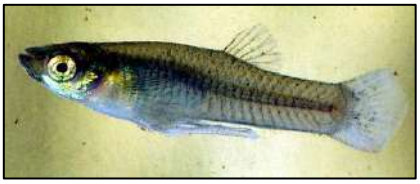
> *National Green Tribunal (NGT) is a statutory body formed in 2010 for disposal of cases related to environmental protection and other natural resources and its Southern Bench is at Chennai.*

- It wipes out the local species like yellow clams (manja matti) and green mussels (pachai aazhi).
- **Issues over NGT Jurisdiction** – *Kaaka aazhi is not an alien* species as it has an entry in the Wildlife Protection Act, 1972 (WPA).
- NGT does *not have jurisdiction over WPA*, which is not listed in Schedule I of the NGT Act.

8.54 Mosquitofish

A new study has revealed that two species of mosquitofish (Gambusia) have invaded various ecosystems across India.

- **Gambusia fish** – An ***insectivorous fish*** that is found mostly in *fresh and brackish, and occasionally marine waters* and has a high breeding capacity.
- When released into freshwater system, they *feed on mosquito larvae* and thus act as *biocontrol agent to control mosquitoes*.
- Commonly used species includes, ***Gambusia affinis, Gambusia holbrooki*** (eastern mosquito fish).
- **Native to** – ***U.S.A***
- **Reasons for its spread** - High breeding capacity, robust adaptability and high tolerance for fluctuating environmental conditions.



- **Impact** – They displace and prey on native fauna, leading to the extinction of native fish, amphibians, and various freshwater communities.
- **In India** – Gambusia was 1st introduced *during British rule in 1928* for mosquito control and now inhabits all around India.

- **Actions taken** – Multiple countries, including India have listed Gambusia as invasive species.
- The World Health Organisation (WHO) has stopped recommending Gambusia as a mosquito control agent in 1982.
- International Union for Conservation of Nature (IUCN) has declared Gambusia as one of the 100 worst invasive alien species in the world.
- **Guppy fish (Poecilia reticulate)** is also deployed as a mosquito predator.

OTHERS

8.55 Oriental Armyworm

Continuous warm temperatures for prolonged periods have led to the serious armyworm infestation in Assam damaging around 28,000 hectares of paddy crop.

- **Scientific name** – *Mythimna separata*
- Also known as the northern armyworm, ear head cutting caterpillar and rice ear-cutting caterpillar.
- **1st report** – Reported as a sporadic pest from Tamil Nadu during 1937 and Kerala and Odisha in 1957.
- **Key features** – It is a ***cyclical pest*** that comes intermittently and was known to strike once every 10-12 years.
- They are ***polyphagous*** (feed on a range of host crop plants)
- **Growing conditions** – Pest population increases during *high temperatures and humid atmosphere.*
- During an outbreak, they multiply largely and move in ***swarms*** like an army, to attack the crops.

Fall armyworm

- **Scientific name** – *Spodoptera frugiperda*
- **Native to**- Tropical and subtropical regions of the Americas.
- **Key features** – It is ***polyphagous*** and a ***transboundary pest*** (fly over 100 km in a single night).

8.56 Permakore

The Koyas have moved on from using traditional Indian Bison horns to palm leaves to craft their 'Permakore'.

- A ***traditional flute of Koya tribes*** that are made of Bison horn.
- In Koya language, **Permam** –Indian Bison or Guar, **Kore** – Horn
- The koya women are ***nowhere associated*** with the Permakore in any phase of its use.
- **Bison horns** - 2 Bison horns are adorned on the head as part of the attire during the ***Kommu Koya dance***
- The ***Permakore flute*** is made of a single horn
- **Koya tribes** - Hunter-gatherers inhabiting ***Papikonda hill*** range in Eastern Ghats in ***Andhra Pradesh*** and in Telangana, Chhattisgarh, and Odisha.

Indian Bison (Indian Gaur) *Bos gaurus*

- It is a bovine species *native to South and Southeast Asia*.
- It is the tallest living and the 2nd heaviest among oxen and is considered as *the largest living bovine*.
- **Estimated population** – Around 13,000 to 30,000 in the world with approximately *85% of the population present in India*.
- **Protection status**
  - IUCN Red List – *Vulnerable*
  - Wildlife Protection Act 1972 – *Schedule I*

***'Bhumi Panduga'**, a festival to mark the commencement of the agricultural season will not be held without Permakore.*

*Papikondalu hill range is also called as the' **Bison hill range'** as it is home to the Indian Bison. It got the national park status in 2008.*

8.57 Sardine Run

Thousands of sardine fish surface near Goa beach, experts call it 'rare' event, known as Sardine Run.

