VISIONIAS
INSPIRING INNOVATION

ENVIRONMENT

Classroom Study Material

(May 2020 to January 2021)

DELHI LUCKNOW JAIPUR HYDERABAD PUNE AHMEDABAD CHANDIGARH GUWAHATI

8468022022
9019066066

enquiry@visionias.in /c/VisionIASdelhi /Vision_IAS vision_ias www.visionias.in /VisionIAS_UPSC

ENVIRONMENT

Table of Contents

Note:

PT 365 documents comprehensively covers the important current affairs of last 1 year (365days) in a consolidated manner to aid Prelims preparation.

In our endeavour to further enhance the document in the interest of the aspirants, following additions have been incorporated:

1. Different colours have been used in the document for easy classification and recollection of a variety of information.
2. QR based Smart quiz has been added to test the aspirant's learnings and understanding.
3. Infographics have been added to ease understanding, provide for smoother learning experience and ensure enhanced retention of the content.

QUIZ **SMART QUIZ**	You can scan this QR code to practice the smart quiz at our open test online platform for testing your understanding and recalling of the concepts.	

1. CLIMATE CHANGE

1.1. GLOBAL SCENARIO

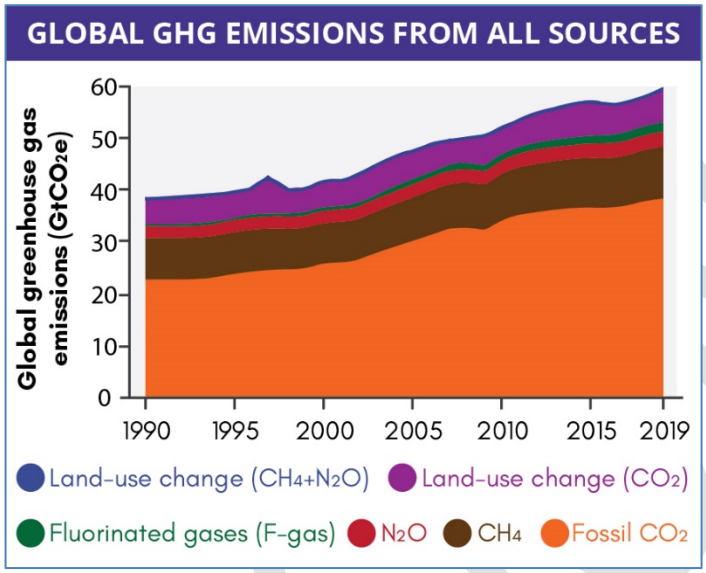
1.1.1. EMISSIONS GAP REPORT 2020

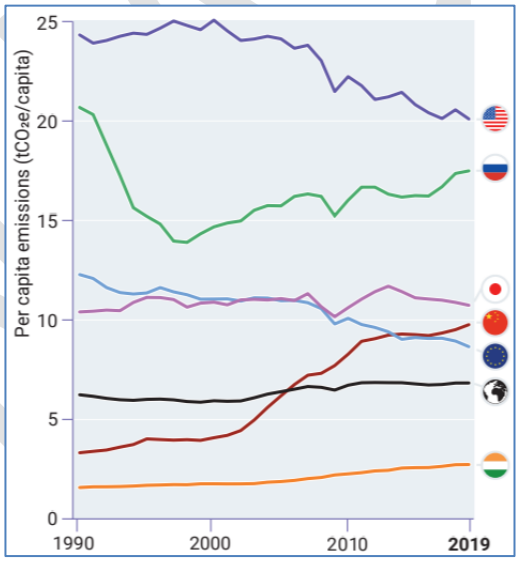
Why in news?

The United Nations Environment Programme (UNEP) recently released its annual Emissions Gap Report 2020.

Key Findings

- **GHG emissions continued to increase** (4% per year since 2010 on average and **rapid increase of 2.6% in 2019 due to forest fires)** and reached a **record high of 59.1 GtCO2e in 2019**.
- **Fossil CO_2 emissions** accounted for maximum GHG emission
- **G20 countries account for bulk of emissions:** Top four emitters - China, US, EU+UK and India contributed 55% of the total GHG emissions in the last decade.
- **Current NDCs** would lead to a temperature increase of at least 3°C by the end of the century.





- **Around two thirds of global emissions** are linked to the **private household activities.**
- The emissions of the richest 1 per cent of the global population account for more than twice the combined share of the poorest 50 per cent.
- **COVID-19 crisis offers only a short-term reduction in global emissions** and will not contribute significantly to emissions reductions by 2030.

Related News:

Triple Emergency

- **Making Peace with Nature,** a new report published by the UNEP highlighted Triple Emergency: **climate change, biodiversity loss and pollution.**
- Climate change, biodiversity loss and pollution add up to three self-inflicted planetary crises that are closely interconnected and put the well-being of current and future generations at unacceptable risk.

Cooling Emissions And Policy Synthesis Report

United Nations Environment Programme and International Energy Agency jointly released this report.

- **Increasing demand for cooling** is contributing to emissions of HFCs, CO_2, and black carbon.
- **Kigali Amendment to the Montreal Protocol** could avoid up to 0.4°C of global warming by 2100.
  - Kigali amendment aims to phase-down production and consumption of hydrofluorocarbons (HFCs), used as refrigerants.

UN Environment Programme (UNEP)

- UNEP is the leading global environmental authority that sets the global environmental agenda and promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system.
- Headquarters: **Nairobi,** Kenya.
- It depends on **voluntary contributions** for 95% of its funding.
- **United Nations Environment Assembly (UNEA) is governing body of the UNEP.**
- UNEA is the world's highest-level decision making body on the environment, with a universal membership of all 193 Member States.

Flagship Publications

- Our Planet
- Tunza
- Atlas of Our Changing Environment
- Global Environment Outlook

Awards by UNEP

- **Champions of the Earth** is the United Nations highest environmental honour.
- **SEED Awards:** It support innovative, small-scale and locally driven entrepreneurs around the globe who integrate social and environmental benefits into their business models.
- **Sasakawa Prize:** It recognizes outstanding individuals and organizations for their contributions to the protection of the environment and the promotion of sustainable development.

UNEP hosts the secretariats of many critical multilateral environmental agreements:

- The **Convention on Biological Diversity.**
- The **Convention on International Trade in Endangered Species of Wild Fauna and Flora.**
- **Minamata Convention on Mercury.**
- The **Basel, Rotterdam and Stockholm Conventions.**
- The **Vienna Convention** for the Protection of Ozone Layer and the **Montreal Protocol.**
- The **Convention on Migratory Species**
- The **Carpathian Convention**- subregional treaty to foster the sustainable development and the protection of the Carpathian region (Europe's largest mountain range)
- The **Bamako Convention**- Treaty of African nations prohibiting the import into Africa of any hazardous waste.
- The **Tehran Convention**- Protection of the Marine Environment of the Caspian Sea

1.1.2. ADAPTATION GAP REPORT, 2020

Why in news?

United Nations Environment Programme (UNEP) released Fifth edition of Adaptation Gap Report, 2020

Key highlights

- 72% of countries have adopted at least one national-level adaptation planning instrument.

- **Annual cost of adaptation to the effects of climate change for developing countries** is estimated to at least quadruple by 2050 ($500 billion).
- The ever-increasing **adaptation cost has outpaced the growth in adaptation finance.**
  - **Adaptation costs is higher in developed countries but burden of adaptation is greater for developing countries** in relation to their gross domestic product.
- **COVID-19 pandemic has impacted adaptation efforts** but its effect is not yet quantified.
- **Key suggestions**
  - **Significant scaling up and incentivizing for both public and private adaptation finance** is required to narrow the gap.
  - **Nature-based solutions** (NbS) must become a priority.

SOME GLOBAL GREEN FINANCE MECHANISMS

Green Climate Fund (GCF)

- GCF under UNFCCC was committed by developed countries in 2009 to mobilise **$100 billion every year by 2020 to help developing countries** cut their carbon dioxide emissions and adapt to the effects of climate change.

Global Environment Facility (GEF) Trust Fund

- The **World Bank** serves as the GEF Trustee, administering the Fund.
- GEF funds are **available to developing countries and countries with economies in transition to meet the objectives** of the international environmental conventions and agreements.
- The GEF serves as a **"financial mechanism" to five conventions:** Convention on Biological Diversity (CBD), United Nations Framework Convention on Climate Change (UNFCCC), Stockholm Convention on Persistent Organic Pollutants (POPs), UN Convention to Combat Desertification (UNCCD), and Minamata Convention on Mercury.

Adaptation Fund:

- Established in 2001 to finance concrete adaptation projects and programmes in developing country, Parties to the Kyoto Protocol that are particularly vulnerable to the adverse effects of climate change.
- It is financed with a share of proceeds from the **clean development mechanism (CDM) project** activities and other sources of funding.

Special Climate Change Fund (SCCF):

- Established under the UNFCCC in 2001 to finance projects in all developing country parties relating to: adaptation; technology transfer and capacity building etc.
- GEF, as an operating entity of the Financial Mechanism, has been entrusted to operate the SCCF.

International Climate Initiative (IKI)

- Financing instruments of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) for the international financing of climate change mitigation and biodiversity.
- It operates within the framework of the United Nations Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity (CBD), financing climate change mitigation and biodiversity conservation in developing, emerging and transition countries.

Key Terms related to Climate Change	
Adaptation	• The process of **adjustment to actual or expected climate and its effects**. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. ○ Paris Agreement on Climate Change requires its signatories to implement adaptation measures through national plans, climate information systems, early warning, protective measures and investments in a green future.
Adaptation gap	• It is defined as the **difference between actually implemented adaptation and a societally set goal**, determined largely by preferences related to tolerated climate change impacts, and reflecting resource limitations and competing priorities.
Adaptation costs	• **Costs of planning, preparing for, facilitating, and implementing adaptation measures**, including transaction costs.
Nature-based Solutions (NbS)	• **Actions to protect, sustainably manage and restore natural or modified ecosystems** that address societal challenges effectively and adaptively, simultaneously providing human wellbeing and biodiversity benefits.
Climate Finance	• Climate finance refers **to local, national or transnational financing**—drawn from public, private and alternative sources of financing—that **seeks to support mitigation and adaptation actions** that will address climate change. ○ **Kyoto Protocol and Paris Agreement** call for financial assistance from Parties with more financial resources to those that are less endowed and more vulnerable.

1.1.3. CLIMATE CHANGE PERFORMANCE INDEX (CCPI)

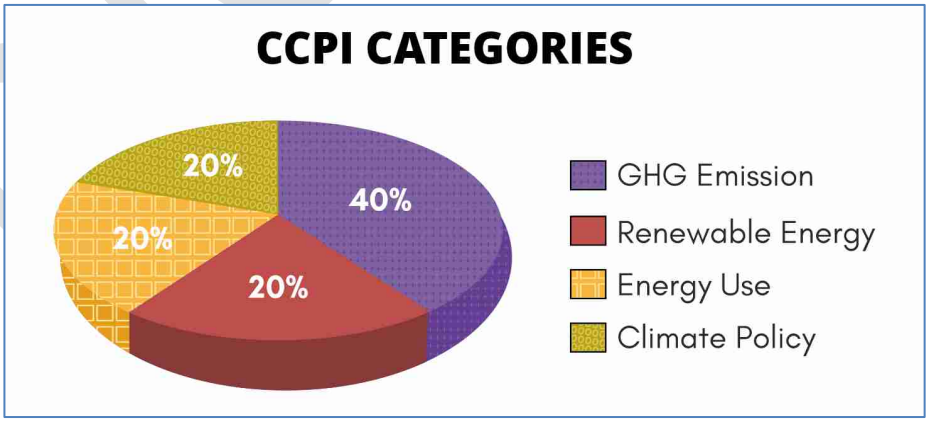
Why in news?

India ranked 10th in the latest edition of the **Climate Change Performance Index (CCPI).**

About Climate Change Performance Index (CCPI)

- The Index is published by **Germanwatch, New Climate Institute and the Climate Action Network**.
- Published annually since 2005, the CCPI is an independent monitoring tool for tracking countries' climate protection performance.
  - In 2017, the methodology of the CCPI was revised to fully incorporate the **2015 Paris Agreement** with the goal to limit global warming to well below 2°C or even to 1.5°C.
- CCPI, 2021 evaluates and compares the climate protection performance of **57 countries and of the European Union (EU)**, which are together responsible for more than 90% of global greenhouse gas (GHG) emissions.
- It assesses countries' performance in four categories. ***(refer infographics)***

Highlights of CCPI



- **First three ranks of the overall ranking remained empty.**
- From the G20 countries, this year, **only the EU as a whole, along with the UK and India, rank among high performers.**
- **Renewable energy continues to expand** (largest annual growth to date in 2019).
- **Several countries updated their NDCs:** China (world's largest emitter) committed to a target of net zero by 2060 and Japan and the Republic of Korea announced their aim to become carbon neutral by 2050.
- **India's ranking:** India is rated high for its performance in the **Energy Use, GHG Emission and Climate Policy** category and medium in **Renewable Energy** category.

Related News: Global Climate Risk Index

- It was released by Germanwatch.
- Index analyses to what extent **countries and regions have been affected by impacts of weather-related loss events** (storms, floods, heat waves etc.).

Key Highlights

- **India was the seventh worst-hit country due to extreme weather** events in 2019 (Mozambique is the worst-affected).
- India had a high **number of fatalities (2,267) and the biggest economic loss** (68,812 million USD) in 2019.
- **Flooding caused by heavy rain was responsible for 1,800 deaths** and led to the displacement of 1.8 million people.

1.1.4. STATE OF THE GLOBAL CLIMATE REPORT

Why in news?

Recently, the State of the Global Climate report (Provisional) was released by World Meteorological Organization (WMO).

About State of Global climate Report

- Report use **Global Climate Indicators (GCI)** to describe the changing climate & providing a broad view of the climate at a global scale.
  - GCI are used to **monitor the domains most relevant to climate change,** including the composition of the atmosphere, the energy changes that arise from the accumulation of greenhouse gases and other factors, as well as the responses of land, ocean and ice.
- **Key findings**
  - Average global temperature in **2020 is set to be about 1.2 ˚C above the pre-industrial (1850-1900) level**.
  - 2020 is very likely to be **one of the three warmest years on record globally**.
  - **Ocean acidification is increasing**: The ocean absorbs around 23% of the annual emissions of anthropogenic CO2 from the atmosphere, thereby helping to alleviate the impacts of climate change on the planet.
  - Number of **tropical cyclones globally was above average in 2020**
  - Despite the COVID-19 lockdown, atmospheric concentrations of greenhouse gases continued to rise

About WMO

- It is an **intergovernmental organization** with a membership of 193 Member States and Territories.
- It is the specialized agency of the United Nations for meteorology (weather and climate), operational hydrology and related geophysical sciences.
- **India is its member.**
- Headquarters: **Geneva, Switzerland**.
- It is a member of the United Nations Development Group.
- Its supreme body is the World Meteorological Congress which is composed of all WMO Members.

Related news: 2020 State of Climate Services report

- It was released by WMO.
- Report provides a basis for understanding how to **strengthen protection for the most vulnerable, including through mechanisms** such as the Climate Risk and Early Warning Systems (CREWS) initiative.

1.1.5. ASSESSMENT OF CLIMATE CHANGE OVER THE INDIAN REGION

Why in news?

Ministry of Earth Sciences' (MoES) released a report titled **'Assessment of Climate Change over the Indian Region'**.

About Report

- It is a **first ever attempt** to document and assess climate change in different parts of India.
- The report **highlights the observed and projected changes** in various climatic dimensions over the Indian region, their impacts and various policy actions to deal with the regional climate change.

Key findings

- **Hindu Kush Himalayas experienced temperature rises 1.3˚C** during 1951–2014. Projected rise by end of 21st century is 5.2˚C.
- **Sea surface temperature of tropical Indian Ocean risen by 1˚C** on average during 1951–2015 (greater than global average SST warming 0.7˚C).
- **Droughts, both the frequency and spatial extent, have increased** significantly during 1951–2016.

- **Sea-level rise in the North Indian Ocean occurred at a rate of 1.06–1.75 mm per year** during 1874–2004 and has accelerated to 3.3 mm per year between 1993–2017.

Related News:
Hotspots of extreme weather events in India

- A study by **Council on Energy, Environment and Water (CEEW)**, a not-for-profit policy research institution, has for the first time **mapped the extreme weather event hotspots in the country.**
- **Key Findings:**
  - **More than 75% of Indian districts**, home to over 638 million people, **are hotspots of extreme climate events** such as cyclones, floods, droughts, heat and cold waves.
  - **Frequency, intensity, and unpredictability** of extreme events have risen in recent decades.
  - There is a **shift in the pattern of extreme climate events** such as flood-prone areas becoming drought-prone and vice-versa in over 40% of districts.
  - Six of India's eight most flood-prone districts in the last decade were in Assam.
  - In past decade, **hot spot districts, affected by cyclones, are all along the eastern coastline.**

Warming Arabian Sea

- According to scientists an **unusually warm Arabian Sea, a result of climate change,** is likely to have **contributed to intense bursts of monsoon rain** in parts of India in August this year.
- **Impact of warming of Arabian Sea**: A **rise in widespread extreme rains over Western Ghats and central India**, since warming induces **increased fluctuations in the monsoon winds**, with ensuing episodes of **enhanced moisture transport from the Arabian Sea towards** the Indian subcontinent.

1.1.6. GLOBAL CARBON PROJECT (GCP) REPORTS

Why in news?

The Global Carbon Project (GCP) released Global Methane Budget (GMB) and Global Nitrous oxide (N_2O) budget.

About Global Carbon Project (GCP)

- The Global Carbon Project is a Global Research Project of Future Earth and a research partner of the **World Climate Research Programme**.
- It was established in 2001 by a shared partnership between the International Geosphere Biosphere Programme (IGBP), the International Human Dimensions Programme on Global Environmental Change (IHDP), the World Climate Research Programme (WCRP) and Diversitas.
- This partnership constituted the Earth Systems Science Partnership (ESSP) which subsequently evolved into **Future Earth**.
- It seeks to quantify global greenhouse gas emissions and their causes. Its projects include global budgets for three dominant greenhouse gases- **carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O)** - and complementary efforts in urban, regional, cumulative, and negative emissions.

