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SIMPLIFYING IAS EXAM PREPARATION

INSTA PT 2022 EXCLUSIVE

ENVIRONMENT

JANUARY 2021 – FEBRUARY 2022

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Government Programmes / Initiatives

1. 'Nal Se Jal' Yojana

Launched in 2019.

Nodal Agency: Ministry of Jal Shakti

- **Aim:** To provide piped drinking water to every rural home by 2024
- It is a component of the government's Jal Jivan Mission.

Implementation:

- The scheme is based on a unique model where **paani samitis (water committee)** comprising villagers will decide what they will pay for the water they consume.
- **The tariff they fix will not be the same for everyone in the village.** Those who have large households will pay more, while poor households or households where there is no earning member, will be exempted.

About Jal Jeevan Mission:

JJM envisages **supply of 55 litres of water per person per day to every rural household through Functional Household Tap Connections (FHTC) by 2024.**

- It is under the Ministry of Jal Shakti.
- It was launched in 2019.

The mission ensures:

1. Functionality of existing water supply systems and water connections.
2. Water quality monitoring and testing as well as sustainable agriculture.
3. Conjunctive use of conserved water.
4. Drinking water source augmentation.
5. Drinking water supply system, grey water treatment and its reuse.

It also encompasses:

1. Prioritizing provision of FHTCs in quality affected areas, villages in drought prone and desert areas, Sansad Adarsh Gram Yojana (SAGY) villages, etc.
2. Providing functional tap connection to Schools, Anganwadi centres, Gram Panchayat buildings, Health centres, wellness centres and community buildings.
3. Technological interventions for removal of contaminants where water quality is an issue.

Implementation:

- The Mission is based on a community approach to water and includes extensive Information, Education and Communication as a key component of the mission.
- JJM looks to create a jan andolan for water, thereby making it everyone's priority.
- The fund sharing pattern between the Centre and states is 90:10 for Himalayan and North-Eastern States, 50:50 for other states, and 100% for Union Territories.

2. National Adaptation Fund for Climate Change (NAFCC)

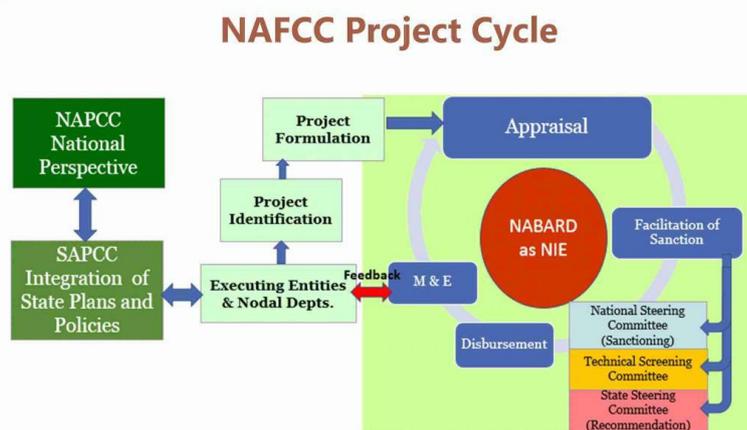
What is NAFCC?

Established in August, 2015.

- It aims to meet the **cost of adaptation to climate change for the State and Union Territories of India** that are particularly **vulnerable to the adverse effects of climate change.**

Implementation:

- Considering the existing arrangement with **NABARD as National Implementing Entity (NIE) for Adaptation Fund (AF) under Kyoto Protocol** and its presence across the country, **NABARD has been designated as National Implementing Entity (NIE)** for implementation of adaptation projects under NAFCC.
- NABARD would perform roles in facilitating** identification of project ideas/concepts from State Action Plan for Climate Change (SAPCC), project formulation, appraisal, sanction, disbursement of fund, monitoring & evaluation and capacity building of stakeholders including State Governments.

**NAFCC Outcome Framework:**

Fund level outcome parameters will consist of the following:

- Reduced key risks and adverse impacts of climate change** in water and agriculture sectors.
- Maximised multi-sectoral, cross-sectoral benefits/co-benefits** to meet the challenges of water and food security.
- Human development, poverty alleviation, livelihood security and enhanced awareness of community.
- Strengthened institutional & individual capacity to reduce risks associated with climate-induced socioeconomic and environmental losses.

Financing:

The Fund is financed in part by government and private donors, and also from proceeds of **Certified Emission Reductions (CERs)** issued under the Protocol's **Clean Development Mechanism projects**.

Governance:

The Fund is **supervised and managed by the Adaptation Fund Board (AFB)**.

- The AFB is composed of 16 members and 16 alternates and meets at least twice a year.
- The World Bank serves as trustee** of the Adaptation Fund on an interim basis.

3. India's Stand at COP-26

The Government of India has articulated and put across the concerns of developing countries at the **26th session of the Conference of the Parties (COP26)** to the United Nations Framework Convention on Climate Change (UNFCCC) held in Glasgow, United Kingdom.

Five Nectar Elements (Panchamrit):

India has presented the following five nectar elements (Panchamrit) of India's climate action:

- Reach **500 GW Non-fossil energy capacity** by 2030.
- 50 per cent of its energy requirements** from renewable energy by 2030.
- Reduction of total projected carbon emissions** by one billion tonnes from now to 2030.
- Reduction of the carbon intensity** of the economy by 45 per cent by 2030, over 2005 levels.
- Achieving the **target of net zero emissions** by 2070.

Mantra of LIFE- Lifestyle:

The **mantra of LIFE- Lifestyle for Environment to combat climate change** was also shared in COP 26.

- It was stated that Lifestyle for Environment has to be taken forward as a campaign to make it a **mass movement of Environment Conscious Lifestyles**.

Net Zero:

India has also pledged to become a **'net zero' carbon emitter by 2070**, and announced enhanced targets for renewable energy deployment and reduction in carbon emissions.

India's approach:

- India emphasized the foundational **principles of equity, and common but differentiated responsibilities and respective capabilities**.
- All countries should have equitable access to the global carbon budget**, a finite global resource, for keeping temperature increase within the limits set by the Paris Agreement.
- And, all countries must stay **within their fair share of this global carbon budget**, while using it responsibly.
- Responsibility of the developed nations:** India also called on the developed countries for climate justice, and for undertaking rapid reductions in emissions during the current decade so as to reach net zero much earlier than their announced dates.

Net-zero, which is also referred to as **carbon-neutrality**, does not mean that a country would bring down its emissions to zero. That would be **gross-zero**, which means **reaching a state where there are no emissions at all, a scenario hard to comprehend**.

Basically, net-zero is a state in which a country's emissions are compensated by absorption and removal of greenhouse gases from the atmosphere.

The **International Air Transport Association (IATA)** 77th Annual General Meeting approved a resolution for the global air transport industry to achieve net-zero carbon emissions by 2050.

4. River Cities Alliance

The River Cities Alliance (RCA) has been launched with the objective to provide the member cities with a platform to discuss and exchange information on aspects that are vital for sustainable management of urban rivers, sharing best practices and supporting innovation.

- The alliance has been launched initially with 30 cities including Dehradun, Rishikesh, Haridwar, Srinagar, Varanasi, Kanpur, Prayagraj etc.
- The Alliance is open to all river cities of India. Any river city can join the Alliance at any time.

National Mission for Clean Ganga and National Institute of Urban Affairs are launching a first of its kind **River Cities Alliance** with 30 cities in India.

River Cities Alliance
Networking

- Organize annual River Summit on Urban River Management
- Facilitate exchange of official visits for member cities
- Publish newsletters with relevant developments in the member cities and emerging practices from across the globe.

5. Green energy corridor

The Cabinet Committee on Economic Affairs has approved **the scheme on Green Energy Corridor (GEC) Phase-II for Intra-State Transmission System (InSTS)**.

What is the Green Energy Corridor Project for Intra-State Transmission System (InSTS)?

The **Green Energy Corridor(GEC) Project** aims at synchronizing electricity produced from renewable sources such as solar and wind with conventional power stations in the grid.

The **GEC-Intra State Transmission System(InSTS)** project was sanctioned in 2015-16, for evacuation and integration of the renewable energy capacity through setting up of transmission lines and increasing transformation capacity of substations.

Phase I of the Project:

- It is being implemented by eight renewable-rich states of Tamil Nadu, Rajasthan, Karnataka, Andhra Pradesh, Maharashtra, Gujarat, Himachal Pradesh, and Madhya Pradesh.
- Under this phase, the target is to install 9700 circuit km of transmission lines and 22,600 MegaVolt-Amperes(MVA) transformation capacity of substations by 2022.
- The funding mechanism consists of a 40% Government of India Grant, 20% state equity and a 40% loan from KfW Bank, Germany.

Phase II of the Project:

- It is being implemented in seven States namely, Gujarat, Himachal Pradesh, Karnataka, Kerala, Rajasthan, Tamil Nadu and Uttar Pradesh.
- Under this phase, the target is to install 10,750 circuit km of transmission lines and 27,500 MegaVolt-Amperes(MVA) transformation capacity of substations by 2025-26.
- The Centre will provide assistance at 33% of the cost of the project.

6. Atmosphere & Climate Research-Modelling Observing Systems & Services (ACROSS)

Cabinet committee on Economic Affairs (CCEA) has approved a scheme called **Atmosphere & Climate Research-Modelling Observing Systems & Services (ACROSS)** to be continued for next five years.

With improved forecasts, it will be easy for predicting the timings, intensity, frequency of disasters like cyclones, heat waves, thunderstorms, excessive rainfall etc., that is progressively growing uncertain with increasing climate change.

ACROSS Scheme:

- ACROSS scheme pertains to the atmospheric science programs of the Ministry of Earth Sciences (MoES).
- It addresses different aspects of weather and climate services, which includes warnings for cyclone, storm surges, heat waves, thunderstorms etc.
- Each of these aspects is incorporated as nine sub-schemes under the umbrella scheme "ACROSS" and is implemented in an integrated.

ACROSS is an umbrella scheme with eight sub-schemes encompassing the programmes for greater understanding of atmospheric science. These eight master schemes are as follows:

1. Commissioning of Polarimetric Doppler Weather Radars (DWRs).
2. Upgradation of Forecast System, Weather & Climate Services.
3. Atmospheric Observations Network.
4. Numerical Modelling of Weather and Climate.
5. Monsoon Mission III.
6. Monsoon Convection.
7. Clouds and Climate Change (MC4).
8. High Performance Computing System (HPCS).

Implementation:

Implemented by MoES in collaboration with the India Meteorological Department (IMD), Indian Institute of Tropical Meteorology (IITM), National Centre for Medium Range Weather Forecasting (NCMRWF) and the Indian National Centre for Ocean Information Services (INCOIS).

7. Compensatory Afforestation Fund Management and Planning Authority (CAMPA)

The **Compensatory Afforestation Fund Management and Planning Authority (CAMPA)** has so far disbursed ₹48,606 crore to 32 States.

- Chhattisgarh and Odisha have had the maximum amount transferred to them, or close to ₹5,700 crore each followed by Jharkhand and Maharashtra at around ₹3,000 crore.

What are CAMPA funds?

CAMPA funds are part of long-pending dues of the Compensatory Afforestation Fund (CAF), a ₹54,000-crore tranche collected for nearly a decade as environmental compensation from industry, which has razed forest land for its business plans.

About CAMPA:

The CAF Act 2016, which came into being more than a decade since it was devised, established an independent authority — **the Compensatory Afforestation Fund Management and Planning Authority** — to execute the fund.

What is Compensatory Afforestation?

Compensatory afforestation means that every time forest land is diverted for non-forest purposes such as mining or industry, the user agency pays for planting forests over an equal area of non-forest land, or when such land is not available, twice the area of degraded forest land.

Fund sharing:

As per the rules, 90% of the CAF money is to be given to the states while 10% is to be retained by the Centre.

- **The funds can be used for**
 - treatment of catchment areas,
 - assisted natural generation,
 - forest management,
 - wildlife protection and management,
 - relocation of villages from protected areas,
 - managing human-wildlife conflicts,
 - training and awareness generation,
 - supply of wood saving devices and allied activities.

8. Kasturirangan Committee on Western Ghats

What did the Gadgil Committee say?

- It defined the boundaries of the Western Ghats for the purposes of ecological management.
- It proposed that this entire area be designated as ecologically sensitive area (ESA).
- Within this area, smaller regions were to be identified as ecologically sensitive zones (ESZ) I, II or III based on their existing condition and nature of threat.
- It proposed to divide the area into about 2,200 grids, of which 75 per cent would fall under ESZ I or II or under already existing protected areas such as wildlife sanctuaries or natural parks.
- The committee proposed a Western Ghats Ecology Authority to regulate these activities in the area.

Why was Kasturirangan Committee setup?

None of the six concerned states (Kerala, Tamil Nadu, Karnataka, Goa, Maharashtra and Gujarat) agreed with the recommendations of the Gadgil Committee, which submitted its report in August 2011.

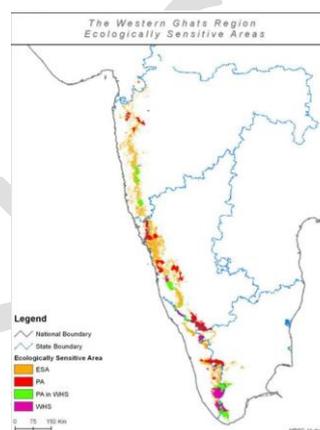
- In August 2012, then Environment Minister constituted a High-Level Working Group on Western Ghats under Kasturirangan to “examine” the Gadgil Committee report in a “holistic and multidisciplinary fashion in the light of responses received” from states, central ministries and others.
- The Kasturirangan report seeks to bring just 37% of the Western Ghats under the Ecologically Sensitive Area (ESA) zones — down from the 64% suggested by the Gadgil report.

Recommendations of Kasturirangan Committee:

- A ban on mining, quarrying and sand mining.
- No new thermal power projects, but hydro power projects allowed with restrictions.
- A ban on new polluting industries.
- Building and construction projects up to 20,000 sq m was to be allowed but townships were to be banned.
- Forest diversion could be allowed with extra safeguards.

Importance of western ghats:

- The Western Ghats is an extensive region spanning over six States. It is the home of many endangered plants and animals. It is a **UNESCO World Heritage site**.
- It is one of the **eight “hottest hot-spots” of biological diversity in the world**.
- According to UNESCO, the Western Ghats are older than the Himalayas. They influence Indian monsoon weather patterns by intercepting the rain-laden monsoon winds that sweep in from the south-west during late summer.



9. National Mission for Clean Ganga

The **National Mission for Clean Ganga** has set a **Guinness World Record** on the first day of the Ganga Utsav for the highest number of photos of handwritten notes uploaded on Facebook in an hour.

About the National Mission for Clean Ganga (NMCG):

It was registered as a society on 12th August 2011 under the **Societies Registration Act 1860**. It acted as the **implementation arm of National Ganga River Basin Authority (NGRBA)** which was constituted under the provisions of **the Environment (Protection) Act (EPA), 1986**.

- NGRBA was dissolved with effect from the 7th October 2016, consequent to the constitution of the **National Council for Rejuvenation, Protection and Management of River Ganga (referred as National Ganga Council)**.

Some facts related to Ganges:

1. Ganga is the third largest river in the world by discharge.
2. The mouth of River Ganga forms the world’s largest delta, known as Sunderbans, and was declared a World Heritage Site by UNESCO in 1997.

10. Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Rights Act)

The President of India has empowered (under **clause (1) of Article 239 of the Constitution**) the **Lieutenant Governor of Ladakh** to exercise the powers and discharge the functions of the State Government under the **Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006** within the Union territory.

About the Forest Rights Act:

The Act passed in 2006 grants legal recognition to the rights of traditional forest dwelling communities.

Rights under the Act:

Title rights - i.e. ownership - to land that is being farmed by tribals or forest dwellers as on 13 December 2005, subject to a maximum of 4 hectares; ownership is only for land that is actually being cultivated by the concerned family as on that date, meaning that no new lands are granted.

Use rights - to minor forest produce (also including ownership), to grazing areas, to pastoralist routes, etc.

Relief and development rights - to rehabilitation in case of illegal eviction or forced displacement; and to basic amenities, subject to restrictions for forest protection.

Forest management rights - to protect forests and wildlife.

**Forest Rights Act**

Enacted in 2006, the Forest Rights Act came into effect in 2008. Considered a landmark piece of legislation as it attempts to correct historical injustices against forest dwellers in the colonial era and in independent India, it recognises forest dwellers' individual rights over their land and a village's rights to manage and conserve the forest:

Individual Forest Rights: Any person belonging to a scheduled tribe can claim rights to live in and cultivate up to 4 ha if he occupied it and depended on it as of December 13, 2005. A non-tribal, in addition, will have to prove his family's residence in the vicinity of the forest for 75 years prior to December 2005

Community Forest Rights: The Act recognises the rights of a gram sabha over forest land within the village boundaries or seasonal use of landscape for pastoral communities. This allows the villagers to own and collect, use and dispose of minor forest produce besides timber, including the right to use grazing land and water bodies and the right to protect and regenerate any community resource, among others

Eligibility criteria:

According to Section 2(c) of Forest Rights Act (FRA), to qualify as **Forest Dwelling Scheduled Tribe (FDST)** and be **eligible for recognition of rights under FRA**, three conditions must be satisfied by the applicant/s, who could be "members or community":

1. Must be a Scheduled Tribe in the area where the right is claimed; and
2. Primarily resided in forest or forests land prior to 13-12-2005; and
3. Depend on the forest or forests land for bonafide livelihood needs.

And to qualify as **Other Traditional Forest Dweller (OTFD)** and be eligible for recognition of rights under FRA, two conditions need to be fulfilled:

1. Primarily resided in forest or forests land for three generations (75 years) prior to 13-12-2005.
2. Depend on the forest or forests land for bonafide livelihood needs.

Process of recognition of rights:

1. The gram sabha, or village assembly, will initially pass a resolution recommending whose rights to which resources should be recognised.
2. This resolution is then screened and approved at the level of the sub-division (or taluka) and subsequently at the district level.

The screening committees consist of three government officials (Forest, Revenue and Tribal Welfare departments) and three elected members of the local body at that level. These committees also hear appeals.

11. National Green Tribunal (NGT)

The **National Green Tribunal (NGT)**, Eastern Zone, has imposed a fine of ₹2 crore on the Jindal Steel and Power Limited (JSPL) for changing the natural course of **Kurbadahali Nalla** (water channel) in Odisha's Angul district.

About NGT:

- Established on **18th October, 2010** under the **National Green Tribunal Act 2010**.
- Established for **effective and expeditious disposal of cases** relating to environmental protection and conservation of forests and other natural resources.

- **New Delhi is the Principal Place of Sitting** of the Tribunal and Bhopal, Pune, Kolkata and Chennai shall be the other four places of sitting of the Tribunal.
- The Tribunal is **not bound by the procedure laid down under the Code of Civil Procedure, 1908**, but **shall be guided by principles of natural justice**.
- NGT is **mandated to make disposal of applications or appeals finally within 6 months of filing of the same**.

With the establishment of the NGT, **India became the third country in the world to set up a specialised environmental tribunal, only after Australia and New Zealand, and the first developing country to do so.**

Composition:

Sanctioned strength: The act allows for up to 40 members (20 expert members and 20 judicial members).

Chairman: Is the administrative head of the tribunal, also **serves as a judicial member and is required to be a serving or retired Chief Justice of a High Court or a judge of the Supreme Court of India.**

Selection:

1. **Members** are chosen by a selection committee (headed by a sitting judge of the Supreme Court of India) that reviews their applications and conducts interviews.
2. **The Judicial members** are chosen from applicants who are serving or retired judges of High Courts.
3. **Expert members** are chosen from applicants who are either serving or retired bureaucrats not below the rank of an Additional Secretary to the Government of India (not below the rank of Principal Secretary if serving under a state government) with a minimum administrative experience of five years in dealing with environmental matters. Or, the expert members must have a doctorate in a related field.

12. Beach Environment & Aesthetics Management Services (BEAMS)

The Ministry of Environment, Forest and Climate Change in its pursuit of **“Sustainable Development” of the coastal regions of India** embarked upon a highly acclaimed & **flagship program Beach Environment & Aesthetics Management Services (BEAMS)**.

What is it?

- BEAMS is one of the initiatives under **‘Integrated coastal zone management’ (ICZM)** approach that the MoEF&CC has undertaken for the sustainable development of coastal regions of India.
- **The prime objective of ICZM approach is to protect and conserve the pristine coastal and marine ecosystems through holistic management of the resources.**

The objective of BEAMS program is:

1. To abate pollution in coastal waters,
2. Promote sustainable development of beach facilities,
3. Protect & conserve coastal ecosystems & natural resources, and
4. Seriously challenge local authorities & stakeholders to strive and maintain high standards of cleanliness,
5. Hygiene & safety for beachgoers in accordance with coastal environment & regulations.

What is ICZM Project?

Integrated coastal zone management (ICZM) aims to improve livelihood of coastal communities and conserve the coastal ecosystem.

- It is a **World Bank assisted project**.

- The National Centre for Sustainable Coastal Management (**NCSCM**), Chennai, will provide scientific and technical inputs.
- The concept of ICZM was born in 1992 during the Earth Summit of Rio de Janeiro.

13. National Mission on use of Biomass in coal based thermal power plants

To address the issue of air pollution due to farm stubble burning and to reduce carbon footprints of thermal power generation, **Ministry of Power** has decided to set up a **National Mission on use of Biomass in coal based thermal power plants**.

Objectives of the mission:

- (a) To increase the level of **co-firing** from present 5% to higher levels to have a larger share of carbon neutral power generation from the thermal power plants.
- (b) To take up R&D activity in boiler design to handle the higher amount of silica, alkalis in the biomass pellets.
- (c) To facilitate overcoming the constraints in supply chain of bio mass pellets and agro- residue and its transport upto to the power plants.
- (d) To consider regulatory issues in biomass co-firing.

Implementation:

1. The Mission would have a Steering Committee headed by Secretary (Power) comprising of all stakeholders including representatives from Ministry of Petroleum & Natural Gas (MoPNG), Ministry of New & Renewable Energy (MNRE) etc.
2. The Executive Committee would be headed by Member (Thermal), CEA. NTPC will play a larger role in providing logistic and infrastructure support in the proposed National Mission.

What is Biomass Cofiring?

It refers to the concurrent blending and combustion of biomass materials with other fuels such as natural gas and coal within a boiler, which reduce the use of fossil fuels for energy generation and emissions without significantly increasing costs and infrastructure investments.

Benefits of Cofiring:

1. Biomass cofiring is a promising technology to decrease the use of fossil fuels for energy generation and hence mitigate greenhouse gas emissions.
2. Coal and biomass cofiring accounts for the relevant advantages of a relative ease of implementation and an effective reduction of CO₂ and other pollutant (SO_x, NO_x) emissions to the atmosphere.
3. Cofiring biomass with coal may record no loss in total boiler efficiency after adjusting combustion output for the new fuel mixture.

14. Species Recovery Programme

The **National Board for Wildlife and Union Ministry of Environment, Forest and Climate Change** included **the caracal**, a medium-sized wildcat found in parts of Rajasthan and Gujarat, in **the list of critically endangered species**.

- The recovery programme for critically endangered species in India now includes 22 wildlife species.

About Caracal:

- Besides India, the caracal is found in several dozen countries across Africa, the Middle East, Central and South Asia.
- While it flourishes in parts of Africa, its numbers in Asia are declining.



- The wildcat has long legs, a short face, long canine teeth, and distinctive ears — long and pointy, with tufts of black hair at their tips.
- The iconic ears are what give the animal its name — caracal comes from the Turkish karakulak, meaning 'black ears'. In India, it is called siya gosh, a Persian name that translates as 'black Ear'.

Historical Evidences:

It finds mention in **Abul Fazl's Akbarnama**, as a hunting animal in the time of Akbar (1556-1605). Descriptions and illustrations of the caracal can be found in medieval texts such as **the Anvar-i-Suhayli, Tutinama, Khamsa-e-Nizami, and Shahnameh**.

About the Species Recovery Programme:

It is one of the three components of **the Integrated Development of Wildlife Habitats (IDWH)**.

- IDWH was started in 2008-09 as a Centrally sponsored Scheme. It is meant for providing support to protected areas (national parks, wildlife sanctuaries, conservation reserves and community reserves except tiger reserves), protection of wildlife outside protected areas and recovery programmes for saving critically endangered species and habitats.