- **Sardines** - small, silvery fish with a single short dorsal fin, no lateral line, and no scales on the head.
- They belong to the herring family of fishes.
- Shoals (group) of the marine species are fluttering in shallow waters along the coast at Keri-Terekhol, on the Goa-Maharashtra border.
- Sardine Run happens due to sudden changes in the temperature of sea surface water.
- A drop or rise in sea surface temperature can induce migration of sardines in higher numbers and sometimes they are trapped in shallow waters.
- When the deeper water rises, it brings nutrient-rich water on top, triggering high food production and Sardines feed on this fresh food called 'phytoplankton'.

8.58 Leh Berry

Ladakh Sea Buckthorn has attained Geographical Indication (GI) tag recently and is the 4th product from Ladakh to get the tag.

- The Leh Berry, or sea buckthorn (Hippophae), is a wonder plant found in Ladakh that yields tiny, sour- tasting orange or yellow berries that are high in vitamins, particularly C.
- It is also popularly known as Wonder Plant, Ladakh Gold, Golden Bush or Gold Mine of cold deserts.
- The root of sea buckthorn is resistant to cold, drought, and barrenness due to nitrogen fixation by rhizobia.
- Rhizobia is a high-quality ecological tree species for improving soil and the ecological environment.
- Ladakh remains the major site for sea buckthorn with over 70% of the total area (13,000 hectares) on which it is present in the country.
- Sea buckthorn is grown completely organically without the use of any pesticide or other chemicals in Ladakh.
- The sea buckthorn fruit is known as the "***King of Vitamin C".***
- It contains over 100 nutrients, 8 vitamins, 24 minerals, 18 amino acids, and antioxidants.

8.59 Sturgeon

Recent study reveals that sturgeon sourced from illegal trade are labelled to mislead.

- Sturgeons are a species of fishes of the family Acipenseridae (subclass Chondrostei), the most endangered species group on earth.
- They are native to **temperate waters of the Northern Hemisphere**, to lower Danube countries such as Bulgaria, Romania, Serbia and Ukraine that produces caviar, has been fished illegally.
- They are found in greatest abundance in the rivers of southern Russia and Ukraine and in the fresh waters of North America.Most species live in the ocean and ascend rivers, possibly once in several years to spawn in spring or summer.
- A few other Sturgeons are confined to fresh water.
- ***The Global Sturgeon Initiative*** by the ***World-Wide Fund for Nature*** aims to save the remaining sturgeon species.
- Sturgeons have been around ***since the age of the dinosaurs***, but are now on the brink of extinction due to overfishing, a flourishing illegal caviar trade and habitat loss.

8.60 Rhododendron

In recent times the rhododendron's development and blooming schedules are affected by rising temperatures and changed precipitation patterns.

- Rhododendron is a genus of flowering plants that includes over a thousand species, including trees, shrubs and creepers.
- **Meaning**- Rose tree in Greek, it is considered an *indicator species* for climate change.
- **1st recorded**- By *Captain Hardwick* in Jammu and Kashmir in 1776 where he spotted the Rhododendron arboreum.
- It is native to **North Temperate Zone,** especially in the moist acidic soil of the Himalayas and into Southeast Asia to the mountains of New Guinea.
- Darjeeling and Sikkim Himalayas comprise only 0.3% of India's geographical area but the region is home to 1/3rd (34%) of all Rhododendron types.
- **Characteristic aspect**- Vivid and striking flowers in red, pink, white, and purple hues.

8.61 Galapagos Tortoises

- There are 13 living species of Galapagos tortoises, which are also as called **giant tortoises.**
- These reptiles are among the **longest-lived** of all land vertebrates and are also the **world's largest tortoises**, some exceeding 5 feet in length and more than 500 pounds weight.