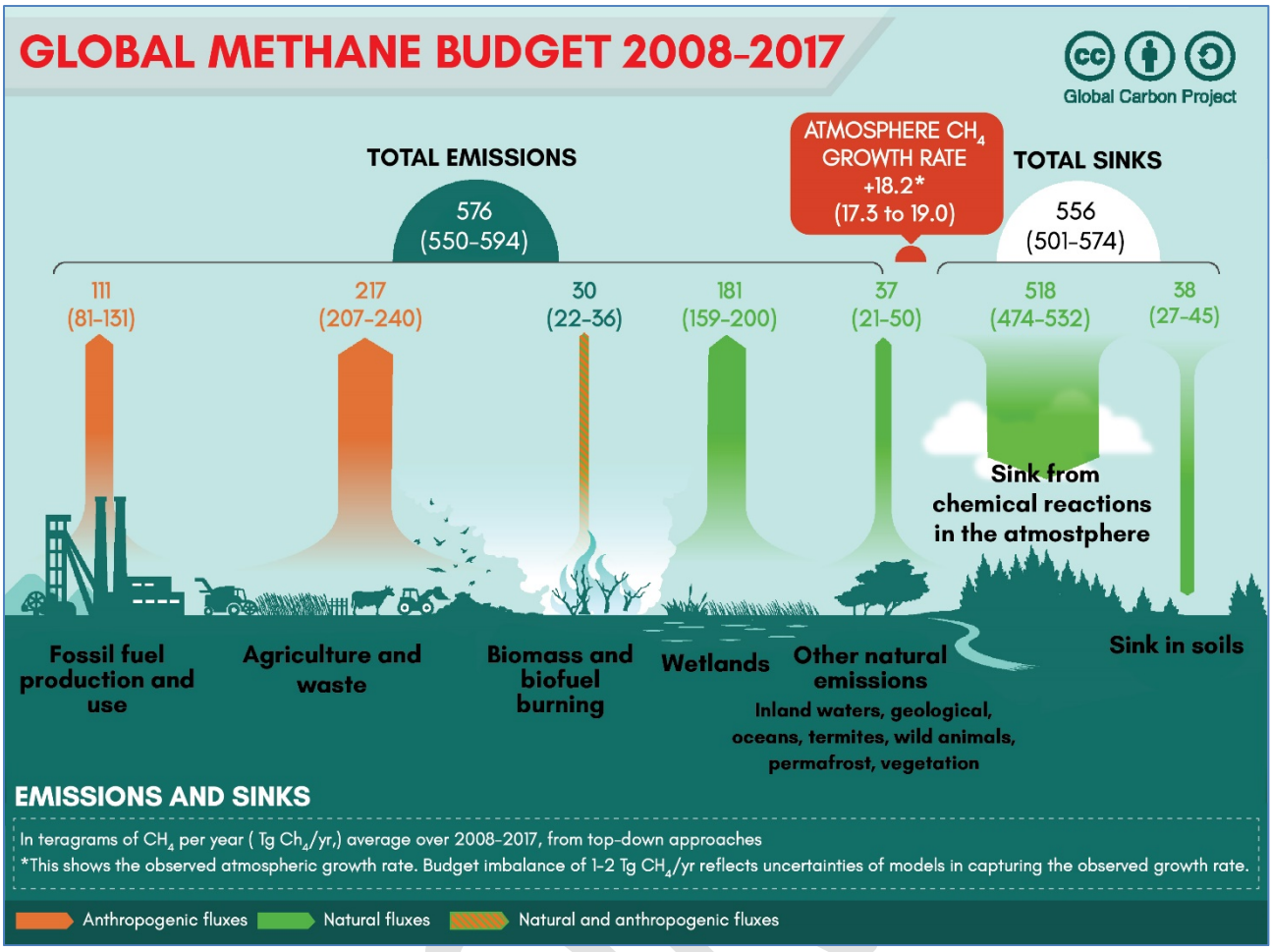
1.1.6.1. GLOBAL METHANE BUDGET (GMB)

About Methane

- Methane is a **potent greenhouse gas (84-86 times stronger than CO2 over 20 years)** and the second biggest contributor to human-caused global warming after CO2.
- Methane **stays in the atmosphere for an average of nine years** and it is typically destroyed through chemical reactions that produce CO2 and water.
  - A relatively small portion is also consumed by bacteria in soils.
- **Methane mitigation offers rapid climate benefits** and economic, health and agricultural co-benefits that are highly complementary to CO2 mitigation.

Key findings

- **Global annual methane emission:** In 2017, **it was** around 9% higher than 2000-06 average.
- **Contribution in Increase: Agriculture and waste contributed (60%)** and **fossil fuels (40%).**
- **Area with largest increase:** Africa and the Middle East, China, and South Asia and Oceania.
- **Methane sinks** have also increased.



1.1.6.2. GLOBAL NITROUS OXIDE (N2O) BUDGET

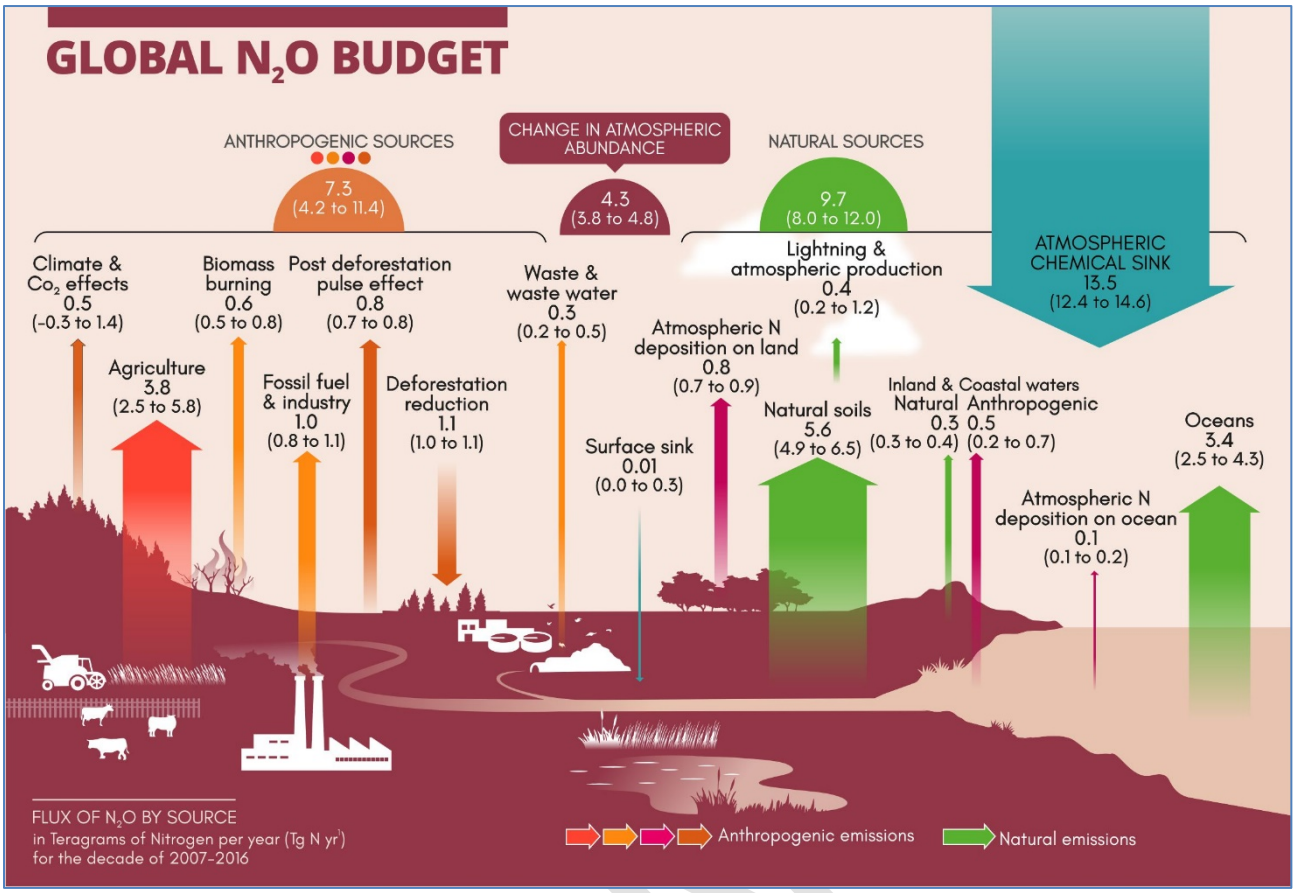
- **GCP, jointly with the International Nitrogen Initiative (INI),** have created a new activity and international consortium of scientists to establish and improve global N2O budget, trends and variability.

About Nitrous Oxide

- N_2O is a **long-lived greenhouse gas (GHG) and an ozone-depleting substance,** with an atmospheric lifetime of 116±9 years.
- It is the **third most important GHG,** leading human-driven climate change, after carbon dioxide and methane.

Key highlights

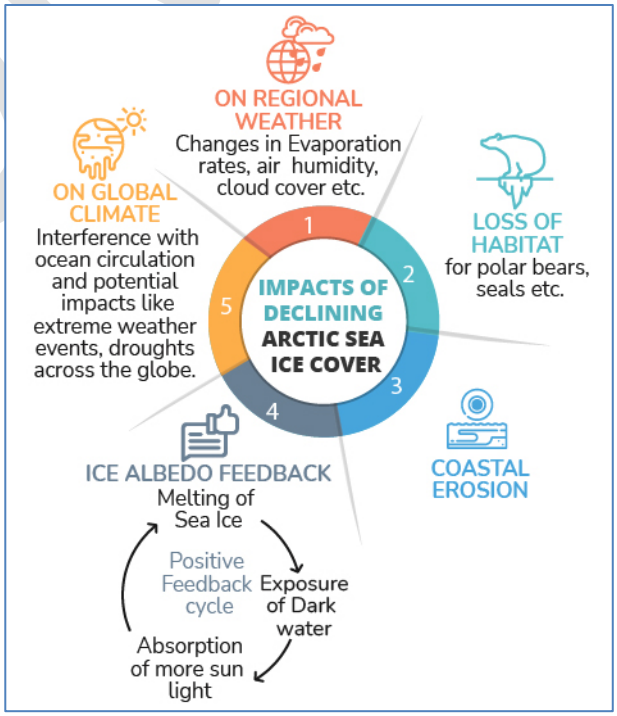
- **Global N_2O emission**: 10% greater global emissions in 2016 than in 1980s.
- **Dominant cause: increase is use of nitrogenous fertilizer** in agriculture, including organic fertilizers from manure produced by livestock.
  - **Agricultural production** contributed almost **70% to global anthropogenic N_2O emission** (2007-2016).
- Emissions from agriculture are **dominated by East Asia, Europe, South Asia, and North America**.
- **Highest growth rates in emissions come from emerging economies:** particularly Brazil, China, and India.



1.1.7. LOSS OF ICE COVER IN THE ARCTIC SEA

Why in news?

Recently, the **National Centre of Polar and Ocean Research (NCPOR)** found the largest decline in the Arctic Sea ice in the last 41 years due to global warming in July 2019.

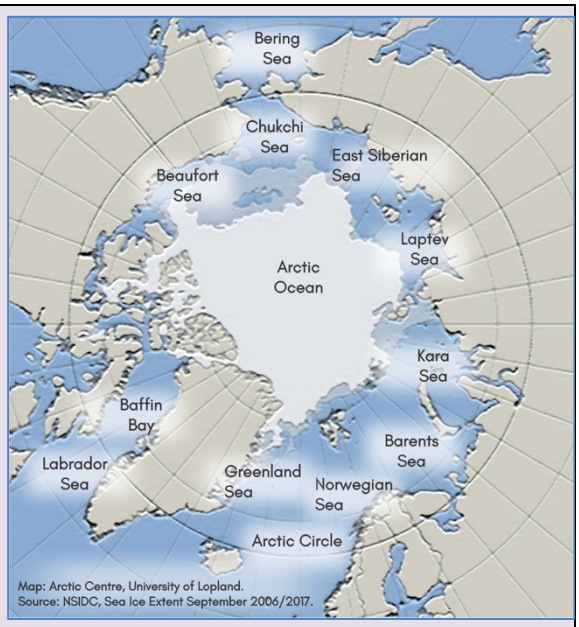


More about the study

- NCPOR noted that between 1979 and 2018, the sea ice has been declining at a rate of -4.7 per cent per decade, while its rate was found to be **-13 per cent in July 2019.**
    - Sea ice is **frozen seawater that floats on the ocean surface.** It forms in both the Arctic and the Antarctic in each hemisphere's winter; it retreats in the summer, but does not completely disappear.
- If this trend continues, there would be **no ice left in the Arctic sea by 2050** since the volume of ice loss during summers might surpass the volume of ice formation during winters.
- Rapid decline in Arctic sea ice cover is **linked with growing carbon emissions and subsequent global warming.**

Arctic Ocean

- The Arctic Ocean is Earth's northernmost body of water and the world's **smallest ocean.**
- It is bordered by Greenland, Canada, Norway, Alaska, and Russia and is almost completely covered with ice for the majority of the year.
- It is surrounded by marginal seas such as the Chukchi, East Siberian, Laptev, Kara, Barents, White, Greenland, and Beaufort.



About National Centre for Polar and Ocean Research (NCPOR)

- It was established as an **autonomous Research and Development Institution** of the **Ministry of Earth Sciences** in 1998 to carry out research activities in the polar and Southern Ocean realms.
- It is also responsible for maintenance of the Indian stations in Antarctica (Maitri & Bharati) and Arctic (Himadri).

Related News:Arctic heat waves

- Recently, Arctic Circle has recorded new high **temperatures reaching over 38 degrees Celsius** in Siberian town amid a heat wave**.**
- Earlier, in 2016 also Arctic circle **recorded above normal temperatures.**
- **Possible reasons:** global rising temperatures, large-scale wind patterns, absence of sea ice, and human-induced climate change etc.
- **Impact:** Threatens local vegetation, ecology, human health and economy.

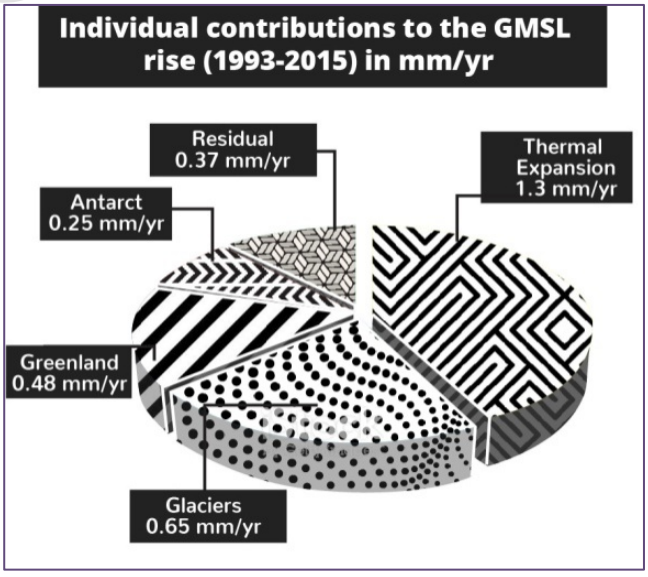
1.1.8. SEA LEVEL RISE

Why in news?

Recently, Scientific Reports journal noted that sea-level rise (SLR) is a "well accepted" consequence of climate change.

Findings of the study

- Sea levels have risen by between **180 to 200 mm since 1900.**
- **0.5-0.7% of the world's land area is at a risk of episodic coastal flooding by 2100.**
- The value of global assets exposed to this change is projected to be between **$6-$9 trillion or 12-20% of the global GDP.**



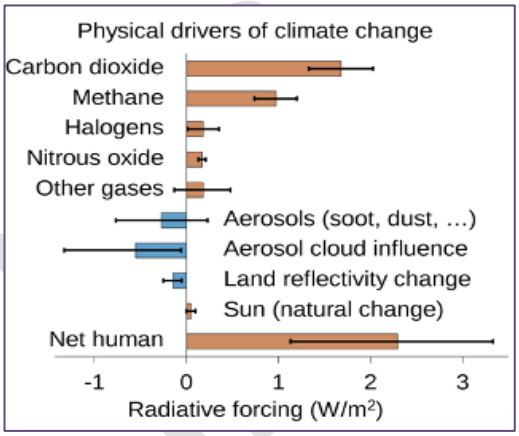
1.1.9. AEROSOL RADIATIVE FORCINGS

Why in News?

Researchers at **Aryabhatta Research Institute of Observational Sciences** (ARIES), Nainital have found that **Aerosol Radiative Forcing (ARF)** over trans-Himalayas is larger than the global averages.

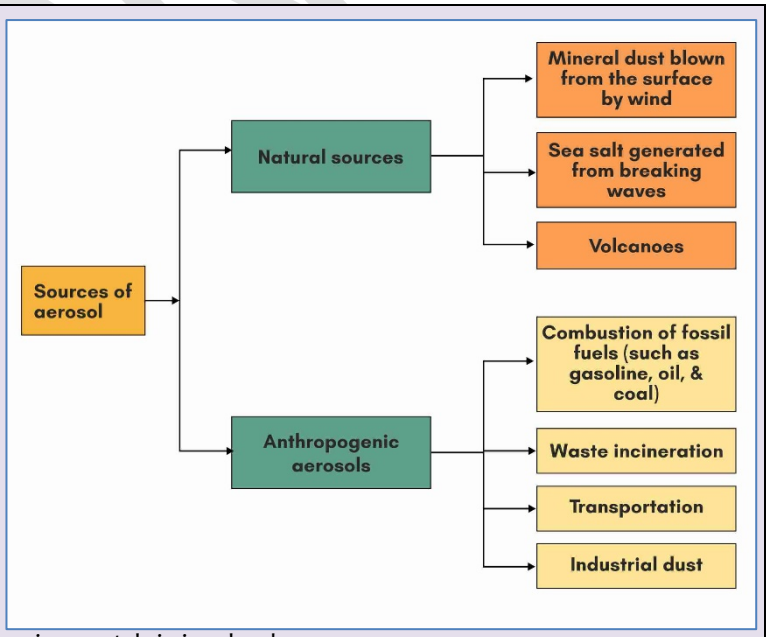
About Aerosol Radiative Forcing (ARF)

- **Effect of aerosols on climate** is normally quantified in terms of ARF.
  - **Radiative forcing** is a measure of the influence a factor (e.g., greenhouse gaseous, aerosol, cloud, and surface albedo has in altering the balance of incoming and outgoing energy in the Earth-atmosphere system and is an index of the importance of the factor as a potential climate change mechanism.
  - It is expressed in watts per square metre (W/m2).
- ARF is the **net change in energy balance of the earth system due to some forced perturbation by anthropogenic aerosols**.
- The atmospheric aerosols play a key role in the regional/global climate system through scattering and absorption of incoming solar radiation and by modifying the cloud formations and have impacts on **atmospheric warming** and **glacier retreat**.
- The **Research shows that** monthly-mean ARF of aerosols leads to heating rates of 0.04 to 0.13 degrees Celsius per day.
  - This **heating over Himalayas strengthens the temperature gradient** between land and ocean and modifies the atmospheric circulation and the monsoon rainfall.



About Aerosol

- **Aerosols** are defined as a combination of liquid or solid particles suspended in a gaseous or liquid environment.
  - In the atmosphere, these particles are mainly situated in the **low layers of the atmosphere (< 1.5 km)** since aerosol sources are located on the terrestrial surface.
  - However, certain aerosols can still be found in the **stratosphere, especially volcanic aerosols ejected into the high-altitude layers.**
- **Other Effects of aerosol**
  - They affect the atmospheric chemical composition.
  - They can reduce visibility.
  - Impacts on air quality and human health (e.g. aerosols can cause damage to heart and lungs).
  - They serve as nuclei for cloud droplets or ice crystals in ice clouds.



1.2. GLOBAL CONVENTIONS AND INITIATIVES

1.2.1. COP 26

Why in news?