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Animal / Wildlife Protection

1. Wild Life (Protection) Act, 1972

The **Wild Life (Protection) Act, 1972** is an Act of the Parliament of India enacted for protection of plants and animal species.

The Act provides for the **protection of wild animals, birds and plants**; and for matters connected therewith or ancillary or incidental thereto. **It extends to the whole of India.**

The Wild Life Act provides for:

- state wildlife advisory boards,
- regulations for hunting wild animals and birds
- establishment of sanctuaries and national parks
- regulations for trade in wild animals, animal products and trophies
- judicially imposed penalties for violating the Act
- It has six schedules which give varying degrees of protection.
 - Schedule I and part II of Schedule II provide absolute protection - offences under these are prescribed the highest penalties.
 - Species listed in Schedule III and Schedule IV are also protected, but the penalties are much lower.
 - Animals under Schedule V, e.g. common crows, fruit bats, rats and mice, are legally considered vermin and may be hunted freely.
 - The specified endemic plants in Schedule VI are prohibited from cultivation and planting.
- Wildlife wardens and their staff administer the act.
- An amendment to the Act in 1982, introduced a provision permitting the capture and transportation of wild animals for the scientific management of the animal population.

Constitution of Various Bodies:

The WPA act provides for the constitution of bodies to be established under this act such as **the National and State Board for Wildlife, Central Zoo Authority and National Tiger Conservation Authority.**

Constitutional Provisions for Wildlife:

- **The 42nd Amendment Act, 1976**, Forests and Protection of Wild Animals and Birds was transferred from State to Concurrent List.
- **Article 51 A (g) of the Constitution** states that it shall be the fundamental duty of every citizen to protect and improve the natural environment including forests and Wildlife.
- **Article 48 A in the Directive Principles of State policy**, mandates that the State shall endeavor to protect and improve the environment and to safeguard the forests and wildlife of the country.

2. Kawal Tiger Reserve

The **Kawal Tiger Reserve** hosted its first ever 'Bird Walk' recently.

- Kawal is home to a rich diversity in flora and fauna with more than 300 species of birds, and over 600 tree species with different forest compositions.
- The reserve is **located in Telangana.**
- The reserve is **the oldest sanctuary in the northern Telangana region of the state.**



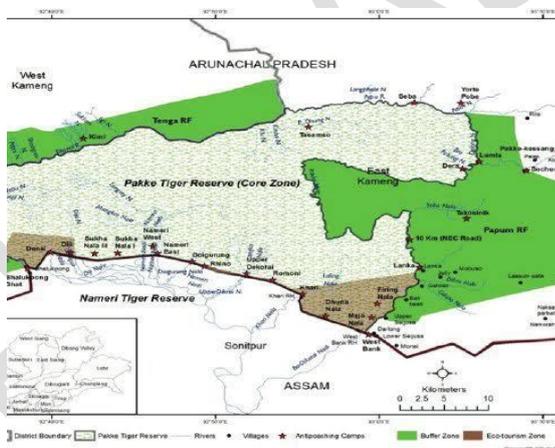
- This sanctuary is **catchment for the rivers Godavari and Kadam**.
- The sanctuary is one of **the richest teak forests in the state**, with dense pristine areas free of human disturbance.

3. Wayanad Wildlife Sanctuary

- The sanctuary is a **component of the Nilgiri Biosphere Reserve** (5,520 sq km) and is a vital component of the **Elephant Reserve No. 7 of South India**.
- It is **the only sanctuary of Kerala where sightings of four-horned antelopes** have been reported.
- Presence of **Egyptian vulture, Himalayan griffon, and Cinereous vultures** are also reported in the sanctuary and **the two species of vultures, red-headed and white-backed vultures**, once common in Kerala, are now restricted to the Wayanad plateau.
- The **Nagarhole-Bandipur-Mudumalai-Wayanad forest complex** is also one of the most important tiger habitats in the country.
- The forests of the wildlife division form the major catchments for the tributaries of **the Kabini river system**.

4. Pakke tiger reserve

- Pakke Tiger Reserve is also known as **Pakhui Tiger Reserve**.
- This Tiger Reserve has won **India Biodiversity Award 2016** in the category of 'Conservation of threatened species' for its **Hornbill Nest Adoption Programme**.
- It is bounded by **Bhareli or Kameng River in the west and north, and by Pakke River in the east**.
- **Neighbours:** Papum Reserve Forest in Arunachal Pradesh, Assam's Nameri National Park, Doimara Reserve Forest and Eaglenest Wildlife Sanctuary.
- **The main perennial streams in the area are** the Nameri, Khari and Upper Dikorai. West of Kameng River is Sessa Orchid Sanctuary.
- It falls within **the Eastern Himalaya Biodiversity Hotspot**.



5. Jim Corbett National Park

- It is located in Nainital district of **Uttarakhand**. The park encompasses the Patli Dun valley formed by the Ramganga river.
- The national park was established in 1936 as **Hailey National Park** to protect the endangered Bengal tiger.
- It is named after Jim Corbett who played a key role in its establishment.
- It is the **oldest national park in India**.
- It was the **first area to come under the Project Tiger initiative** in 1973.

6. Navegaon-Nagzira Tiger Reserve (NNTR)

- A **rare Melanistic Leopard** (commonly known as Black Panther) has been recorded in Navegaon-Nagzira Tiger Reserve (NNTR) of Maharashtra.

- The tiger reserve comprises the notified area of Navegaon National Park, Navegaon Wildlife Sanctuary, Nagzira Wildlife Sanctuary, New Nagzira Wildlife Sanctuary and Koka Wildlife Sanctuary.
- **NNTR has connectivity with the major tiger reserves in Central India** like Kanha and Pench Tiger Reserve in Madhya Pradesh, Pench & Tadoba-Andhari TR in Maharashtra, Indravati tiger Reserve in Chhattisgarh and indirectly with the Kawal & Nagarjunsagar Tiger Reserve in Telangana & Andhra Pradesh and Achanakmar TR in Chhattisgarh.
- It is also connected to important tiger bearing areas like Umred-Karhandala sanctuary and Bramhapuri division.

ALL ABOUT MELANISM

- ▶ Black panther in Asia and Africa is black leopard (*Panthera Pardus*), and the one in the US is black jaguar (*Panthera Onca*)
- ▶ Black panther same species as a normal-coloured panther with a high amount of pigment (melanin) causing the animal to appear to be black. Melanism occurs because of a recessive gene mutation
- ▶ Condition is caused by agouti gene which regulates distribution of black pigment within hair shaft
- ▶ Closer look at a panther's coat will reveal characteristic spots of leopard and jaguar, hiding under a cloak of excess



The leopard was recorded in camera traps during Phase IV estimation in NNTR in February

melanin in what is called 'ghost striping'.

▶ Black panthers found in states like Kerala, Karnataka, Chhattisgarh, Maharashtra, Goa, Tamil Nadu, Assam, Arunachal Pradesh, and Odisha

▶ Melanism hereditary but is not necessarily passed on directly to the next generation.

A black panther cub may be born even if both parents are normal coloured

▶ Normal-colored leopard can carry recessive melanistic gene. Often, a black leopard cub is born along with fair-colored cubs. If both parents are black, the leopard cubs are always black

7. Dihing Patkai:

- **Dihing Patkai is Assam's 7th National Park.**
- **Assam now has the third most National Parks** after the 12 in Madhya Pradesh and nine in the Andaman and Nicobar Islands.
- It has 47 species each of reptiles and mammals, including tiger and clouded leopard.
- **National Paks in Assam:** Kaziranga, Manas, Nameri, Orang, Dibru-Saikhowa and Raimona National Park. Kaziranga and Manas are UNESCO World Heritage Sites. They are also tiger reserves along with Nameri and Orang.
- **Raimona** adjoins the Buxa Tiger Reserve in West Bengal to its west, Phipsoo Wildlife Sanctuary in Bhutan to its north and the first addition to Manas National Park to the east.

8. Pulicat Lake and Nelapattu bird sanctuary

Increase in numbers of migratory birds visiting the [Pulicat Lake](#) in India

More on this news:

- This positive development is largely **due to increase in the storage levels in the reservoir in adjoining areas**
- **Pulicat lake is the second largest brackish water lake** in the country; next only to [Chilika lake](#)
- Greater flamingos and pelicans are some of the famous migratory birds that visit this place
- The region in which Pulicat lake is situated receives rainfall from both South-West as well as North-East monsoon winds
- **Nelapattu Bird Sanctuary** is a famous bird sanctuary located near this lake
- The lake is also home for **black-headed ibis, Asian openbill, black-crowned night heron, and little cormorant. Other migratory birds that visit the sanctuary include northern pintail, common teal, little grebe, northern shoveler, Eurasian coot, Indian spot-billed duck, grey heron, Oriental darter, black-winged stilt, garganey and gadwall**
- **The presence of Barringtonia and Acacia nilotica species** near the Pulicat lake region provides an ideal breeding site for spot-billed pelicans.

About Pulicat Lake and Nelapattu bird sanctuary

- **Nelapattu bird sanctuary** is considered one of the biggest habitats for some hundreds of pelicans and other birds. **Located about 20 km north of the Pulicat Lake** on the Andhra Pradesh-Tamil Nadu border, the sanctuary is spread in about 459 hectares.
- Pulicat Lake is the second largest brackish water lake or lagoon in India, after Chilika Lake. It straddles the border of Andhra Pradesh and Tamil Nadu states with over 96% of it in Andhra

Pradesh. The lake encompasses the Pulicat Lake Bird Sanctuary. The barrier island of **Sriharikota separates the lake from the Bay of Bengal** and is home to the Satish Dhawan Space Centre. Two rivers which feed the lagoon are the **Arani River at the southern tip and the Kalangi River** from the northwest, in addition to some smaller streams. **The Buckingham Canal, a navigation channel, is part of the lagoon on its western side.**

- Flamingo Festival is held every year to promote tourism in Pulicat and Nelapattu.

9. Central Zoo Authority

Vision Plan (2021-2031) for Indian Zoos was recently released. The vision plan is aimed at upgrading Indian zoos and strengthening the Central Zoo Authority (CZA).

It is the **statutory regulatory body** for zoos in India. It was established in 1992.

- The main objective of the Authority is to complement and strengthen the national effort in conservation of the rich biodiversity of the country, particularly the fauna as per **the National Zoo Policy, 1998**.

Important functions:

1. It enforces minimum standards and norms for the upkeep and healthcare of animals in Indian zoos.
2. Every zoo in the country is required to obtain recognition from CZA for its operation.
3. It can also de-recognise zoos.

10. Cheetah reintroduction project

The Government is preparing to translocate the first batch of eight **from South Africa and Namibia to Kuno National Park in Madhya Pradesh** and total 50 in various parks over a period of five years.

What next?

In this regard, the Union Minister for Environment, Forests and Climate Change has launched the **'Action Plan for Introduction of Cheetah in India'** under which 50 of these big cats will be introduced in the next five years.

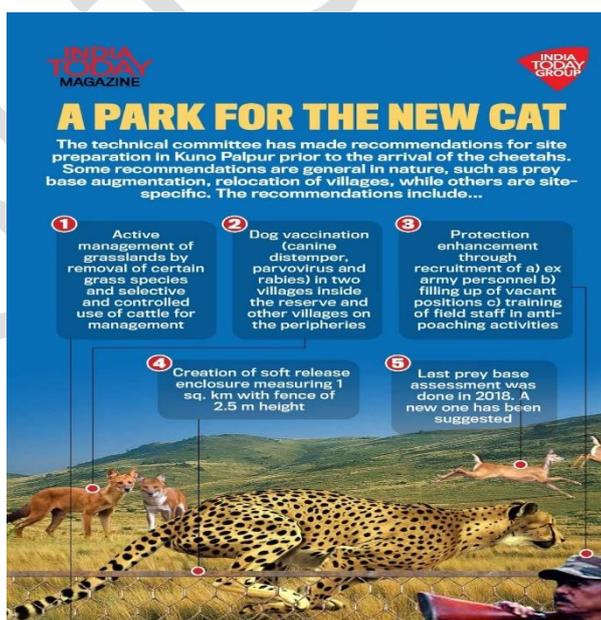
- The action plan was launched at the 19th meeting of **the National Tiger Conservation Authority (NTCA)**.

What is reintroduction and why reintroduce Cheetah now?

- 'Reintroduction' of a species means releasing it in an area where it is capable of surviving.
- Reintroductions of large carnivores have increasingly been recognised as a strategy to conserve threatened species and restore ecosystem functions.
- The cheetah is the only large carnivore that has been extirpated, mainly by over-hunting in India in historical times.

Facts:

- The cheetah, **Acinonyx jubatus**, is one of the oldest of the big cat species, with ancestors that can be traced back more than five million years to **the Miocene era**.
- The cheetah is also **the world's fastest land mammal**.
- It is listed as **vulnerable in IUCN red listed species**.



- The country's last spotted feline died in Chhattisgarh in 1947. Later, the cheetah — which is the fastest land animal — was declared extinct in India in 1952.
- The Asiatic cheetah is classified as a **"critically endangered" species** by the IUCN Red List, and is believed to survive only in Iran.

Cheetah reintroduction programme in India:

The Wildlife Institute of India at Dehradun had prepared a ₹260-crore cheetah re-introduction project seven years ago.

- India has plans to reintroduce cheetahs at the Kuno National Park in Sheopur and Morena districts of Madhya Pradesh's Gwalior-Chambal region.
- This could be the world's first inter-continental cheetah translocation project.

Reasons for extinction:

- The reasons for extinction can all be traced to man's interference. Problems like **human-wildlife conflict**, loss of habitat and loss of prey, and illegal trafficking, have decimated their numbers.
- The **advent of climate change** and growing human populations have only made these problems worse.
- With less available land for wildlife, species that require vast home range like the cheetah are placed in competition with other animals and humans, all fighting over less space.

11. Kerala Bird Atlas

The **first-of-its-kind State-level bird atlas in India**, has been created with The Kerala Bird Atlas (KBA).

- KBA is said to be Asia's largest bird atlas in terms of geographical extent.
- KBA has been conducted as a citizen science-driven exercise with the participation of over 1,000 volunteers of the birdwatching community.

12. Koala

- **Australia has designated the koala as an endangered species** amid pressure on the marsupials' eucalyptus tree habitats in eastern states of Australia.
- The koala is an **arboreal herbivorous marsupial, native to Australia**.
- It is the only extant representative of Phascolarctidae family. Its closest living relatives are wombats, which are the members of Vombatidae family.
- The species was classed as vulnerable 10 years also in Queensland, New South Wales and Australian Capital Territory.
- Endangered status to koala means, the species and their forest homes should be provided with greater protection in accordance with Australia's national environment law. This would not only protect Koala but many other species living alongside them.



13. Sea Cucumber

- Sea cucumber in India is treated as an endangered species listed under **schedule I of Wildlife Protection Act of 1972**.
- They are **marine invertebrates** that live on the seafloor found generally in tropical regions. They're named for their unusual oblong shape that resembles a fat cucumber.
- They are an integral part of the coral ecosystem as **one of the main by-products of the sea cucumbers digestion of sand is calcium carbonate and this is essential for the survival of the coral reefs**.
- They act like **garbage collectors of the ocean world**, and they recycle nutrients, thus playing an important role in keeping coral reefs in good condition.



- Sea cucumbers are in high demand in China and Southeast Asia. It is primarily smuggled from Tamil Nadu to Sri Lanka in fishing vessels from Ramanathapuram and Tuticorin districts.
- **IUCN Red List:** Brown Sea Cucumber (Endangered), Blackspotted Sea Cucumber (Least Concern), Blue Sea Cucumber (Data Deficient), etc.

14. Swamp deer

- The **barasingha**, also called swamp deer, deer is endemic to Kaziranga.
- The eastern swamp deer was once concentrated in the central Kohora and Bagori ranges of Kaziranga.
- **IUCN status:** Vulnerable.
- **State animal of Madhya Pradesh and Uttar Pradesh.**
- **Range:** central and northern India and southern Nepal.
- **India:** Assam, Jumna River, Ganges River, Brahmaputra River, Madhya Pradesh, Uttar Pradesh, and Arunachal Pradesh.



15. Finn's weaver bird

- Finn's weaver (*Ploceus megarhynchus*) bird, numbering less than 500 in India, which **until now was listed as "vulnerable"** in the International Union for Conservation of Nature's (IUCN) Red List has been **uplisted to "endangered" category.**
- The bird is primarily found in Terai grasslands in Uttarakhand and western Uttar Pradesh, apart from a few pockets in Assam.



16. Olive Ridley Turtles

Researchers of the Zoological Survey of India (ZSI) are carrying out tagging of the Olive Ridelys at three mass nesting sites — **Gahirmatha, Devi River mouth and Rushikulya.**

- The tagging would help them identify the migration path and places visited by the marine reptiles after congregation and nesting.



Key facts:

- The Olive ridley turtles are the smallest and most abundant of all sea turtles found in the world.
- They inhabit warm waters of the Pacific, Atlantic and Indian oceans.
- These turtles, along with their cousin **the Kemps ridley turtle**, are best known for their unique mass nesting called **Arribada**, where thousands of females come together on the same beach to lay eggs.
- Rushikulya rookery coast in the Ganjam district of Odisha, Gahirmatha beach and the mouth of the Debi River, are the major nesting sites in Odisha.
- **IUCN status:** Vulnerable.

Every year, the Indian Coast Guard's "**Operation Olivia**", initiated in the early 1980s, helps protect Olive Ridley turtles as they congregate along the Odisha coast for breeding and nesting from November to December.

17. Nilgais

The Bihar government has announced that it will not cull **the Blue Bull**, locally known as **the nilgai or ghurparas**, anymore. It will, instead, sterilise them to control their increasing population in the state.

- The nilgai is **the largest Asian antelope and is ubiquitous across the northern Indian subcontinent.**



- The nilgai is **the sole member of the genus Boselaphus and placed in the family Bovidae.**
- **Sexual dimorphism** is prominent; the males are larger than females and differ in colouration.
- It occurs in India, Nepal, and Pakistan. Significant numbers occur in the Terai lowlands in the foothills of the Himalayas.
- It is **indigenous to the Indian subcontinent.**
- **IUCN status:** Least Concern.

18. Indus river dolphins

Punjab's wildlife preservation wing has proposed to protect Indus dolphins and their natural habitat.

About Indus Dolphin:

- The Indus river dolphin is **classified as endangered by the International Union for the Conservation of Nature (IUCN).**
- The Indus river dolphin was declared **the State aquatic animal of Punjab in 2019.**
- They are found in Pakistan. In 2007, a remnant but viable population of Indus dolphins was discovered in **Punjab's Harike wildlife sanctuary and in the lower Beas river.**
- They are functionally blind and rely on echolocation to navigate, communicate and hunt prey including prawns, catfish and carp.

19. Ganges River Dolphin

The Jal Shakti Ministry has released a guide for the safe rescue and release of stranded Ganges river dolphins.

- The document has been prepared by **the Turtle Survival Alliance** and the Environment, Forest and Climate Change Department (EFCCD) of the Uttar Pradesh Government.
- The manual is endorsed by **the IUCN Cetacean Specialist Group.**

About the Ganges Dolphin:

- The Ganges river dolphin is **the national aquatic animal of India** and is popularly known as '**Susu**'.
- It is listed as '**endangered**' under the IUCN Red List Assessments, Schedule I of the Indian Wildlife (Protection) Act (1972), Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
- The species, whose global population is estimated at 4,000, is mostly found in the Indian subcontinent.
- It has **rudimentary eyes.** From preying to surfing, dolphins do it through ultrasonic sound.
- The Ganges river dolphin can only live in freshwater and is essentially blind.
- **They are distributed across seven states in India:** Assam, Uttar Pradesh, Madhya Pradesh, Rajasthan, Bihar, Jharkhand and West Bengal.

Threats:

The dolphins often accidentally enter canals in northern India and are unable to swim up against the gradient. They are also vulnerable to harm by people.

20. Irrawaddy Dolphin

Irrawaddy dolphin found dead in Chilika Lake.

PROJECT DOLPHIN
PRESERVING OUR UNDERWATER FRIENDS

- 10-YEAR PROJECT TO FOCUS ON BOTH RIVER AND SEA DOLPHINS
- AIM TO STRENGTHEN BIODIVERSITY, CREATE EMPLOYMENT OPPORTUNITIES AND ATTRACT TOURISM
- KILLING, HABITAT FRAGMENTATION BY DAMS AND BARRAGES AND INDISCRIMINATE FISHING HAS REDUCED THE GANGES RIVER DOLPHIN POPULATION FROM TENS OF THOUSANDS TO AROUND 3,700 OVER THE LAST CENTURY
- GANGES RIVER DOLPHIN, A SPECIES OF FRESHWATER DOLPHINS, IS PRIMARILY FOUND IN GANGA AND BRAHMAPUTRA RIVERS, AND THEIR TRIBUTARIES IN INDIA, BANGLADESH AND NEPAL
- IN INDIA, THESE DOLPHINS ARE SIGHTED IN DEEP RIVERS IN ASSAM, BIHAR, JHARKHAND, MADHYA PRADESH, RAJASTHAN, UTTAR PRADESH AND WEST BENGAL
- GANGES RIVER DOLPHIN, OFFICIALLY DISCOVERED IN 1801, CAN LIVE ONLY IN FRESHWATER

About Irrawaddy Dolphins

- Irrawaddy dolphins fall under **Schedule I of the Indian Wildlife (Protection) Act, 1972** and mentioned in the International Union for the Conservation of Nature (IUCN) Red List of **Endangered Species**.
- Found in coastal areas in South and Southeast Asia, and in three rivers: the Irrawaddy (Myanmar), the Mahakam (Indonesian Borneo) and the Mekong (China).
- The concentrated lagoon populations are found in Chilika Lake in Odisha, and Songkhla Lake in southern Thailand.



About Chilika Lake:

- Chilika is **Asia’s largest and world’s second largest lagoon**.
- It is **the largest wintering ground for migratory birds on the Indian sub-continent** and is home to a number of threatened species of plants and animals.
- In 1981, Chilika Lake was designated **the first Indian wetland of international importance under the Ramsar Convention**.
- Major attraction at Chilika is **Irrawaddy dolphins** which are often spotted off Satpada Island.
- The large **Nalabana Island** (Forest of Reeds) covering about 16 sq km in the lagoon area was declared a bird sanctuary in 1987.
- **Kalijai Temple** – Located on an island in the Chilika Lake.

About Indian Ocean Humpback dolphins:

- The Indian Ocean Humpback Dolphin occurs within the Indian Ocean from South Africa to India.
- The International Union for Conservation of Nature (IUCN) categorizes **the Indian Ocean Humpback Dolphin as Endangered (Source: Wiki)**.
- Indian Humpback Dolphin is listed in Appendix I of The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).



21. Pygmy hogs

- Eight pygmy hogs released in Manas National Park, Assam.
- They were released by **the Pygmy Hog Conservation Programme (PHCP)**.
- By 2025, the PHCP plans to release a target of 60 pygmy hogs in **Manas**- their home where their last original population still survives, albeit in declined numbers.

What is PHCP?

In 1995, Durrell Wildlife Conservation Trust, Jersey, UK partnered with Forest Department, Government of Assam, IUCN, Wild Pig Specialist Group and Ministry of Environment, Forest and Climate Change, Government of India and formed PHCP which is being implemented with the PHCP's key partner Aaranyak and EcoSystems India.

- They are the world's rarest and smallest wild pigs.
- The pygmy hog is native to dense alluvial grasslands in the southern foothills of the Himalayas.
- **Endemic to India**, they are restricted to very few locations around Manas National Park in north-western Assam.
- With just around 250 animals in the wild, the pygmy hog is one of the world's most threatened mammals.
- Currently listed as '**Critically Endangered**' on the IUCN Red List of Threatened Species.
- The pygmy hog is designated as a **Schedule I species in India under the Wildlife Protection Act, 1972.**



22. Snow Leopard

Oct 23 is recognised as International Snow Leopard Day.

Background:

The day came into being with the adoption of the **Bishkek Declaration** by 12 countries on the conservation of snow leopards.

About Snow Leopard:

Scientific name: Panthera uncia.

Habitat: Snow leopards live in the mountains of Central Asia.

Numbers: There are only between 3,920 and 6,390 snow leopards left in the wild.

Range extends through twelve countries: Afghanistan, Bhutan, China, India, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, and Uzbekistan.