- Tortoises do not have teeth, so they use the bony outer edges of the mouth to bite off and mash food.
- There are 2 main types of Galapagos tortoises that includes:
    1. **Domed tortoises** – Live in the cooler regions of the archipelago.
    2. **Saddle-backed tortoises** – Live in dry, coastal environments.
- The Galapagos archipelago, around 1,000 kilometres (600 miles) off the coast of Ecuador, has flora and fauna found nowhere else in the world.
- These 19 islands and the surrounding marine reserve have been called a unique 'living museum and showcase of evolution'.

8.62 Oyster Restoration Program

Native oysters return to Belfast, Ireland after a century's absence.

- **Oyster** is the common name for a number of different families of salt-water bivalve molluscs that live in marine or brackish habitats.
- **Objective** – To help *restore the native population* of the species, improve water quality and boost marine biodiversity.
- As a local equivalent of a coral reef, Oysters conjoin with each other to form a reef.
- Once they start forming their beds then small fish and crustaceans like worms, snails, algae and many more will come to live and feed there.
- They are supreme water filters, with just 1 animal able to filter ***over 200 litres of seawater a day***.

8.63 Wild Orchids

- **Orchids** – A diverse group of flowering plants with vibrant and intricate flowers which belong to the ***family Orchidaceae***. **Range** – Tropical rainforests, mountains, and even deserts.
- **Distribution** – India has ***over 1200 species of Orchids***, 388 are endemic to India while *128 are endemic to the Western Ghats*.

- **3 Types –** 60% of all orchids found in India are epiphytic, 447 are terrestrial and 43 are mycoheterotrophic.
    - **Epiphytic** – Grow *on another plant* including rock surfaces (lithophytes) for physical support, drawing moisture and nutrients from the air, not from the host.
    - **Terrestrial** – Grow *on land and climbers,* found largely in temperate and alpine regions.
    - **Mycoheterotrophic** - Derive *nutrients from mycorrhizal fungi*, attached to roots of a vascular plant.

Hot-spots of orchids in India - *Himalayas, North-East India and Western Ghats and they are highest in Arunachal Pradesh followed by Sikkim and West Bengal.*

- **Protection status** – Appendix II of CITES (trade of wild orchid is banned globally).
- **Threat** – *Habitat loss* owing to illegal logging and the *most endangered are the epiphytic orchids*.
- **Importance** – They are *natural gauges of air quality* because they don't grow in polluted air.
- It *helps in cross-pollination* and helps the next generation of *insects to survive and grow* as caterpillars thrive on them for food.
- It has *symbiotic relationship with the indigenous people*.
    - The Oraon and Kharia tribal communities use orchids to treat cuts and fractures, skin diseases, aches and pains, gastrointestinal acidity and so on.

8.64 International Year of Camelids

The United Nations has declared 2024 as the International Year of Camelids.

- **Camelids -** As a group Camelids include alpacas, Bactrian camels, dromedaries, guanacos, llamas, and vicuñas.
- The Camelidae family consists of the Old and New World camelids.
- The 3 Old World camelids (OW) are the dromedary, the domestic Bactrian camel, and the wild Bactrian camel.
- Camelids play an important role in meeting the Sustainable Development Goals (SDGs) envisaged by the United Nations.
- **Uses -** Camelids are a source of milk and meat, which helps people fight hunger.
- They also provide fibre, which can be used for clothing and shelter, used by people as a means of transportation, and provide organic fertilizer, which can be used in agriculture.

8.65 Taiga Flycatchers

Taiga Flycatchers, migratory bird was recently for the first spotted at Ernakulam, Kerala.

- The taiga flycatcher or red-throated flycatcher (Ficedula albicilla) is a migratory bird in the family Muscicapidae.
- Taiga Flycatchers hail from the region between eastern Russia and eastern Siberia (Kamchatka province).
- They are ***migratory birds*** and are found in southern Nepal, northeast India, Bangladesh, Southeast Asia and southeast China during the winter.

8.66 Picocystis salinarum

- It is a green alga that lives in saline-soda lakes. It is an ***extremophilic alga***, adaptating to highly saline-alkaline/hyperosmotic conditions. It was spotted for the 1st time in India in the Sambhar Lake.

8.67 Pantoea Tagorei

- It is a Gram-negative, short-rod, non-motile, facultatively anaerobic, potassium-solubilizing ***bacterium.***

- The bacteria promotes plant growth and is being used in organic farming. It solubilizes potassium, replenishes nitrogen, and solubilizes phosphorus.
- It was discovered by a team of microbiologists from Visva Bharati University and named after Nobel laureate Rabindranath Tagore and his son, Rathindranath.