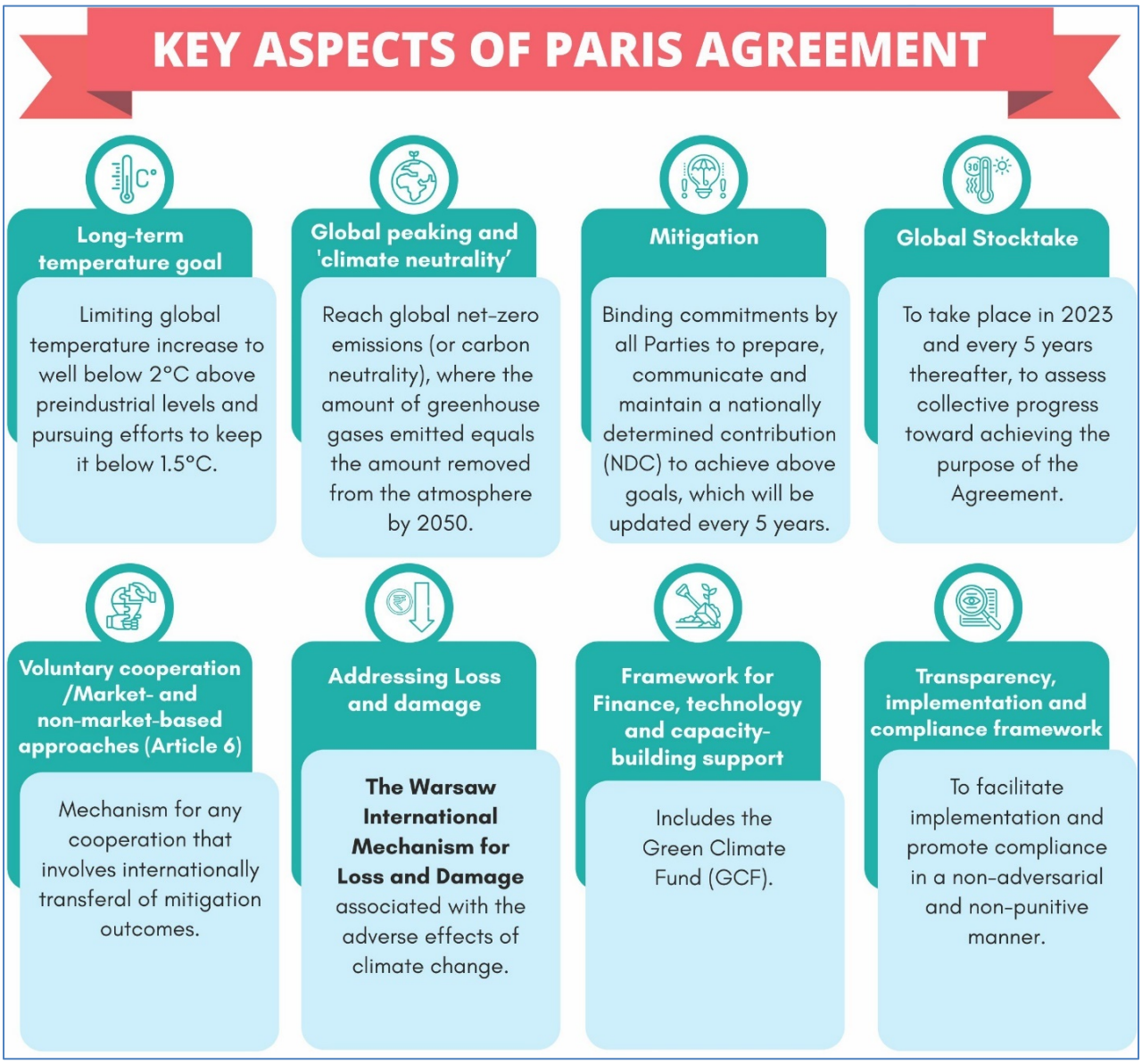
Conference of Parties (COP 26) of Paris Agreement, under the auspices of United Nations Framework Convention on Climate Change (UNFCCC), to be held in **Glasgow, UK was postponed** to November 2021 due to the COVID-19 pandemic.

About Paris Agreement

- **Paris Agreement is a legally binding international treaty on climate change** which was adopted at 21st Conference of Parties in Paris (2015).

Four priorities for COP 26 of UNFCCC:

- The National climate plans – the **Nationally determined contributions (NDCs)** – should show that countries are working to implement the Paris Agreement, and that each new NDC should show more ambition than the previous one.
- All nations should adopt strategies to reach net zero emissions by 2050.
- The development of a robust package of projects and initiatives to help communities and nations adapt to climate disruption and build resilience against future impacts.
- The provision of finance, with developed countries at COP26 delivering on their commitment to mobilize 100 billion dollars a year by 2020.



About UNFCCC

- Established in 1992 UNFCCC acts as a **framework for international cooperation to combat climate change** by limiting average global temperature increases and the resulting climate change and coping with impacts.
- The UNFCCC is a "Rio Convention", **one of two opened for signature at the "Rio Earth Summit" in 1992**. Its sister Rio Conventions are the UN Convention on Biological Diversity (UNCBD) and the Convention to Combat Desertification (UNCCD).
- It entered into force in March 1994. Today, it has near-universal membership. The **197 countries that have ratified the Convention are called Parties to the Convention**.
- The **UNFCCC secretariat is located in Bonn, Germany**.
  - The secretariat provides technical expertise and assists in the analysis and review of climate change information reported by Parties and in the implementation of the Kyoto mechanisms.

- It also maintains the registry for Nationally Determined Contributions (NDC) established under the Paris Agreement.

Operating Mechanism of UNFCC

- **Conference of the Parties (COP):** It is the supreme decision-making body of the Convention. o All States that are Parties to Convention are represented at COP.
  - It meets every year, unless the Parties decide otherwise.
- **Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP):**
  - It oversees implementation of Kyoto Protocol and takes decisions to promote its effective implementation.
  - All States that are Parties to the Kyoto Protocol are represented at the CMP, while States that are not Parties participate as observers.
- **Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA):**
  - It oversees the implementation of the Paris Agreement and takes decisions to promote its effective implementation.
  - All States that are Parties to the Paris Agreement are represented at the CMA, while States that are not Parties participate as observers.

Related News:

Government constitutes Apex Committee for the Implementation of the Paris Agreement (AIPA)

- AIPA is a **17 member inter-ministerial committee** constituted to ensure
  - Coordinated response on climate change matters that protects country's interests.
  - India is on track towards meeting its climate change obligations under Paris Agreement including its submitted Nationally Determined Contributions (NDCs).
- **The three quantitative goals in the Indian NDCs are:**
  - 33-35% reduction in the gross domestic product emissions intensity by 2030 from 2005 levels.
  - 40% share of non-fossil fuel based electricity by 2030.
  - Creating a carbon sink of 2.5-3 billion tonnes of carbon dioxide through afforestation programmes.
- AIPA has been constituted under Environment (Protection) Act, 1986. Secretary, Ministry of Environment, Forest and Climate Change will be the chairperson of AIPA.
- **Functions of AIPA**
  - Coordinate communication and reporting of NDCs to UNFCCC.
  - Develop policies and programmes, to make India's domestic climate actions compliant with international obligations and assign responsibilities to concerned ministries.
  - Function as a National Authority to regulate carbon markets in India, under Article 6 of Paris Agreement in post-2020 period.
  - Take note of private sector's contributions for combating climate change.
  - Seek guidance from and provide inputs to Prime Minister's Council on Climate Change.

India Climate Change Knowledge Portal

- Portal was recently launched by Ministry of Environment, Forest and Climate Change.
- It will be a single point Information resource on different climate initiatives taken by various Line Ministries.
- It will help in disseminating knowledge among citizens about all the major steps Government is taking at both national and international levels to address climate change issues.
- **Major components of portal**: India's Climate Profile, National Policy Framework, Bilateral and Multilateral Cooperation, International Climate Negotiations etc.

1.2.2. INTERNATIONAL SOLAR ALLIANCE (ISA)

Why in news?

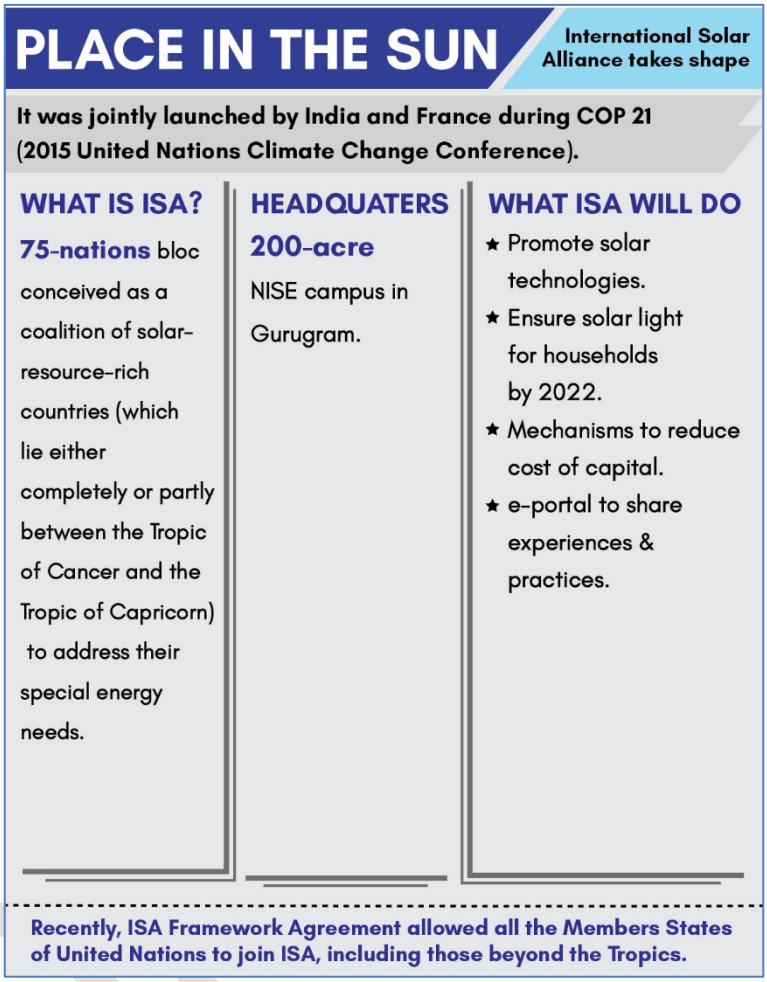
Recently, the third Assembly of the International Solar Alliance (ISA) was held virtually.

Key highlights

- **India and France re-elected as President and Co- President** of the ISA for a term of two years.
- Four Vice-Presidents were chosen to represent the **four regions of ISA** i.e. Asia Pacific Region; Africa Region; Europe and others Region; and Latin America & Caribbean Region.
- **Initiatives launched:**
  - **Coalition for Sustainable Climate Action (CSCA)** for institutionalizing ISA's engagement with the private and public corporate sector.
  - **Seventh Programme on Solarizing Heating and Cooling systems,** which significantly draws its energy from traditional power sources.
  - For the first time, following **Solar awards** were conferred.

- ✓ **Visvesvaraya award,** recognizes the countries with maximum floating solar capacity in each of the four regions of ISA.
- ✓ **Kalpana Chawla award** recognises outstanding contribution of scientists and engineers working in the field of solar energy.
- ✓ **Diwakar award** recognizes organisations & institutions that have been working for the benefit of differently-abled people and have maximised the use of solar energy.

- In the wake of the global pandemic, ISA set up ISA CARES, an initiative dedicated **to deployment of solar energy in healthcare sector** in LDC/SIDS ISA Member countries.



Related news: World Solar Technology Summit (WSTS)

- First World Solar Technology Summit (WSTS) organized by the International Solar Alliance (ISA)
- **Aims of WSTS** is to bring together key stakeholders (researchers, innovators etc.) to present and discuss the recent highlights of solar technologies, cost-wise; technology-wise, technology transfers, challenges and concerns in the field.
- **Key highlights of the summit**
  - **ISA signed a tripartite agreement with Ministry of new and renewable energy and World Bank** which made it the nodal agency to implement the country's 'One Sun One World One Grid' (OSOWOG) initiative.
  - **ISA Journal on Solar Energy (I JOSE)** launched to help authors from across the globe to publish articles on solar energy.

1.2.3. CLIMATE ADAPTATION AND RESILIENCE FOR SOUTH ASIA (CARE) PROJECT

Why in news?

World Bank approved a $39.5 million CARE Project **to bolster climate action in South Asia.**

About Climate Adaptation and Resilience for South Asia (CARE) Project

- The Project will **build resilience to climate threats and disasters** by sharing regional data and knowledge.
  - It will help in **developing regional standards and guidelines** for infrastructure, and promoting climate-resilient policies and investments.
- The project will help **develop a public platform to inform climate planning and investments**, and fund technology to support resilience in South Asia.
  - It will fund a public domain platform known as **Regional Resilience Data and Analytics Service**, with information about weather hazards, climate variability, and sector-specific data to help policymakers assess climate risks.
- It will also **assess climate impacts** in districts across Bangladesh, Nepal, and Pakistan to support agriculture, livestock, water, and transport.

- It includes a $36 million grant from the **International Development Association** and **$3.5 million** from the **Program for Asia Resilience to Climate Change.**
- CARE will work with two regional organizations:
  - **Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES)**
  - **Asian Disaster Preparedness Center (ADPC).**

Other global initiatives/treaties related to Climate Change	
Climate Adaptation Summit (CAS) 2021	• CAS 2021 **was hosted online by Netherlands** and convened global leaders and local stakeholders. • **It aims to accelerate, innovate, and scale up the world's efforts in adapting to the effects of climate change.** • CAS 2021 is set to **deliver an Adaptation Action Agenda** as a roadmap for a decade of transformation towards a climate-resilient future by 2030.
Climate Action Summit 2020	• The Summit was co-hosted by United Nations, UK and France, in partnership with Chile and Italy, **to mark the fifth anniversary of the adoption of the Paris Agreement.** • At the Summit, **countries set out new commitments under three pillars of Paris Agreement:** mitigation, adaptation and finance commitments. These will take shape of: o New Nationally Determined Contributions (NDCs), o Long-Term Strategies setting out a pathway to net zero emissions; o climate finance commitments to support most vulnerable; o ambitious adaptation plans and underlying policies
Kyoto Protocol (KP), 2005	• The Kyoto Protocol adopted, was the first legally binding climate treaty. It required developed countries to reduce emissions by an average of 5 percent below 1990 levels, and established a system to monitor countries' progress. • The **second commitment period of the Kyoto Protocol ended in 2020.**

1.3. MITIGATION MEASURES

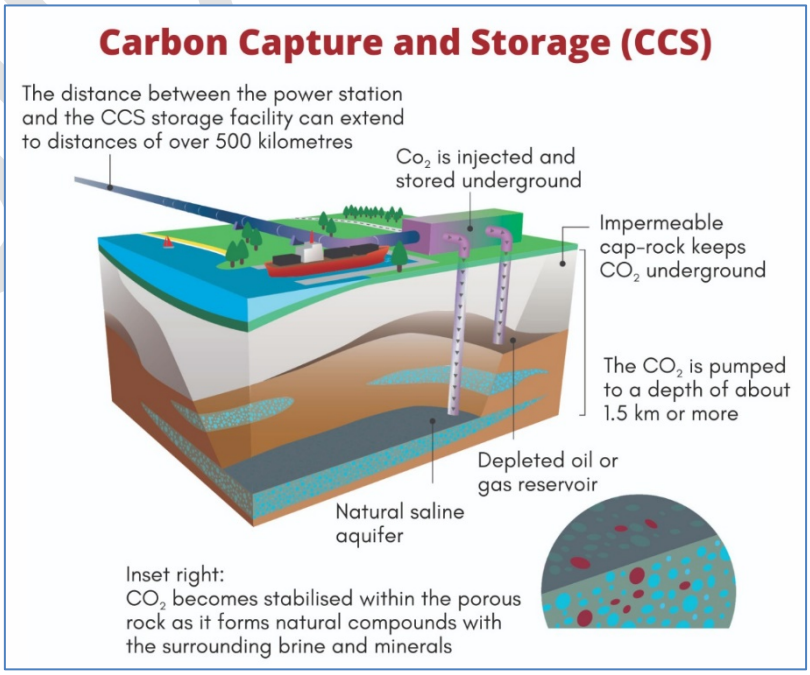
1.3.1. CARBON CAPTURE, UTILISATION & STORAGE (CCUS)

Why in news?

The Department of Science & Technology (DST) has invited proposals from Indian researchers in the area of CCUS under **Accelerating CCUS Technologies (ACT)** in collaboration with other ACT member countries.

About Accelerating CCUS Technologies (ACT)

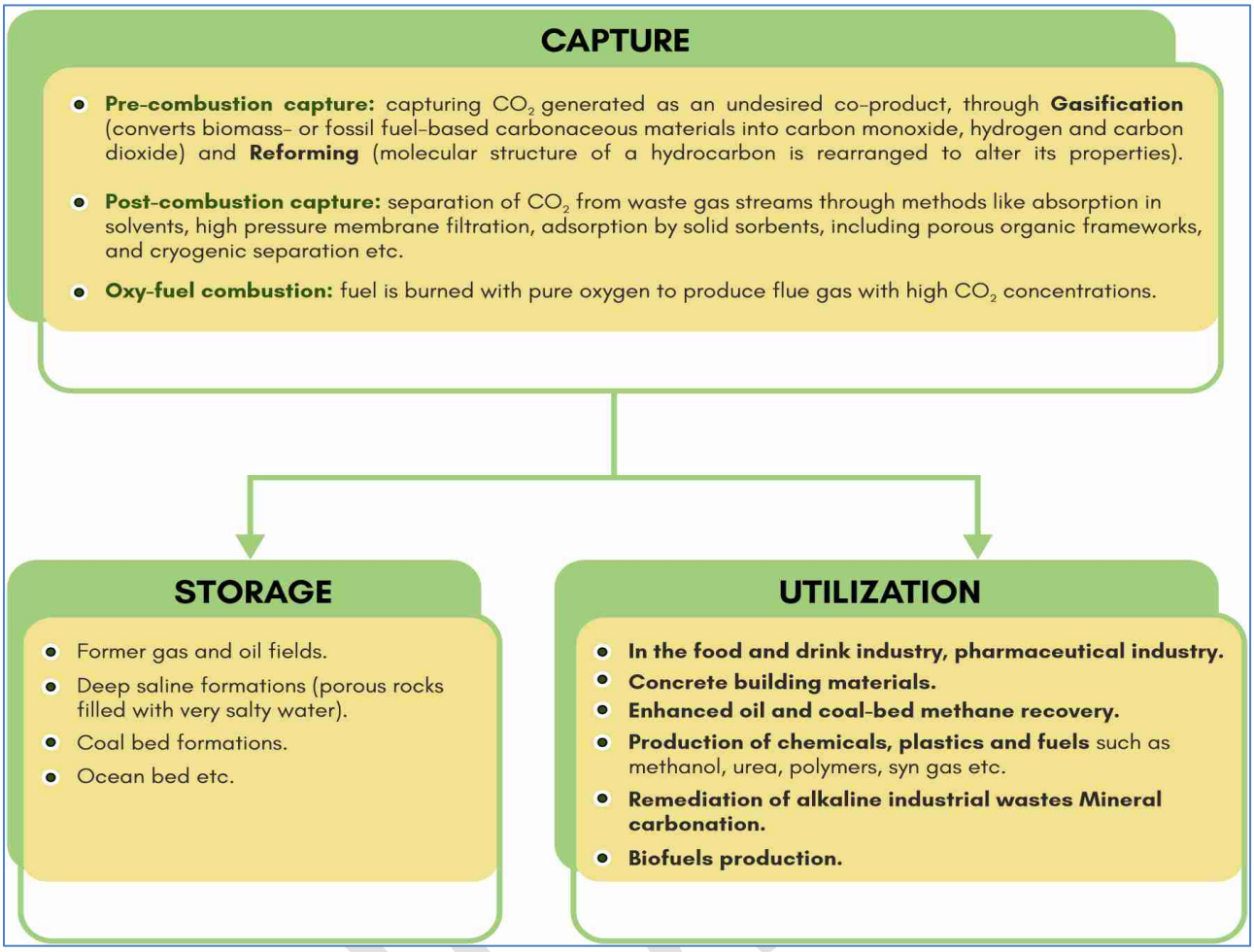
- ACT is an initiative to facilitate the emergence of Carbon dioxide (CO_2) Capture, Utilisation, and Storage (CCUS) via **translational funding of projects** aimed at accelerating and maturing CCUS technology through targeted innovation and research activities.
- Sixteen countries, regions, and provinces, **including India,** are working together in ACT.
- CCUS is also one of the identified innovation challenges in the **Mission Innovation (MI) Programme**- a global initiative of 24 countries and the European Union to accelerate the global clean energy innovation in which the Department of Science & Technology (DST) is an active partner.