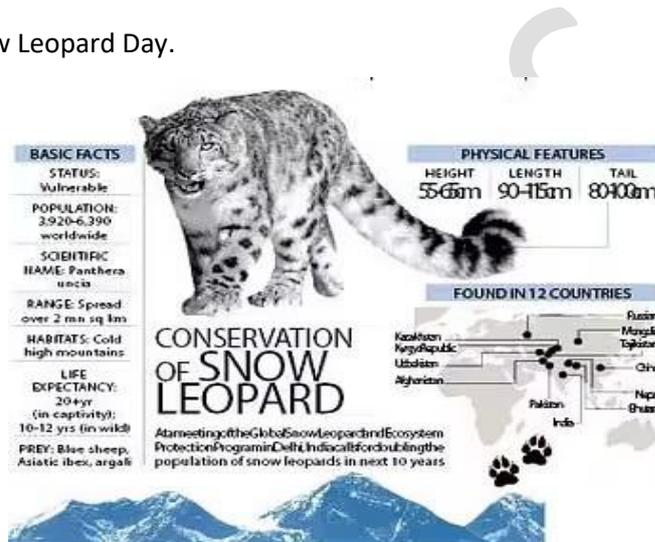
Protection:

- Snow leopards are categorized as 'Vulnerable' by IUCN and in the Schedule I of the Indian Wildlife (Protection) Act 1972.
- They are listed in Appendix I of the Convention on International Trade in Endangered Species (CITES) and the Convention on Migratory Species (CMS), revealing the need for the highest conservation status to the species, both globally and in India.
- Potential snow leopard habitat in India include the following states/UT: Jammu and Kashmir, Ladakh, Uttarakhand, Himachal Pradesh, Sikkim and Arunachal Pradesh

Conservation efforts- National level:

As per reports, **India is home to about 450-500 snow leopards** which can be spotted in the upper Himalayan regions of the country.

1. India has been conserving snow leopards and their habitats through **the Project Snow Leopard (PSL)**.
2. India has also been part of **the Global Snow Leopard and Ecosystem Protection (GSLEP) Programme** since 2013.
3. For conservation, **India has identified three large landscapes, namely, Hemis-Spiti** across Ladakh and Himachal Pradesh; **Nanda Devi – Gangotri** in Uttarakhand; and **Khangchendzonga – Tawang** across Sikkim and Arunachal Pradesh.



- Ladakh adopted two endangered species, **snow leopard and black-necked crane**, as State animal and State bird
- Black-necked cranes are only found in **Ladakh's Changthang region**. The bird is classified as **Near-Threatened**, as per the IUCN classification; whereas Snow leopard has been classified as '**vulnerable**'

4. Snow Leopard is in the list of 22 critically endangered species for the recovery programme of the Ministry of Environment Forest & Climate Change.
5. **SECURE Himalaya: Global Environment Facility (GEF)-United Nations Development Programme (UNDP)** funded the project on conservation of high-altitude biodiversity and reducing the dependency of local communities on the natural ecosystem. This project is now operational in four snow leopard range states, namely, Jammu and Kashmir, Himachal Pradesh, Uttarakhand, and Sikkim.
6. Community volunteer programme “**HimalSanrakshak**” to protect snow leopards.

Conservation efforts- International level:

- In 2013, the **Bishkek Declaration** set a goal of protecting at least 20 snow leopard landscapes with viable snow leopard populations by 2020, and led to the formation of the Global Snow Leopard and Ecosystem Protection Program (GSLEP). Since then, **October 23 is commemorated each year as International Snow Leopard Day.**
- **The Global Snow Leopard and Ecosystem Protection Programme (GSLEP)** was also launched on the same day to address high-mountain development issues using conservation of the snow leopard as a flagship.

Challenges to their conservation:

Increased habitat loss and degradation, poaching and conflict with communities.

23. India's leopard count

Union Environment Ministry has released a new report titled- [Status of Leopards, Co-predators and Megaherbivores-2018](#).

- The report was released on July 29, 2021 — [World Tiger Day](#).

As per the report:

- India's official leopard count has increased 63 per cent from 2014-2018. There were 12,852 leopards in the country in 2018 (7,910 in 2014).
- The largest number of leopards have been estimated in Madhya Pradesh (3,421) followed by Karnataka (1,783) and Maharashtra (1,690).

About Leopard:

1. **Scientific Name-** Panthera pardus.
2. Listed in [Schedule I of the Indian Wildlife \(Protection\) Act, 1972](#).
3. Included in **Appendix I of CITES**.
4. Listed as **vulnerable on the IUCN Red List**.
5. **Nine subspecies of the leopard** have been recognized, and they are distributed across Africa and Asia.

The government has also informed that there are 14 tiger reserves that had received the accreditation of the [Global Conservation Assured | Tiger Standards \(CA|TS\)](#), an accreditation tool agreed upon by tiger range countries. These include:

1. Manas, Kaziranga and Orang in Assam.
2. Satpura, Kanha and Panna in Madhya Pradesh.
3. Pench in Maharashtra.
4. Valmiki Tiger Reserve in Bihar.
5. Dudhwa in Uttar Pradesh.
6. Sunderbans in West Bengal.
7. Parambikulam in Kerala.
8. Bandipur Tiger Reserve of Karnataka.
9. Mudumalai and Anamalai Tiger Reserve in Tamil Nadu.

24. Raptor Species

160 species of birds of prey endangered worldwide

- Around 30 per cent of the 557 raptor species around the world are threatened by extinction to some degree, according to a new study.
- The Philippine eagle, the hooded vulture and the Annobonscops-owl were among the 166 species facing some degree of threat, the study found.
- The new analysis by [International Union for the Conservation of Nature \(IUCN\)](#) and [BirdLife International](#), a global initiative to protect birds and wildlife by non-profits, was published in the journal Proceedings of the National Academy of Sciences.

Threats to the Birds of Prey

- The threats to the birds of prey are a result of **habitat loss, pollution, toxic substances, human-wildlife conflicts, collisions with aerial structures and electrocution by power lines and climate change.**
- Migratory birds of prey are at risk to these threats due to long annual journeys from their breeding grounds to wintering areas and back.
- The population of Philippine eagles, the largest variety of eagles in the world, decreased rapidly in the last decades due to **extensive deforestation.**
- Some vulture populations have declined by over 95 per cent in Asian countries such as India because of the **widespread use of diclofenac**, an anti-inflammatory drug.

Raptors MOU

- The CMS **Memorandum of Understanding on the Conservation of [Migratory Birds](#) of Prey in Africa and Eurasia** (Raptors MOU) aims to promote internationally coordinated actions to achieve the favourable conservation status of migratory birds of prey throughout their range in the African-Eurasian region, and to reverse their decline when and where appropriate.
- The Raptors MOU is one of several instruments **operating under the Convention on the Conservation of Migratory Species of Wild Animals (CMS).**
- The MoU seeks willingness of the signatory range states for working for conservation of the raptor species and their habitats.
- **India signed Raptor MOU in 2016.**
- Raptor MoU is also in conformity with the provisions of the existing Wild Life (Protection) Act, 1972

25. One-horned rhinos

Assam marked World Rhino Day — September 22 — with a special ceremony by burning a stockpile of nearly 2,500 horns of the one-horned rhinoceros.

- It has been publicised as a milestone towards rhino conservation and is aimed at busting myths about rhino horns.
- It's a loud and clear message to the poachers and smugglers that such items have no value.

Is the government allowed to do so?

India is a signatory to **CITES (Convention on International Trade in Endangered Species of Wild Flora and Fauna)**. Thus, it is illegal to sell the horns in the country anyway.

- Also, the case for the destruction of horns is a process that is in compliance with **Section 39(3)(c) of the Wildlife (Protection) Act of 1972.**



About One- horned rhinos:

- Only the Great One-Horned Rhino is found in India.
- Also known as Indian rhino, it is the largest of the rhino species.
- It is identified by a single black horn and a grey-brown hide with skin folds.
- They primarily graze, with a diet consisting almost entirely of grasses as well as leaves, branches of shrubs and trees, fruit, and aquatic plants.

Protection Status:

1. **IUCN Red List:** Vulnerable.
2. **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES):** Appendix I (Threatened with extinction and CITES prohibits international trade in specimens of these species except when the purpose of the import is not commercial, for instance for scientific research).
3. **Wildlife Protection Act, 1972:** Schedule I.

Other Conservation Efforts by India:

- **The five rhino range nations** (India, Bhutan, Nepal, Indonesia and Malaysia) have signed a declaration 'The New Delhi Declaration on Asian Rhinos 2019' for the conservation and protection of the species.
- The Ministry of Environment Forest and Climate Change (MoEFCC) has begun **a project to create DNA profiles of all rhinos in the country.**
- **National Rhino Conservation Strategy:** It was launched in 2019 to conserve the greater one-horned rhinoceros.

About the Indian Rhino Vision 2020 (IRV 2020):

Launched in 2005.

- IRV 2020 is an initiative led by the Forest Department, Government of Assam, in partnership with WWF India, International Rhino Foundation, and several other organizations.
- The goal of IRV2020 was to increase the rhino population in Assam to 3,000 by establishing populations in new areas.
- Rhinos are now found in four Protected Areas in Assam: Pabitora Wildlife Reserve, Rajiv Gandhi Orang National Park, Kaziranga National Park, and Manas National Park.

26. Humboldt penguins

- Humboldt penguins are a medium-sized species among at least 17 species.
- Humboldt penguins have an average height of just over 2 ft (Among the Species, the Emperor penguin is the largest and stands at over 4 ft tall).
- The Humboldt penguin (*Spheniscus humboldti*) belongs to a genus that is commonly known as the 'banded' group (Penguins are divided into six genera).
- Humboldt penguins are endemic to the Pacific coasts of Chile and Peru.
- They are so named because their habitat is located near the Humboldt Current, a large oceanic upwelling characterised by cold waters.
- They are classified as **vulnerable by the IUCN Red List.**

**27. Gharials**

1. The Gharial or fish eating crocodile is native to the Indian subcontinent.
2. The gharial is listed in **schedule 1 of the Wildlife (Protection) Act, 1972** and also described as **critically endangered on the**



International Union for Conservation of Nature Red List of Threatened Species.

3. They are genetically weaker than salt water crocodiles and muggers.
4. Small released populations are present and increasing in the rivers of the National Chambal Sanctuary, Katarniaghat Wildlife Sanctuary, Son River Sanctuary and the rainforest biome of Mahanadi in Satkosia Gorge Sanctuary, Odisha.

28. Blackbucks

- **Odisha's blackbuck population has doubled in the last six years,** according to figures from the latest population census released recently by the chief conservator of forest (wildlife).
- The antelopes numbered 7,358 — 4,196 females, 1,712 males and 1,450 young, according to census figures.
- Blackbucks are **found only in the Ganjam district in the southern part of the state.**
- **Protection status:** The blackbuck is a **Schedule-1 animal according to the Wild Life (Protection) Act, 1972** (amended in 1992) and is considered as '**Vulnerable**' according to the **Red Data Book.**
- The blackbuck is known in Odisha and Ganjam as **Krushnasara Mruga.**

**Other related facts:**

Bishnoi community of Rajasthan is known worldwide for their conservation efforts to blackbuck and Chinkara.

State animal of Andhra Pradesh, Haryana & Punjab.

Protected Areas:

1. Velavadar Blackbuck Sanctuary — Gujarat.
2. Point Calimere Wildlife Sanctuary.
3. Nilgiri biosphere reserve.
4. Corbett national park.

Environment Protection

1. Extended Producers Responsibility on plastic packaging

The government has notified the **Guidelines on Extended Producers Responsibility (EPR) on plastic packaging under Plastic Waste Management Rules, 2016**. The guidelines will come into effect from 1st July 2022.

Overview of the new guidelines:

Four categories of plastic packaging specified:

1. **Category one** will include rigid plastic packaging.
2. **Category two** will include flexible plastic packaging of single layer or multilayer (more than one layer with different types of plastic), plastic sheets and covers made of plastic sheet, carry bags, plastic sachet or pouches.
3. **Category three** will include multi-layered plastic packaging (at least one layer of plastic and at least one layer of material other than plastic).
4. **Category four includes** plastic sheet or like used for packaging as well as carry bags made of compostable plastics.

The guidelines also include:

- Specifications for reuse, recycling, use of recycled plastic content, and end-of-life disposal of non-recyclable plastic packaging.
- setting up a **centralised online portal by Central Pollution Control Board (CPCB)** for the registration as well as filing of annual returns by producers, importers and brand-owners, plastic waste processors of plastic packaging waste by March 31.
- **Environmental compensation** shall be levied based upon polluter pays principle, with respect to non-fulfilment of EPR targets by producers, importers and brand owners, for the purpose of protecting and improving the quality of the environment and preventing, controlling and abating environment pollution.
- For the first time, **the guidelines allow for the sale and purchase of surplus extended producer responsibility certificates**. Thus setting up a market mechanism for plastic waste management.

The **Environment Ministry** has notified **the Plastic Waste Management Amendment Rules, 2021**, which prohibit specific **single-use plastic** items which have “low utility and high littering potential” by 2022.

The New Rules:

1. **What is banned?** The manufacture, import, stocking, distribution, sale and use of the identified **single-use plastic** will be prohibited with effect from the 1st July, 2022.
2. The ban will **not apply to commodities made of compostable plastic**.
3. **For banning other plastic commodities** in the future, other than those that have been listed in this notification, the government has given industry ten years from the date of notification for compliance.
4. **The permitted thickness of the plastic bags**, currently 50 microns, will be increased to 75 microns from 30th September, 2021, and to 120 microns from the 31st December, 2022.
5. **The Central Pollution Control Board, along with state pollution bodies**, will monitor the ban, identify violations, and impose penalties already prescribed under **the Environmental Protection Act, 1986**.
6. **The plastic packaging waste**, which is not covered under the phase out of identified single use plastic items, shall be collected and managed in an environmentally sustainable way through **the Extended Producer Responsibility (EPR)** of the Producer, importer and Brand owner (PIBO), as per **Plastic Waste Management Rules, 2016**.

What is single-use plastic?

It is a form of plastic that is disposable, which is only used once and then has to be thrown away or recycled like water bottles, straw, cups etc.

2. Coastal Regulation Zone (CRZ) norms

Under **the section 3 of Environment Protection Act, 1986** of India, Coastal Regulation Zone notification was issued in February 1991 for the first time.

- In **2018-19**, fresh Rules were issued, which aimed to remove certain restrictions on building, streamlined the clearance process, and aimed to encourage tourism in coastal areas.

Objectives:

- **They restrict certain kinds of activities** — like large constructions, setting up of new industries, storage or disposal of hazardous material, mining, reclamation and bunding — within a certain distance from the coastline.

What are the restrictions?

- The **restrictions depend on criteria** such as the population of the area, the ecological sensitivity, the distance from the shore, and whether the area had been designated as a natural park or wildlife zone.
- The latest Rules have a **no-development zone of 20 m** for all islands close to the mainland coast, and for all backwater islands in the mainland.

For the so-called **CRZ-III (Rural) areas**, two separate categories have been stipulated.

1. In the densely populated rural areas (**CRZ-IIIA**) with a population density of 2,161 per sq km as per the 2011 Census, the no-development zone is 50 m from the high-tide level, as against the 200 m stipulated earlier.
2. **CRZ-IIIB** category (rural areas with population density below 2,161 per sq km) areas continue to have a no-development zone extending up to 200 m from the high-tide line.

Implementation:

While the CRZ Rules are made by the Union environment ministry, implementation is to be ensured by state governments through their **Coastal Zone Management Authorities**.

3. Living root bridges

- Also known as **Jing Kieng Jri**, these are aerial bridges built by weaving and manipulating the roots of the Indian rubber tree- (**Ficus elastica**).
- They have been serving as connectors for generations in **Meghalaya**.
- Built over centuries, the bridges, primarily a means to cross streams and rivers, have also become world-famous tourist attractions.

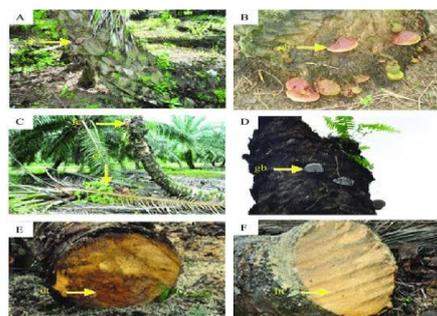
**Context:**

The Zoological Survey of India has underlined some green rules for the living root bridges of Meghalaya to get the UNESCO World Heritage Site tag.

4. Two species of fungi associated with basal stem rot found

Researchers from Kerala have identified two new species of fungi from the genus **Ganoderma** that are associated with **coconut stem rot disease**.

- The two Fungi species have been named **Ganoderma Keralense** and **Ganoderma Pseudoapplanatum**.



The basal stem rot of coconut is known by several names in different parts of India:

1. Ganoderma wilt in Andhra Pradesh.
2. Anaberoga in Karnataka.
3. Thanjavur wilt in Tamil Nadu.

5. Changes to Biological Diversity Act, 2002

Government has recently introduced the **Biological Diversity (Amendment) Bill, 2021** in Lok Sabha.

Highlights of the Bill:

1. The Bill seeks to **reduce the pressure on wild medicinal plants** by encouraging the cultivation of medicinal plants.
2. The Bill proposes to **exempt AYUSH practitioners from intimating biodiversity boards** for accessing biological resources or knowledge.
3. The Bill also facilitates **fast-tracking of research, simplify the patent application process, decriminalises certain offences.**
4. The Bill brings more **foreign investments** in biological resources, research, patent and commercial utilisation, without compromising the national interest.
5. The bill focuses on **regulating who can access biological resources and knowledge and how access will be monitored.**
6. The Bill has also clarified and strengthened the role of **state biodiversity boards.**

Biological Diversity Act, 2002:

- Enacted for the conservation of biological diversity and **fair, equitable sharing of the monetary benefits** from the commercial use of biological resources and **traditional knowledge.**
- The main intent of this legislation is to protect India's rich biodiversity and associated knowledge against their use by foreign individuals.
- It seeks to check **biopiracy**, protect biological diversity and local growers through a three-tier structure of central and state boards and local committees.
- The Act provides for setting up of a **National Biodiversity Authority (NBA), State Biodiversity Boards (SBBs) and Biodiversity Management Committees (BMCs) in local bodies.**
- The NBA will enjoy the power of a civil court.

6. Flex Fuel Vehicles (FFV)

FFV is a modified version of vehicles that could **run both on gasoline and doped petrol with different levels of ethanol blends.**

- FFVs will allow vehicles to use all the blends and also run on unblended fuel.
- FFVs have compatible engines to run on more than 84 percent ethanol blended petrol.

Benefits:

- FFVs are aimed at reducing the use of polluting fossil fuels and cutting down harmful emissions.
- Alternative fuel ethanol is Rs 60-62 per litre while petrol costs more than Rs 100 per litre in many parts of the country, so by using ethanol, Indians will save Rs 30-35 per litre.
- For India, FFVs will present a different advantage as they will allow vehicles to use different blends of ethanol mixed petrol available in different parts of the country.
- Also, these vehicles are a logical extension of **the Ethanol Blended Petrol (EBP) programme** launched by the Union Ministry of Petroleum and Natural Gas in January 2003.
- Since India has surplus produce of corn, sugar and wheat, the mandatory blending of ethanol programme will help farmers in realising higher incomes.

- For the overall Indian economy, higher usage of ethanol as an automobile fuel will help save import costs as the country meets more than 80 per cent of its crude oil requirements through imports.

Disadvantages/challenges of using FFVs:

1. **Customer acceptance** will be a major challenge since the cost of ownership and running cost are going to be very high compared with 100 per cent petrol vehicles.
2. **Running cost** (due to lower fuel efficiency) will be higher by more than 30 per cent when run with 100 per cent ethanol (E100).
3. **Flex Fuel Engines cost more** as ethanol has very different chemical properties than petrol. Ethanol has very low (40 per cent) Calorific value as compared to Gasoline, very High Latent heat of vaporization causing cooling of charge/combustion etc.
4. **Ethanol also acts as a solvent and could wipe out the protective oil film inside the engine** thereby could cause wear and tear.

7. Forest Conservation Act

Context:

The Union Government has proposed certain amendments to the existing [Forest Conservation Act \(FCA\)](#).

Proposed changes:

1. Absolve **agencies involved in national security projects and border infrastructure projects** from obtaining **prior forest clearance** from the Centre. Such a permission is necessary under the Forest Conservation Act (FCA).
2. **Exempt land acquired before 1980** — before the FCA came into effect — by public sector bodies such as the Railways.
3. Facilitating **private plantations for harvesting and exploration or extraction of oil and natural gas** deep beneath forest land by drilling holes from outside the forest areas.
4. **Building in forests:** To ease the grievances of the individuals whose land fall in state specific private forests act or within the purview of dictionary meaning of forest, the ministry has proposed to allow them the right to construct structures for bonafide purposes including forest protection measures and residential units up to an area of 250 sq mtr as one time relaxation.
5. **Punishments:** Make offences under the modified Act punishable with simple imprisonment for a period which may extend to one year and make it cognisable and non-bailable.
6. It also has provisions for **penal compensation to make good for the damage already done**.

Why were these amendments necessary?

The essential tension in the FCA is that the state is committed to a principle of increasing forest cover, and this makes it harder to access land for infrastructure projects by States and private entities.

- Several Ministries have expressed resentment on how the Act was being interpreted over the right of way of railways, highways.
- As of today, a landholding agency (Rail, NHAI, PWD, etc.) is required to take approval under the Act and pay stipulated compensatory levies such as [Net Present Value \(NPV\)](#), [Compensatory Afforestation \(CA\)](#), etc. for use of such land which was originally been acquired for non-forest purposes.
- With more land coming under the definition of “forest”, it’s becoming harder for State Governments or private industry to use land that falls under the definition of “forest” for non-forestry purposes.
- Through the years, this has given rise to multiple instances of litigation, as well questions on the legal definition of “forest”.

- States have been told to provide a definition of what constitutes a forest, but several haven't given them because this has political consequences. All of this has led to conflicting interpretations of the FCA through the years.

The proposed amendment is part of a larger rationalising of existing forest laws.

When was the FCA enacted?

The FCA first came in 1980 and was amended in 1988.

While States had already notified forest land, the FCA made it **necessary to get the Centre's permission for using such forest land for "non forestry purposes" and the creation of an advisory committee** to recommend such re-classification.

The 1996 Supreme Court judgment (in **TN Godavarman Thirumulpad versus Union of India and Others case**) paved the way for the calculating:

1. The net present value, or the economic value of the portion of forest being razed for development work that had to be paid by project proponents.
2. The creation of a compensatory afforestation fund.
3. Providing non-forestry land in lieu of the diverted forest.

Definition of "Forest":

Before the 1996 Supreme Court judgement in **TN Godavarman Thirumulpad versus Union of India and Others**, forest land was only that as was defined by the 1927 Forest Act. But the court included all areas which are recorded as 'forest' in any government record, irrespective of ownership, recognition and classification.

8. Mangroves

Mangroves occur worldwide in the tropics and subtropics, mainly between latitudes 30° N and 30° S, with the greatest mangrove area with 5° of the equator.

- A mangrove is a **shrub or small tree** that grows in coastal saline or brackish water.
- Mangroves are **salt-tolerant trees**, also called **halophytes**, and are adapted to live in harsh coastal conditions.
- They contain a complex salt filtration system and complex root system to cope with salt water immersion and wave action.
- They have blind roots which are called **Pneumatophores**. These roots help these trees to respire in anaerobic soils.
- The seeds of Mangrove Forests trees germinate in the trees itself before falling – This is called **Viviparity mode of reproduction**.



Importance of Mangroves:

1. Mangrove roots help to impede water flow and thereby enhance the deposition of sediment in areas (where it is already occurring), stabilise the coastal shores, provide a breeding ground for fishes.
2. Mangroves moderate monsoonal tidal floods and reduce inundation of coastal lowlands.
3. They prevent coastal soil erosion.
4. They protect coastal lands from tsunami, hurricanes and floods.
5. Mangroves enhance the natural recycling of nutrients.
6. Mangrove supports numerous flora, avifauna and wildlife.
7. Provide a safe and favourable environment for breeding, spawning, rearing of several fishes.
8. They supply woods, firewood, medicinal plants and edible plants to local people.
9. They provide numerous employment opportunities to local communities and augments their livelihood.