8.68 Babool

- Babool also known as gum arabic (***Acacia nilotica)*** is a perennial tree that can thrive on marginal land, which is unsuitable for agriculture, and can survive both droughts and floods.
- Babool seeds are highly nutritious and the tree works as a windbreak and haven for biodiversity.
- As a nitrogen-fixing legume, it also helps in reclamation of areas degraded by mining or erosion.
- But, excess consumption of babool seeds may affect milk yield in cows.
- **India** is home to at least three of nine subspecies of the tree, with natural babool forests found in Maharashtra, Gujarat, Andhra Pradesh, Rajasthan, Haryana and Karnataka.
- Historically in India, the bitter babool has been used as famine food in arid and semi-arid regions like Rajasthan.

8.69 Eretmoptera murphyi (Midge)

Antarctica's Signy Island, half of which is always covered in ice, has been dealing with an unwelcome guest, a flightless midge, for years.

- Eretmoptera murphyi feasts on dead organic matter and has led to faster plant decomposition.
- It leads to increasing the soil nitrate levels by three-five times compared to places on the island where the midge is absent and only native invertebrate species live.

8.70 Apis Mellifera

A recent study has found that Apis mellifera can be an effective biomonitor for determining the spread of antimicrobial resistance (AMR) in urban neighbourhoods.

- The western honey bee or European honey bee is the most common of the 7–12 species of honey bees worldwide.
- **Geographical Range -** It is native to Europe, western Asia, and Africa. Now it can be found on every continent except Antarctica.
- **Diet -** Adult bees eat pollen and nectar as well as concentrated nectar called honey.
- Young larval bees eat honey, nectar and the bodily secretions from worker bees called ***"worker jelly" or "royal jelly***".
- **Anti-Microbial Resistance (AMR)** - It is the ability of microorganisms to persist or grow in the presence of drugs designed to inhibit or kill them.
- **Biomonitoring** – It is a tool for measuring biodiversity and pollution through the analysis of pollen collected by bees, which act as natural drones and bioindicators.

8.71 Sea Slaters

A new study has found that diffused light pollution in the night sky could be confusing a species of woodlouse called Sea slaters.

- Sea slaters are members of a group of crustaceans called the *Isopoda* (Iso means "same" and pod means "foot").
- It is a species of ***woodlouse.*** It is also known as the *common sea slater, or sea roach.*
- **Scientific Name** - *Ligia oceanica*.
- **Habitat** - It is semi-terrestrial and lives in *Europe and Indo-Pacific region*.

- It is an herbivore and scavenger and eat dead plant and fungal matter thus acting as important "*natural recycler*".
- While sea slaters are not a threatened or vulnerable species, they play an important part in their local ecosystem.
- They search for food at night and can *change their colour* to blend in and hide themselves from predators.

8.72 Snow Crab

In recent years, billions of snow crabs have disappeared from the eastern Bering Sea off the coast of Alaska due to marine heatwave that likely caused them to starve to death.

- **Sexual dimorphism** – Males and females can be distinguished by the *shape of their abdominal flaps* which are triangular in males and broadly rounded in females.
- While males can reach 6 inches, females seldom grow larger than 3 inches in shell width.
- **Range –** Off the coast of Alaska in the *Bering, Beaufort, and Chukchi Seas*.
- **Habitat –** *Soft sandy or Muddy Ocean bottoms*, typically in water less than 650 feet deep.
- **Feed** – Animals living in the sediment and anything dead
- **Predators** – Seals, sea otters, octopi, other crabs, and a wide variety of fishes.
- **Growing Conditions** – They are *cold-water species* and live below 2 and up to 12 degrees Celsius.

8.73 Shaligrams

Shaligrams, worshipped by Hindus and Buddhists for over 2,000 years, are becoming rarer because of climate change.

- They are ***ancient fossils of ammonites***, a class of extinct sea creatures related to modern squids.
- Originating from a single remote region in northern Nepal in the ***Kali Gandaki River Valley of Mustang.***
- Shaligram stones are viewed primarily as manifestations of the Hindu god Vishnu.
- Because they are **not human-made**, but created by the landscape, they are believed to have an intrinsic consciousness of their own.