About Carbon capture, utilisation and storage (CCUS)

- CCUS is group of technologies designed to **reduce the amount of CO_2** released into the atmosphere from coal and gas power stations as well as heavy industry including cement and steel production.

- Once captured, the CO_2 can be either re-used in various products, such as cement or plastics (**utilisation**), or stored in geological formations deep underground (**storage**).



1.3.2. DECARBONISING TRANSPORT

Why in news?

NITI Aayog in collaboration with International Transport Forum (ITF) have jointly launched the Decarbonising Transport in India project.

More on news

- The project is carried out in the wider context of the Decarbonising Transport Initiative **(DTI)** and is a **part of Decarbonising Transport in Emerging Economies (DTEE)** family of projects, which supports transport decarbonisation across different world regions.
- **Purpose**
  - Develop a pathway towards a **low-carbon transport system** for India.

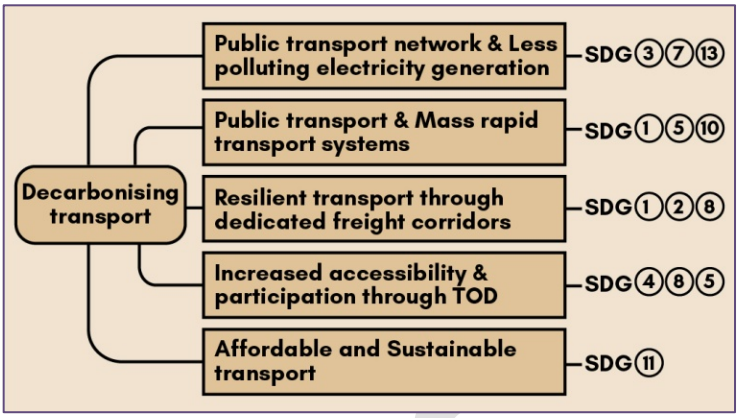
About Decarbonising Transport initiative and Decarbonising Transport in Emerging Economies

- The **DTI was launched in 2016 with funding from the** International Transport Forums **(ITF) and other funding partners** including World Bank, European Commission etc.
- The initiative **promotes carbon-neutral mobility to help stop climate change.** It provides decision makers with tools to select CO2 mitigation measures that deliver on their climate commitment.
- Under it, the **DTEE project** helps national governments and other stakeholders to identify transport measures and establish pathways to reduce transport CO2 emissions and meet their climate goals and NDCs.
- India, Argentina, Azerbaijan, and Morocco are current participants.
- The **DTEE is a collaboration between the ITF and the Wuppertal Institute**, supported by the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

About ITF

- The ITF is an **inter-governmental organisation within the OECD** (Organisation for Economic Co-operation and Development) system.
- It is the **only global body with a mandate for all modes of transport.**
- It acts as a **think tank for transport policy issues** and organises the annual global summit of transport ministers.
- **India has been a member** of ITF since 2008.

- Design a tailor-made **transport emissions assessment framework for India**
- Facilitate the government with a **comprehensive understanding of present as well as future transport activities** along with the related CO2 emissions.



- Transport emits around 23% of the energy-related CO_2 that feeds global warming. Without immediate action, its share could reach 40% by 2030 and 60% by 2050.

Related News: Nationally Determined Contributions- Transport Initiative for Asia (NDC- TIA)

- NDC-TIA project **aims at promoting a coherent strategy of effective policies for decarbonising transport** that are co-ordinated among various sector ministries, civil society and the private sector.
- Project **engages in China, India and Vietnam over the period 2020-24.**
- It is a **joint project of seven organisations** including World Resources Institute, International Transport Forum, International Council on Clean Transportation etc.
- The **implementing partner in India for the project is NITI Aayog.**

1.3.3. CARBON PRICING

Why in News?

A recent study, that examined 142 countries, **found that CO_2 emissions fell 2% (2007-2017) in countries with a carbon price,** while they increased by 3% in countries that did not have such pricing.

About Carbon Pricing

- **Carbon pricing** is an instrument that captures the external costs of emission and ties them to their sources through a price, usually in the form of a price on the CO2 emitted.
  - **Costs of emission includes** damage to crops, health care costs from heat waves and droughts etc.
- **Types of Carbon pricing being adopted**
  - **Carbon tax** directly sets a price on carbon by defining an explicit tax rate on greenhouse gas emissions (GHGs) emissions
  - **Emissions trading system (ETS):** It caps the total level of GHG and allows those industries with low emissions to sell their extra allowances to larger emitters.
  - **Internal carbon pricing (ICP):** It is a tool an organization uses internally to guide its decision-making process in relation to climate change impacts, risks and opportunities.
    - ✓ Recently, Indian companies are voluntarily started implementing ICP.
- **Pricing on carbon helps in:**
  - shifting the burden back to those who are responsible for it, and who can reduce it;
  - stimulates clean technology and market innovation
  - Meeting Paris climate agreement target
- **Initiatives under the United Nations Framework Convention on Climate Change (UNFCCC):** International Emissions Trading (IET); Joint Implementation (JI) and Clean Development Mechanism (CDM).

Related News: Green tax

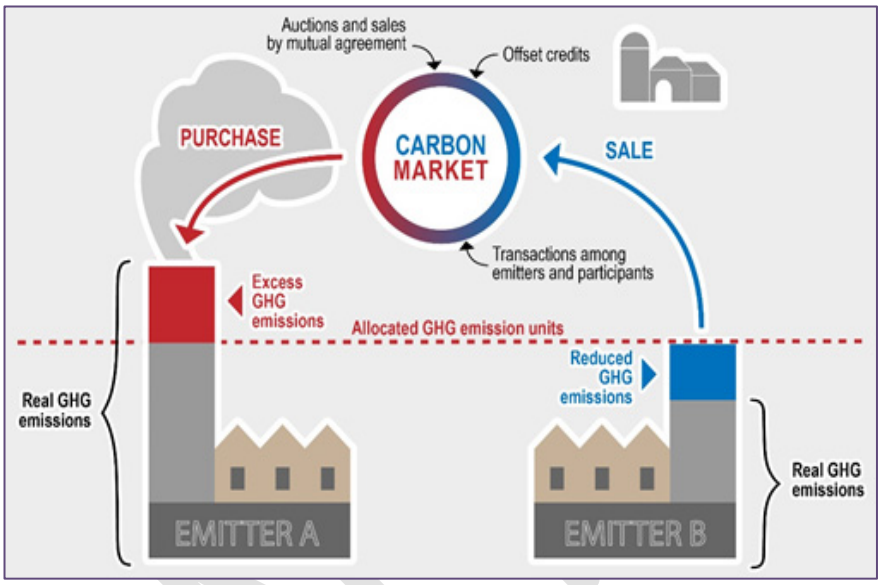
- Ministry for Road Transport and Highways approves a proposal to levy "Green Tax" on old vehicles
- Green tax is also called as **pollution tax or environmental tax** and is the tax levied on all the goods that cause environmental pollution.
- **Key proposals:**
  - **Transport vehicles older than 8 years could be charged Green Tax** at the time of renewal of fitness certificate, at the rate of 10 to 25 % of road tax.
  - **Personal vehicles to be charged** after 15 years;
  - **Lower Green tax for public transport vehicles**; Differential tax depending on fuel (petrol/diesel); and exemptions to vehicles including strong hybrids, electric vehicles, CNG vehicles, ethanol LPG vehicles, etc.
  - Revenue collected from the Green Tax to be kept in a **separate account and used for tackling pollution.**

1.3.4. CARBON TRADING

Why in News?

- In a world first, Indore-based **Enking International** in India may become the **world's first company that operates in the carbon markets** space to go in for an initial public offering (IPO).
- The company is involved in **trading in carbon offsets**. These are **market-tradeable instruments that are issued to entities** whose projects reduce carbon dioxide emissions.

About Carbon trading

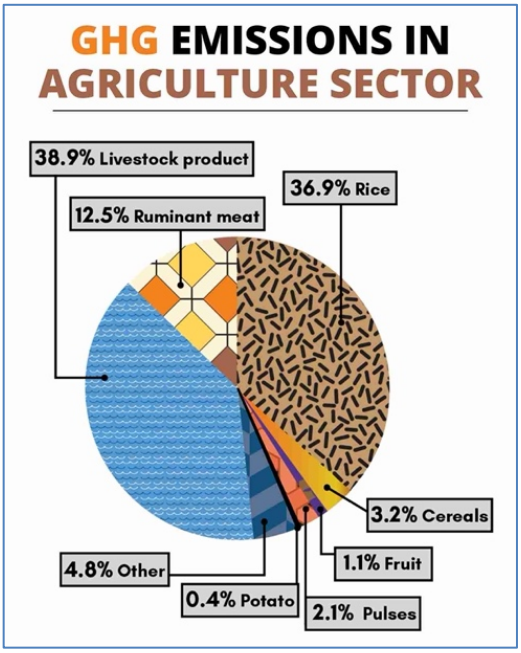


- Carbon trading began under the **Kyoto Protocol of 1997** (which came into force in 2005).
- Under this, **'certified emission reductions' or CERs**, were issued to entities that put up projects that reduced emissions — such as wind, solar, or energy efficiency.
    - It allows **nations which are unable to meet their reduction targets to purchase carbon credits**.
- Paris Agreement also **allows voluntary trading between countries to meet their NDC goals.** If a country reduces more GHG emissions than its target, it can sell the emission reduction to another country as an "internationally traded mitigation outcome".
- In India, **Renewable Energy Certificate' (REC) and 'Perform Achieve Trade' (PAT)** are energy certification programmes.
    - **Central Electricity Regulatory Commission (CERC) is the Market Regulator** for the trading of Energy Savings Certificates (ESCerts).

1.3.5. GREEN-AG PROJECT

Why in news?

Recently Union Government launched **'Green – Ag:** Transforming Indian Agriculture for global environment benefits and the conservation of critical biodiversity and forest landscape' to reduce emissions from agriculture.



About Green-Ag Project

- It **aims to bring at least 104,070 ha of farms under sustainable land and water management** and ensure 49 million Carbon dioxides equivalent sequestered or reduced through sustainable land use and agricultural practices.
- Project will be implemented in 5 state: **Mizoram, Rajasthan, Madhya Pradesh, Odisha and Uttarakhand**.
- It is **funded by the Global Environment Facility (GEF),** while the Department of Agriculture, Cooperation, and Farmers' Welfare is the national executing agency.
- Other key players involved in its implementation are **Food and Agriculture Organization (FAO) and the Union Ministry of Environment, Forest and Climate Change (MoEF&CC).**

Agricultural emissions in India

- In India agriculture and livestock accounts **for 18% of gross national emissions,** the third-highest sector after energy and industry.
  - Out of this **more than 85% of emissions are due to cattle production system, rice cultivation and ruminant meat** and remaining 15% comes from other crops and nitrous oxide emitted from fertilisers.
- Most of the GHG emission from Indian agriculture takes places from states like **Punjab, Haryana, UP, Bihar, West Bengal etc.**

Other steps taken by Government

- India's **National Mission for Sustainable Agriculture (NMSA),** among eight NAPCC missions, aims to tackle agricultural emissions and enhance food security.
- A policy introduced in 2015 made **neem coating of urea compulsory** to reduce nitrous oxide emissions.
- **Soil health cards** to use fertilizers efficiently and according to need of soil.
- India has **installed 200,000 solar water pumps** and another 2.5 million are planned to reduce emissions from energy use in agriculture.
- **Green India Mission**, launched in 2014, which aims to expand tree cover by 5million hectares and increase the quality of another 5m hectares of existing cover in 10 years.

2. POLLUTION

2.1. AIR POLLUTION

2.1.1. STUBBLE BURNING

Why in News?

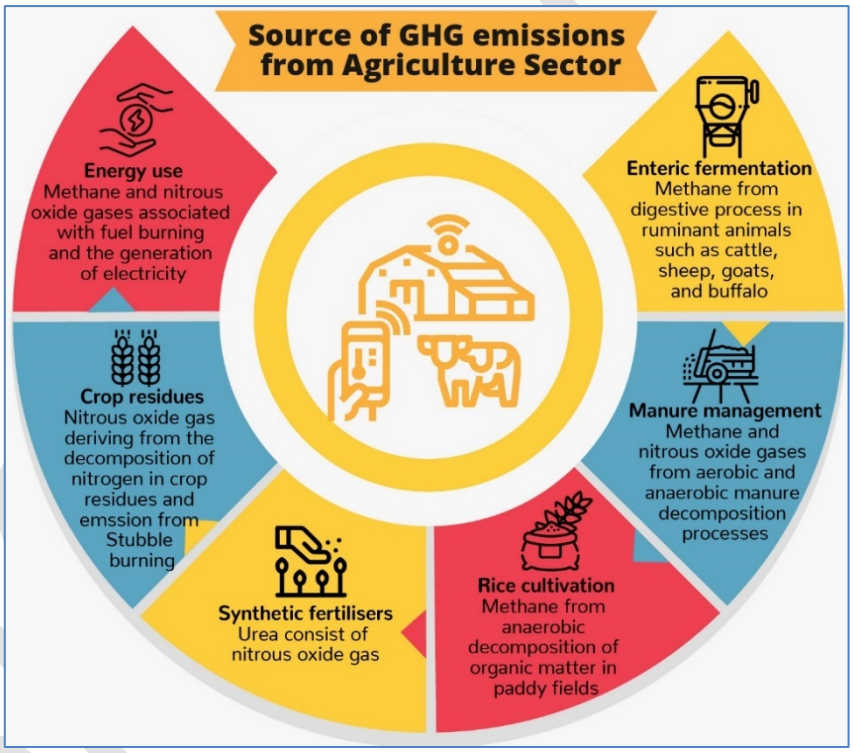
Environment Pollution (Prevention and Control) Authority (EPCA) submitted report to Supreme Court on stubble burning.

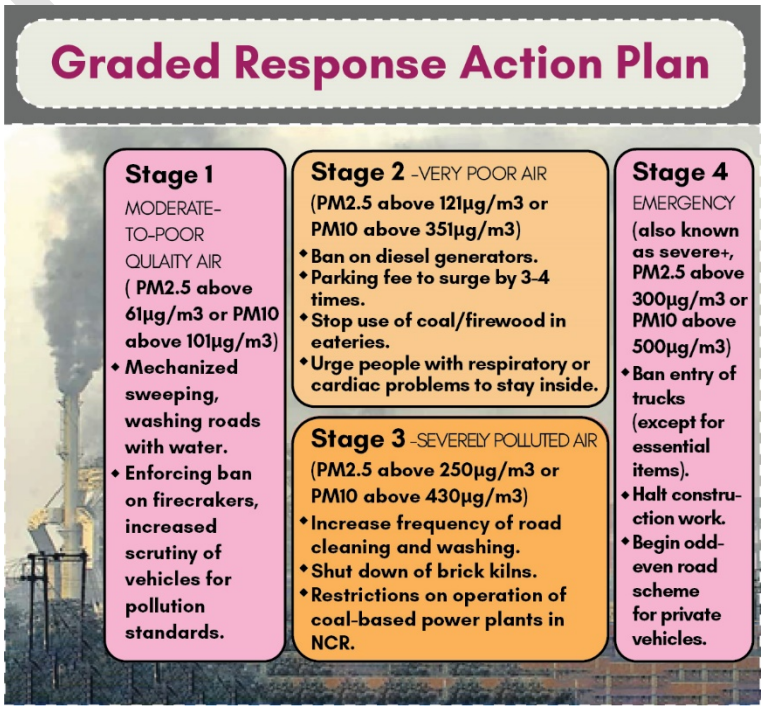
About Stubble burning

- Stubble burning is the act of setting fire to the crop residue that remains after grains like paddy, wheat etc. have been harvested in order to prepare field for sowing next crop.
  - It is one of the chief causes for **rising air pollution levels in Delhi during winters.**
- **Reasons for Stubble burning**
  - **Mechanization (use of combine harvesters) leaves behind smaller stubble** on the ground that is difficult to collect.
  - **Laws like Punjab Preservation of Subsoil Water Act** which has delayed date for paddy transplantation.
  - **Crop intensification leaves farmers with small windows** to clear the fields so burning the residue is the easiest.
- **Measures to control Stubble burning**
  - **In-situ Measures:** Use of Happy seeder Machines; Custom Hiring Centers to make this equipment available to small and marginal farmers on reasonable rent; Promotion of short duration rice varieties and crop diversification etc
  - **Ex-situ measures:** Using stubble in different ways like cattle feed, compost manure, roofing in rural areas, biomass energy, packing materials etc.

About Environmental Pollution (Prevention and Control) Authority (EPCA)

- EPCA was constituted under **Environment Protection Act, 1986** with the objective of protecting and improving the quality of the environment and preventing and controlling the **environmental pollution in the National Capital Region.**
- EPCA has been empowered to **take suo motu action as well as on the basis of complaints made by any individual, representative body or organisation** functioning in the environmental issues sector.





Policy response to address stubble burning

- **National Green Tribunal had banned crop residue burning** in the states of Rajasthan, Uttar Pradesh, Haryana and Punjab.
- **National Policy for Management of Crop Residue (NPMCR), 2014** to ensure prevention of burning of crop residues, by incentivizing purchase of modern machineries.
- Central Sector Scheme on **'Promotion of Agricultural Mechanization for In-Situ Management of Crop Residue in the States of Punjab, Haryana, Uttar Pradesh and NCT of Delhi'**.
- **Supreme Court guideline to incentivise farmers** for stopping the burning of paddy crop stubble.
- Environment Pollution (Prevention and Control) Authority **(EPCA) directed Delhi, Haryana, Rajasthan and Uttar Pradesh to implement Graded Response Action Plan (GRAP)**, to combat air pollution in Delhi-NCR.
  - GRAP is a set of **stratified actions** that are taken once the pollution level reaches a certain specified limit. (see Infographic).

Related News

Pusa bio-decomposer

- Recently, Indian Agricultural Research Institute (IARI), Pusa, Delhi has **developed a decomposer capsule, "Pusa bio-decomposer"** which could be converted into a liquid solution and sprayed on fields to decompose the stubble.

Anti-smog gun

- It was recently installed in Delhi to reduce air-pollution mainly concentration of PM10 and PM2.5.
- Anti-smog gun is designed to create an ultra-fine fog, comprising very fine water droplets (less than 10-micron in size).
- These tiny water droplets will be spread over a sizeable area with the help of a high-speed fan, which can absorb smallest dust particles in air.

Green crackers

- Green crackers don't contain banned chemicals such as lithium, arsenic, barium and lead.
- They are named **Safe Water Releaser** (SWAS), **Safe Thermite Cracker** (STAR) and **Safe Minimal Aluminium** (SAFAL) crackers.
- Green crackers release water vapour and **don't allow the dust particles to rise**. They are designed to have 30% **less particulate matter pollution**.
- They have been developed by **National Environmental and Engineering Research Institute (NEERI),** a Council of Scientific and Industrial Research lab.