9. Mahendragiri Biosphere Reserve

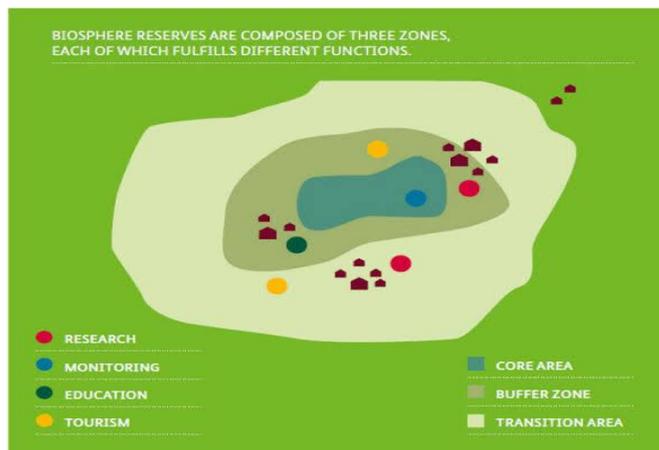
The Odisha government has proposed a **second biosphere reserve in the southern part of the state at Mahendragiri**, a hill ecosystem having rich biodiversity.

- The 5,569-square kilometre **Similipal Biosphere Reserve is Odisha's first such reserve** and was notified May 20, 1996.

What are biosphere reserves?

Biosphere Reserve (BR) is an international designation by **United Nations Educational, Scientific and Cultural Organization (UNESCO)** for representative parts of natural and cultural landscapes extending over large areas of terrestrial or coastal/marine ecosystems or a combination of both.

- Biosphere Reserves tries to balance economic and social development and maintenance of associated cultural values along with the preservation of nature.
- The concept of Biosphere Reserves was **launched in 1971 as a part of United Nations Educational, Scientific and Cultural Organization (UNESCO)'s 'Man and Biosphere Programme'**.



Criteria for Designation of Biosphere Reserve:

1. A site must contain a protected and minimally disturbed core area of value of nature conservation.
2. Core area must be a bio-geographical unit and should be large enough to sustain a viable populations representing all trophic levels.
3. The involvement of local communities and use of their knowledge in biodiversity preservation.
4. Areas potential for preservation of traditional tribal or rural modes of living for harmonious use of the environment.

10. Umngot

- It is a river in Meghalaya.
- It is considered to be India's clearest river.
- The river attracts many tourists to Dawki bordering Bangladesh.
- The river is the natural boundary between Ri Pnar (of Jaintia Hills) with Hima Khyrim (of Khasi Hills).



11. Red sanders

- Red sanders (*Pterocarpus santalinus*) is known for its rich hue and therapeutic properties.
- The tree is endemic to several districts in Andhra Pradesh and some parts of Kerala, Tamil Nadu and Karnataka.
- The species was listed in Appendix II of CITES in 1995, and subsequently export of red sanders was prohibited in 2004.
- But, in 2019, the Directorate General of Foreign Trade (DGFT) has revised its export policy to permit the export of red sanders if it is obtained from cultivated land.
- Red Sanders usually grow in the rocky, degraded and fallow lands with Red Soil and hot and dry climate.
- The International Union for Conservation of Nature (IUCN) has put it under the category of near threatened from earlier endangered species in the Red List.



12. Eco-sensitive Zones (ESZs)

- **Eco-Sensitive Zones (ESZs) or Ecologically Fragile Areas (EFAs)** are areas notified by the **MoEFCC** around Protected Areas, National Parks and Wildlife Sanctuaries.
- The purpose of declaring ESZs is to **create some kind of “shock absorbers” to the protected areas** by regulating and managing the activities around such areas.
- They also act as a **transition zone from areas of high protection to areas involving lesser protection**.
- The Environment (Protection) Act, 1986 does not mention the word “Eco-Sensitive Zones”.
- The width of the ESZ and type of regulation may vary from protected area to area. However, as a general principle, ESZ could go up to 10 kilometres around a protected area as provided in the Wildlife Conservation Strategy, 2002.
- Moreover, in the case where sensitive corridors, connectivity and ecologically important patches, crucial for landscape linkage, are beyond 10 km width, these should be included in the ESZs.
- **Activities permitted in the areas** include ongoing agriculture and horticulture practices by local communities, rainwater harvesting, organic farming, adoption of green technology and use of renewable energy sources.
- Activities, including commercial mining, setting of saw mills and industries causing pollution, commercial use of firewood and major hydro-power projects, are **prohibited in such areas**. It also prohibits tourism activities like flying over protected areas in an aircraft or hot air balloon, and discharge of effluents and solid waste in natural water bodies or terrestrial areas.
- Felling of trees, drastic change in agriculture systems and commercial use of natural water resources, including groundwater harvesting and setting up of hotels and resorts, are the **activities regulated in the areas**.

13. Marine heatwaves

A marine heat wave is usually defined as a **coherent area of extreme warm sea surface temperature** that persists for days to months. Marine heatwaves **happen when sea temperatures are warmer than normal for an extended period**. MHWs have been observed in all major ocean basins over the recent decade.

Causes:

- The most common cause of marine heat waves are **ocean currents** which can build up areas of warm water and air-sea heat flux, or warming through the ocean surface from the atmosphere.
- **Weak winds:** Normally, sunlight passes through the atmosphere and heats the surface of the ocean. If there are weak winds this warm water doesn't mix with the cooler waters below. It sits on top and continues to heat leading to marine heat waves.

Impacts of rising marine heatwaves:

- Affect ecosystem structure, by supporting certain species and suppressing others.
- Can change the habitat ranges of certain species, such as the spiny sea urchin off southeastern Australia which has been expanding southward into Tasmania at the expense of kelp forests which it feeds upon.
- Can cause economic losses through impacts on fisheries and aquaculture.
- There is a link between marine heat waves and harmful algal blooms.

Marine heatwaves in Indian ocean:

According to a study, the **Western Indian Ocean region** experienced **the largest increase in marine heatwaves at a rate of about 1.5 events per decade**, followed by the north Bay of Bengal at a rate of 0.5 events per decade.

From 1982 to 2018, the Western Indian Ocean had a total of 66 events, while the Bay of Bengal had 94 events.

Factors affecting:

- The marine heatwaves in the Western Indian Ocean and the Bay of Bengal increased drying conditions over the central Indian subcontinent.
- Correspondingly, there is a significant increase in the rainfall over south peninsular India in response to the heatwaves in the north Bay of Bengal.

Renewable Energy

1. Green hydrogen

India, being a **tropical country**, has a significant edge in **green hydrogen production** due to its favourable geographic conditions and abundant natural resources.

- Producing hydrogen from renewables in India is likely to be cheaper than producing it from natural gas.

Need for:

- The vast majority of industrial hydrogen, about 70 metric tonnes (MT), is currently produced from natural gas through a conventional process known as **steam methane reforming (SMR)** with large quantities of by product CO₂.

The focus on producing clean energy through green hydrogen is in line with the government's goal of producing **450 GW of renewable energy by 2030 and, in the process, achieve emission goals under the Paris Agreement and reduce import dependency on fossil fuels.**

Efforts by the government in this regard:

The Centre is planning to use the **green hydrogen fuel from wastewater** by using solar energy. It is possible by using **electrolyzers**.

How can this be achieved?

By segregation of solid waste management using the rooftop solar, we can make green hydrogen with the help of electrolyzers. The power and water cost of producing it would be negligible. We can use this fuel even in railway engines along with cement and chemical companies instead of coal.

What is green hydrogen?

Hydrogen when produced by electrolysis using renewable energy is known as Green Hydrogen which has no carbon footprint.

Significance of Green Hydrogen:

- Green hydrogen energy is vital for India to meet its Nationally Determined Contribution (INDC) Targets and ensure regional and national energy security, access and availability.
- Green Hydrogen can act as an energy storage option, which would be essential to meet intermittencies (of renewable energy) in the future.
- In terms of mobility, for long distance mobilisations for either urban freight movement within cities and states or for passengers, Green Hydrogen can be used in railways, large ships, buses or trucks, etc.

Applications of green hydrogen:

- Green Chemicals like ammonia and methanol can directly be utilized in existing applications like fertilizers, mobility, power, chemicals, shipping etc.
- Green Hydrogen blending up to 10% may be adopted in CGD networks to gain widespread acceptance.

Benefits:

- It is a clean-burning molecule, which can decarbonize a range of sectors including iron and steel, chemicals, and transportation.
- Renewable energy that cannot be stored or used by the grid can be channelled to produce hydrogen.

India's first Green Hydrogen micro-grid project in Andhra Pradesh:

- NTPC has awarded a project of “**Standalone Fuel-Cell based Micro-grid with hydrogen production** using electrolyser in NTPC Guest House at Simhadri (near Visakhapatnam)
- It would be a precursor to large-scale hydrogen energy storage projects and would be useful for **studying and deploying multiple microgrids in various off-grid** and strategic locations of the country.
- The hydrogen would be produced using the **advanced 240 kW Solid Oxide Electrolyser** by taking input power from the nearby Floating Solar project.

2. Solar waste handling policy

According to **the International Renewable Energy Agency (IRENA)**, India needs a firm policy on managing waste that results from used solar panels or from the manufacturing process.

- Solar waste is the electronic waste generated by discarded solar panels.

Need for: According to IRENA, it is estimated that the global photovoltaic waste will touch 78 million tonnes by 2050 with India expected to be one of the top five photovoltaic-waste creators.

- **India currently considers solar waste a part of electronic waste** and does not account for it separately.

3. Rooftop solar scheme

The Ministry of New & Renewable Energy has allowed **households to get rooftop solar panels** installed by themselves or by any vendor of their choice and a photograph of the installed system for distribution utility is sufficient to avail benefits or subsidy under the **Rooftop solar scheme**.

- Earlier under the rooftop solar scheme, the households were required to get that from the listed vendors only to avail the benefits and subsidy under the scheme.

About the scheme:

Implemented by **the Ministry of New and Renewable Energy**.

Presently under implementation is **the Grid-Connected Rooftop Solar Scheme (Phase II)**: It aims to achieve a cumulative capacity of 40,000 MW from Rooftop Solar Projects by the year 2022.

This scheme is being **implemented in the state by distribution companies (DISCOMs)**.

- Under this scheme the Ministry is providing a 40% subsidy for the first 3 kW and 20% subsidy beyond 3 kW and upto 10 kW of solar panel capacity.
- The residential consumer has to pay the cost of rooftop solar plant by reducing the subsidy amount given by the Ministry as per the prescribed rate to the vendor.

The major objective of the programme includes:

- To promote the grid-connected SPV rooftop and small SPV power generating plants among the residential, community, institutional, industrial and commercial establishments.
- To mitigate the dependence on fossil fuel based electricity generation and encourage environment-friendly Solar electricity generation.
- To create an enabling environment for investment in the solar energy sector by the private sector, state government and the individuals.
- To create an enabling environment for the supply of solar power from rooftop and small plants to the grid.

Benefits of rooftop solar:

- An alternative source of electricity to that provided by the grid.
- **Environmental benefits:** It reduces the dependence on fossil-fuel generated electricity.
- **Ability to provide electricity to those areas that are not yet connected to the grid** — remote locations and areas where the terrain makes it difficult to set up power stations and lay power lines.

What is the potential for rooftop solar in India?

The Ministry of New and Renewable Energy has pegged the market potential for rooftop solar at 124 GW.

4. Net zero buildings

A net-zero energy building is one that relies on renewable sources to produce as much energy as it uses, usually as measured over the course of a year.

- Homes and other structures that create almost as much energy as they use are sometimes called near-zero energy buildings.
- It is also possible for a building to produce an energy surplus, sending excess back to the electrical grid.



Net-zero energy buildings start with energy-conscious design. Many features work without an energy source. For example:

1. In cold climates, south-facing buildings with large expanses of windows on that side can produce heat through passive solar gain.
2. On the cold north side of the building, smaller windows can angle to wider openings, permitting more light while limiting heat loss.
3. In warmer seasons, passive ventilation systems can pull cool air up from the lower levels and vent it through the building's highest point.
4. Rooftop systems can collect rainwater to reduce usage of treated water.

5. Solar Radiation Modification (SRM)

- **Solar Radiation Modification (SRM)**, also known as Solar Radiation Management, Radiation Modification Measures or Solar Geoengineering, would **aim to address a symptom of climate change by reflecting more sunlight back into space, or by allowing more infrared radiation from Earth to escape, in order to reduce the Earth's temperature.**
- It includes numerous proposed methods which differ significantly. None are ready for deployment.
- Solar Radiation Modification **could not be a substitute for reducing emissions, or removing atmospheric CO₂.**

Species Discovery / Species Sighted / Species Extinct

1. Albino Indian Flapshell turtle

- A rare species of Albino Indian Flapshell turtle was recently sighted by Mountaineers in Sirnapalli forest in Telangana's Nizamabad.
- The Indian flapshell turtle is commonly found in South Asian countries like Pakistan, Sri Lanka, India, Nepal, Bangladesh and Myanmar.
- The rare yellow color of the turtle may be due to the lack of a pigment called tyrosine present in high amounts in reptiles. A genetic mutation or possible congenital disorder is likely responsible for the lack of tyrosine.
- Indian flapshell turtles are typically are only 9 to 14 inches (22 centimeters to 35 centimeters) long, and like to eat frogs, snails and aquatic vegetation.



Conservation Status:

- IUCN Red List: Vulnerable.
- CITES: Appendix II.
- Wildlife (Protection) Act, 1972: Schedule I.

2. Georissa mawsmaiensis

- A micro snail species named **Georissa mawsmaiensis** has recently been discovered from Mawsmai, a limestone cave in Meghalaya, 170 years after the last such discovery was made.
- It was in 1851 that **Georissa saritta**, a member of the same genus as the latest find, was collected and described from the Musmai (Mawsmai today) valley near Cherrapunjee.
- **The members of the Georissa genus are widely distributed** across and reported from Africa, Asia, and the Pacific. However, they are confined to microhabitats consisting of limestone caves or karst landscapes formed by the dissolution of limestone.



About the Mawsmai cave:

- It is situated in the small village of Mawsmai, around four kilometres from Cherrapunjee (Sohra) in the East Khasi Hills district of Meghalaya.
- The term 'Mawsmai' means 'Oath Stone' in the Khasi language. The Khasi people use the local term 'Krem' for the cave.
- Mawsmai cave is located at an altitude of 1,195 metres above sea level and is indirectly influenced by the streams of the Kynshi river originating from the East Khasi Hills.

3. A 'mermaid' species of algae discovered on Andaman and Nicobar Islands

- After nearly four decades, a new species of algae has been discovered on the islands.
- Researchers have named the species **Acetabularia jalakanyakae**.
- The plant consists of **a single gigantic cell with a nucleus**, which is its main characteristic.
- The species is **the first of the genus Acetabularia to be discovered in India**.
- Another feature of Acetabularia is **their regenerative potential**.



Pollution

1. Fly Ash

What is Fly Ash?

Popularly known as **Flue ash or pulverised fuel ash**, it is a coal combustion product.

Composition:

Composed of the **particulates that are driven out of coal-fired boilers together with the flue gases**.

- Depending upon the source and composition of the coal being burned, the components of fly ash vary considerably, but **all fly ash includes substantial amounts of silicon dioxide (SiO₂), aluminium oxide (Al₂O₃) and calcium oxide (CaO), the main mineral compounds in coal-bearing rock strata**.
- **Minor constituents include:** arsenic, beryllium, boron, cadmium, chromium, hexavalent chromium, cobalt, lead, manganese, mercury, molybdenum, selenium, strontium, thallium, and vanadium, along with very small concentrations of dioxins and PAH compounds. It also has unburnt carbon.

Health and environmental hazards:

Toxic heavy metals present: All the heavy metals found in fly ash nickel, cadmium, arsenic, chromium, lead, etc—are toxic in nature. They are minute, poisonous particles accumulate in the respiratory tract, and cause gradual poisoning.

Radiation: For an equal amount of electricity generated, fly ash contains a hundred times more radiation than nuclear waste secured via dry cask or water storage.

Water pollution: The breaching of ash dykes and consequent ash spills occur frequently in India, polluting a large number of water bodies.

Effects on environment: The destruction of mangroves, drastic reduction in crop yields, and the pollution of groundwater in the Rann of Kutch from the ash sludge of adjoining Coal power plants has been well documented.

However, fly ash can be used in the following ways:

1. Concrete production, as a substitute material for Portland cement, sand.
2. Fly-ash pellets which can replace normal aggregate in concrete mixture.
3. Embankments and other structural fills.
4. Cement clinker production – (as a substitute material for clay).
5. Stabilization of soft soils.
6. Road subbase construction.
7. As aggregate substitute material (e.g. for brick production).
8. Agricultural uses: soil amendment, fertilizer, cattle feeders, soil stabilization in stock feed yards, and agricultural stakes.
9. Loose application on rivers to melt ice.
10. Loose application on roads and parking lots for ice control.

Components	Composition (wt %)
SiO ₂	18.9
Al ₂ O ₃	15.2
Fe ₂ O ₃	10.6
Na ₂ O	0.988
CaO	1.18
K ₂ O	2.23
TiO ₂	0.468
SO ₃	0.366
MgO	0.348
SiO ₂ /Al ₂ O ₃	1.2

2. Stubble Burning

It is a common practice followed by farmers to prepare fields for sowing of wheat in November as there is little time left between the harvesting of paddy and sowing of wheat.

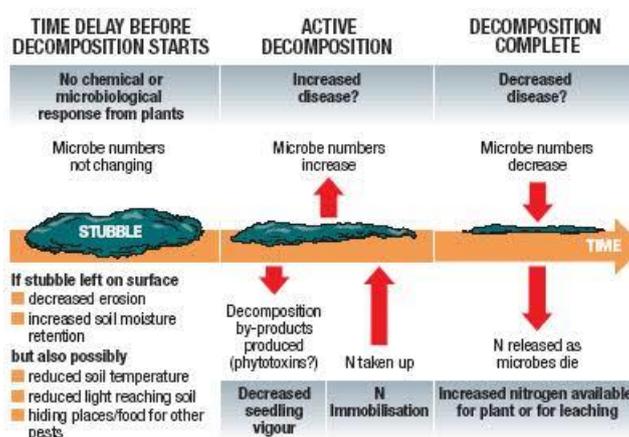
Impact: Stubble burning results in emission of harmful gases such carbon dioxide, sulphur dioxide, nitrogen dioxide along with particulate matter.

Advantages of stubble burning:

- It quickly clears the field and is the cheapest alternative.
- Kills weeds, including those resistant to herbicide.
- Kills slugs and other pests.
- Can reduce nitrogen tie-up.

Effects of Stubble Burning:

- **Pollution:** Open stubble burning emits large amounts of toxic pollutants in the atmosphere which contain harmful gases like methane (CH₄), Carbon Monoxide (CO), Volatile organic compound (VOC) and carcinogenic polycyclic aromatic hydrocarbons. They may eventually cause smog.
- **Soil Fertility:** Burning husk on ground destroys the nutrients in the soil, making it less fertile.
- **Heat Penetration:** Heat generated by stubble burning penetrates into the soil, leading to the loss of moisture and useful microbes.



Alternative solutions that can avoid Stubble Burning:

1. Promote paddy straw-based power plants. It will also create employment opportunities.
2. Incorporation of crop residues in the soil can improve soil moisture and help activate the growth of soil microorganisms for better plant growth.
3. Convert the removed residues into enriched organic manure through composting.
4. New opportunities for industrial use such as extraction of yeast protein can be explored through scientific research.

Chhattisgarh Model:

An innovative experiment has been undertaken by the Chhattisgarh government by setting up **gauthans**.

- A gauthan is a dedicated five-acre plot, held in common by each village, where all the unused stubble is collected through parali daan (people’s donations) and is converted into organic fertiliser by mixing with cow dung and few natural enzymes.

Pusa Decomposer:

The Delhi government has started spraying **bio-decomposer solution** in farmlands to decompose the stubble left after the harvest.

Pusa Decomposer is a mix of seven fungi that produce enzymes to digest cellulose, lignin and pectin in paddy straw.

- The fungi thrive at 30-32 degree Celsius, which is the temperature prevailing when paddy is harvested and wheat is sown.

How these decomposers are used on fields?

- A liquid formulation is formed using decomposer capsules and fermenting it over 8-10 days and then spraying the mixture on fields with crop stubble to ensure speedy bio-decomposition of the stubble.
- The farmers can prepare 25 litre of liquid mixture with 4 capsules, jaggery and chickpea flour. The mixture is sufficient to cover 1 hectare of land.
- It takes around 20 days for the degradation process to be completed.

Benefits of PUSA decomposers:

1. Improves the fertility and productivity of the soil as the stubble works as manure and compost for the crops and lesser fertiliser consumption is required in the future.
2. It is an efficient and effective, cheaper, doable and practical technique to stop stubble burning.
3. It is an eco-friendly and environmentally useful technology.

3. E-Waste

International E-Waste Day has been observed on **October 14** every year since 2018.

Impacts of e-waste:

Toxicity: E-waste consists of toxic elements such as Lead, Mercury, Cadmium, Chromium, Polybrominated biphenyls and Polybrominated diphenyl.

Effects on Humans: Some of the major health effects include serious illnesses such as lung cancer, respiratory problems, bronchitis, brain damages, etc due to inhalation of toxic fumes, exposure to heavy metals and alike.

Effects on Environment: E-waste is an environmental hazard causing groundwater pollution, acidification of soil and contamination of groundwater and air pollution due to the burning of plastic and other remnants.



E-Waste Management Rules, 2016:

The Ministry of Environment, Forest and Climate Change notified the E-Waste Management Rules, 2016 in supersession of the E-waste (Management & Handling) Rules, 2011.

- Over 21 products (Schedule-I) were included under the purview of the rule. It included Compact Fluorescent Lamp (CFL) and other mercury containing lamps, as well as other such equipment.
- For the first time, the rules brought the producers under Extended Producer Responsibility (EPR), along with targets. Producers have been made responsible for the collection of E-waste and for its exchange.
- Various producers can have a separate Producer Responsibility Organisation (PRO) and ensure collection of E-waste, as well as its disposal in an environmentally sound manner.
- Deposit Refund Scheme has been introduced as an additional economic instrument wherein the producer charges an additional amount as a deposit at the time of sale of the electrical and electronic equipment and returns it to the consumer along with interest when the end-of-life electrical and electronic equipment is returned.
- The role of State Governments has been also introduced to ensure safety, health and skill development of the workers involved in dismantling and recycling operations.
- A provision of penalty for violation of rules has also been introduced.
- Urban Local Bodies (Municipal Committee/Council/Corporation) have been assigned the duty to collect and channelize the orphan products to authorized dismantlers or recyclers.

Basel Convention on the Control of the Trans-boundary Movement of Hazardous Waste, 1992:

The Basel Convention started to address e-waste issues since 2002 which include, among others, environmentally sound management; prevention of illegal traffic to developing countries and; building capacity around the globe to better manage e-waste.

- The Mobile Phone Partnership Initiative (MPPI) was adopted by the sixth meeting of the Conference of the Parties to the Basel Convention.
- The Nairobi Declaration on the Environmentally Sound Management of Electrical and Electronic Waste and decision IX/6 adopted by the ninth meeting of the Conference of the Parties (COP9) gave a mandate to the Secretariat to implement a work plan for the environmentally sound management of e-waste.

Rotterdam Convention, 2004:

The Convention seeks to promote exchange of information (through Prior Informed Consent) among Parties over a range of potentially hazardous chemicals (includes pesticides and industrial chemicals) that may be exported or imported.

4. Frothing in the Yamuna River**What causes frothing in the Yamuna?**

- The release of untreated or poorly treated effluents, including sewage from those parts of the city that are not connected to the sewerage network and industrial waste, could lead to frothing.
- Surfactants and phosphates from detergents in households and industrial laundry find their way into the river, as all the sewage is not treated.

Why is Yamuna so polluted?

1. **The sewage treatment plants** of Delhi are major contributors of the Pollutants being discharged in the river.
2. **Pollutants discharge** from different types of industry is also a major issue.
3. **Agriculture activities** along the banks of the river in Delhi contributes to river pollution.
4. **Agricultural waste and pesticide discharge** from the Haryana field also contributes to the pollution.
5. **The low volume of water flow** in the river causes the pollutants to accumulate and raise the pollution level.

About Yamuna River:

- The river Yamuna is a major tributary of river Ganges.
- Originates from the Yamunotri glacier near Bandarpoonch peaks in the Mussoorie range of the lower Himalayas in Uttarkashi district of Uttarakhand.
- It meets the Ganges at the Sangam in Prayagraj, Uttar Pradesh after flowing through Uttarakhand, Himachal Pradesh, Haryana and Delhi.
- Tributaries: Chambal, Sindh, Betwa and Ken.