8.74 Silver Cockscomb

Silver cockscomb which is widely regarded as a weed is found to have benefits that is being largely used by the Soliga tribal community.

- Silver cockscomb is a short-lived beautiful but *troublesome weed* that is 50-60 cm-tall with simple, spirally arranged leaves around the stem.
- In Karnataka's Chamarajanagara district, the silver cockscomb is referred to as *anne soppu.*
- It is also known as lagos spinach, the weed belongs to the Amaranthaceae family, which includes economically important plants like spinach (Spinacia oleracea), beetroot and quinoa.
- **Benefits** – The Soliga tribes consume the silver cockscomb as a leafy vegetable as they are high in nutrients such as beta-carotene and folic acids, and have vitamin E, calcium and iron.
- Most farmers use the plant as fodder for livestock. It is frequently used in traditional Chinese and Indian medicine for treating eye diseases and ulcers.

Soliga Tribes

- Soligas are an *indigenous tribe of Karnataka.*
- They are indigenous people of South India and are credited with being the first at many things:
- They are considered the first settlers of India.
- Their home, Biligiri Rangan (BR) Hills, was among the first areas to be declared a wildlife sanctuary in India, in 1974.
- In 2011, when the region was declared a tiger reserve, the Soligas were the first community to win resident rights in a tiger reserve.

- **Issues** – If left unchecked, it can spread quickly and suppress the growth of other crops, affecting their yield.
- It also attracts insects, caterpillars, worms and moths that can harm crops.

8.75 Candida Auris

Recently, Candida auris, a drug-resistant fungus that was identified as a global threat was found in hospitalised stray dogs in Delhi.

- **About** - *Candida auris* is an emerging **multidrug-resistant fungus** causing life-threatening outbreaks.
- The World Health Organization has declared Candida auris as ***one of the world's 4 'critical priority' fungal pathogens.***
- **Origin** - First reported in Japan in 2009, C. auris has since spread all over the world.
- It grows as yeast and causes candidiasis in humans.
- **Infections Caused** - C. auris has caused bloodstream infections, wound infections, and ear infections.
- It also has been isolated from respiratory and urine specimens, but it is unclear if it causes infections in the lung or bladder.
- **Spread** - contact with contaminated environmental surfaces or equipment, or from person to person.
- **Treatment** - Most C. auris infections are treatable with a class of antifungal drugs called *echinocandins*.
- However, some C. auris infections have been resistant to all 3 main classes of antifungal medications, making them more difficult to treat.

8.76 Vibrio Bacteria

Clusters of brown Sargassum seaweed reported to be infested by Vibrio bacteria, a flesh-eating bacterium, were found awash in Florida.

- Vibrios are gram-negative, highly motile, facultative anaerobes (not requiring oxygen).
- Some species of which cause serious diseases in humans and other animals.People can get infected by Vibrio by eating raw or uncooked seafood.
- Contact with an open wound could cause necrotizing fasciitis, the flesh-eating bacteria infection.
- The infection can lead to amputation or death.
- **Amplification** - Scientists discovered a set of genes called 'zot' genes, which causes leaky gut syndrome.
- If a fish eats a piece of plastic and gets infected by this Vibrio, then it results in a leaky gut and diarrhoea.
- It's going to release waste nutrients such nitrogen and phosphate that could stimulate Sargassum growth and other surrounding organisms.

8.77 Methylotuvimicrobium buryatense 5GB1C

According to a new study, a strain of bacteria could potentially remove methane from major emission sites such as landfills, paddy fields, and oil and gas wells.

- Methylotuvimicrobium buryatense 5GB1C is a *bacterial strain that consumes methane (methanotrophs).*
- It can grow at low methane concentrations ranging from 200-1,000 ppm.
- **Methanotrophs** - Organisms that require methane as a source of carbon and energy for their metabolism.
- They are *gram-negative bacteria* that are capable in utilizing methane as a carbon energy source and able to grow both *aerobically or anaerobically* which only need single-carbon compound to live on.

Methane

- Methane is responsible for *30% global warming.*
- It has a lifetime of *12 years* (lesser when compared to CO_2)
- It is over *85 times more potent* than carbon dioxide (CO_2) on a 20-year timescale.