Green Charcoal

- Recently, Green Charcoal Hackathon was launched, by Ministry of power, with the **objective to clean the air by eliminating farm fire, producing renewable energy out of the agroresidue** etc.
- Green Charcoal is a type of **bio-fuel that can be made locally and inexpensively.**
- To make this, **agricultural waste materials** appropriate to the season and the region **are carbonized** (conversion of an organic substance into carbon or a carbon-containing residue) in a kiln.
- It **burns cleanly, reducing exposure to the smoke** that causes respiratory infections.

2.1.2. NATIONAL CLEAN AIR PROGRAMME (NCAP)

Why in News?

Union government approved Rs 2,200 crore, to state governments, to fight air pollution to fight air pollution to 42 cities with a population in excess of a million under NCAP.

Moe on the News

- Money **will be used under NCAP** to improve air quality in these cities. Delhi will not receive funds under this grant.
- Money will **go towards capacity building of the local urban bodies and state pollution control boards.**

About NCAP

- NCAP is a **pollution control initiative launched by the Ministry of Environment** to cut the concentration of coarse (PM10) and fine particles (PM2.5) by at least 20% in the next five years, with 2017 as the base year for comparison.
- It is to be implemented in **102 non-attainment cities**.
- Central Pollution Control Board (CPCB) **executes the programme** for the prevention, control, and abetment of air pollution within the framework of NCAP. It directs state governments about implementing action plans immediately under NCAP.

Related News: First ever International Day of Clean Air For Blue Skies.

- In 2019, United Nations adopted a resolution to observe International Day of Clean Air for Blue Skies **on 07th September every year starting from 2020.**
- **It aims to:**
  - Raise **public awareness** at all levels.
  - Demonstrate close **link of air quality to other environmental/developmental challenges** such as climate change and Sustainable Development Goals.
  - Promote and facilitate **solutions that improve air quality.**
  - **Bring together diverse international actors** to form a strategic alliance.

2.1.3. EMISSION NORMS FOR THERMAL POWER PLANTS

Why in news?

India has pushed back deadlines for coal-fired power plants to adopt new emission norms by up to three years (deadline for some plants extended to the year 2025).

Background

- **As per Centre for Science and Environment (CSE) estimate, Coal based Thermal power plants (TPPs)** are responsible for -
- **70% of total freshwater withdrawal** by all industries.
- Over 60% of total industrial emissions of particulate matter (PM), 45% of SO2, 30% of NOx and more than 80% of mercury.
- In 2015, Ministry of Environment, Forests and Climate Change (MoEFCC) notified specific standards for the thermal power plants to control the emissions under **'Environment (Protection) Amendment Rules, 2015'.**
  - These norms prescribe emission standards for **Particulate Matter (PM), SO_2, NO_x, Mercury (Hg) and Water**.
- According to rules,
  - TPPs were required to achieve the **notified limit within 2 years i.e. by 2017 in a phased manner.**
  - It amends existing norms related to **emission of suspended particulate matter (SPM) and introduces new norms for emission of SO2, NOx and Mercury** from TPPs.
  - Separate norms have been prescribed for thermal power stations (TPSs) units **installed before 31st December 2003**; units installed **between 31st December 2003 and 31st December 2016**; and those installed **after 1st January 2017**.
  - It also **specifies modified limits for specific water consumption** by TPPs and insists to convert existing **once through based condenser cooling (OTBCC) system to recirculation type**.
- India had initially set a 2017 deadline for thermal powerplants, but it was postponed to varying deadlines for different regions, ending in 2022.
  - Now, thermal plants near populous regions and the capital New Delhi will have to comply by 2022, while utilities in less polluting areas have up to 2025 to comply or retire units.
  - Utilities that miss the new target are also allowed to continue operating after paying a penalty.

Pollution Control Technologies

Flue Gas Desulfurization (FGD)

- It is a set of technologies used to remove SO_2 from **exhaust flue gases of fossil-fuel power plants**.
- This is accomplished through either a **wet or a dry process.**
- **Dry FGD:** In the process of dry scrubbing injection systems, **lime** is used as a reagent to react and remove gaseous pollutants.
  - A dry injection process injects dry hydrated lime directly into the flue gas duct.
  - It yields a dry final product, collected in particulate control devices for further treatment.
- **Wet FGD:** A shower of lime slurry is sprayed into a flue gas scrubber, where the SO_2 is absorbed into the spray and becomes a wet calcium sulfite and waste water.
- **FGD wastewater** can be effectively and efficiently treated using large filter presses or large vacuum belt filters for very large sludge production.

Selective catalytic reduction (SCR)

- It is currently the most widely applied technology.
- Ammonia is used as a reducing agent to convert NOx to nitrogen **in the presence of a catalyst in a converter.**
  - The catalyst is usually a mixture of titanium dioxide, vanadium pentoxide, and tungsten trioxide.
- SCR can remove 60–90% of NOx from flue gases.

- The process is very expensive and the associated ammonia injection results in an ammonia slipstream in the exhaust.

Selective non-catalytic reduction (SNCR)

- In the SNCR process a reagent, i.e., **urea**, ammonium hydroxide, anhydrous ammonia, or aqueous ammonia, is injected into flue gases in the furnace within the appropriate temperature zone.
- The NOx and the reagent (urea, etc.) react to form N2 and H2O and do not require a catalyst.

Electrostatic precipitator

- An electrostatic precipitator is a filtration device that removes fine particles, like dust and smoke, from a flowing gas using the force of an induced electrostatic charge minimally impeding the flow of gases through the unit.

Related News

Thermal power plants (TPP) allowed to use coal with high ash content

- Environment Ministry issued **new regulations under which TPPs will be able to use coal irrespective of ash content.**
  - This overturned 2014 regulation that made it **mandatory for all coal-based TPPs** to use **coal with no more than 34% ash content.**
  - Under 2014 regulation, it was **mandatory for coal producers to remove impurities from coal** before transporting it to TPP.
  - 34% limit pushed TPP to import coal and drove up cost of power.
    - ✓ India's domestic coal reserves have ash content up to 40 to 45%, so more coal is required to generate 1 kwh of electricity and leads to more emissions.
- **New Notification**
  - TPPs are **liable for proper disposal of coal ash and meeting emission standards** i.e.onus of addressing pollution due to high ash content now lies with TPPs instead of coal companies.
  - Set **norms for disposal of rejects** at washeries, disposal of ash by TPPs etc.
  - **Stresses on use of pollution control technologies** by TPP like flue gas desulphurisation.
  - Makes it **compulsory to transport coal in covered vehicles**.

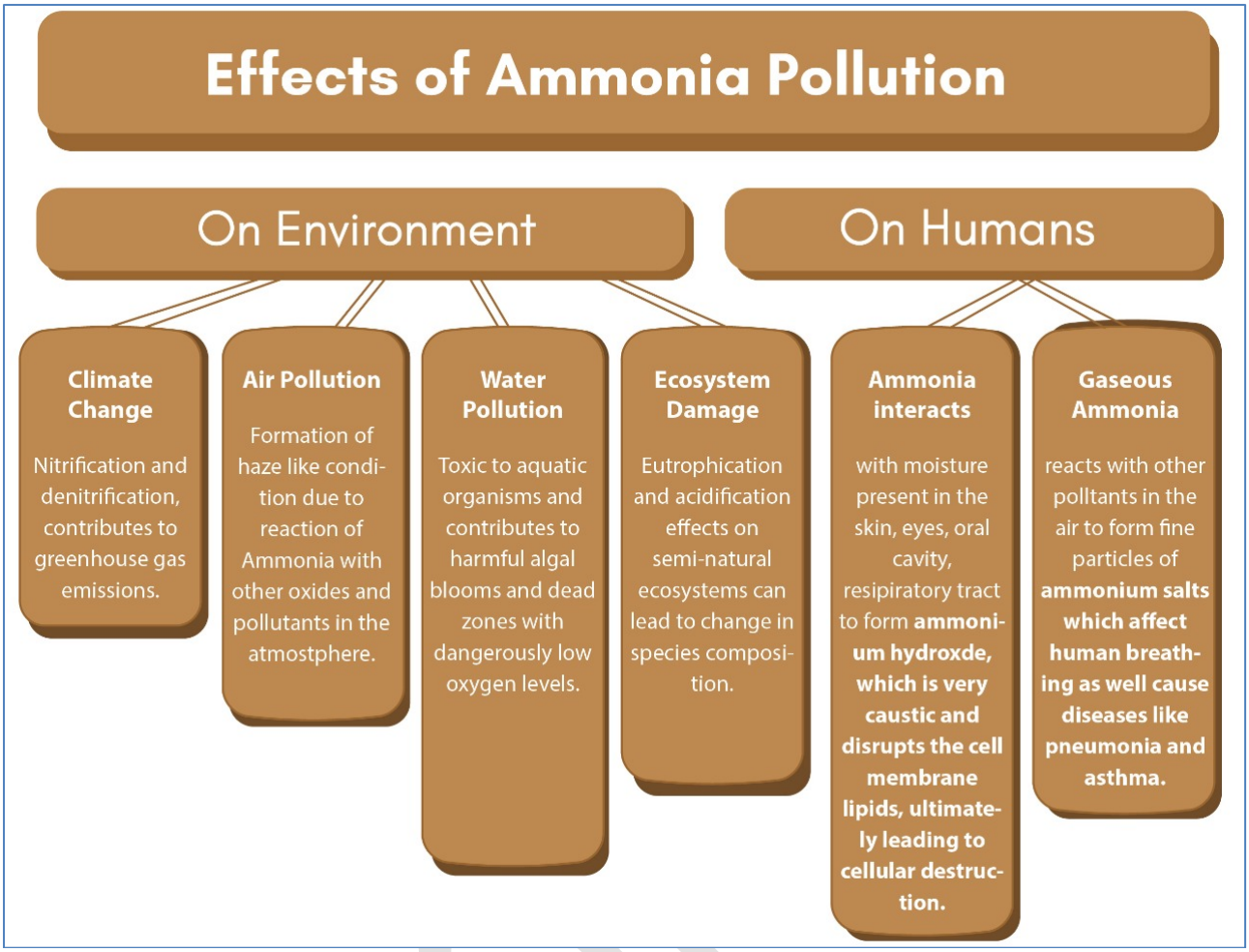
2.1.4. AMMONIA POLLUTION

Why in news?

Recently, Ammonia gas leaked at the Indian Farmers Fertilizer Cooperative Limited (IFFCO) unit at Prayagraj, Uttar Pradesh.

About Ammonia

- Ammonia (NH_3) is a **colourless highly reactive and soluble alkaline gas.**
- It is **prominent constituent of the nitrogen cycle** that adversely affects ecosystems at higher concentrations.
- Ammonia is **stored in liquid form under high pressure** or in gaseous form at low temperature.
- Ammonia is **naturally present in the body** and secreted by the kidneys to neutralise excess acid, while ammonia in the form of nitrogen is essential for plant growth.
- **Sources of emissions:**
  - The largest source of NH_3 emissions is **agriculture, including animal husbandry and NH_3-based fertilizer applications.**
  - Other sources of NH_3 include industrial processes, vehicular emissions, volatilization from soils and oceans, **decomposition of organic waste, forest fires, animal and human waste**, nitrogen fixation processes.
- **Uses:**
  - It is used as an **industrial chemical in the production** of fertilisers, plastics, synthetic fibres, dyes and other products.
  - It is critical in the **manufacturing of fertilizers**, because ammonia is a building block for ammonium nitrate (NH_4NO_3) that is used in agriculture as a high-nitrogen fertilizer.



Related News: Indo Gangetic plain (IGP) global hotspot of atmospheric ammonia (NH_3), IIT Kharagpur study

- **Study findings**
  - IGP is the **global hot-spot of NH_3 due to intense agricultural activities** and fertilizer production.
  - There is a **positive correlation of NH_3 with total fertilizer consumption and temperature** since high temperature favours volatilization.
  - Agricultural emission is **negatively correlated with total precipitation** as wet deposition helps removal of NH_3.

Green Ammonia

- Green ammonia refers to ammonia, which has been **produced through a process that is 100% renewable and carbon-free.**
- It uses renewable energy **instead of natural gas or coal for producing hydrogen**; hence, is an effective way to reduce greenhouse emissions.
- Ammonia is a **pungent gas that is widely used to make agricultural fertilisers.** It is easier and cheaper to store, and transport.
- Government plans to invite bids for **setting up green ammonia projects to reduce import dependence.**

2.1.5. INDOOR AIR POLLUTION

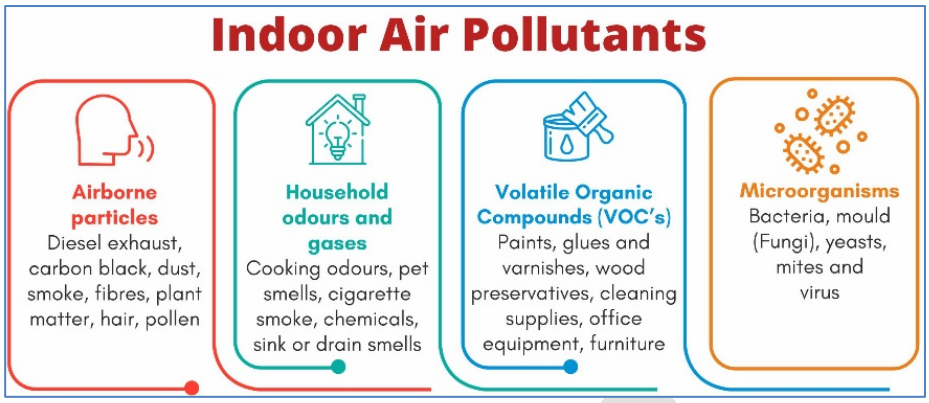
Why in news?

Recently, a report published in the Lancet journal highlighted that Indoor air pollution (IAP) caused 64% fewer deaths in the last two decades (1990-2019) in India.

About IAP

- **IAP is the degradation of indoor air quality by harmful chemicals and other materials**. Indoor air quality is affected by many factors, including the type and running conditions of indoor pollution sources, ventilation conditions, as well as indoor activities.
- **Severity:** According to the Environment Protection Act, 1986, the levels of indoor air pollutants are often 2-5 times higher than outdoor levels. In some cases, these levels can exceed the outdoor levels of the same pollutants 100 times.

- Thus, it can affect the health of individuals more severely as people spend most of their time (more than 80%) indoors.



Initiatives

- **To save people from the ill effects of IAP, the central government has launched two schemes**
  - **Unnat Chulha Abhiyan** was launched to promote improved biomass cookstove
  - **Pradhan Mantri Ujjwala Yojana** was launched for LPG connections to Below Poverty Line families.
  - **Retrofit of Air-conditioning to improve Indoor Air Quality for Safety and Efficiency (RAISE)** which is a joint initiative of Energy Efficiency Services Limited (EESL) and USAID.
- **In September, 2010, the UN Foundation launched the Global Alliance for Clean Cook Stoves.** This is a public–private initiative that brings together partners from the range of specialties across which the issue of indoor air pollution sprawls.

Impact of Indoor Air Pollution

- **On Health**- Indoor air pollution increases the potential of health risks such as respiratory illness, acute respiratory tract infection, stillbirth, lung cancer, leukemia, stroke, ischaemic heart diseases, etc.
- **On Women, Aged and Young Children**- they are the most affected, as they spend the majority of their time in the home.
  - Indoor air pollution significantly affects problem solving, mathematical abilities, IQ and learning capabilities in children.
- **On Overall Productivity**- As it aids in following lifestyle changes like fatigue, dizziness, allergies, hypersensitivity coughing, sinus congestion etc.
- **On Mortality**: According to WHO, due to indoor pollutants 3.8 million premature deaths occur annually.

Related News: Indigenous Air Unique quality Monitoring (AUM) Photonic System

- It is an indigenous photonic system for **real-time remote monitoring of air quality** parameters.
- It is an innovative application of the **principles of laser backscattering, statistical mechanics,** optoelectronics, artificial intelligence, machine/deep learning, and Internet of Things.
- It can **identify, classify, and quantify various pollutants simultaneously** (of orders of less than one part per billion) and meteorological parameters, with very high precision, sensitivity and accuracy.

2.2. WATER POLLUTION AND CONSERVATION

2.2.1. MARINE PLASTIC POLLUTION

Why in news?

A report titled "Breaking the Plastic Wave"- 'A Comprehensive Assessment of Pathways Towards Stopping Ocean Plastic Pollution', published by The Pew Charitable Trusts in partnership with SYSTEMIQ Ltd.

Highlights of the Report

- The annual flow of plastic into the ocean **could triple by 2040 to 29 million metric tonnes per year**, without immediate and sustained action.
- **Waste plastic makes up 80% of all marine debris** from surface waters to deep-sea sediments.
- Plastic has been **detected on shorelines of all the continents**, with more plastic materials found near popular tourist destinations and densely populated areas.
- **Sources of plastic:** The main sources of marine plastic are land-based, from urban and storm runoff, sewer overflows, beach visitors, inadequate waste disposal and management, industrial activities, construction and illegal dumping. Ocean-based plastic originates mainly from the fishing industry, nautical activities and aquaculture.
- **Harmful impacts of Plastic pollution:** Plastic can take hundreds to thousands of years to decompose; impacts marine life, ocean health, coastal tourism and even human health; gets into the human food chain etc.

- **Efforts at the international level:**
  - 1972 Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter (London Convention),
  - 1978 Protocol to the International Convention for the Prevention of Pollution from Ships (MARPOL).

Bio-degradable plastics

- Biodegradable plastics are **plastics degraded by microorganisms** into water, carbon dioxide (or methane) and biomass under specified conditions which depend on various factors such as temperature and the amount of moisture present.
- These are promising alternatives to conventional plastics under the right conditions, but these **conditions are generally not found** in the natural environment, and especially not in the Ocean.
- They are also **energy intensive and expensive** to produce.
- Even in ideal conditions, biodegradability **does not resolve critical issues such as entanglement**, or ingestion by marine animals.

Microplastic

- Under the influence of solar UV radiation, wind, currents and other natural factors, **plastic fragments into small particles, termed microplastics** (particles smaller than 5 mm) or nanoplastics (particles smaller than 100 nm). This **disperses plastic even farther and deeper into the ocean**, where it invades more habitats and becomes effectively impossible to retrieve.
  - **Microbeads** are manufactured solid plastic particles of less than one millimeter.

India and its efforts in dealing with Marine Plastic Pollution

- India is a **signatory to MARPOL** (International Convention for the Prevention of Pollution from Ships, 1978). In addition, Prevention of Marine Pollution is also dealt with by Merchant Shipping Rules, 2009 under the Merchant Shipping Act, 1958.
- **Periodic surveys of Indian flag vessels** to ensure compliance to the above rules. Foreign vessels are likewise inspected under Port State Inspection regime and heavy penalty is levied in case of non-compliance.
- The government has announced a **number of steps to phase out single-use plastics** with the eventual goal of stopping all usage to reduce the country's plastic footprint **under the Plastic Waste Management (Amendment) Rules 2018.**
- **BIS has come out with an Indian standard** according to which plastic microbeads of diameter 5 mm or less, that are insoluble in water, and solid plastic particles used to exfoliate or cleanse in personal care products are banned.
- **State initiatives:**
  - Kerala's Suchitwa Mission, under which fishermen are engaged in not just finding fish but also plastic that either gets stuck in the fishing nets or floats in the sea. In last 10 months since the project was launched, they have managed to recover 25 tonnes of plastic waste.

2.2.2. GROUNDWATER EXTRACTION

Why in News?