5. Firecrackers

The Supreme court's October 23, 2018 judgment banned the sale and production of firecrackers in Delhi-NCR and regulated the use of firecrackers across the country.

- **Barium-based** firecrackers were specifically banned.
- Online sale of firecrackers was completely banned.

How do firecrackers work?

Firecrackers use fuel and oxidisers to produce a combustion reaction, and the resulting explosion spreads the material in a superheated state. The metal salts in the explosive mix get 'excited' and emit light.

Index Value	Name	Color	Advisory
0 to 50	Good	Green	None
51 to 100	Moderate	Yellow	Unusually sensitive individuals should consider limiting prolonged outdoor exertion
101 to 150	Unhealthy for Sensitive Groups	Orange	Children, active adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion
151 to 200	Unhealthy	Red	Children, active adults, and people with respiratory disease, such as asthma, should avoid prolonged outdoor exertion; everyone else should limit prolonged outdoor exertion
201 to 300	Very Unhealthy	Purple	Children, active adults, and people with respiratory disease, such as asthma, should avoid outdoor exertion; everyone else should limit outdoor exertion
301-500	Hazardous	Maroon	Everyone should avoid all physical activity outdoors.

Can green crackers make a difference?

The Council of Scientific and Industrial Research, through its National Environmental

Engineering Research Institute (CSIR-NEERI), Nagpur, has come out with firecrackers that have “reduced emission light and sound” and 30% less particulate matter using Potassium Nitrate as oxidant.

- These crackers are named **Safe Water Releaser**, which minimises Potassium Nitrate and Sulphur use, but matches the sound intensity of conventional crackers, Safe Minimal Aluminium, where Aluminium use is low and Safe Thermite Crackers with low Sulphur and Potassium Nitrate.

6. Sand and dust storms

Sand and dust storms impact over 500 million in India, according to **Asian and Pacific Centre for the Development of Disaster Information Management (APDIM) report Sand and Dust Storms Risk Assessment** in Asia and the Pacific.

APDIM is a regional institution of the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP).

What are Sand and dust storms?

- Sand and dust storms are **common meteorological hazards in arid and semi-arid regions**. They are usually caused by thunderstorms – or strong pressure gradients associated with cyclones – which increase wind speed over a wide area.
- These strong winds lift large amounts of sand and dust from bare, dry soils into the atmosphere, transporting them hundreds to thousands of kilometres away.
- Some 40% of aerosols in the troposphere (the lowest layer of Earth’s atmosphere) are dust particles from wind erosion. The main sources of these mineral dusts are the arid regions of Northern Africa, the Arabian Peninsula, Central Asia and China.
- Once released from the surface, dust particles are raised to higher levels of the troposphere by turbulent mixing and convective updrafts. They can then be transported by winds for lengths of time, before being pulled back down to the surface again.

Environmental Impact:

- Sand and dust storms are a transboundary meteorological hazard. **They affect agriculture, energy, environment, aviation, human health.**
- In some places, much of this dust is characterised by high salt content, making it toxic for plants.
- Very high dust deposition also occurs in the Himalaya-Hindu Kush mountain range and the Tibetan Plateau, that are the sources for fresh water for more than 1.3 billion people in Asia.
- **The deposition of dust on glaciers induces a warming effect**, increasing the melting of ice, with direct and indirect impacts on society through numerous issues, including food security, energy production, agriculture, water stress and flood regimes.

Sand and dust storms directly affect 11 of the 17 United Nations-mandated sustainable development goals (SDG):

- Ending poverty in all forms
- Ending hunger
- Good health and well-being
- Safe water and sanitation
- Affordable and clean energy
- Decent work and economic growth
- Industry innovation and infrastructure
- Sustainable cities and communities
- Climate action
- Life below water
- Life on land

The impacts of dust storms are not all negative. They can increase the nutrient content in the areas of deposition and benefit vegetation.

Dust particles that carry iron can enrich parts of oceans, improving the phytoplankton balance and impacting marine food webs.

7. Sea snot

Turkey's **Sea of Marmara**, that connects **the Black Sea to the Aegean Sea**, had witnessed the **largest outbreak of 'sea snot'**. The sludge was spotted in the adjoining **Black and Aegean seas**.

What is sea snot?

- It is a **slimy layer of grey or green sludge**, which can cause considerable damage to the marine ecosystem.
- It is **formed when algae are overloaded with nutrients**.
- A 'sea snot' outbreak was **first recorded in the country in 2007**. Back then, it was also spotted in the Aegean Sea near Greece.



Overloading of nutrients happens because of warm weather caused by global warming, water pollution, uncontrolled dumping of household and industrial waste into the seas etc.

What are the impacts? Concerns?

1. It has spread through the sea south of Istanbul and also **blanketed harbours and shorelines**.
2. It is posing a severe **threat to the marine ecosystem of the country**- it has caused mass deaths among the fish population, and also killed other aquatic organisms such as corals and sponges.
3. If unchecked, this can collapse to the bottom and cover the sea floor, causing major damage to the marine ecosystem.
4. Over a period of time, it could end up poisoning all aquatic life, including fishes, crabs, oysters, mussels and sea stars.
5. Besides aquatic life, **the 'sea snot' outbreak has also affected the livelihoods of fishermen**.
6. It can also cause **an outbreak of water-borne diseases** such as cholera in cities like Istanbul.

8. Oil Spill

OECD defines an oil spill as oil, discharged accidentally or intentionally, that floats on the surface of water bodies as a discrete mass and is carried by the wind, currents and tides.

- Oil spills can pollute land, air, or water, though it is mostly used for oceanic oil spills.

Effects of oil spills:

- **Ecosystem Destruction:** Oil spills can have a major impact on the temporary animal and fish loss of habitat. Heavy oils may affect several organism functions like respiration, feeding, and **thermo-regulation**.
- **It can affect living beings** in case of direct contact with the environment polluted with spilled oil components (some of which may persist a long time), such as drinking polluted water or breathing polluted dust particles.
- **Effects on flora:** If the oil washes into coastal marshes, mangrove forests, or other wetlands, fibrous plants and grasses absorb oil, which can damage plants and make the area unsuitable as wildlife habitat.
- **On Marine Organisms:** Oil spills frequently kill marine mammals such as whales, dolphins, seals, and sea otters.
- **On Birds:** Oil spills also damage nesting grounds, potentially causing serious long-term effects on entire species.

Methods through which oil spill can be cleaned:

- **Containment Booms:** Floating barriers, called booms are used to restrict the spread of oil and to allow for its recovery, removal, or dispersal.
- **Skimmers:** are devices used for physically separating spilled oil from the water's surface.
- **Sorbents:** Various sorbents (e.g., straw, volcanic ash, and shavings of polyester-derived plastic) that absorb the oil from the water are used.
- **Dispersing agents:** These are chemicals that contain surfactants, or compounds that act to break liquid substances such as oil into small droplets. They accelerate its natural dispersion into the sea.

Bio-agents: Nutrients, enzymes, or microorganisms such as *Alcanivorax* bacteria or *Methylocella silvestris* that increase the rate at which natural biodegradation of oil occurs are added.

9. Black carbon

The world Bank had recently conducted a research study on impact of Black Carbon over **the Himalaya, Karakoram and Hindu Kush (HKHK) mountain ranges**, where glaciers are melting faster than the global average ice mass.

- The report is titled "Glaciers of the Himalayas, Climate Change, Black Carbon and Regional Resilience".

Key findings:

- **Black carbon (BC)** deposits produced by human activity accelerate **the pace of glacier and snow melt in the Himalayan region.**
- The rate of retreat of HKHK glaciers is estimated to be 0.3 metres per year in the west to 1.0 metre per year in the east. BC adds to the impact of climate change.
- Deposits of BC act in two ways hastening the pace of glacier melt: by **decreasing surface reflectance of sunlight and by raising air temperature.**

About Black Carbon:

- BC is a short-lived pollutant that is the second-largest contributor to warming the planet behind carbon dioxide (CO₂).
- Unlike other greenhouse gas emissions, BC is quickly washed out and can be eliminated from the atmosphere if emissions stop.
- Unlike historical carbon emissions, it is also a localised source with greater local impact.
- It is **formed through the incomplete combustion** of fossil fuels, biofuel, and biomass, and is emitted in both anthropogenic and naturally occurring soot.

Sources of black carbon in HKHK regions:

Industry [primarily brick kilns] and residential burning of solid fuel together account for 45–66% of regional anthropogenic [man-made] BC deposition, followed by on-road diesel fuels (7–18%) and open burning (less than 3% in all seasons)" in the region.

10. High levels of mercury found in rivers linked to Greenland Ice Sheet

According to recent research, high concentrations of **mercury** were found in the water bodies fed by **the Greenland Ice Sheet.**

Mercury level found:

Typical dissolved mercury content in rivers is about 1 – 10 ng L⁻¹ (the equivalent of a salt grain-sized amount of mercury in an Olympic swimming pool of water).

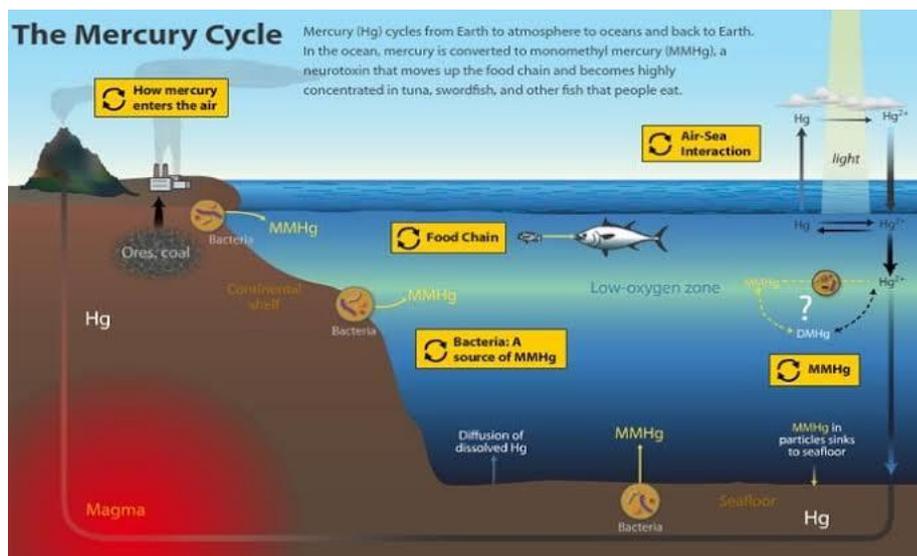
- In the water bodies fed by **the Greenland Ice Sheet**, scientists found dissolved mercury levels in excess of 150 ng L⁻¹, far higher than an average river.

What are the reasons behind the high concentration of mercury?

It is not the industries or other anthropogenic activities, as is the case with most contaminants.

Mercury-rich bedrock is

weathered during the slow movement of glaciers down the slope of hills and the ground particles are carried into the streams as the glacier melts.



What are the concerns now?

1. So far, efforts were aimed at preventing mercury being released from **direct anthropogenic activity, like industry**. But **mercury coming from climatically sensitive environments like glaciers could be a source that is much more difficult to manage**.
2. Besides, this will lead to **increased water pollution** as the Earth continues to heat up and ice-sheets and glaciers melt faster than ever before.

Significance of the latest discovery:

- We now understand that **even glaciers carry potential toxins**. This will force researchers to study how these toxins influence water quality and downstream communities, which may alter in a warming world.
- Also, it shall help us **understand its influence on the Earth's geochemical and biological processes**.

Basics- about Mercury:

- **Sources:** Mercury is a naturally occurring element that is found in air, water and soil. Released into the atmosphere through natural processes such as weathering of rocks, volcanic eruptions, geothermal activities, forest fires, etc. Mercury is also released through human activities.
- **Mercury may have toxic effects** on the nervous, digestive and immune systems, and on lungs, kidneys, skin and eyes.
- **Chemical of major public health concern-** Mercury is considered by the World Health Organisation (WHO) as one of the top **ten chemicals or groups of chemicals of major public health concern**.
- **Minamata Disease:** A disorder caused by methylmercury poisoning that was first described in the inhabitants of Minamata Bay, Japan and resulted from their eating fish contaminated with mercury industrial waste.

About the Minamata Convention:

- The Minamata Convention on Mercury is a global treaty to protect human health and the environment from the adverse effects of mercury and its compounds.
- It was agreed at **the fifth session of the Intergovernmental Negotiating Committee in Geneva, Switzerland 2013**. It entered into force in 2017.
- **Controlling the anthropogenic releases** of mercury throughout its lifecycle is one of the key obligations under the Convention.

- It is a **UN treaty**.
- The Convention also addresses **interim storage of mercury and its disposal once it becomes waste, sites contaminated by mercury as well as health issues**.
- **India** has ratified the Convention.

11. Flue gas desulphurisation

- Removal of Sulfur Dioxide is called as Flue-gas Desulphurization (FGD).
- It seeks to remove gaseous pollutants viz. SO₂ from exhaust flue gases generated in furnaces, boilers, and other industrial processes due to thermal processing, treatment, and combustion.

Common methods used:

1. Wet scrubbing using a slurry of alkaline sorbent, usually limestone or lime, or seawater to scrub gases;
2. Spray-dry scrubbing using similar sorbent slurries;
3. Wet sulfuric acid process recovering sulfur in the form of commercial quality sulfuric acid;
4. SNOX Flue gas desulfurization removes sulfur dioxide, nitrogen oxides and particulates from flue gases;
5. Dry sorbent injection systems that introduce powdered hydrated lime (or other sorbent material) into exhaust ducts to eliminate SO₂ and SO₃ from process emissions.

Events / Celebrations

1. World Wetlands Day

When is it celebrated? 2nd Feb Every Year.

Significance: The day also marks the anniversary of the signing of **the Convention on Wetlands of International Importance (Ramsar Convention) in Ramsar, Iran, on 2 February 1971.**

Protection: Wetlands are currently protected under different designations, including **the Ramsar Convention on wetlands, the UNESCO Man and Biosphere Programme** and others, and some of these overlap.

Significance of World Wetlands Day 2022:

The **World Wetlands Day 2022** is significant as this is **the first time that the day will be observed as a United Nations International Day.**

Theme for 2022: "Wetlands Action for People and Nature".

What are wetlands?

We can find wetlands wherever water bodies meet the land.

- Wetlands include mangroves and marshes, peatlands, rivers, lakes and other water bodies, deltas, floodplains and swamps in forested areas, paddy-fields and coral reefs.

Why wetlands are crucial for a healthy planet?

The health of people on our planet depends on healthy wetlands.

- 40% of the world's species live or breed in wetlands.
- Wetlands are "nurseries of life" - 40% of animals breed in wetlands.
- Wetlands are "kidneys of the earth" - they clean the environment of pollutants.
- Wetlands "matter for climate change" - they store 30% of land based carbon.
- Wetlands "minimize disaster risks" - they absorb storm surge.

Deepor Beel Wetland

Degradation of Assam's Deepor Beel due to anthropogenic forces.

About Deepor Beel:

1. Deepor Beel is a [Ramsar site](#) and a part of it is also wildlife sanctuary (Rani Reserve forest) in Guwahati, Assam.
2. Deepor Beel is a permanent freshwater lake, in an earlier channel of the [Brahmaputra River](#), to the south of the main river.
3. The site is an important destination for many migratory species of birds.

Ramsar Convention:

- The Ramsar Convention is an international agreement promoting the conservation of wetlands.
- The Convention was adopted at Ramsar in Iran in 1971 and came into force in 1975. Almost 90% of the UN member states are part of the Convention.

Montreux Record:

Montreux Record under the Convention is a register of wetland sites on the List of Wetlands of International Importance where changes in ecological character have occurred, are occurring, or are likely to occur as a result of technological developments, pollution or other human interference.

It is **maintained as part of the Ramsar List.**

- The Montreux Record was established by Recommendation of the Conference of the Contracting Parties (1990).
- Sites may be added to and removed from the Record only with the approval of the Contracting Parties in which they lie.
- **Currently, two wetlands of India are in Montreux record:** Keoladeo National Park (Rajasthan) and Loktak Lake (Manipur).

Chilka lake (Odisha) was placed in the record but was later removed from it.

Two more Ramsar sites announced on World Wetlands Day:

Two new sites are- Khijadiya wildlife sanctuary in Gujarat and Bakhira wildlife sanctuary in Uttar Pradesh.

- Now, India has a network of **49 such sites, the highest in South Asia**, covering 10,93,636 hectares.

2. World Sustainable Development Summit

21st edition of the event was held in virtual format.

Theme: Towards a Resilient Planet: Ensuring a Sustainable and Equitable Future.

About the World Sustainable Development Summit:

- It is the annual flagship event of **The Energy and Resources Institute (TERI)**.
- It is the **sole Summit on global issues taking place in the developing world**.
- It provides a platform for global leaders and practitioners to discuss and deliberate over climatic issues of universal importance.
- It strives to provide long-term solutions for the benefit of the global community by assembling the world's most enlightened leaders and thinkers on a single platform.

It is continuing **the legacy of Delhi Sustainable Development Summit (DSDS) which was initiated in 2001** with the aim of making 'sustainable development' a globally shared goal.

What is sustainable development?

'Development which meets the needs of the present without compromising the ability of future generations to meet their own needs'

- This most widely accepted definition of Sustainable Development was given by **the Brundtland Commission** in its report **Our Common Future (1987)**.
- Sustainable development (SD) calls for concerted efforts towards building an inclusive, sustainable and resilient future for people and planet.

Three core elements of sustainable development are:

- Economic growth, social inclusion and environmental protection. It is crucial to harmonize them.

The Energy and Resources Institute – TERI:

- It is a leading think tank dedicated to conducting research for sustainable development of India and the Global South.
- TERI was **established in 1974** as an information centre on energy issues. However, over the following decades, it made a mark as a research institute, whose policy and technology solutions transformed people's lives and the environment.

MAJOR DATES IN CORPORATE SUSTAINABILITY

1987

The **United Nations' Brundtland Report** provides one of the most popular definitions of sustainable development: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

1997

The **GRI (Global Reporting Initiative)** is formed by the United States-based nonprofits Ceres (formerly the Coalition for Environmentally Responsible Economies) and Tellus Institute with the support of the United Nations Environment Programme (UNEP).

2002

The **World Summit in Johannesburg** extends the definition of "sustainable development" to embrace not only environmental aspects but also social inclusion and economic development.

2011

The **Sustainability Accounting Standards Board (SASB)** is created to develop and disseminate sustainability accounting standards.

2013

The **International Integrated Reporting Council (IIRC)** releases its framework based on the concept of multicapitals to support the integration of financial and pre-financial data.

2015

The U.N. General Assembly adopts the **2030 Agenda for Sustainable Development**, accompanied by a list of Sustainable Development Goals (SDGs), namely, 17 objectives and 169 targets.

3. 4th Asia Ministerial Conference on tiger conservation

4th **Asia Ministerial Conference on Tiger Conservation** was organised by the **Government of Malaysia and Global Tiger Forum (GTF)**.

- The conference is an important event for reviewing progress towards the **Global Tiger Recovery Programme** and commitments to tiger conservation.

Outcome: The **Kuala Lumpur Joint Statement** was adopted.

India's statement at the summit:

India will facilitate **Tiger Range Countries** towards finalisation of **New Delhi declaration for the Global Tiger Summit** to be held at Vladivostok, Russia later this year.

A **"Pre-Tiger Summit"** meeting was held at New Delhi in 2010, wherein the **draft declaration on tiger conservation for Global Tiger Summit** was finalised.

India's efforts in tiger conservation:

- India has achieved the remarkable feat of **doubling the tiger population in 2018** itself, 4 years ahead of the targeted year 2022.
- The model of success of India's tiger governance is now being replicated for other wildlife like the Lion, Dolphin, Leopard, Snow Leopard and other small wild cats.
- The budgetary allocation for tiger conservation has increased from Rs 185 crore in 2014 to Rs 300 crore in 2022.
- **14 Tiger Reserves in India** have already been awarded with **international CA|TS accreditation** and efforts are on to bring in more Tiger Reserves under CA|TS accreditation.
- Approximately 4.3 million man-days of employment are being generated by 51 Tiger Reserves in India and funds from **Compensatory Afforestation Fund Management and Planning Authority (CAMPA)** are being utilized for promoting voluntary village resettlement from core areas of the Tiger Reserves.
- India is one of the Founding members of the intergovernmental platform of Tiger Range Countries – **Global Tiger Forum**, and over the years, GTF has expanded its programme on multiple thematic areas, while working closely with the Government of India, tiger states in India and tiger range countries.
 - **Global Tiger forum** is the only intergovernmental international body established with members from willing countries to embark on a global campaign to protect the tiger.

Two legal instruments that have enabled tiger recoveries in India are:

1. The Wildlife Protection Act of 1972.
2. The Forest (Conservation) Act of 1980, which reinforced Project Tiger.

Conservation Status of Tiger:

1. Indian Wildlife (Protection) Act, 1972: Schedule I.
2. International Union for Conservation of Nature (IUCN) Red List: Endangered.
3. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES): Appendix I.

What is Conservation Assured | Tiger Standards (CA|TS)?

CA|TS has been agreed upon as an accreditation tool by the **global coalition of Tiger Range Countries (TRCs)** and has been developed by tiger and protected area experts.

- **CA|TS** is a set of criteria which allows tiger sites to check if their management will lead to successful tiger conservation.
- It was officially launched in 2013.

- **The Global Tiger Forum (GTF)**, an international NGO working on tiger conservation, and **World Wildlife Fund India** are the two implementing partners of the National Tiger Conservation Authority for CATS assessment in India.

4. Earth Overshoot Day, 2021

Earth Overshoot Day 2021 happened on **July 29**, almost a month earlier than the year before.

- It was pushed forward because **emissions are on the rise and biodiversity loss is speeding up.**

Who announces the date?

The date is announced annually by **the Global Footprint Network**, the global organisation calling for urgent climate action and sustainable consumption.

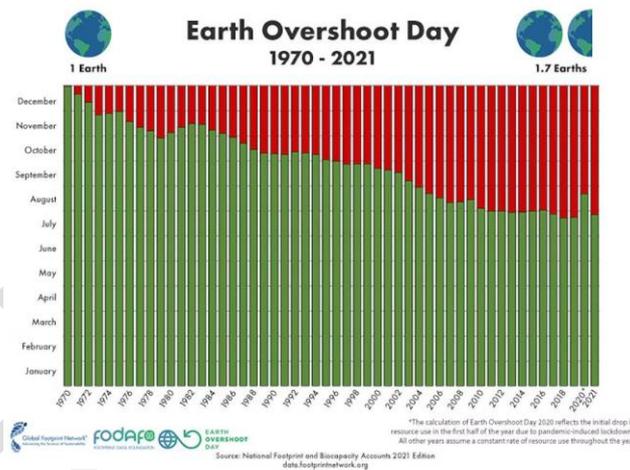
What is it?

Each year, **Earth Overshoot Day** marks the date when we have used all the biological resources that the Earth can renew during the entire year.

- This means humanity has again used up all biological resources that our planet regenerates during the entire year by 29th July, 2021.

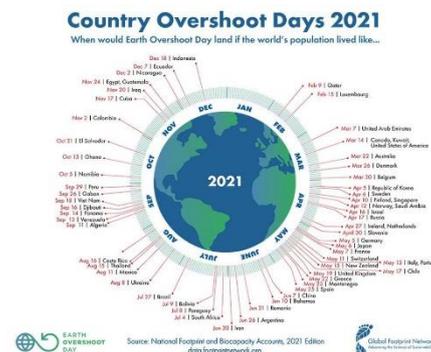
Why has it been observed one month earlier?

1. We've already seen a 6.6% increase in our global **carbon footprint**, while our global forest biocapacity decreased by 0.5% due to widespread deforestation in the Amazon rainforest.
2. Deforestation had also increased by 12% in 2020, and estimates for 2021 suggest the figure will reach a 43% year-on-year increase.



What's the concern now?

- At our current rate, we're using around 1.7 Earths every single year. From now until the end of the year, we're operating on "ecological deficit spending".
- Our spending for 2021 is among some of the highest since we entered into the overshoot territory in the 1970s, based on UN data.



The concept of earth overshoot day:

The concept of Earth Overshoot Day was first conceived by **Andrew Simms** of the UK think tank New Economics Foundation, which partnered with Global Footprint Network in 2006 to launch the first global Earth Overshoot Day campaign.

How is it computed?