8.78 Desiccation-tolerant (DT) vascular plants

In the Western Ghats, researchers have found 62 species of plants, 16 are Indian endemic, and 12 are exclusive to Western Ghat outcrops that can survive extreme dehydration.

- Hydration and desiccation-tolerance are two commonly studied strategies for plants in extreme habitats.
- ***Hydration*** is a condition where plant tissues can tolerate more than 30% of water content.
- But in desiccation, plants undergo longer dry days during which the moisture content of the leaves is the same as in the air.
- **Desiccation-tolerant** (DT) vascular plants are able to withstand extreme dehydration, losing up to 95% of their water content, and they revive themselves once water is available again.
- **Characteristics -** DT plant varieties are found in both flowering and non-flowering species and in both temperate and tropical climates.
- They are usually found in rocky outcrops and can recover quickly when water supplies are restored.
- Ferricretes (layers of sedimentary rock) and basaltic plateaus seemed to be the preferred habitats.
- Some species were found to survive at increasing temperatures, which is crucial for the warming planet.
- **Extremophytes** - Some plant species ranging from algae to angiosperms thrive in harsh environments and are termed as extremophytes.
- **DT in India** - India now has 9 new generic records for the global list of desiccation-tolerant (DT) plants.
- They are identified as Pyrrosia, Aleuritopteris, Corallodiscus, Arundinella, Bhidea, Bothriochloa, Danthonidium, Dimeria and Glyphochloa.
- Colour changes and morphological characteristics were also observed in the species to adapt to the dryness.

8.79 Fish Mint

Fish mint, an herb which has a fish-like taste and smell has recognised health benefits.

- **Scientific name** – Houttuynia cordata
- **Morphology** – It has *white flowers* and broad, heart-shaped leaves.
- It has a *fish-like taste and smell* and hence the name.
- **Native** – Believed to be from Southeast Asia.
- **Literary sources** – Documented in ancient texts of traditional Chinese and Japanese medicine, as well as *Ayurveda and Siddha*.

Different names	States
Ja mardoh	Meghalaya
Tokning-khok	Manipur
Masunduri	Assam

- **Growing conditions** – It grows on *moist soils* and resistant to flooding.
- **Medicinal purpose** – The Chinese herb is used to *treat asthma* due to its anti-allergic and anti-inflammatory properties.
- It is used to alleviate symptoms of jaundice, pneumonia or simple stomach infections.
- In Japan, as an herbal tea it prevents *periodontal disease and other infectious oral diseases*.
- It is a potential nutraceutical agent for the therapy of viruses such as SARS-CoV-2, HIV, herpes simplex and influenza.
- **Health**– It has the ability to *reduce body weight*, epididymal fat, insulin resistance, plasma and liver lipids.
- **Cosmetics** - The leaves are *used in cosmetics* such as serums for acne-prone irritated skin.

Nutraceuticals are products derived from food sources that are purported to provide extra health benefits, in addition to the basic nutritional value found in foods.

8.80 Extinct Animals

- **Extinct animals-** Formosan clouded leopard, Bali tiger, Schomburgk's deer, Japanese sea lion,Syrian wild ass.

- **Sumatran elephant-** It is *not extinct* and was changed from Endangered to Critically Endangered.

Extinct animals	Description
Formosan clouded leopard	• It is a leopard species. • An extensive 15 year survey from 1997 to 2012 failed to find any individuals. • It was 1st described in 1862. • Within 120 years it went extinct in its home range *Taiwan*. 
Bali tiger	• It is a tiger species, which is described as smallest tiger on the *Sunda Islands*. • After 2017 reform in taxonomy, this species was brought under Panthera tigiris sondaica, which includes Sumatran tiger. • It was believed to have gone extinct in 1950s. 
Schomburgk's deer	• It was endemic to *Thailand* and resembled the barasingha. • The deer population dwindled after Thailand intensified rice cultivation. • It was last recorded in 1938. 
Japanese sea lion	• It is a species of aquatic mammal. • It went extinct in the 1970s. • It was driven to extinction by over-hunting and possibly submarine warfare during World War II. 
Syrian wild ass	• This is an equine species, also called as hempine. • It was the smallest equine species and couldn't be domesticated. • It was rendered extinct by 1927. • It is extinct due to overhunting and by the consequences of World War I. 

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