Ministry of Jal Shakti notified new guidelines to regulate extraction of groundwater.

Key guidelines

- A no objection certificate **(NOC) is mandatory for new and existing industries, group housing societies, and private water supply tankers** for withdrawal of groundwater.
- **Projects falling within 500 m. from demarcated wetland areas shall mandatorily submit a detailed proposal** indicating that groundwater abstraction does not affect the protected wetland areas.
- **Installation of digital water flow meters is mandatory** for all users seeking NOC.

Groundwater usage in India

- **India uses the most groundwater in the world**, extracting 253 bcm (billion cubic metres) per year. This is approximately 25% of the global groundwater extraction.
- 90% of the annual ground water extraction in India is used for irrigation in agricultural activities, whereas, the remaining 10% of extraction is for drinking & domestic as well as industrial uses.
- Out of the total 6,881 assessment units, **17% have been categorised as 'over-exploited'** (more extraction than recharge), 5% as 'critical' (extraction is 90-100% of what's recharged), 14% as 'semi-critical' (extraction 70-90% of what's recharged) units and 63% as 'safe'.
  - **Majority of the over-exploited units** are concentrated in parts of **Punjab, Haryana, Delhi**, western UP, Rajasthan, Gujarat, Karnataka, Andhra Pradesh, Telangana and Tamil Nadu.

Categories exempted from getting an NOC

- Individual domestic consumers in both rural and urban areas for drinking water and domestic uses
- Rural drinking water supply schemes
- Armed Forces Establishments and Central Armed Police Forces establishments in both rural and urban areas
- Agricultural activities
- Micro and small enterprises drawing groundwater less than 10 cubic metre/day

- **District authorities are authorized to take enforcement measures** like sealing of abstraction structures and prosecuting those violating the NOC conditions
    - Non-compliance may attract a **penalty between Rs 50,000 and Rs 10 lakh.**

Related bodies

- **Central Ground Water Authority (CGWA):** It has been constituted under **Environment (Protection) Act, 1986** to regulate and control development and management of ground water resources in the country.
- **Central Water Commission (CWC):** It is an **attached office of the Ministry of Jal Shakti**. The Commission is entrusted with the general responsibilities of **initiating, coordinating and furthering schemes for control, conservation and utilization of water resources** throughout the country (in consultation of the concerned State Governments).
    - These schemes may be related to the purpose of Flood Control, Irrigation, Navigation, Drinking Water Supply and Water Power Development, growing alternatives to paddy etc.

Related news

India Water Resources Information System

Ministry of Jal Shakti has launched a new version of India-WRIS.

About WRIS

- This is a **web portal containing information related to Water Resources** through dashboards for rainfall, water levels & discharge of rivers, water bodies, ground water levels, reservoir storages, evapotranspiration and soil moisture, as well as modules on water resources projects, water bodies, hydro-met data availability and tools for GIS layer editing.
- India-WRIS was **launched in 2019 under National Hydrology Project**. National Water Informatics Centre to maintains and updates India WRIS.

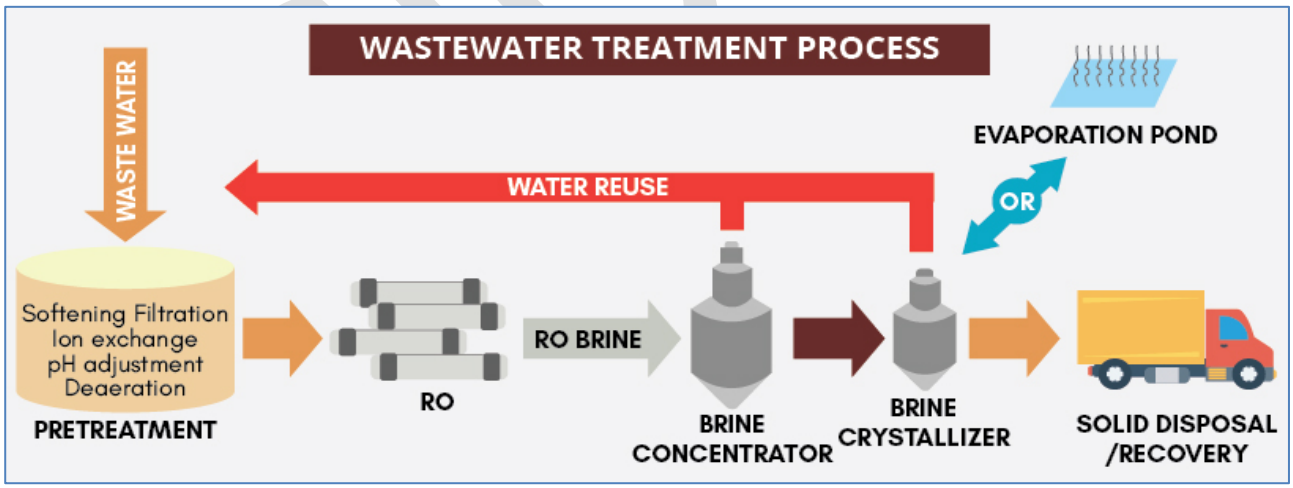
2.2.3. ZERO LIQUID DISCHARGE (ZLD)

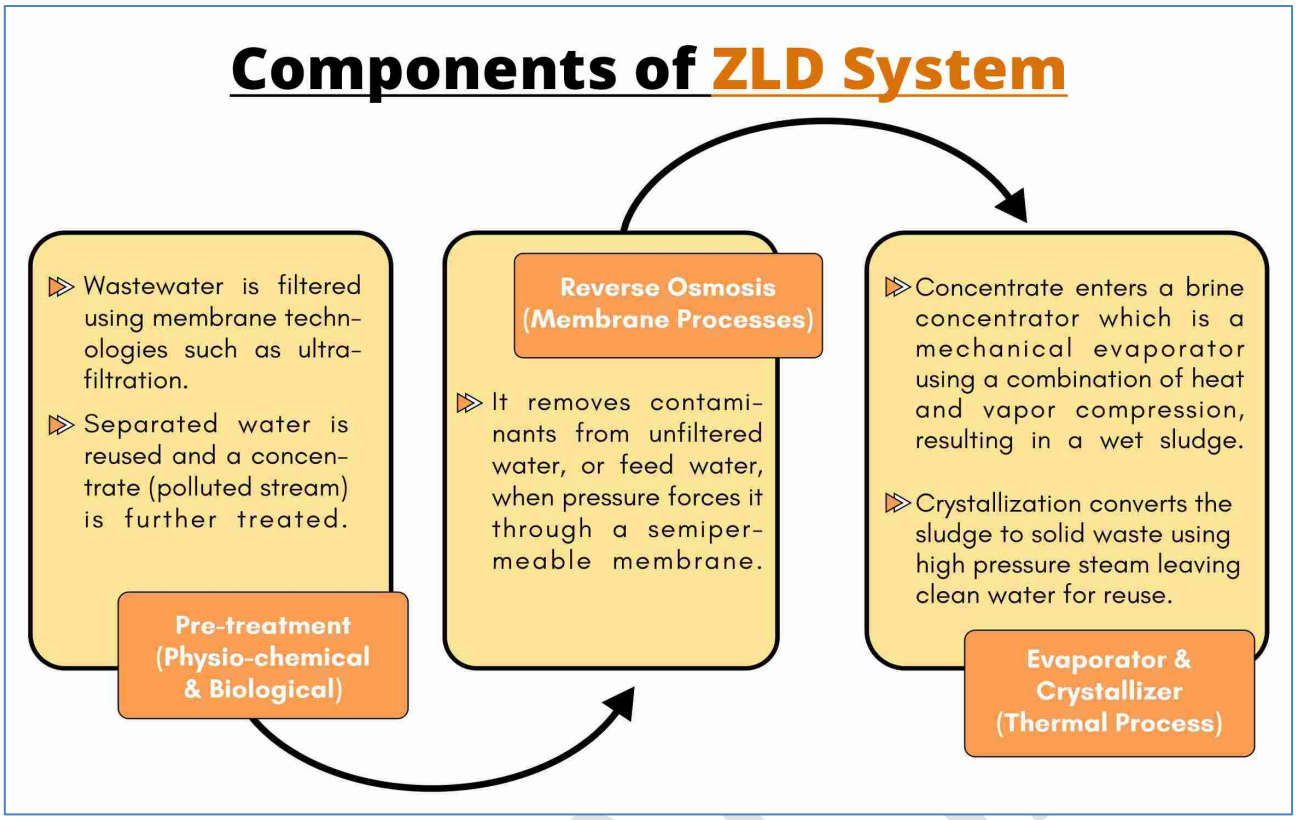
Why in News?

The Centre is examining various options of moving forward on the country's ZLD policy trying to make a balance between the environmental protection and industrial development.

About ZLD

- ZLD is a **water treatment process** to recirculate all the water back to the process with zero liquid waste.
- A ZLD system involves a range of advanced **wastewater treatment technologies for treating water up to the level that can be reused inside the same Company.**





2.3. SOLID WASTE

2.3.1. PLASTIC WASTE

Why in news?

Recently, the Ministry of Environment, Forest and Climate Change released draft of 'uniform framework for Extended Producers Responsibility' under Plastic Waste Management Rules (PWMR) 2016.

About draft Extended Producers Responsibility (EPR) framework

- EPR is strategy used to **promote reuse, recycling, and eco-friendly disposal of waste** by assigning the **responsibility of disposal of the waste to the manufacturer/producer of the goods**.
- EPR framework under PWMR 2016 has proposed three models:
  - **Plastic credit model**
    - ✓ In this **producer is not required to recycle** their own packaging, **but to ensure that an equivalent amount of packaging waste has been recovered and recycled** to meet their obligation. Producers and processors/ exporters **may exchange plastic credits** for a financial transaction at a price and other terms as negotiated between them.
  - **Producer Responsibility Organisations (PROs)**
    - ✓ Under this an **organisation will manage the waste** on behalf of producers.
    - ✓ **Municipal bodies can also register** as PRO or waste collector.
    - ✓ There will be a **National PRO Advisory Committee** to govern plastic waste management in the country.
  - **Fee-based mechanism**
    - ✓ Under this the **producers will contribute to the EPR corpus fund** at the central level, each producer contributing **based on generation of plastic waste vis-a-vis efforts required.**
    - ✓ This may be an **escrow account managed by Special Purpose Vehicle**, where private and other stakeholders can become members.
- It also has **provisions to impose penalties** on producers if they fail to meet their targeted collection.
- The **monitoring** of the entire mechanism of the EPR will be the **responsibility of the Central Pollution Control Board (CPCB).**

Plastic Waste Management Rules 2016 (amended in 2018)

- **Defines minimum thickness** of plastic carry bags i.e. 50 microns. This would increase the cost and the tendency to provide free carry bags would come down.
- **Responsibility (financial and/or physical) of local bodies**: Rural areas are brought under the rules since plastic has reached rural areas as well. The gram sabhas have been given responsibility of implementation.
- **Extended Producer Responsibility**: Producers and brand owners have been made responsible for collecting waste generated from their products.
- **Producers are to keep a record** of their vendors to whom they have supplied raw materials for manufacturing. This is to curb manufacturing of these products in unorganised sector.
- **Responsibility of waste generator**: All institutional generators of plastic waste shall segregate and store their waste as per Solid Waste Management Rules, and handover segregated wastes to authorized waste disposal facilities.
- **Responsibility of street vendors and retailers**: Not to provide such carry bags or fine would be imposed. Only the registered shopkeepers on payment of a registration fee to local bodies would be allowed to give out plastic carry bags on charge.
- **Promote the use of plastic for road construction or energy** recovery.
- A **Central Registration System** for the registration of the producer/ importer/ owner.
- **Phasing out of Multi-layered Plastic (MLP)** that are "non-recyclable or non-energy recoverable or have no alternate use".

2.3.2. BIOMEDICAL WASTE

Why in news?

Central Pollution Control Board (CPCB) has released revised guidelines for Biomedical waste management generated from COVID-19.

More on news

- Guidelines were issued under the title **'Guidelines for Handling, Treatment and Disposal of Waste Generated during Treatment/Diagnosis/ Quarantine of COVID-19 Patients.'**
- These were issued under, and in addition to **Biomedical Waste Management Rules, 2016.**
- These guidelines are **applicable to all stakeholders** including isolation wards, quarantine centres, sample collection centres, laboratories, Urban Local Bodies (ULBs) and **common biomedical waste treatment and disposal facilities (CBWTFs)**.

About Biomedical waste

- Biomedical waste comprises human & animal anatomical waste, treatment apparatus like needles, syringes and other materials used in health care facilities in the process of treatment and research.
- This waste is generated during diagnosis, treatment or immunisation in hospitals, nursing homes, pathological laboratories, blood bank, etc.

Key guidelines for COVID-19 Biomedical waste management

- **Collection and segregation of waste**
  - **Use dedicated trolleys and collection bins** in COVID-19 isolation wards and label "COVID-19 Waste" to be pasted on these items.
  - **Depute dedicated sanitation workers** separately for biomedical waste and general solid waste so that waste can be collected and transferred timely to temporary waste storage area.
- **Transportation and disposal of waste**
  - COVID-19 garbage is collected and taken in a **separate vehicle for proper disposal** as biomedical waste either to a CBWTF or a waste-to-energy plant, where it is then either **incinerated, autoclaved (sterilised for shredding and recycling) or burnt to produce energy**.
  - **Quantification and tracking** the movement of COVID-19 waste needed to be carried out by all quarantine centres though the CPCB's biomedical waste-tracking mobile application called **COVID19BWM**.
- **Role of nodal authorities - Designated trained nodal officers** for biomedical waste management in hospitals must be made **responsible for training waste handlers** about infection prevention measures.

Bio-medical Waste Management Rules 2016 (amended in 2018)

- **Pre-treatment of waste:** Waste generated in laboratories, microbiological waste, blood samples and blood bags to be pre-treated through disinfection or sterilisation on-site in the manner as prescribed by WHO.
- **Phasing out** of use of chlorinated plastic bags, gloves and blood bags.
- **Better segregation:** Bio-medical waste has been classified into **4 categories:** Untreated human anatomical waste, Animal anatomical waste, Soiled waste and Biotechnology waste.
- **Storage of waste:** Provision within the premises for a safe, ventilated and secured location for storage of segregated biomedical waste.
- **Training and Immunisation:** Regular training to all its health care workers and immunising all health workers.
- **Transportation and handling:** Ensure that the bio-medical waste collected from the occupier is transported, handled, stored, treated and disposed without any adverse effect to the human health and the environment.
- **Procedure of Disposal:** The biomedical waste must be **segregated in coloured bags (Yellow, Red, White and Blue)** according to the category of the waste. It can be stored up till 48hrs after which it is either needed to be treated at insitu site or collected by the worker from CBMWTF.
- **Record maintenance and monitoring:** Maintain and update bio-medical waste management register and record for operation of incineration, hydro or autoclaving etc, also review and monitor the activities related to bio-medical waste management through committee.
- **Establish GPS and Bar-coding facility at** Common biomedical waste treatment facility.

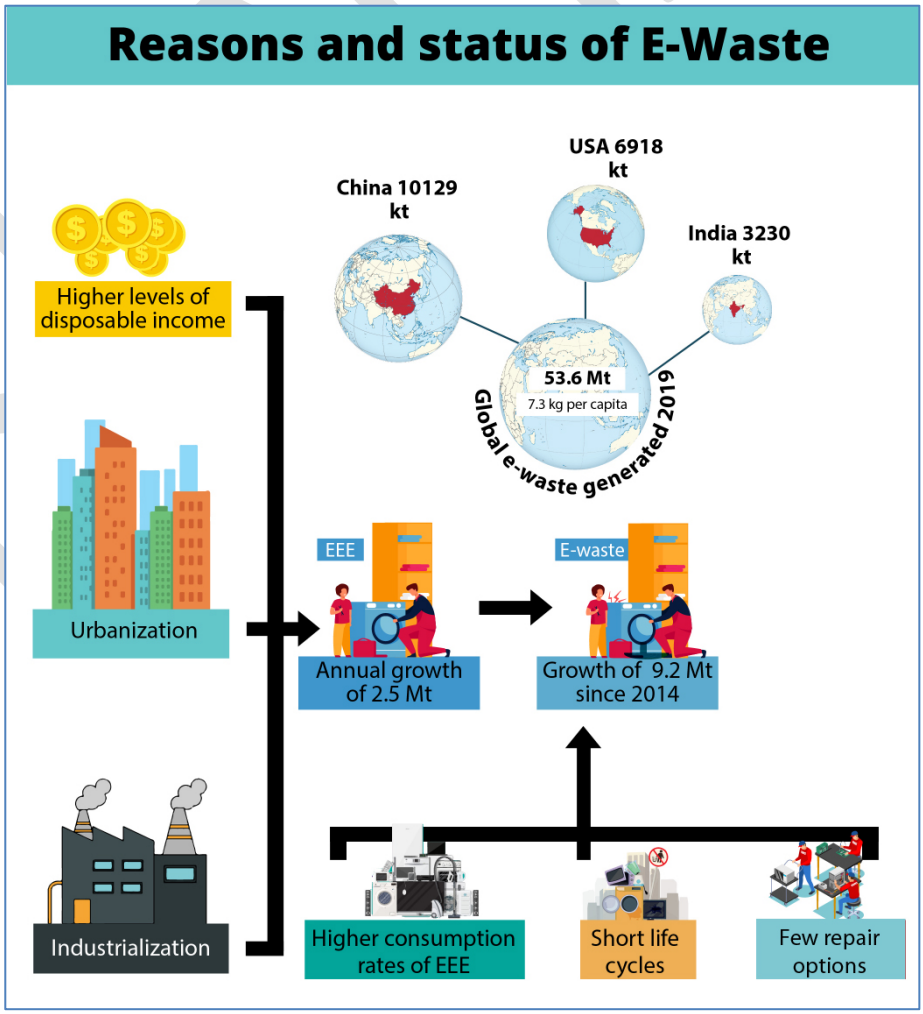
2.3.3. GLOBAL E-WASTE MONITOR 2020

Why in News?

Global E-waste Monitor 2020, a collaborative product of Global E-waste Statistics Partnership, International Telecommunication Union and International Solid Waste Association was released in close collaboration with UN Environment Programme (UNEP).

About E-Waste

- Electronic waste (e-waste) refers to **all items of electrical and electronic equipment (EEE)** and its parts that have been discarded **as waste without intent of re-use.**
- Common hazardous materials found in e-waste are: heavy metals (such as mercury, lead, cadmium etc.) and chemicals (such as CFCs/chlorofluorocarbon or various flame retardants).



E-waste (Management) Rules, 2016

- It is applicable to all the stakeholders such as Producer Responsibility Organisations, Consumers, Dismantlers, Recyclers, Dealers, Manufacturers etc.
- It adopted **collection mechanism-based approach** which includes collection centre, collection point, and take back system etc. for collection by Producers under Extended Producer Responsibility (EPR).

- It covered even components and spare parts of electric & electronic equipments. Mercury containing lamps like CFLs were also included.
- It has the **interest-bearing Deposit Refund Scheme** charged by the producer to the consumer at the time of purchase.
- It **introduced Pan India EPR Authorization by CPCB** replacing the state wise EPR authorization.
- MoEFCCC also brought further amendments to these rules in 2018, introducing following new provisions-
  - **Phase wise Collection:** It introduced the phase-wise collection targets for e-waste, which shall be 10% of the quantity of waste generation as indicated in the EPR Plan during 2017- 18, with a 10% increase every year until 2023.
  - **Separate e-waste collection targets** have been drafted for new producers, i.e., those producers whose number of years of sales operation is less than the average lives of their products.
  - **Reduction of Hazardous Substances (RoHS):** Under this, cost for sampling and testing shall be borne by the government for conducting the RoHS test and if the product does not comply with RoHS provisions the cost will be borne by the Producers.
  - **Registration of Producer Responsibility Organizations (PROs)** by applying to the Central Pollution Control board (CPCB).