Earth Overshoot Day is computed by dividing the planet's bio capacity (the amount of ecological resources Earth is able to generate that year), by humanity's Ecological Footprint (humanity's demand for that year), and multiplying by 365, the number of days in a year.

What is Ecological Footprint?

It is a metric that comprehensively compares human demand on nature against nature's capacity to regenerate.

5. World Wildlife Day

In 2013, the United Nations General Assembly (UNGA) proclaimed 3 March – **the day of signature of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1973** – as UN World Wildlife Day to celebrate and raise awareness of the world's wild animals and plants.

- The UNGA resolution also designated **the CITES Secretariat** as the facilitator for the global observance of World Wildlife Day.

Theme this year: "Forests and Livelihoods: Sustaining People and Planet".

About CITES:

- The **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)** is an international regulatory treaty between 183 party states.
- **Formed in 1973** and regulates the international trade in over 35,000 wild species of **plants and animals**.
- The focus of the convention is not solely on the protection of species. **It also promotes controlled trade that is not detrimental to the sustainability of wild species.**

How does CITES work?

The convention works primarily through a system of classification and licensing.

Wild species are categorised in Appendices I to III. This often reflects species' threat status on the Red List of the IUCN, the International Union for Conservation of Nature's Red List of Threatened Species first created in 1964.

1. Appendix I prohibits trade in species classified as highly endangered.
2. Appendix II allows trade under very specific conditions. This requires exporting countries obtain a permit, but not the importing country.
3. Appendix III species require only a certificate of origin to be traded.

National CITES management authorities may issue permits once scientific authorities show non-detriment findings.

CITES is **legally binding on state parties** to the convention, which are obliged to adopt their own domestic legislation to implement its goals.

6. Asian Waterbird Census

- Asian Waterbird Census is an annual event in which thousands of volunteers across Asia and Australasia count waterbirds in the wetlands of their country.
- This event happens every January.
- This event is coordinated by wetlands International and forms part of global waterbird monitoring programme called **the International Waterbird Census (IWC)**.
- It was started in the year 1987.
- Its main focus is to monitor the status of waterbirds and the wetlands.
- In India, the AWC is annually coordinated by **the Bombay Natural history Society (BNHS) and Wetlands International**.

What are waterbirds?

According to Wetlands International (WI), waterbirds are defined as species of birds that are ecologically dependent on wetlands. These birds are considered to be an important health indicator of wetlands of a region.

Reports / Release

1. [UNEP Frontiers report](#)

The [United Nations Environment Programme \(UNEP\)](#) recently released its latest **annual Frontiers report**.

- This is the **fourth edition of the Frontiers Report**, which was first published in 2016 with an alert to the growing risk of zoonotic diseases, four years before the outbreak of the COVID-19 pandemic.
- The Report identifies and offers solutions to three environmental issues that merit attention and action from governments and the public at large.

Highlights of the report:

Focus areas:

Urban noise pollution, wildfires and phenological shifts – the three topics of this Frontiers report – are issues that highlight the urgent need to address **the triple planetary crisis of climate change, pollution and biodiversity loss**.

2. [State of Forest Report 2021](#)

The **Ministry of Environment, Forests and Climate Change (MoEFCC)** has released **the India State of Forest Report (ISFR) 2021**.

- The **biennial report** by the Forest Survey of India (FSI) is an assessment of the country's forest resources.

Highlights of the Report:

- India's forest and tree cover has risen by 2,261 square kilometers in the last two years with **Andhra Pradesh growing the maximum forest cover of 647 square kilometers**.
- The **total tree-and-forest cover in the country** includes an increase of 1,540 square kilometres of forest cover and 721 sq km of tree cover compared to the 2019 report.
- India's total forest and tree cover is now spread across 80.9 million hectares, which is **24.62 per cent of the geographical area of the country**.
- **The top five states in terms of increase in forest cover** are Andhra Pradesh (647 sq km), Telangana (632 sq km), Odisha (537 sq km), Karnataka (155 sq km) and Jharkhand (110 sq km).
- **The gain in forest cover or improvement in forest canopy density may be attributed** to better conservation measures, protection, afforestation activities, tree plantation drives and agroforestry.
- **Among the mega cities in the country**, Ahmedabad has been the biggest loser when it comes to forest cover.

States with maximum forest cover:

- **Area-wise**, Madhya Pradesh has the largest forest cover in the country followed by Arunachal Pradesh, Chhattisgarh, Odisha and Maharashtra.
- 17 states/UTs have above 33 per cent of the geographical area under forest cover.
- Out of these states and UTs, Lakshadweep, Andaman & Nicobar Islands, Arunachal Pradesh and Meghalaya have more than 75 per cent forest cover.

Mangrove cover in the country:

- There is an increase of 17 sq km in mangrove cover in the country as compared to the previous assessment of 2019.
- Total mangrove cover in the country is 4,992 sq km.
- **Top three states showing mangrove cover increase** are Odisha (8 sq km) followed by Maharashtra (4 sq km) and Karnataka (3 sq km).

Carbon stock:

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

Concerns:

The north-east did not show positive results as the current assessment showed a decrease of forest cover to the extent of 1,020 sq km in the region.

Arunachal Pradesh lost the maximum forest cover of 257 sq km, followed by Manipur which lost 249 sq km, Nagaland 235 sq km, Mizoram 186 sq km and Meghalaya 73 sq km.

In total 140 hill districts of the country, the forest cover reduced by 902 sq km in the last two years. In the 2019 report, the forest cover in the hill regions had increased by 544 sq km.

Efforts by Government to increase forest cover in the country:

To achieve India's aim of increasing additional carbon sink of 2.5 to 3 billion tonnes CO₂ equivalent by 2030, **Nagar Van Yojna** has been introduced to increase the tree cover and joined with the second phase of Green Mission in the next five years.

Significant features of ISFR 2021:

1. In the present ISFR 2021, FSI has included a new chapter related to **the assessment of forest cover in the Tiger Reserves, Corridors and Lion conservation area of India**.
2. A new initiative of FSI has also been documented in the form of a chapter, where **the 'Above Ground Biomass'** has been estimated. FSI, in collaboration with Space Application Centre (SAC), ISRO, Ahmedabad, initiated a special study for estimation of Above Ground Biomass (AGB) at pan-India level, using L- band of **Synthetic Aperture Radar (SAR) data**.
3. FSI in collaboration of with Birla Institute of Technology & Science (BITS) Pilani, Goa Campus has performed a study based on **'Mapping of Climate Change Hotspots in Indian Forests'**. The collaborative study was carried out with the objective to map the climatic hotspots over the forest cover in India, using computer model-based projection of temperature and rainfall data, for the three future time periods i.e. year 2030, 2050 and 2085.
4. **The report also contains information on various parameters State/UT wise**. Special thematic information on forest cover such as hill, tribal districts, and north eastern region has also been given separately in the report.

3. India ranks third globally in forest area gain: Survey

As per the latest economic survey:

- India has increased its forest area in the past decade and **ranks third globally in average annual net gain in forest area from 2010-2020**.
- Forests covered 24% of India's total geographical area accounting for 2% of the world's total forest area in 2020.
- The top 10 countries account for 66% of the world's forest area. Of these Brazil (59%), Peru (57%), Democratic Republic of Congo (56%) and Russia (50%) have half or more of their total geographical area under forests.
- Among Indian States, Madhya Pradesh with 11% of India's total forest cover, had the largest area under forests in 2021, followed by Arunachal Pradesh (9%), Chhattisgarh (8%), Odisha (7%) and Maharashtra (7%).
- Mizoram (85%), Arunachal Pradesh (79%), Meghalaya (76%), Manipur (74%) and Nagaland (74%) were the top five States in terms of highest proportion of forest cover to the geographical area of the State in 2021.

4. Climate vulnerability index

Environmental think tank **Council on Energy, Environment and Water** has carried a **first-of-its-kind district-level climate vulnerability assessment, or Climate Vulnerability Index (CVI)**.

- Under this, it has analysed 640 districts in India to assess their vulnerability to extreme weather events such as cyclones, floods, heatwaves, droughts, etc.

Findings of the climate vulnerability index:

- **Assam, Andhra Pradesh, Maharashtra, Karnataka and Bihar** are most vulnerable to extreme climate events such as floods, droughts and cyclones in India.
- More than 80 per cent Indians live in districts vulnerable to climate risks – that is 17 of 20 people in India are vulnerable to climate risks, out of which every five Indians live in areas that are extremely vulnerable.
- North-eastern states are more vulnerable to floods.

How were the districts assessed?

The Index takes into account certain indicators when assessing the preparedness of a state or district.

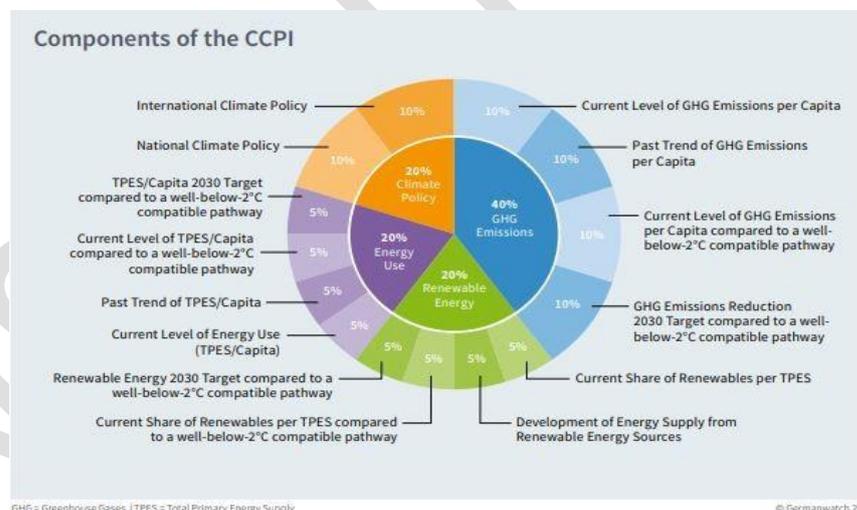
- These include availability of critical infrastructure like cyclone and flood shelters, government mechanisms in place including updating of disaster management plans, mitigation strategies, standard operating procedures before, during and after an extreme weather event such as how people and livestock are being evacuated or how food is being mobilised and how the administration prevents loss of lives and livelihoods.

5. Climate Change Performance Index

The **17th edition of the Climate Change Performance Index** was released.

About CCPI:

- It is compiled by Germanwatch, the New Climate Institute, and the Climate Action Network.
- It monitors climate mitigation progress of 60 countries and the European Union.
- It aims to enhance transparency in international climate politics and enables the comparability of climate protection efforts and progress made by individual countries.



Methodology:

Methodological approach and data sources

The CCPI assesses countries' performance in four categories:

- "GHG Emissions" (40% of overall score).
- "Renewable Energy" (20% of overall score).
- "Energy Use" (20% of overall score).
- "Climate Policy" (20% of overall score).

Performance of India:

- In the overall rankings, India is at number 10 with a score of 69.22. It is a high performer except in the renewable energy category, in which it is ranked “medium”.
- The report says that India is benefiting from its relatively low per-capita emissions.

6. WMO report on terrestrial water storage (TWS) loss

A report on **terrestrial water storage (TWS) loss- 2021 State of Climate Services-** was recently released by [the World Meteorological Organization \(WMO\)](#).

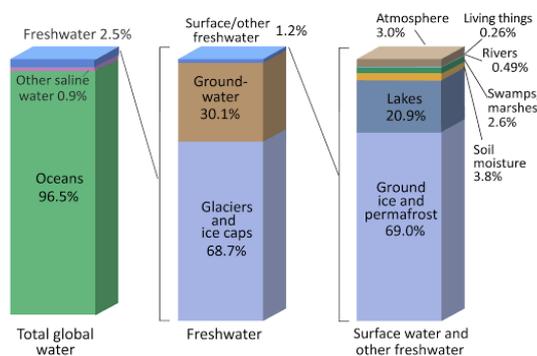
What is terrestrial water storage (TWS)?

TWS is the sum of all water on the land surface and in the subsurface, ie **surface water, soil moisture, snow and ice and ground water**.

Highlights of the report:

1. Overall, terrestrial water storage (TWS) dropped at a rate of 1 cm per year in 20 years (2002-2021).
2. The biggest losses have occurred in **Antarctica and Greenland**.
3. Many highly populated, lower latitude locations have also experienced TWS losses.
4. **India is the ‘topmost hotspot of TWS loss’**: **India has recorded the highest loss in terrestrial water storage** if the loss of water storage in Antarctica and Greenland is excluded.
5. In India, **the TWS has been lost at a rate of at least 3 cm per year**. In some regions, the loss has been over 4 cm per year too.
6. **The northern part of India has experienced the maximum loss** within the country.

Where is Earth's Water?



About WMO:

- The World Meteorological Organization (WMO) is a **specialized agency of the United Nations** dedicated to meteorology (weather), climatology (climate), operational hydrology (water) and other related geophysical sciences such as oceanography and atmospheric chemistry.
- Predecessor organization — International Meteorological Organization (IMO) — founded in 1873.

Reports:

1. Greenhouse Gas Bulletin.
2. Status of the World Climate.

What does WMO do?

1. WMO coordinates the activities of National Meteorological and Hydrological Services in 191 States and Territories so that basic weather, climate and water services are made available to anyone who needs them, when they need them.
2. WMO guarantees the publication of observations and statistics and furthers the application of meteorology and hydrology (including the monitoring and predictions of climate change and ozone) to all aspects of human activities such as aviation, shipping, water management and agriculture.
3. WMO also encourages research and training in meteorology and hydrology and their related applications and contributes towards reducing the impact of weather- and climate-related hazards. This is accomplished through regular, reliable forecasts and early warnings on flooding, drought, tropical cyclones, tornadoes and other extreme events.

4. Predictions concerning locust swarms and the transport of pollutants (nuclear and toxic substances, volcanic ash) are also provided by WMO Members."

7. IUCN Red List of Threatened Species

The **International Union for Conservation of Nature (IUCN)** has released its latest **Red List of Threatened Species**.

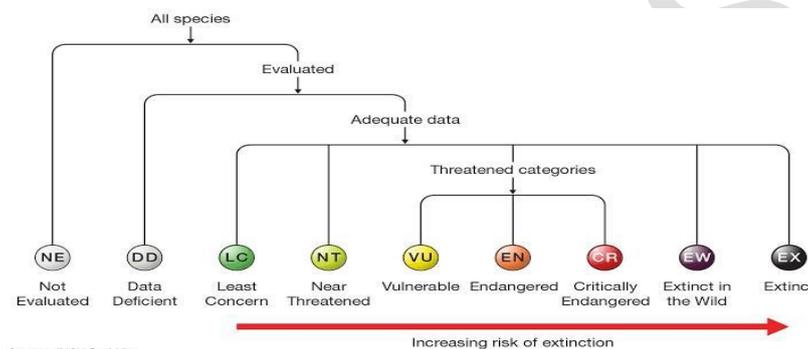
Key facts:

1. Some 902 species are officially extinct.
2. 30 per cent of the species (38,543) that it assessed (138,374) face the threat of extinction.
3. Some 80 species are extinct in the wild, 8,404 are critically endangered, 14,647 are endangered, 15,492 are vulnerable and 8,127 are near threatened.
4. Some 71,148 species are of least concern, while 19,404 are data deficient.

Important Species mentioned in the report:

1. **The Atlantic bluefin tuna** (*Thunnus thynnus*) moved from endangered to least concern while the Southern bluefin tuna (*Thunnus maccoyii*) moved from critically endangered to endangered.

2. **The world's largest living lizard, the Komodo dragon** (*Varanus komodoensis*), has been moved from vulnerable to endangered. The species is endemic to Indonesia and occurs only in the World Heritage-listed Komodo National Park and neighbouring Flores.



Source: IUCN Red List

CRITERIA ⇒ ↓ CATEGORY	A Population trend % decline	B Geographic distribution Area in km ²	C & D Population size Number of mature individuals	E Extinction % probability
EXTINCT				
EX: Extinct	Certainty that the last wild individual has died			
EW: Extinct in the Wild	Certainty that the last wild individual has died, but captive individuals persist			
THREATENED				
CR: Critically Endangered	≥80 ^{A2/3/4} to ≥90 ^{A1}	<10 ^{B2} to <100 ^{B1}	<50 ^{D1} to <250 ^C	≥50 in 10yr or 3ge ^C
EN: Endangered	≥50 ^{A2/3/4} to ≥70 ^{A1}	<500 ^{B2} to <5,000 ^{B1}	<250 ^{D1} to <2,500 ^C	≥20 in 20yr or 5ge ^C
VU: Vulnerable	≥30 ^{A2/3/4} to ≥50 ^{A1}	<2,000 ^{B2} to <20,000 ^{B1}	<1,000 ^{D1} to <10,000 ^C or <20km ^{D2} or ≤5 sites ^{D2}	≥10 in 100 yr
NOT THREATENED				
NT: Near Threatened	Close to qualifying among threatened categories			
LC: Least Concern	Widespread and abundance taxa			
UNKNOWN STATUS				
DD: Data Deficient	Not enough information to assess extinction risk			
NE: Not Evaluated	Not assessed against criteria			
REGIONAL (in addition to global categories)				
RE: Regionally Extinct	Extinct regionally but not elsewhere			
NA: Not Applicable	Individuals are vagrant, outside their natural range or introduced for no conservation purposes			

Superindexes indicate codes for criteria A to D and sub-criteria 1 to 4 — yr = years, ge = generations

What is IUCN red list of threatened species?

It is the world's most comprehensive inventory of the global conservation status of plant and animal species.

How are species categorised?

It uses a set of quantitative criteria to evaluate the extinction risk of thousands of species.

The IUCN Red List Categories:

- The IUCN Red List Categories define the extinction risk of species assessed. Nine categories extend from NE (Not Evaluated) to EX (Extinct).
- Critically Endangered (CR), Endangered (EN) and Vulnerable (VU) species are considered to be threatened with extinction.

Utility of the red list:

- It brings into focus the ongoing decline of Earth's biodiversity and the influence humans have on life on the planet. It provides a globally accepted standard with which to measure the conservation status of species over time.
- Scientists can analyze the percentage of species in a given category and how these percentages change over time; they can also analyze the threats and conservation measures that underpin the observed trends.

8. Birds of the Sundarban Biosphere Reserve- a publication by ZSI:

The report was recently published by the Zoological Survey of India (ZSI).

- The report not only documents the avifauna of the Sunderbans, but also serves as a comprehensive photographic field guide, with detailed distribution and locality data for all the species from the region.

Key Findings:

1. The Indian Sunderbans, which is part of the largest mangrove forest in the world, is home to 428 species of birds. This means that one in every three birds in the country is found in the unique ecosystem.
2. Some birds, like the masked finfoot and the Buffy fish owl, are recorded only from the Sunderbans.
3. The area is home to nine out of 12 species of kingfishers found in the country as well rare species such as the Goliath heron and the spoon-billed sandpiper.

About Indian Sundarbans:

- Covers 4,200 sq. km and includes the Sunderban Tiger Reserve of 2,585 sq. km — home to about 96 royal Bengal tigers (as per the last census in 2020).
- It is a world heritage site and a Ramsar site (a wetland site designated to be of international importance).
- It is also home to a large number of "rare and globally threatened species, such as the critically endangered northern river terrapin (Batagur baska), the endangered Irrawaddy dolphin (Orcaella brevirostris), and the vulnerable fishing cat (Prionailurus viverrinus)."
- Two of the world's four horseshoe crab species, and eight of India's 12 species of kingfisher are also found here. Recent studies claim that the Indian Sundarban is home to 2,626 faunal species and 90% of the country's mangrove varieties.

International Efforts / Organisations

1. Global Environment Facility

- GEF was established during the Rio Earth Summit of 1992.
- It is based in Washington, D.C., United States.
- The GEF is jointly managed by the United Nations Development Programme (UNDP), the World Bank, and the United Nations Environment Programme (UNEP).
- 183 nations are united under GEF in partnership with civil society organizations (CSOs), international institutions, private sector, etc. to address the environmental issues across the globe.
- It provides funds to the developing countries and transition economies for projects related to climate change, biodiversity, the ozone layer, etc.

As an independently operating financial organization, GEF addresses six designated focal areas which are listed below:

1. Biodiversity
2. Climate change
3. International waters
4. Ozone depletion
5. Land degradation
6. Persistent Organic Pollutants

GEF also serves as a financial mechanism for the following conventions:

1. United Nations Convention on Biological Diversity (UNCBD)
2. United Nations Framework Convention on Climate Change (UNFCCC)
3. United Nations Convention to Combat Desertification (UNCCD)
4. Stockholm Convention on Persistent Organic Pollutants (POPs)
5. Minamata Convention on Mercury

Although **the Global Environment Facility is not linked to the Montreal Protocol on Substances that Deplete the Ozone Layer** formally, it supports its implementation in countries with the economies in transition.

2. COP26 climate conference

The **UK hosted the COP 26 UN Climate Change Conference**. It was held in **the Scottish Event Campus in Glasgow**.

What is **the Conference of Parties?**

COP comes under **the United Nations Climate Change Framework Convention (UNFCCC)** which was **formed in 1994**.

- The UNFCCC was established to work towards “stabilisation of greenhouse gas concentrations in the atmosphere.”
- COP members have been meeting every year since 1995 (COP1 was held in 1995 in Berlin).
- The Conference of Parties (COP) is the **apex decision-making body of the United Nations Climate Change Framework Convention (UNFCCC)**.

It laid out a list of responsibilities for the member states which included:

1. Formulating measures to mitigate climate change.
2. Cooperating in preparing for adaptation to the impact of climate change.
3. Promoting education, training and public awareness related to climate change.

About UNFCCC:

The UNFCCC was adopted in **1992 at the Rio Earth Summit**, which marked the beginning of the international community's first concerted effort to confront the problem of climate change.

- Known also as **the Rio Convention**, the UNFCCC established a framework for action to stabilise concentrations of greenhouse gases in the earth's atmosphere.
- The UNFCCC **entered into force in 1994**, and nearly all of the world's nations have now signed on.
- It is the parent treaty of **the 2015 Paris Agreement**. It is also the parent treaty of **the 1997 Kyoto Protocol**.

3. Infrastructure for Resilient Island States

This initiative has been launched by India for developing the infrastructure of small island nations vulnerable to climate change.

- The new initiative is the result of cooperation between India, the U.K. and Australia and included the participation of leaders of small island nations such as Fiji, Jamaica and Mauritius.

Implementation:

The IRIS initiative is a part of **the Coalition for Disaster Resilient Infrastructure (CDRI)** that would focus on building capacity, having pilot projects, especially in small island developing states.

About CDRI:

- Launched by Modi in September 2019 at the UN Secretary-General's Climate Action Summit in New York, US.
- It is a platform where knowledge is generated and exchanged on different aspects of disaster and climate resilience of infrastructure.
- It will create a mechanism to assist countries to upgrade their capacities and practices, with regard to infrastructure development in accordance with their risk context and economic needs.
- So far, 25 other countries, including Germany, Italy, Japan, Australia, and the United States have joined this coalition.
- **CDRI is the second international collaboration set up by India in the climate change sphere**, the other being **the International Solar Alliance** that has now evolved to the status of a "treaty-based" intergovernmental organisation.

Small Island Developing States:

- Small Island Developing States (SIDS) are a distinct group of **38 UN Member States and 20 Non-UN Members/Associate Members of United Nations regional commissions** that face unique social, economic and environmental vulnerabilities.
- The SIDS were **recognized as a distinct group of developing countries in June 1992**, at the UN Conference on Environment and Development.
- SIDS' unique and particular vulnerabilities are highlighted in **"The Future We Want"**, adopted at the United Nations Conference on Sustainable Development (also known as Rio+20) that took place in Rio de Janeiro, Brazil in June 2012.
- **The geographical regions** in which SIDS are located are the Caribbean, the Pacific, and the AIS (Atlantic, Indian Ocean and South China Sea).
- **The Barbados Programme of Action** was produced in 1994 in order to assist the SIDS in their sustainable development efforts.
- **The United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (UN-OHRLS)** represent this group of states.

4. Global Methane Pledge

The Global Methane Pledge was **launched at the UN COP26 climate conference** in Glasgow.