2.3.4. SUSTAINABLE PROCESSING OF MUNICIPAL SOLID WASTE

Why in news?

CSIR developed facility that has **helped in achieving decentralised Decimation of Solid Wastes** and **create value-added end-products** from abundantly available redundant stuffs such as Dry Leaves, Dry Grass etc.

Waste to Wealth

It refers to the process of conversion of waste to a product that can be put to primary use which can be viewed as a process of generating wealth.

Some of the technologies for 'Waste to Wealth'

Technology	Details

Plasma arc gasification process	• It uses **electricity to generate high temperature plasma arc** (above 3000°C) inside the plasma reactor which **converts the waste into syngas** (consists of CO, H2, CO_2).
	• **Wealth:**
	  ○ Syngas can be used in gas engines for **generation of electricity.**
	  ○ **Residual ash can be mixed with cement** for preparation of recycled bricks for usage in construction.

Bio-gasification	• In this, bio-degradable component of the waste is **decomposed in an anaerobic (absence of oxygen) environment and biogas is liberated.**
	• **Wealth:**
	  ○ Biogas can be **used as fuel for cooking and in gas engines for generation of electricity.**
	  ○ Residual slurry from biogas plant is converted to compost through vermi-composting which is **utilized in organic farming.**

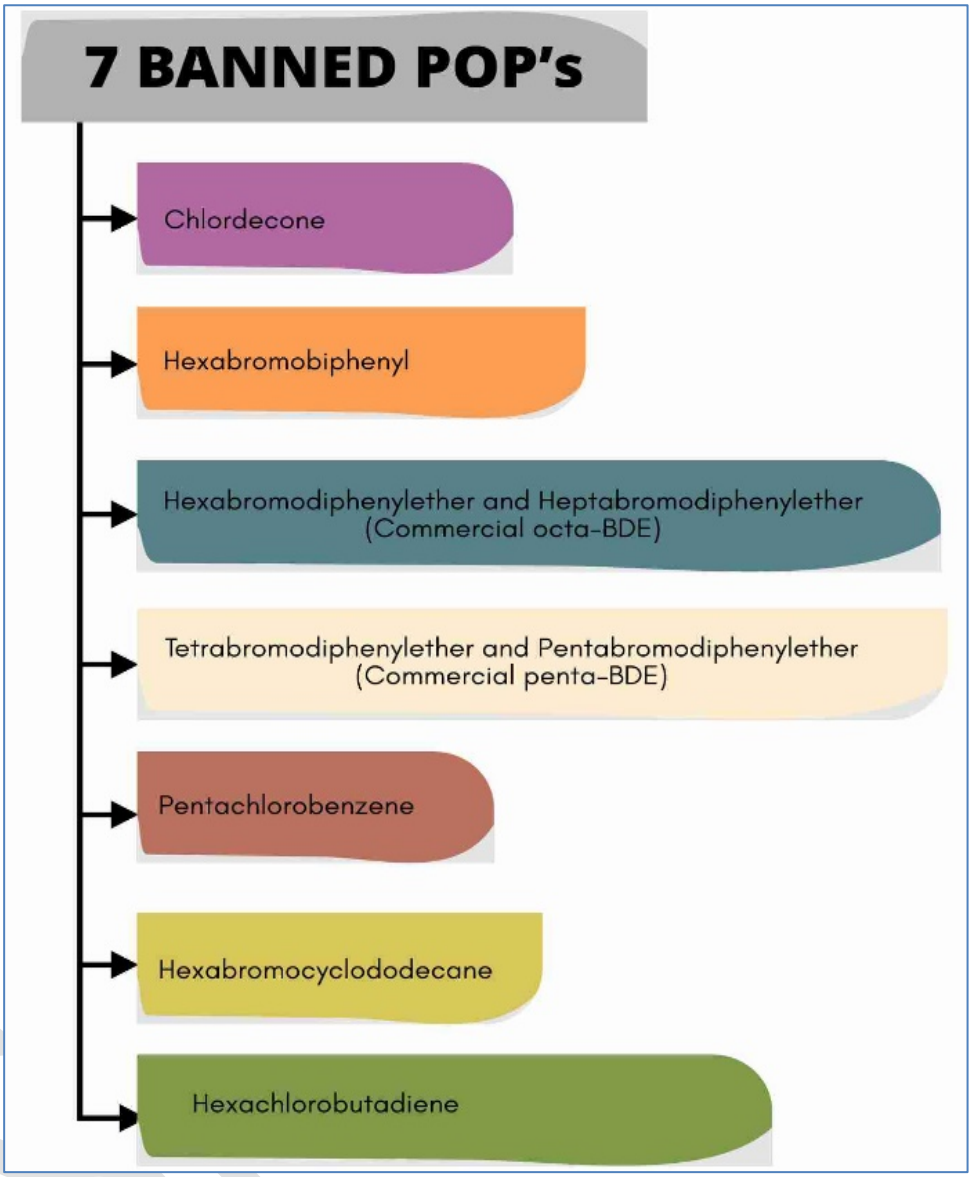
Biomass Waste Disposal	• Biomass waste such as dry leaves, dead branches, dry grass etc. are disposed of by first shredding it to suitable size followed by mixing **with the slurry of the biogas digester.**
	• This mixture is **feedstock for briquette**, which is utilized as fuel for cooking.
	• **Wealth:**
	  ○ These briquettes are also **utilized for production of syngas.**
	  ○ The ash produced from burning of briquette is mixed with cement and water for **production of bricks for construction work.**

Pyrolysis	• Polymer waste is heated to a temperature of **400 – 600°C in an anaerobic environment in presence of suitable catalyst.** The volatile matter from polymer waste on condensation gives **pyrolysis oil**.
	• **Wealth:**
	  ○ **Non-condensed syngas and crude pyrolysis oil** are used for heating purposes.
	  ○ The **solid residue known as char** is mixed with the biogas slurry for production of briquette.

2.4. STOCKHOLM CONVENTION

Why in news?

Recently, Cabinet ratified ban of 7 Persistent Organic Pollutants (POP's) listed under Stockholm Convention. Also, the **Cabinet has delegated its powers** to ratify chemicals under the Stockholm Convention to Union Ministries of External Affairs **(MEA)** and Environment, Forest and Climate Change **(MoEFCC).**



More on News

- The ratification process **would enable India to access Global Environment Facility (GEF)** financial resources in updating National Implementation Plan (NIP).
  - NIP is to meet the country's obligations under the Stockholm Convention.

About Stockholm Convention

- Stockholm Convention is a **global treaty to protect human health and environment from POPs.**
  - It is **legally binding.**
- India **ratified the Stockholm Convention in 2006.**
  - Ministry of Environment had notified the **'Regulation of POP Rules'** in 2018, under the Environment (Protection) Act, 1986.
- POPs are chemical substances that **persist in environment for a long period, bio-accumulate in living organisms, adversely affect human health/ environment** and have the property of long-range environmental transport.
  - **Exposure to POPs can lead to** cancer, damage to central and peripheral nervous systems, diseases of immune system, reproductive disorders and child development.

Organochlorines

- According to reports, Organochlorines seem to be the reason **behind a mystery disease that has impacted 450 patients in with seizures, nausea, dizziness and headaches.**
- Organochlorines are a **group of chlorinated compounds that belong to the class of persistent organic pollutants (POPs).**
  - They are relatively cheaper and as a result widely used as pesticides (40% of all pesticides) in Asia.
  - They are capable of causing adverse effects in the central and peripheral nervous system.

2.5. ENVIRONMENTAL PERFORMANCE INDEX (EPI)

Why in News?

EPI was recently released by **Yale University**.

About EPI

- It is a biennial index which ranks 180 countries on 32 performance indicators across 11 categories **covering environmental health and ecosystem vitality.**
- EPI ranks **180 countries** on **environmental health and ecosystem vitality** using 32 performance indicators across 11 categories including Air Quality, Sanitation & Drinking Water, Heavy Metals, Waste Management, Biodiversity & Habitat, Ecosystem Services, Fisheries, Climate Change, Pollution Emissions, Water Resources, and Agriculture.
- Overall EPI rankings indicate **which countries are best addressing the environmental challenges** that every nation faces.

Key Findings

- India **secured 168 rank (compared to 177 in 2018) out of 180 countries** in the 12th edition of the biennial Environment Performance Index
  - India scored **below the regional average score on all five key parameters** on environmental health.
  - All South Asian countries, except Afghanistan, were ahead of India in the ranking.
  - According to the index **India needs to re-double national sustainability efforts** on all fronts such as air and water quality, biodiversity and climate change.

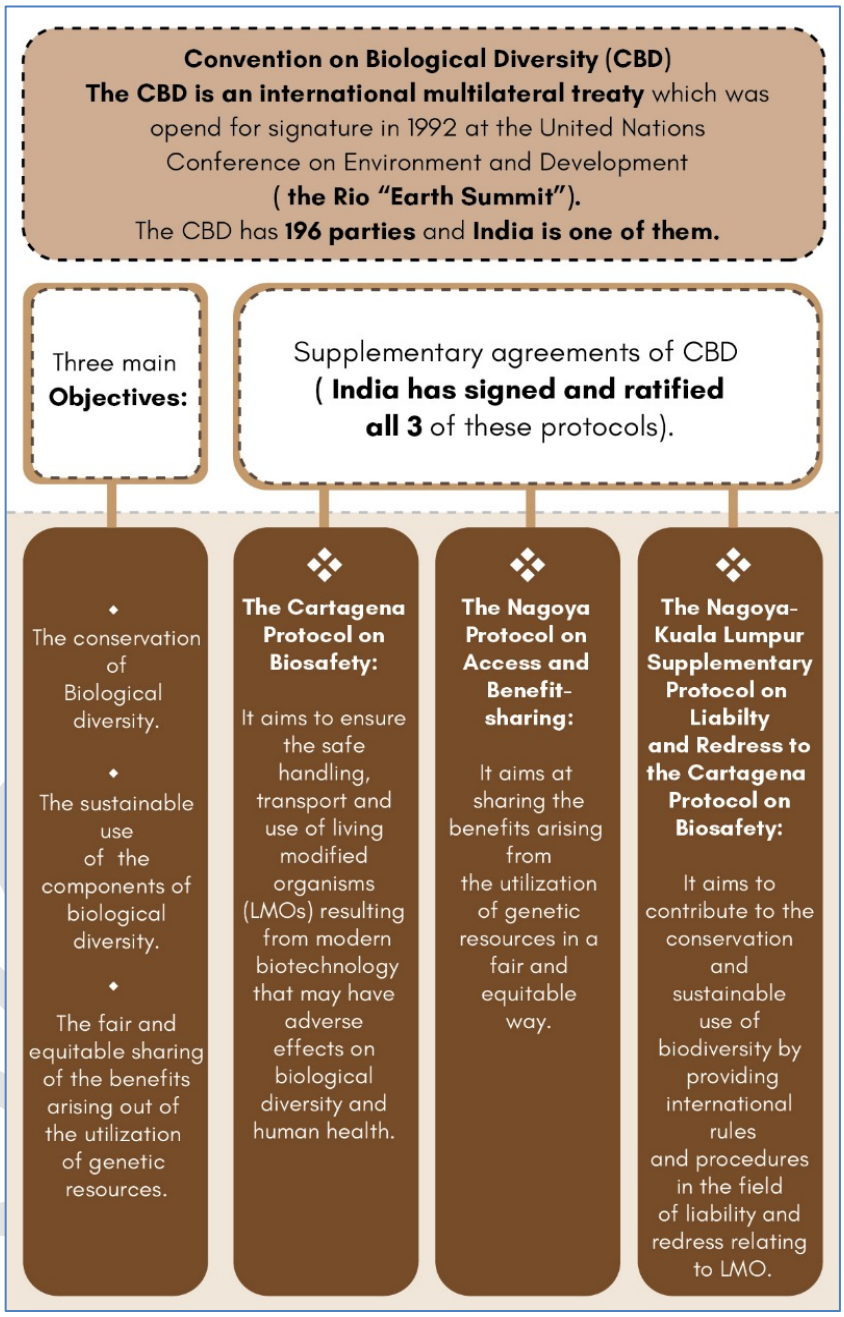
3. BIODIVERSITY

3.1. SUPER YEAR FOR BIODIVERSITY

Why in news?

The year 2020 is the **"Super Year For Biodiversity"**, as the **Strategic Plan for Biodiversity** with 20 global **Aichi targets adopted in 2010 ends in 2020.**

About Strategic Plan for Biodiversity 2011-2020 (SPB 2011-2020)



- SPB 2011-2020 was adopted by the parties to the CBD, during the tenth meeting of the Conference of the Parties **(COP10)** in 2010 in **Nagoya, Japan.**
- The Strategic Plan is comprised of a shared vision, a mission and **20 targets organized under 5 strategic goals,** collectively known as the **Aichi Biodiversity Targets (ABTs).**
  - **Vision:** Living in Harmony with Nature where by 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people.
  - **Mission:** To take effective and urgent action to halt the loss of biodiversity in order to ensure that **by 2020 ecosystems are resilient and continue to provide essential services,** thereby securing the planet's variety of life, and contributing to human well-being, and **poverty eradication.**
- To implement the SPB 2011-2020, Parties to CBD agreed to:
  - Update their **national biodiversity strategies and action plans (NBSAPs)** in line with the SPB 2011-2020.
  - Develop **national targets** using the Strategic Plan and ABTs as a flexible framework, and **integrate these national targets into the updated NBSAPs.**
  - Adopt the updated NBSAPs as a **policy instrument.**
  - **Report on progress** achieved towards implementation of the Strategic Plan and Aichi Biodiversity Targets through **National Reports.**
    - According to India's **6th National Report,** India is on track to achieve 9 out of its 12 NBTs and exceed 1 of them (NBT 6), but is moving towards 2 of the targets (NBT 4 and 12) at an insufficient rate.
- Presently, the negotiations to develop the post-2020 global biodiversity framework are ongoing.

CBD strategic gols	Aichi Target
Address underlying causes	1 Improve awareness of biodiversity 2 Mainstream biodiversity 3 Reform Incentives 4 Implement plans for sustainability
Reduce pressures and promote sustainable use	5 Reduce habitat loss and degradation 6 Fish sustainably 7 Make farming and forestry sustainable 8 Reduce pollution 9 Tackle invasive species 10 Minimise climate change Impacts
Safegaurd ecosystems, species and genes	11 Protect and manage critical sites 12 Prevent extinctions 13 Maintain genetic diversity
Enhance benefits from biodiversity and ecosystems	14 Safeguard ecosystem services 15 Restore degraded forest 16 Implement access and benefit sharing
Enhance implementation through planning, knowledge management and capacity building	17 Implement NBSAPs 18 Protect traditional knowledge 19 Share biodiversity knowledge 20 Increase conservation finance

The 12 National Biodiversity targets of India are:

1. By 2020, a significant proportion of the country's population, especially the youth, is aware of the values of biodiversity and the steps they can take to conserve and use it sustainably **(Aichi Target 1).**
2. By 2020, values of biodiversity are integrated into national and state planning processes, development programmes and poverty alleviation strategies **(Aichi Target 2).**
3. Strategies for reducing the rate of degradation, fragmentation and loss of all natural habitats are finalized and actions put in place by 2020 for environmental amelioration and human well-being **(Aichi Targot 5 &15).**
4. By 2020, Invasive alien species and pathways are identified and strategies to manage them developed so that populations of prioritized invasive alien species are managed **(Aichi Target 9).**
5. By 2020, measures are adopted for sustainable management of agriculture, forestry and fisheries **(Aichi Target 6, 7, 8).**
6. Ecologically representative areas under terrestrial and inland water, and also coastal and marine zones, especially those of particular importance for species, biodiversity and ecosystem services, are conserved effectively and equitably, based on protected area designation and management and other area-based conservation measures and are integrated into the wider landscapes and seascapes, covering over 20% of the geographic area of the country, by 2020 **(Aichi Target 10,11, 12),**
7. By 2020, genetic diversity of cultivated plants, farm livestock, and their wild relativos, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity **(Aichi Target 13).**
8. By 2020, ecosystem services, especially those relating to water, human health, livelihoods and well-being, are enumerated and measures to safeguard them are identified, taking into account the needs of women and local communities, particularly the poor and vulnerable sections **(Aichi Target 14,).**
9. By 2015, Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization as per the Nagoya Protocol are operational, consistent with national legislation **(Aichi Target 16).**
10. By 2020, an effective, participatory and updated national biodiversity action plan is made operational at different lovels governance **(Aichi Target 3, 4,17).**
11. By 2020, national initiatives using communities' traditional knowledge relating to biodiversity are strengthened, with the view to protecting this knowledge in accordance with national legislation and international obligations **(Aichi Target 18).**
12. By 2020, opportunities to increase the availability of financial, human and technical resources to facilitate effective implementation of the **Strategic Plan for Biodiversity 2011-2020** and the national targets are identified and the Strategy for Resource Mobilization is adopted **(Aichi Target 19,20).**

Related News

Global Biodiversity Outlook

- Recently, Fifth Global Biodiversity Outlook (GBO-5) report was released.
- It is a flagship **publication of the Convention on Biological Diversity (CBD).**
- **GBO-5 provides global summary of progress towards the Aichi Biodiversity Targets.**
- **Progress made in Aichi Biodiversity Targets in past decade:** At the global level **none of the 20 targets have been fully achieved,** though six targets have been partially achieved (Targets 9, 11, 16, 17, 19 and 20).

UN Biodiversity Summit

- Recently, India participated in the UN Biodiversity Summit.
- The summit is **first of its kind which had taken place on Biodiversity** in the United Nations General Assembly.

- It was convened by **UN secretary general António Guterres** on the sidelines of the General Assembly aimed to build political momentum and bolster financial commitments ahead of talks next year in China.
- It was participated by Head of States/Minister level representing the countries which are **party to Convention on Biological Diversity (CBD).**
- Theme of the summit: **"Urgent action on biodiversity for sustainable development."**

International Day of Biodiversity (IDB)

- **UN has proclaimed May 22 as IDB** to increase understanding and awareness of biodiversity issues.
  - It is celebrated to commemorate May 22, 1992 for adoption of text of **Convention on Biological Diversity (CBD).**
- Theme for 2020: **Our solutions are in Nature.**
- **Few Initiatives launched by India on IBD-**
  - **Biodiversity Samrakshan Internship Programme** to engage postgraduate students to support the projects of National Biodiversity Authority.
  - **UNEP Campaign on Illegal Trafficking of Endangered Species** launched by the **Wildlife Crime Control Bureau,** with UNEP to address environmental challenges related to illegal trafficking.
  - **A Webinar Series on 'Biodiversity Conservation and Biological Diversity Act, 2002'.**
  - **WWF Model Conference of Parties (MCoP)** that engages the younger generation in conversations around impact of humanity's footprint on biodiversity
  - **An awareness campaign supported by WWF.**

3.2. WILDLIFE AND CONSERVATION

3.2.1. INTERNATIONAL UNION FOR CONSERVATION OF NATURE (IUCN) RED LIST

Why in news?