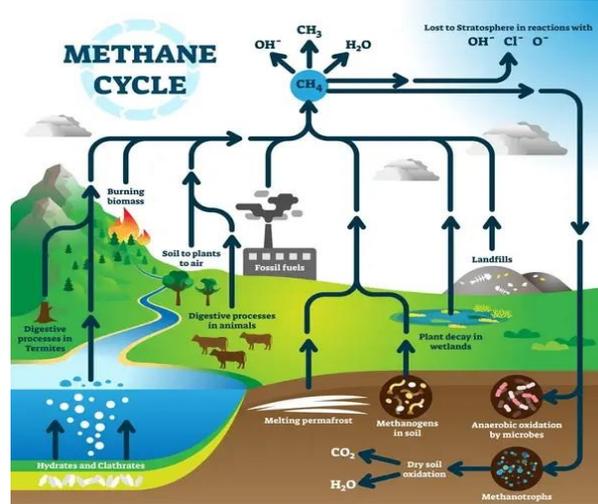
- It is an effort led jointly by the United States and the European Union.

About the Global Methane Pledge:

- The pledge was first announced in September by the US and EU, and is essentially an agreement to reduce global methane emissions.
- One of the central aims of this agreement is to cut down methane emissions by up to 30 per cent from 2020 levels by the year 2030.

Need for limiting the methane emissions:

- Methane is the second-most abundant greenhouse gas in the atmosphere, after carbon dioxide, and, therefore, pledges related to cutting down its emissions are significant.
- According to the latest Intergovernmental Panel on Climate Change report, methane accounts for about half of the 1.0 degrees Celsius net rise in global average temperature since the pre-industrial era.
- Rapidly reducing methane emissions is complementary to action on carbon dioxide and other greenhouse gases, and is regarded as the single most effective strategy to reduce global warming in the near term and keep the goal of limiting warming to 1.5 degrees Celsius within reach.



TROPOSPHERIC OZONE (O₃)

Tropospheric ozone is a powerful greenhouse gas and air pollutant that is harmful to human health, agricultural crops and ecosystems.

SOURCES Tropospheric ozone does not have any direct emissions sources, rather it is formed when sunlight interacts with different pollutants.

LIFETIME IN ATMOSPHERE: WEEKS
Reducing the pollutants that form tropospheric ozone would generate rapid benefits for the climate and human health.

STRATOSPHERE
In the stratosphere, ozone protects the Earth from the sun's ultraviolet radiation. (50 km)

TROPOSPHERE
At lower levels, ozone is a greenhouse gas and air pollutant that is the main ingredient of smog. (10 km)

IMPACTS

- CLIMATE:** Contributes to global warming.
- HEALTH:** Causes 1+ million pollution-related deaths every year and millions more chronic diseases.
- AGRICULTURE & ECOSYSTEMS:**
 - Toxic to many plants.
 - Causes up to 15% in annual yield losses of soy, wheat, rice and maize.

The world's land ecosystems capture and store about 30% of CO₂ emissions every year. Tropospheric ozone damages plants and their ability to sequester CO₂, which doubles its climate impact.

Chemicals forming tropospheric ozone: SUNLIGHT + METHANE (CH₄) + CARBON MONOXIDE (CO) + NON-METHANE VOLATILE ORGANIC COMPOUNDS (NMVOC) + NITROGEN OXIDES (NO_x)

Why is dealing with methane important for climate change?

- According to the International Energy Agency (IEA), while methane has a much shorter atmospheric lifetime (12 years as compared to centuries for CO₂), it is a much more potent greenhouse gas simply because it absorbs more energy while it is in the atmosphere.
- In its factsheet on methane, the UN notes that methane is a powerful pollutant and has a global warming potential that is 80 times greater than carbon dioxide, about 20 years after it has been released into the atmosphere.

- Significantly, **the average methane leak rate of 2.3 per cent “erodes much of the climate advantage gas has over coal”**.
- The IEA has also said that **more than 75 per cent of methane emissions can be mitigated with the technology that exists today**, and that up to 40 per cent of this can be done at no additional costs.

Sources of human-caused methane emissions:

- Most human-caused methane emissions came from three sectors: Fossil fuels, waste and agriculture.
- Oil and gas extraction, processing and distribution accounted for 23 per cent of methane emissions in the fossil fuel sector. Coal mining accounted for 12 per cent of emissions.
- Landfills and wastewater made up about 20 per cent of emissions in the waste sector. In the agricultural sector, livestock emissions from manure and enteric fermentation constituted for roughly 32 per cent and rice cultivation eight per cent of emissions.

5. Green Bonds

State Bank of India has dual listed its \$650 million **green bonds** simultaneously on the India International Exchange (India INX) and Luxembourg Stock Exchange (LuxSE).

What Is a Green Bond?

A green bond is a **type of fixed-income instrument** that is specifically earmarked to raise money for climate and environmental projects.

These bonds are **typically asset-linked and backed by the issuing entity's balance sheet**, so they usually carry the same credit rating as their issuers' other debt obligations.

- Green bonds may come with tax incentives to enhance their attractiveness to investors.
- The **World Bank is a major issuer of green bonds**. It has issued 164 such bonds since 2008, worth a combined \$14.4 billion. In 2020, the total issuance of green bonds was worth almost \$270 billion, according to the [Climate Bond Initiative](#).

How Does a Green Bond Work?

Green bonds work **just like any other corporate or government bond**.

- Borrowers issue these securities in order to secure financing for projects that will have a **positive environmental impact**, such as ecosystem restoration or reducing pollution.
- Investors who purchase these bonds can expect to make as the bond matures.
- In addition, **there are often tax benefits** for investing in green bonds.

Green Bonds Vs Blue Bonds:

Blue bonds are sustainability bonds to finance projects that **protect the ocean and related ecosystems**.

- This can include projects to support sustainable fisheries, protection of coral reefs and other fragile ecosystems, or reducing pollution and acidification.
- **All blue bonds are green bonds, but not all green bonds are blue bonds.**

Green Bonds Vs Climate Bonds:

"**Green bonds**" and "**climate bonds**" are sometimes used interchangeably, but some authorities use the latter term specifically for **projects focusing on reducing carbon emissions** or alleviating the effects of climate change.

6. Clean, healthy and sustainable environment, a universal right

The [United Nations Human Rights Council](#) has unanimously voted for **recognising a clean, healthy and sustainable environment as a universal right** in Geneva, Switzerland.

Significance:

If recognised by all, the right would be the first of its kind in more than 70 years since [the Universal Declaration of Human Rights](#) was adopted by [the UN General Assembly](#) in 1948.

The resolution emphasises “the rights to life, liberty and security of human rights defenders working in environmental matters, referred to as **environmental human rights defenders.**”

Expected outcomes of this recognition:

1. Stronger environmental laws and policies.
2. Improved implementation and enforcement.
3. Greater public participation in environmental decision-making.
4. Reduced environmental injustices.
5. A level playing field with social and economic rights.
6. And better environmental performance.

7. International Blue Flag Certification

Two more Indian Beaches (Kovalam in Tamil Nadu and Eden in Puducherry) get coveted International Blue Flag Certification. India now has **10 Blue Flag beaches**.

- This is another recognition of **India's commitment to protect and conserve the pristine coastal and marine ecosystems** through holistic management of the resources.

8 nominated beaches in India were awarded the Blue Flag certificate last year.

These are:

1. Shivrajpur-Gujarat.
2. Ghoghla-Diu.
3. Kasarkod -Karnataka.
4. Padubidri-Karnataka.
5. Kappad-Kerala.
6. Rushikonda- Andhra Pradesh.
7. Golden-Odisha.
8. Radhanagar- Andaman and Nicobar.

What is the Blue flag certification?

- **Blue Flag certification** is a globally recognised eco-label accorded by "**Foundation for Environment Education in Denmark**" based on **33 stringent criteria**.
- The **Blue Flag Programme for beaches and marinas** is run by the **international, non-governmental**, non-profit organisation the '**Foundation for Environmental Education (FEE)**.'
- It was **started in France in 1985** and has been implemented in Europe since 1987, and in areas outside Europe since 2001, when South Africa joined.
- Neat and clean beaches are an indicator that the coastal environment is in good health and the **Blue Flag certification** is a global recognition of India's conservation and sustainable development efforts.
- A waving "Blue Flag" is an indication of **100% compliance to these 33 stringent criteria** and sound health of the beach.

What is the 'Blue Flag Beach'?

- The 'Blue Flag' beach is an 'eco-tourism model'.
- It marks out beaches as providing tourists and beachgoers clean and hygienic bathing water, facilities/amenities, a safe and healthy environment, and sustainable development of the area.

8. Marine Environment Protection Committee (MEPC)

With Arctic summer ice reaching its 12th lowest ever extent, **the Clean Arctic Alliance** has called for urgent cuts to **black carbon** emissions from shipping, ahead of **the 77th Marine Environment**

Protection Committee (MEPC) meeting (MEPC 77) at the International Maritime Organization (IMO) in November.

About the Marine Environment Protection Committee (MEPC):

In order to ensure that a proactive stance is taken by in order to protect and safeguard the interests of the marine environment and ecosystem, the IMO has established the Marine Environment Protection Committee (MEPC).

- The committee seeks to provide a solution for the problem of air pollution caused by the constant and heavy traffic of ships in the oceanic areas.
- The committee in its sessions also seeks to provide required revisions to the existing MARPOL stipulations and guidelines.
- The creation and enforcement of PSSAs (Particularly Sensitive Sea Areas) and other special oceanic zones is also an area that is looked into by the environment protection organisation.

9. Turtle Survival Alliance (TSA)

The Turtle Survival Alliance (TSA) was formed in 2001 as an International Union for Conservation of Nature (IUCN) partnership for sustainable captive management of freshwater turtles and tortoises, and initially designated a Task Force of the IUCN Tortoise and Freshwater Turtle Specialist Group.

- Indian biologist Shailendra Singh has been awarded the **Behler Turtle Conservation Award** for bringing three **critically endangered turtle conservation species** back from the brink of extinction- **Red-crowned Roofed Turtle (Batagur kachuga), Northern River Terrapin (Batagur baska), and Black Softshell Turtle (Nilssonina nigricans)**
- This award is bestowed by several global bodies involved in turtle conservation such as **Turtle Survival Alliance, IUCN/SSC Tortoise and Freshwater Turtle Specialist Group, Turtle Conservancy, and the Turtle Conservation Fund.**
- There are **29 species of freshwater turtles and tortoises in the country.**

Note: Difference between Tortoise and turtle: Tortoises have more rounded and domed shells where turtles have thinner, more water-dynamic shells. Tortoises spend most of their time on land and turtles are adapted for life spent in water.

10. IPCC's Sixth Assessment report

IPCC released its Sixth Assessment Report "Climate Change 2021: The Physical Science".

- Several Indian Scientists have participated in the preparation of this report.

What is Sixth Assessment Report (AR6)?

The Sixth Assessment Report (AR6) of the **United Nations Intergovernmental Panel on Climate Change (IPCC)** is the sixth in a series of reports intended to assess scientific, technical, and socio-economic information concerning climate change.

- **This report evaluates** the physical science of climate change – looking at the past, present, and future climate.
- It reveals **how human-caused emissions are altering our planet** and what that means for our collective future.

The report highlights that our climate is rapidly changing due to human influence and is already altering our planet in drastic ways –

- **Arctic Sea ice** is at its lowest level in more than 150 years;
- Sea levels are rising faster than at any time in at least the last 3,000 years; and
- Glaciers are declining at a rate unprecedented in at least 2,000 years.

11. International Nitrogen Initiative Conference

The **8th International Nitrogen Initiative Conference (INI2020)** was held recently- virtually.

About the International Nitrogen Initiative Conference:

- Set up in **2003** under sponsorship of **the Scientific Committee on Problems of the Environment (SCOPE)** and from **the International Geosphere-Biosphere Program (IGBP)**.
- It is **a triennial event** that brings together scientists from around the world dealing with reactive nitrogen compounds in agriculture, industry, traffic, soil, water and air.
- **Objective:** To stimulate an exchange among policymakers and other relevant stakeholders of results, ideas and visions to improve future **holistic management of reactive nitrogen**.
- The program is currently a sustained partner of **Future Earth**.

Nitrogen as an essential nutrient:

- Nitrogen, which is a **vital macronutrient for most plants**, is the most abundant element in the atmosphere.
- A little over 78% of dry air on Earth is nitrogen. But **atmospheric nitrogen, or dinitrogen, is unreactive and cannot be utilised by plants directly**.
- Therefore, **nitrogen-fixing bacteria like rhizobia** live symbiotically with leguminous plants, providing nitrogen to the plant and soil in the form of reactive compounds like ammonia and nitrate.

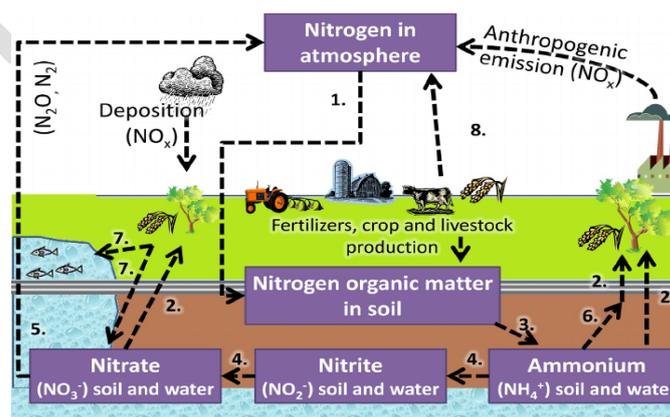
How Nitrogen turned into pollutants from nutrients and how it is affecting health and environment?

- Nitrogen compounds **running off farmland** have led to water pollution problems around the world, while **nitrogen emissions from industry, agriculture and vehicles** make a big contribution to air pollution.
- **Over 80% of the nitrogen in soil is not utilised by humans**. While over four-fifths of the nitrogen is used to feed livestock, only about six per cent reaches humans in case of non-vegetarian diet, as compared to the 20% that reaches the plate of a vegetarian.

Therefore, Nitrogen becomes a pollutant when it escapes into the environment and reacts with other organic compounds. It is either released into the atmosphere, gets dissolved in water sources such as rivers, lakes or groundwater, or remains in the soil.

Nitrogen pollution has a significant impact on the environment:

1. It **creates harmful algal blooms and dead zones in our waterways** and oceans; the algae produce toxins which are harmful to human and aquatic organisms (and indirectly affects fisheries and biodiversity in coastal areas).
2. **Contamination of drinking water:** 10 million people in Europe are potentially exposed to drinking water with nitrate concentrations above recommended levels. This can have an adverse effect on human health.
3. **Food Security:** Excessive nitrogen fertiliser application contributes to soil nutrient depletion. As the world needs to feed an ever-growing population, loss of arable land is a major global problem.
4. The release of **Nitrous Oxide is essentially a greenhouse gas** which is harmful to the environment.



Protocols / Conventions

1. Stockholm Convention on POPs

European Commission has proposed to tighten limits for a range of persistent organic pollutants (POPs) to tackle contamination in recycled products, health and environment.

What are POPs?

In 1995, the Governing Council of the United Nations Environment Programme (UNEP) called for global action to be taken on POPs, which it defined as **“chemical substances that persist in the environment, bio-accumulate through the food web, and pose a risk of causing adverse effects to human health and the environment”**.

Uniqueness of POPs:

- POPs are **lipophilic**, which means that they accumulate in the fatty tissue of living animals and human beings.
- **In fatty tissue**, the concentrations can become magnified by up to 70 000 times higher than the background levels.
- As **you move up the food chain, concentrations of POPs tend to increase** so that animals at the top of the food chain such as fish, predatory birds, mammals, and humans tend to have the greatest concentrations of these chemicals.

About Stockholm Convention on POPs:

Signed in 2001 and **effective from May 2004** (Ninety days after the ratification by at least 50 signatory states).

Aims to **eliminate or restrict** the production and use of **persistent organic pollutants (POPs)**.

The 12 initial POPs under the Stockholm Convention:

Initially, twelve POPs have been recognized as causing adverse effects on humans and the ecosystem and these can be placed in 3 categories:

1. **Pesticides:** aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, toxaphene;
2. **Industrial chemicals:** hexachlorobenzene, polychlorinated biphenyls (PCBs); and
3. **By-products:** hexachlorobenzene; polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDF), and PCBs.

Since then, additional substances such as carcinogenic polycyclic aromatic hydrocarbons (PAHs) and certain brominated flame-retardants, as well as organometallic compounds such as tributyltin (TBT) have been added to the list of Persistent Organic Pollutants.

Sources of POPs:

- Improper use and/or disposal of agrochemicals and industrial chemicals.
- Elevated temperatures and combustion processes.
- Unwanted by-products of industrial processes or combustion.

Is it legally binding?

Yes. **Article 16** of the Convention requires that effectiveness of the measures adopted by the Convention is evaluated in regular intervals.

Other Conventions dealing with POPs:

Convention on Long-Range Transboundary Air Pollutants (LRTAP), Protocol on Persistent Organic Pollutants (POPs).

Recent developments:

The Union Cabinet, in 2021, approved the Ratification of **seven chemicals** listed under the **Stockholm Convention** on Persistent Organic Pollutants (POPs).

- The Cabinet has also delegated its **powers to ratify chemicals** under the Stockholm Convention to the Union Ministers of External Affairs (MEA) and Environment, Forest and Climate Change (MoEFCC) in respect of POPs already regulated under the domestic regulations.

These are:

1. Chlordecone.
2. Hexabromobiphenyl.
3. Hexabromodiphenyl ether and Heptabromodiphenylether.
4. Tetrabromodiphenyl ether and Pentabromodiphenyl ether.
5. Pentachlorobenzene.
6. Hexabromocyclododecane.
7. Hexachlorobutadiene.

Benefits for India:

The ratification process would enable India to access **Global Environment Facility (GEF)** financial resources in updating the National Implementation Plan (NIP).

2. Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention)

The four West African countries- Gambia, Guinea Bissau, Mauritania and Senegal- have signed a **joint declaration to advance transboundary cooperation in the Senegal-Mauritanian Aquifer Basin (SMAB)**.

- They have agreed to establish a legal and institutional framework for cooperation on SMAB.
- This would be the first such mechanism in West Africa and pave the way for strengthened collaboration on shared groundwater resources worldwide.

About SMAB:

- The Senegalo-Mauritanian aquifer basin is the largest basin in the Atlantic margin of north-west Africa, having an area of 350,000 square kilometres.
- More than 24 million inhabitants of the region are dependent on it for drinking water and other needs.

Need for:

Senegal, upon accession to **the UNECE Water Convention** in 2018, had requested for such a declaration.

- **The Water Convention Secretariat**, together with the Geneva Water Hub and the International Groundwater Resources Assessment Centre, subsequently facilitated the declaration.

About the Water Convention:

- The Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) was adopted in Helsinki in 1992 and **entered into force in 1996**.
- The Convention is a unique **legally binding instrument** promoting the sustainable management of shared water resources, the implementation of the Sustainable Development Goals, the prevention of conflicts, and the promotion of peace and regional integration.

Implementation:



1. The Water Convention requires Parties to prevent, control and reduce transboundary impact, use transboundary waters in a reasonable and equitable way and ensure their sustainable management.
2. Parties bordering the same transboundary waters have to cooperate by entering into specific agreements and establishing joint bodies.
3. As a framework agreement, the Convention does not replace bilateral and multilateral agreements for specific basins or aquifers; instead, it fosters their establishment and implementation, as well as further development.

Members:

As of September 2018, it has been ratified by 43 parties, which includes 42 states and the European Union. It has been signed but not ratified by the United Kingdom.

3. Kunming Declaration on biodiversity conservation

The “Kunming Declaration” was adopted by over 100 countries in the 15th meeting of the Conference of the Parties (COP) to [the United Nations Convention on Biological Diversity \(UNCBD\)](#).

Theme of the COP-15: “Ecological Civilization: Building a Shared Future for All Life on Earth”.

Kunming Declaration:

- It calls upon the parties to “mainstream” biodiversity protection in decision-making and recognise the importance of conservation in protecting human health.
- By adopting this, the nations have committed themselves to support the development, adoption and implementation of an effective post-2020 implementation plan, capacity building action plan for the Cartagena Protocol on biosafety.
- Signatory nations should ensure that the post-pandemic recovery plans contribute to the conservation and sustainable use of biodiversity, promoting sustainable and inclusive development.
- The declaration expects signatory nations to synchronize Biodiversity plans with the three UN decades program which are on ‘Sustainable Development’, ‘Ecosystem Restoration’, ‘Ocean Science for Sustainable Development’.

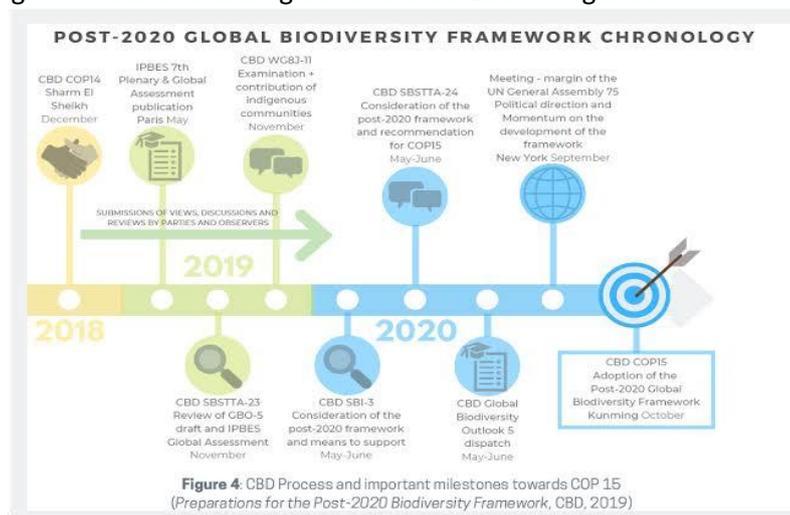
Convention on Biological Diversity, 1992:

The Convention on Biological Diversity (CBD) entered into force on 29 December 1993. It has 3 main objectives:

1. The conservation of biological diversity.
2. The sustainable use of the components of biological diversity.
3. The fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

The Convention was opened for signature on 5 June 1992 at the United Nations Conference on Environment and Development (the Rio “Earth Summit”).

- This convention is a legally binding framework treaty that has been ratified by 180 countries.



- The CBD Secretariat is based in Montreal, Canada and it operates under the United Nations Environment Programme.
- The areas that are dealt by convention are conservation of biodiversity, sustainable use of biological resources and equitable sharing of benefits arising from their sustainable use.
- The convention came into force in 1993. Many biodiversity issues are addressed including habitat preservation, intellectual property rights, biosafety and indigenous people's rights.

30 by 30 Target:

The declaration made a reference to the '30 by 30' target which is a key proposal being debated at the COP15, that would afford 30% of the Earth's land and oceans protected status by 2030.

- Apart from this, the goal to halve the use of chemicals in agriculture and stop creating plastic waste is also being debated.

4. Montreal Protocol on Substances that Deplete the Ozone Layer

World Ozone Day is celebrated on **16th September each year** to commemorate the signing of the **Montreal Protocol**.

- **This international environmental treaty** for phasing out of production and consumption of **Ozone Depleting Substances** came into force on this day in 1987.
- The Day is celebrated every year **to spread awareness among people about the depletion of Ozone Layer** and the measures taken/ to be taken to preserve it.

The theme World Ozone Day 2021: "Montreal Protocol - Keeping us, our food and vaccines cool".

Montreal Protocol:

The Montreal Protocol on Substances that Deplete the Ozone Layer (the Montreal Protocol) is an international agreement made in 1987.

- It was **designed to stop the production and import of ozone depleting substances** and reduce their concentration in the atmosphere to help protect the earth's ozone layer.
- The Montreal Protocol sits under the **Vienna Convention for the Protection of the Ozone Layer** (the Vienna Convention).

What is the 'Kigali Amendment'?

Kigali Amendment was adopted by the **Parties to the Montreal Protocol on October, 2016** at 28th Meeting of the Parties to the Montreal Protocol held at Kigali, Rwanda.

- **Under the Kigali Amendment;** Parties to the Montreal Protocol will phase down production and consumption of **Hydrofluorocarbons**, commonly known as HFCs.
- All amendments and adjustments of the Montreal Protocol, prior to the Kigali Amendment have Universal support.

Goals under Kigali Amendment:

- Before the middle of this century, current HFC use has to be curtailed by at least 85 per cent. Countries have different timelines to do this.
- India has to achieve this target by 2047 while the developed countries have to do it by 2036. China and some other countries have a target of 2045.
- While the reductions for the rich countries have to begin immediately, India, and some other countries, have to begin cutting their HFC use only from 2031.

India's achievements in implementation of Montreal Protocol:

- India, as Party to the Montreal Protocol since June 1992, has been successfully implementing the Montreal Protocol.
- **India has phased out** Chlorofluorocarbons, Carbon tetrachloride, Halons, Methyl Bromide and Methyl Chloroform for controlled uses in line with the Montreal Protocol.
- **Currently Hydrochlorofluorocarbons are being phased out** as per the accelerated schedule of the Montreal Protocol.

- **Hydrochlorofluorocarbons Phase out Management Plan (HPMP) Stage-I** has been successfully implemented from 2012 to 2016 and **HPMP Stage-II** is currently under implementation from 2017 and will be completed by 2023.
- **Government of India has recently decided to Ratify the Kigali Amendment** to the Montreal Protocol.

Benefits of ratification of the Kigali Amendment:

- HFC phasedown is expected **to prevent the greenhouse gas emissions**, helping prevent climate change and would benefit the people.
- The industry producing and consuming Hydrofluorocarbons **will be phasing out Hydrofluorocarbons as per the agreed schedule under and transition to non-HFC** and low global warming potential technologies.

What are hydrofluorocarbons?

HFCs are known to be much worse than carbon dioxide in causing global warming.

In fact, according to the UN Environment Programme (UNEP), the average global warming potential of 22 of the most used HFCs is about 2,500 times that of carbon dioxide.

5. Antarctic Treaty

23 June 2021- **60th anniversary of the entry into force of [the Antarctic Treaty](#)** (23 June 1961).

Significance of the treaty:

1. Negotiated during the middle of the Cold War by 12 countries with Antarctic interests, it remains **the only example of a single treaty that governs a whole continent**.
2. It is also the foundation of **a rules-based international order for a continent without a permanent population**.

But, the treaty was negotiated in a very different era and is it still relevant today?

While the Antarctic Treaty has been able to successfully respond to a range of challenges, circumstances are radically different in the 2020s compared to the 1950s.

1. Antarctica is much more accessible, partly due to technology but also climate change.
2. More countries now have substantive interests in the continent than the original 12.
3. Some global resources are becoming scarce, especially oil.
4. There is also uncertainty as to China's intentions in Antarctica. China joined the treaty in 1983 and became a consultative party in 1985.
5. This will inevitably result in increased attention being given to the potential for Antarctic mining to take place sometime in the future.

Therefore, Calls to revisit the prohibition on Antarctic mining would seem inevitable.

About the Antarctic Treaty:

Signed between 12 countries in Washington on 1st December 1959 for making the Antarctic Continent a demilitarized zone to be preserved for scientific research only.

- **The twelve original signatories** are Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the Union of Soviet Socialist Republics, the UK and the US.
- The treaty **entered into force in 1961 and currently has 54 parties**.
- **Headquarters:** Buenos Aires, Argentina.

For the purposes of the treaty system, **Antarctica is defined as all of the land and ice shelves south of 60°S latitude**.

Provisions:

1. Antarctica shall be used for peaceful purposes only(Art. I).

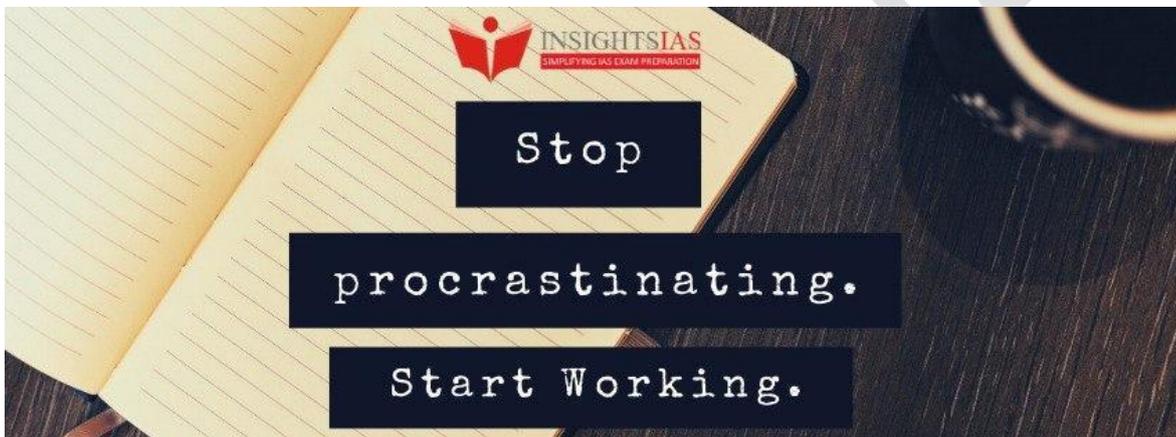
2. Freedom of scientific investigation in Antarctica and cooperation toward that end shall continue(Art. II).
3. Scientific observations and results from Antarctica shall be exchanged and made freely available(Art. III).
4. Article IV effectively seeks to neutralise territorial sovereignty in Antarctica.
5. The treaty also put a freeze on any disputes between claimants over their territories on the continent.

Antarctic Treaty System:

As disputes have arisen over the years, many have been addressed through the expansion of the treaty framework with these agreements. This framework is now referred to as the “Antarctic Treaty System”.

The Antarctic Treaty system is made up of four major international agreements:

1. The 1959 Antarctic Treaty.
2. The 1972 Convention for the Conservation of Antarctic Seals.
3. The 1980 Convention on the Conservation of Antarctic Marine Living Resources.
4. The 1991 Protocol on Environmental Protection to the Antarctic Treaty.



Miscellaneous

1. Revival of Saraswati river

The **governments of Haryana and Himachal Pradesh** have entered into an agreement to build a **dam at Adi Badri** in Yamunanagar district, which, among others, will rejuvenate the mythical Saraswati river.

- **Adi Badri**, situated in Haryana near the Himachal Pradesh border, is believed to be the river's origin point.

About Saraswati:

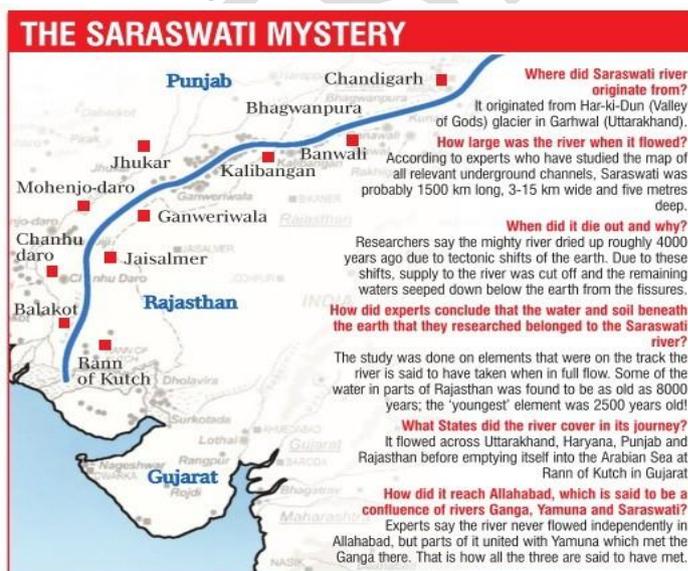
The river, which had **originated from Kapal tirth in the Himalayas in the west of Kailash**, was flowing southward to Mansarovar and then taking a turn towards west.

The river flowed through **Haryana, Rajasthan and North Gujarat**. It also flowed through Pakistan before meeting Western Sea through Rann of Kutch and was approximately 4,000 km in length.

- **The river had two branches:** western and eastern. The Himalayan-born Satluj "of the PAST", which flowed through the channels of present-day Ghaggar-Pataliwal rivulets, represents the western branch of the ancient river.
- On the other hand, Markanda and Sarsuti represented the western branch of Saraswati, known as Tons-Yamuna.
- The confluence of the branches was near Shatrana, 25 km south of Patiala. And suddenly, it flows crossing the dessert (Rann of Kutch) and meet gulf of western sea.

Historical evidence:

- The Saraswati River is one of the main Rigvedic rivers mentioned in the scripture Rig Veda and later Vedic and post-Vedic texts.
- Book 6 of the Rig Veda includes a hymn called the '**Nadistuti Sukta**', which sings praises of the Saraswati as being "perfect mother, unsurpassed river, supreme goddess".
- For 2000 years, between 6000 and 4000 B.C., the Saraswati flowed as a great river.



2. Sixth mass extinction

The **ongoing sixth mass extinction** may be one of the most serious environmental threats to the persistence of civilisation, according to new research.

- Earth was once home to two million known species. According to the study, however, **since 1500, as many as 7.5%-13% of these species may have been lost. That numbers anywhere from 150,000 to 260,000 different species.**

What is the mass extinction of species?

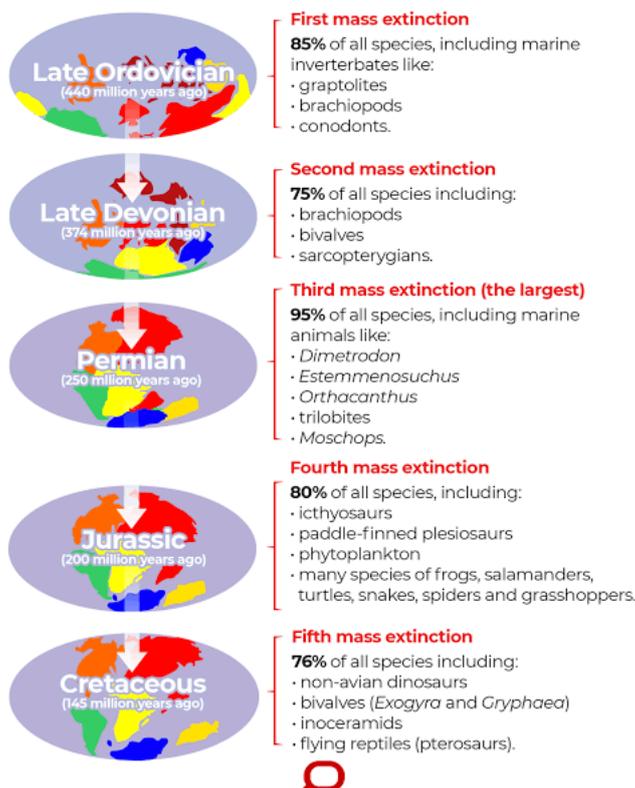
Mass extinction refers to a substantial increase in the degree of extinction or **when the Earth loses more than three-quarters of its species in a geologically short period of time.**

So far, during the entire history of the Earth, **there have been five mass extinctions.**

Reasons and impacts:

- The five mass extinctions that took place in the last 450 million years have led to the destruction of 70-95 per cent of the species of plants, animals and microorganisms that existed earlier.
- These extinctions were caused by “catastrophic alterations” to the environment, such as massive volcanic eruptions, depletion of oceanic oxygen or collision with an asteroid.
- After each of these extinctions, it took millions of years to regain species comparable to those that existed before the event.

The “Big Five” mass extinctions



What is the sixth mass extinction?

The sixth, which is ongoing, is referred to as the **Anthropocene extinction**.

Researchers have described it as the “**most serious environmental problem**” since the loss of species will be permanent.

Why it is attributable to humans?

One of the reasons that humanity is an “unprecedented threat” to many living organisms is because of their **growing numbers**.

The loss of species has been occurring since human ancestors developed agriculture over 11,000 years ago. Since then, **the human population has increased from about 1 million to 7.7 billion**.

Changes occurred and occurring:

- More than 400 vertebrate species went extinct in the last century, extinctions that would have taken over 10,000 years in the normal course of evolution.
- Many of the species currently endangered or on the brink of extinction are being decimated by legal and illegal wildlife trade.
- **Several species of mammals that were relatively safe one or two decades ago are now endangered, including cheetahs, lions and giraffes.** There are as few as 20,000 lions left in the wild, less than 7,000 cheetahs, 500 to 1,000 giant pandas, and about 250 Sumatran rhinoceros.

Vulnerable regions:

- **Tropical regions have seen the highest number of declining species.** In South and Southeast Asia, large-bodied species of mammals have lost more than four-fifths of their historical ranges.
- While fewer species are disappearing in temperate zones, the percentage is just as high or higher. **As many as half of the number of animals that once shared our planet are no longer here, a loss described as “a massive erosion of the greatest biological diversity in the history of Earth”.**

What happens when species go extinct?

Impact can be **tangible** such as in the form of a loss in crop pollination and water purification.

If a species has a specific function in an ecosystem, **the loss can lead to consequences for other species by impacting the food chain.**

Effects of extinction will worsen in the coming decades as **the resulting genetic and cultural variability will change entire ecosystems.**

- When the number of individuals in a population or species drops too low, its contributions to ecosystem functions and services become unimportant, its genetic variability and resilience is reduced, and its contribution to human welfare may be lost.

3. Gherkins

India has emerged as the largest exporter of gherkins in the world.



- Also known as **pickling cucumber.**
- Gherkin cultivation, processing and exports started in India during the early 1990s with a modest beginning in Karnataka and later extended to the neighbouring states of Tamil Nadu, Andhra Pradesh and Telangana.
- Nearly 15% production of the world's gherkin requirement is grown in India.

INDIA EMERGES AS LARGEST EXPORTERS OF CUCUMBER AND GHERKINS IN THE WORLD

INDIA EXPORTS GHERKINS WORTH USD 114 MILLION FROM APRIL-OCT 2021, WHILE IN 2020-21 EXPORTS EXCEEDED USD 200 MILLION

India has emerged as the largest exporter of gherkins in the world. India has exported cucumber and gherkins to the tune of 1,23,846 Metric Tonnes with a value of USD 114 million during April-October (2020-21).

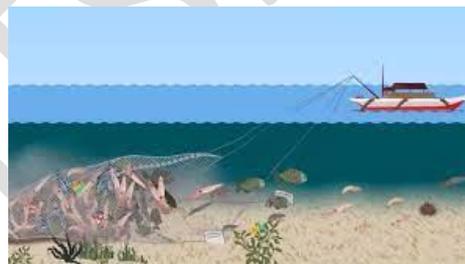
India has crossed the USD 200 million mark of export of agricultural processed product, - pickling cucumber, which is globally referred as gherkins or cornichons, in the last financial year.

In 2020-21, India had shipped 2,23,515 Metric Tonnes of cucumber and gherkins with a value of USD 223 million. Following directions of the Department of Commerce, Ministry of Commerce & Industry, the Agricultural and Processed Food Products Export Development Authority (APEDA) undertook a series of initiatives in infrastructure development, product promotion in the global market and adherence to food safety management system in processing units.

4. Bottom trawling

Bottom trawling, an ecologically destructive practice, involves trawlers dragging weighted nets along the sea-floor, causing great depletion of aquatic resources.

- Bottom trawling captures juvenile fish, thus exhausting the ocean's resources and affecting marine conservation efforts. This practice was started by Tamil Nadu fishermen in Palk Bay and actively pursued at the peak of the civil war in Sri Lanka.



Solution to the bottom trawling- deep-sea fishing plan:

The solution to the bottom trawling issue lies in transition from trawling to deep-sea fishing.

- The activity of catching fish that live in the deep parts of the sea/ocean is called deep-sea fishing.
- The boats are designed in such a way that fishermen get access to the deeper parts of the ocean and fish species.
- It is practiced worldwide, especially in the coastal areas with no ecological damage.
- The depth of water should be at least 30 meters to be considered a deep sea fishing zone.

Efforts by Government- the Palk Bay scheme:

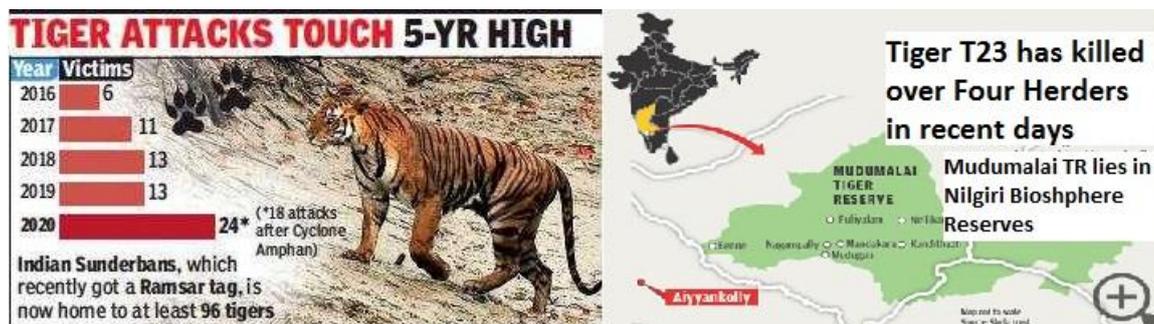
- Launched in July 2017 under the Blue Revolution programme.
- The scheme is financed by the Union and the State Governments with beneficiary participation.
- It had envisaged the provision of 2,000 vessels in three years to the fishermen of the State and motivate them to abandon **bottom trawling.**

5. Human-Animal Conflicts

Government Initiatives to reduce the man-tiger conflicts are:

- **Sonitpur Model:** **WWF India** had developed the '**Sonitpur Model**' during 2003-2004 by which community members were connected with the state forest department.

- They were given **training on how to work** with them to drive elephants away from crop fields safely. Afterward, crop **losses dropped to zero for four years running**. Human and elephant deaths also reduced significantly.



Advisory for management of Human-Wildlife Conflict (HWC) approved by Standing Committee of National Board of Wildlife (SC-NBWL):

- **Empower gram panchayats** in dealing with the problematic wild animals as per the **Wildlife (Protection) Act, 1972**.
- **Utilize add-on coverage** under the **Pradhan Mantri Fasal Bima Yojna** for crop compensation against crop damage due to HWC.
- **Augment fodder and water sources** within the forest areas.
- **Other measures:** The advisory prescribes **inter-departmental committees** at the local/state level, adoption of early warning systems, creation of barriers, dedicated circle wise Control Rooms with toll-free hotline numbers which could be operated on a 24X7 basis.

6. Guduchi

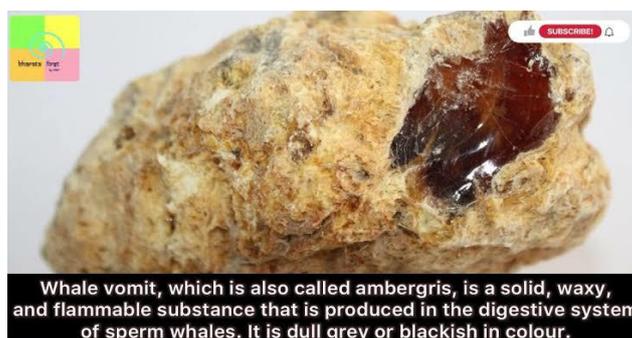
The Ministry of Ayush’s advisory on the use of **Guduchi, also known as Giloy**, confirms that Guduchi (*Tinospora cordifolia*) is safe to use but some similar looking plants like *Tinospora crispa* may be harmful.

- Guduchi is a popularly known **herb** and has been used in therapeutics since long in AYUSH systems.
- It is a large, glabrous, perennial, deciduous, climbing shrub of weak and fleshy stem found throughout India.
- It is a widely used plant in folk and Ayurvedic systems of medicine.
- The chemical constituents reported from this shrub belong to different classes, such as alkaloids, diterpenoid lactones, glycosides, steroids, sesquiterpenoid, phenolics, aliphatic compounds and polysaccharides.
- Potential medicinal properties reported by scientific research include anti-diabetic, antipyretic, antispasmodic, anti-inflammatory, anti-arthritic, antioxidant, anti-allergic, anti-stress, anti-leprotic, antimalarial, hepato-protective, immuno-modulatory and anti-neoplastic activities.



7. Ambergris

- Ambergris, used for making perfumes, is produced in the stomach of sperm whales when indigestible parts move into the intestines and bind together.
- They slowly become a solid mass, growing over many years. “When the animal vomits the mass, it floats a foot below the surface of the sea.



8. Extra neutral alcohol (ENA)

- It is a **byproduct of the sugar industry**.
- Formed from molasses that are a residue of sugarcane processing.
- It is the primary raw material for making alcoholic beverages.

Features:

It is **colourless food-grade alcohol** that does not have any impurities. It has a **neutral smell and taste** and typically contains over 95 per cent alcohol by volume.

Other applications of ENA:

- An essential ingredient in the manufacture of cosmetics and personal care products such as perfumes, toiletries, hair spray, etc.
- Utilized in the production of some lacquers, paints and ink for the printing industry, as well as in pharmaceutical products such as antiseptics, drugs, syrups, medicated sprays.



9. Hydrogen fuel

- Hydrogen is the lightest and first element on the periodic table. Since the weight of hydrogen is less than air, it rises in the atmosphere and is therefore rarely found in its pure form, H₂.
- At standard temperature and pressure, hydrogen is a nontoxic, nonmetallic, odorless, tasteless, colorless, and highly combustible diatomic gas.

Occurrence of Hydrogen:

- Molecular hydrogen is not available on Earth in convenient natural reservoirs.
- Most hydrogen on Earth is bonded to oxygen in water and to carbon in live or dead and/or fossilized biomass. It can be created by splitting water into hydrogen and oxygen.

Significance of Hydrogen Based economy:

- Due to its ability to power fuel cells in zero-emission electric vehicles, its potential for domestic production, and the fuel cell's potential for high efficiency hydrogen is considered an alternative.
- Water is the only by-product that results from the usage of hydrogen fuel that makes the fuel 100 per cent clean.
- Hydrogen can also serve as fuel for internal combustion engines.
- The energy in 2.2 pounds (1 kilogram) of hydrogen gas contains about the same as the energy in 1 gallon (6.2 pounds, 2.8 kilograms) of gasoline.

10. Ashwagandha

The Ministry of Ayush has collaborated with the U.K.'s London School of Hygiene and Tropical Medicine (LSHTM) to conduct a study on 'Ashwagandha' for promoting recovery from COVID-19.

Key facts:

- 'Ashwagandha' (*Withania somnifera*) is commonly known as 'Indian winter cherry'. It is a traditional Indian herb that boosts energy, reduces stress and makes the immune system stronger.
- It is classified as an **adaptogen**, which means that it can help the body to manage stress.
- **Ashwagandha is widely grown in dry parts of subtropical regions.** Rajasthan, Punjab, Haryana, Uttar Pradesh, Gujarat, Maharashtra and Madhya Pradesh are major ashwagandha growing states in India.
- Being a hardy and drought-tolerant crop, ashwagandha requires a relatively dry season throughout its growing period. Areas with 60-75 cm rainfall are suitable for its cultivation.
- Temperature **between 20°C to 35°C** is most suitable.
- It grows well in **sandy loam or light red soils** having pH 7.5-8.0. Black or heavy soils having good drainage are also suitable for ashwagandha cultivation.

**11. Forest fires**

Himachal Pradesh frequently witnesses forest fires during dry weather conditions.

What is the forest cover of Himachal Pradesh?

Although **two-thirds of the total geographical area of Himachal Pradesh is legally classified as forest area**, much of this area is permanently under snow, glaciers, cold desert or alpine meadows and is above the tree line.

- As per the Forest Survey of India, the **effective forest cover is around 28 percent of the total area** which amounts to 15,434 square kilometres.
- **Chir Pine, Deodar, Oak, Kail, Fir and Spruce** are some of the common trees found here.

How fire prone are these forests?

Except for periods of precipitation in monsoon and winter, the forests remain vulnerable to wildfires.

- **In the summer season**, forest fires occur frequently in the low and middle hills of the state, where forests of Chir Pine are common.
- **During the post-monsoon season and in winters**, forest fires are also reported in higher areas, including parts of Shimla, Kullu, Chamba, Kangra and Mandi districts, where they usually occur in grasslands.

Causes of the fire

Natural causes such as lightning or rubbing of dry bamboos with each other can sometimes result in fires, but forest officials maintain that **almost all forest fires can be attributed to human factors**.

- Setting up of temporary hearth to cook food by the **herdsman and minor forest produce gatherer may leave behind a smouldering fire**, it can develop into a forest fire.
- Also, when people **burn their fields to clear them of stubble**, dry grass or undergrowth, the fire sometimes spreads to the adjoining forest.
- A spark can also be produced when dry pine needles or leaves fall on an **electric pole**.

What is done to prevent and control forest fires?

To prevent and control forest fires the following can be done:

1. Forecasting fire-prone days using meteorological data,
2. Clearing camping sites of dried biomass,
3. Early burning of dry litter on the forest floor,
4. Growing strips of fire-hardy plant species within the forest, and
5. Creating fire lines in the forests are some of the methods to prevent fires (fire lines are strips in the forest kept clear of vegetation to prevent the fire from spreading).