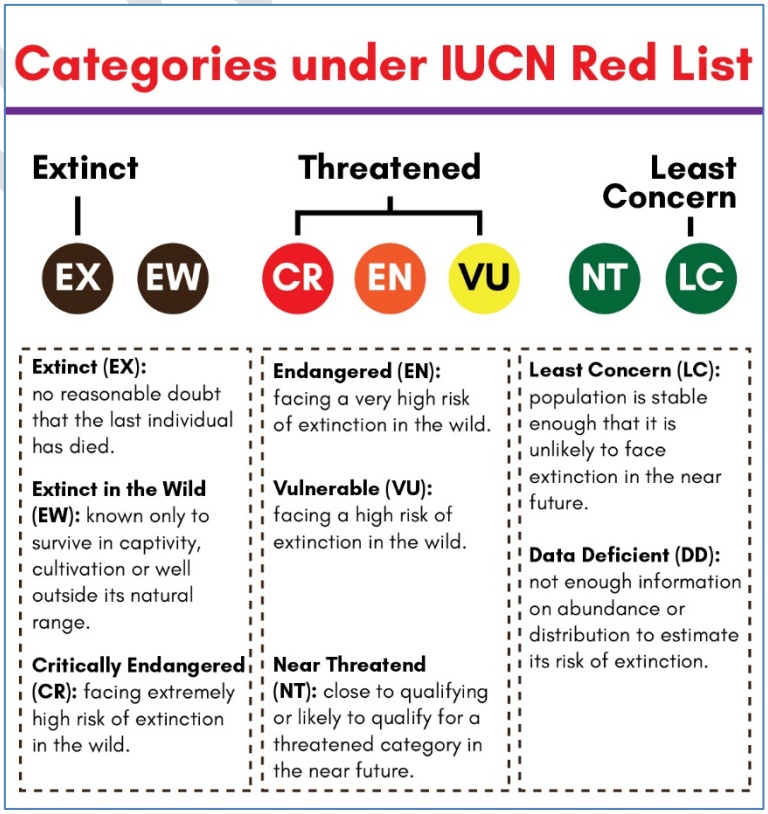
International Union for Conservation of Nature (IUCN) updated the red list of the threatened species.

About IUCN

- The IUCN is the **world's oldest global environmental** organization (both government and civil society organizations) **to promote nature conservation and the ecologically sustainable use of natural resources.**
- **Every four years, IUCN convenes the IUCN World Conservation Congress** to set the global conservation agenda.

More on the News

- The IUCN Red List of Threatened Species, founded in 1964, is the **world's most comprehensive inventory of the global conservation status of plant and animal species.**
  - **It uses a set of quantitative criteria** to evaluate the extinction risk of the species included in the **Global Species Programme of the IUCN.**



Updates

- An **additional 31 species are extinct in the wild** including species of fishes, sharks, and frogs.
- 15 freshwater fish species endemic to Lake Lanao and its outlet in the Philippines
- Lost Shark (listed as critically endangered / possibly extinct)
- Three Macadamia species of protea (a genus of South African flowering plants) family.
- There are now 112,432 species on the IUCN Red List and nearly **1/3rd (30,178) of species are threatened with extinction.**

- Findings related to Indian species:
  - **No confirmed sightings of the Jerdon's Courser (CR) since 2009:** Jerdon's Courser is a nocturnal bird known only from Eastern Ghats (Andhra Pradesh and Telangana) and is found on the fringes of **Sri Lankamaleswara Wildlife Sanctuary**.
    - ✓ It inhabits open patches within scrub-forest. This habitat is under tremendous pressure due to various anthropogenic activities.
  - **Himalayan Quail (CR) was last spotted in 2010 however it may still be extant, with an estimated year of extinction of 2023:** The Himalayan quail is a medium-sized bird belonging to the pheasant family, with distinctive red or yellow bill and legs, and prominent white spots around the eyes. It is native to India, found only in the mountains of **Uttarakhand in north-west Himalayas**.
  - All **five freshwater dolphins species - Ganga, Amazon, Indus, Irrawaddy and Tucuxi** - are threatened with extinction.

Related News
Red List Assessment of Indian Grasshoppers
Recently, the **Grasshopper Specialist Group of the International Union for the Conservation of Nature (IUCN) initiated the Red List Assessment of grasshoppers in India.**

- Red List of Threatened Species, founded in 1964, is the world's most comprehensive inventory of the global conservation status of biological species.
- The project will start from the Nilgiri biosphere reserve spread in three states of Kerala, Tamil Nadu and Karnataka followed by other parts of the country
- The assessment will also include a **new species of grasshopper (named 'TettilobusTrishula' or 'Shiva's pygmy trishula')** discovered in the **Eravikulam National Park** in **Kerala's Idukki district.**
  - Grasshoppers are primarily considered as agricultural pest.
  - They live in all sorts of environments except those covered in snow.
  - Their survival status would explain about the environment they are living in.
- The Indian grasshopper species has remained a neglected group since none had been included earlier in the Red List of Threatened species.

3.2.2. TIGER STATUS REPORT 2018

Why in News?

Fourth tiger census report, Status of Tigers, Co-predators, Prey and their Habitat, 2018 shows the count of tigers in India, has risen to 2967, in 2018 from 2,226 in 2014.

More on News

- Report assesses the status of tigers in terms of spatial occupancy and density of individual populations across India.
- **Technologies used in this assessment**
  - **M-STrIPES** (Monitoring system for tigers - intensive protection and ecological status) using GPS to geotag photo-evidences and survey information, made this exercise more accurate
  - **CaTRAT** (Camera Trap data Repository and Analysis Tool) for automated segregation of camera trap photographs to species.
- During the release of the report**, a water and fodder scheme was proposed within the reserves** so that fewer animals stray out of these reserves and minimizes animal-human conflict.
- It is also **crucial to keep track of their numbers** as Global Tiger Forum, an international collaboration of tiger-bearing countries, **has set a goal of doubling the count of wild tigers by 2022.**
  - **India already achieved the target of doubling the count**.

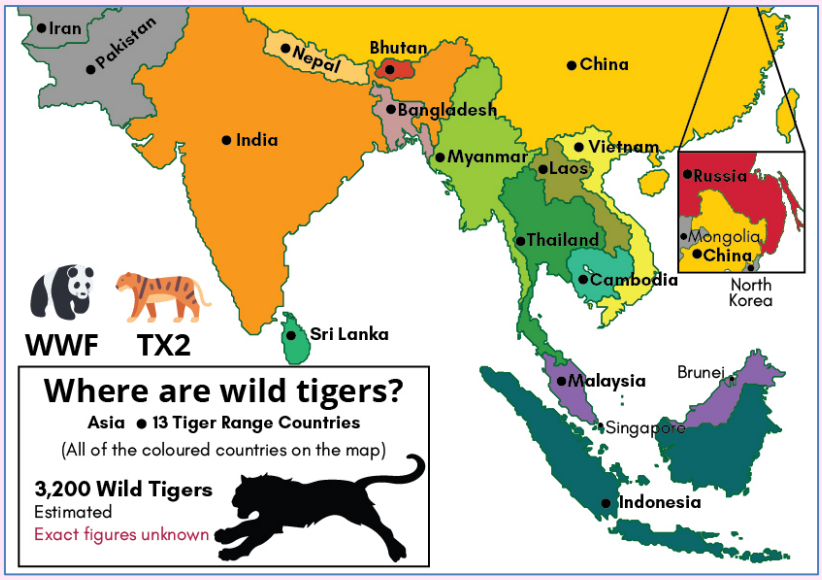
Key Findings

- **At 2,967, India hosts 70% of the world's tigers**. Tigers were observed to be increasing at a rate of 6% per annum (2006 to 2018).
  - Nearly a third of India's tigers are living outside tiger reserves.
- **Madhya Pradesh (526) has the maximum number** of tigers followed by Karnataka (524) and Uttarakhand (442).
- **Northeast has suffered losses in population.** Tiger status in Chhattisgarh, Jharkhand and Odisha has steadily declined.

- **Largest contiguous tiger population** in the world of about 724 tigers was found in the Western Ghats (**Nagarhole-Bandipur-Wayanad -Mudumalai- Satyamangalam-BRT block**).
  - Second largest population of about 604 tigers was found across Uttrakhand and western Uttar Pradesh (**Rajaji-Corbett-Ramnagar-Pilibhit-Dudhwa block**).
  - **Corbett TR in Uttarakhand has highest tiger density in the world.**
- Nearly **17 of the 50 reserves are approaching the peak of their capacity** at sustaining their populations.
- **Factors that correlate and possibly determine tiger density:**
  - Density would increase with increase in primary prey (chital, sambar and gaur).
  - Density would increase with increase in tiger habitat and its quality.
  - Density should decline with increasing human impacts and decrease in protection regime.
- While the number of **tigers has increased, the same is not true for the co-predators such as** striped hyena, the Indian wild dog (dhole), jackals and wolves.
- **Highest prey densities** were recorded for Corbett, Rajaji, Pench and Bandipur. Tiger Reserves of the North East are plagued with prey depletion due to the practice of bush meat consumption.

About Indian Tiger or Royal Bengal Tiger (Panthera tigris)

- It is the **tiger species native to India.**
- IUCN Status: **Endangered**
- The largest populations of Bengal tigers are in India, but there are some smaller groups in **Bangladesh, Nepal, and Bhutan**. It may also be present in areas of **China and Burma.**
- India is home to about **70 per cent of global tiger population.**
- Tigers are both **a Flagship and Umbrella species.** As a Flagship species they are important for conservation and as Umbrella species, tiger conservation leads to conservation of other species.
- **Tigers inhabit 13 countries** – Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Lao PDR, Malaysia, Myanmar, Nepal, Russia, Thailand and Vietnam.



- In 2010, these **countries pledged to double the number of tigers by 2022,** which is the Chinese Year of the Tiger.
- **Conservation status of Tiger**
  - **IUCN Red List:** Endangered
  - **Wild life protection Act**: Schedule 1
  - **CITES**: Appendix 1

Related News

Conservation Assured | Tiger Standards (CA|TS)

- India has decided **to extend CA|TS across all its tiger reserves** for further strengthening and improving management interventions.
  - This brings India's **total number of registered sites to 94** (including sites outside the Tiger Reserves).
- CA|TS is a conservation tool that **sets best practice and standards to manage target species,** and encourages assessments to benchmark progress.
  - Tigers are the first species selected for the initiative.
- It is a partnership of tiger range governments, inter-governmental agencies, institutions, NGOs and conservation organisations.
- **It is being adopted for use beyond tigers,** including potentially jaguars, lions and freshwater dolphins.
- **World Wide Fund for Nature** is helping tiger range countries to implement CA|TS.

TX2 Tiger Conservation Awards (TTCA)

- TX2 is the global award which was set up in 2010 in **St. Petersburg Tiger Summit by international organizations working for tiger conservation like** WWF, UNDP, IUCN, Global Tiger Fund, CATS and The Lion's Share.

- TX2 stands for "Tigers times two", **signaling the goal set by 13 tiger range countries to double population of wild tigers by 2022.**
- TTCA are given in two categories:
  - **Tiger Conservation Excellence Award: Transboundary Manas Conservation Area (TraMCA)** comprising Manas National Park in Assam and Royal Manas National Park in Bhutan won this award.
    - ✓ Award recognises a site that has **achieved excellence in two or more of five themes:**
      - Tiger and prey population monitoring and research;
      - effective site management;
      - enhanced law enforcement and protection;
      - community-based conservation,
      - habitat and prey management.
  - **TX2 Award:** This award is given for efforts to increase tiger population and includes a financial grant to assist ongoing conservation.
    - ✓ **Pilibhit Tiger Reserve (PTR)** in Uttar Pradesh won this award for doubling its population.
      - PTR is important for connectivity across the vast **Terai Arc Landscape of India and Nepal.**
      - Its southern boundary is marked by the **river Sharada and Khakra.**

KAZI 106F

- It is **India's only Golden Tiger** found in **Kaziranga National Park of Assam**.
- **A golden tiger**, also called tabby tiger or strawberry tiger, is a tiger with a **color variation** caused by a **recessive gene**.
- **The yellow skin** of tigers is controlled by a set of **'agouti genes'** while the **black stripes** are controlled by **'tabby genes'** and their alleles. **Suppression** of any of these genes may lead to **color variation** in a tiger.
- Golden tigers are characterized by **blonde or pale-golden color and reddish stripes** in place of black like in normal tigers.
- **Concerns**: Their rare skin tone is a result of **excessive inbreeding**.
  - **Inbreeding is defined as** the probability of two alleles in an individual being identical by descent, and is normally the result of mating related individuals.
  - It can increase the chances of offspring being affected by deleterious or recessive traits.
  - Tigers resort to inbreeding when their population is almost islanded without connectivity to other landscapes, which is mainly caused by habitat loss and destruction of corridors.

3.2.3. STATUS OF LEOPARDS IN INDIA, 2018

Why in news?

Status of Leopards in India, 2018 Report was recently released by Ministry for Environment, Forest and Climate Change.

Key Findings

- **Species:** Leopards are among the most adaptable carnivores, and are known to exist very close to human habitations.
- **Population:** India now has 12,852 leopards, **60% increase compared to the previous estimate (2014).** Highest population
  - **State Wise: Highest population in** Madhya Pradesh, followed by Karnataka and Maharashtra.
  - **Region wise:** central India and eastern ghats

About Leopards

- Indian subspecies (Panthera pardus fusca) is **found in all forested habitats in the country, absent only in the arid deserts and above the timber line in the Himalayas.**
  - In the Himalayas they are sympatric with snow leopards (Panthera uncia).
- **IUCN status:** Vulnerable.
- It is also listed in **Appendix I of the Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES)** and in Schedule I of the Wildlife (Protection) Act 1972.

Related News: Leopard poaching in India

- A recent study by TRAFFIC India revealed that of the total of 747 leopard deaths between 2015-2019 in India, 596 were linked to illegal wildlife trade and poaching.
- Highest poaching incidents were reported from Uttarakhand and Maharashtra.
- TRAFFIC is **non-governmental organisation** working globally on **trade in wild animals and plants** in the context of biodiversity conservation and sustainable development.
  - It was established in 1976 by **International Union for Conservation of Nature (IUCN) and World Wide Fund for Nature**.

- **Rajasthan was first state to launch a project Leopard** to mitigate human-leopard conflicts and conserving the leopard population.
- **Threat:** Poaching, habitat loss, depletion of natural prey and human-conflict**.**

3.2.4. SNOW LEOPARD

Why in news?

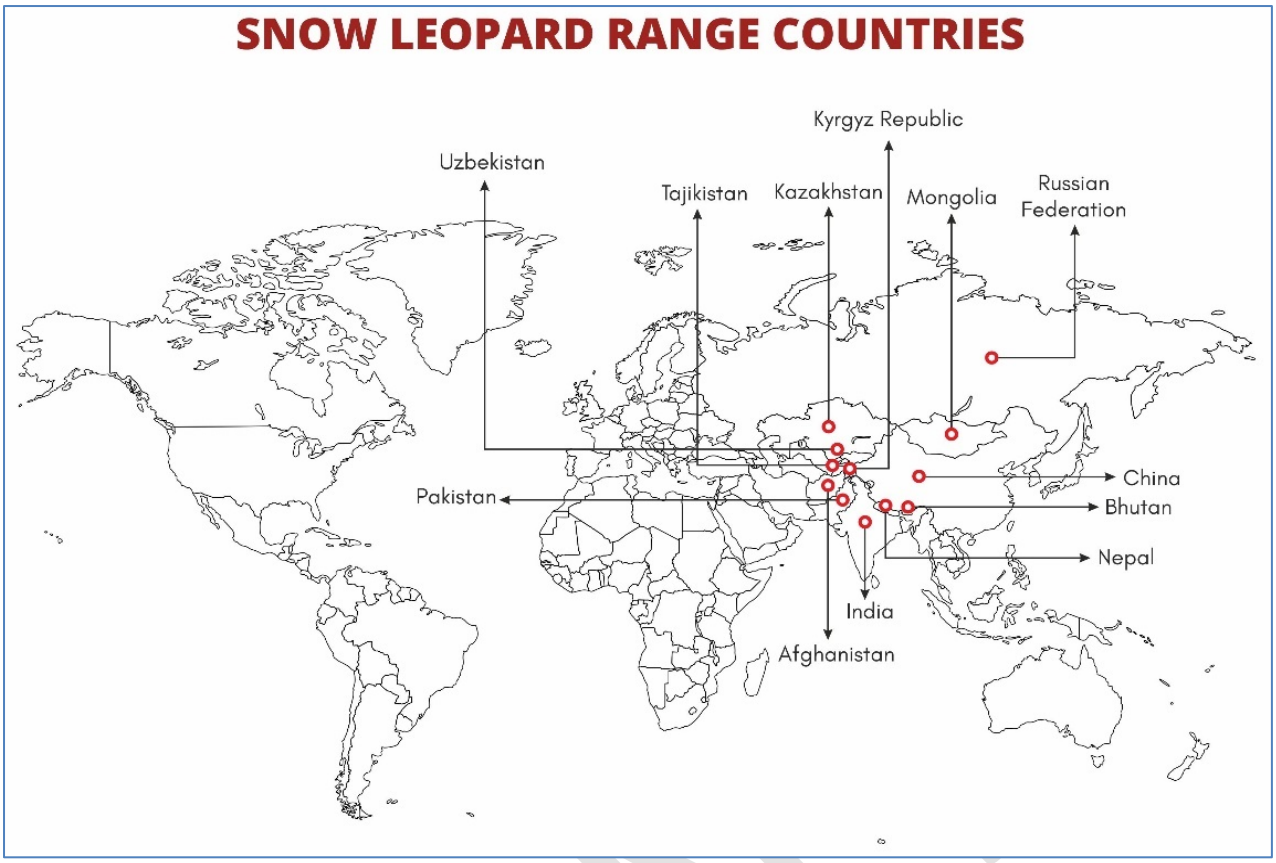
India's first snow leopard conservation centre will be established in Uttarakhand.

More about news

- The conservation centre will be built by the **Uttarakhand forest department along United Nations Development Programme (UNDP) in Uttarkashi forests** as part of its six-year long project, **SECURE Himalayas**.
    - The project looks into conversation of snow leopards and other endangered species and their habitats, found in Himalayas. **This project was started in 2017.**
    - It is funded by **the Global Environment Facility**-United Nations Development Programme.
- The Snow leopard conservation centre aims to protect the animal with the help of local community and also **give employment to locals** from nearby villages through tourism. It also aims to conservation and restoration of Himalayan ecosystems.

About Snow Leopards

- It is a **Schedule I animal under Wildlife Protection Act** of India.
- IUCN status: **Vulnerable**
- They are listed under Appendix I of CITES.
- The animal faces many threats to its existence due to poaching and habitat destruction.
- In India, it inhabits the Himalayas at elevations ranging from 3,000 to 4,500 metres across **Jammu and Kashmir, Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, and Arunachal Pradesh.**
    - This area contributes to about five per cent of the global snow leopard range.
    - In Uttarakhand, snow leopards are found in Nanda **Devi Biosphere Reserve, Gangotri National Park, Askot Wildlife Sanctuary**.



3.2.5. ASIATIC LIONS

Why in News?

Gujarat government is not in favour of translocating lions to Madhya Pradesh (MP).

More on the News

- Gir National Park and Wildlife Sanctuary (Gujarat) is the **only place in the world where Asiatic lions** are found.
- In 2013, Supreme Court ruled **in favour of creating a second home for them** by translocating a few of them to **Kuno Wildlife Sanctuary in MP**.
    - High rate of inbreeding and the resultant reduced genetic diversity may make Gir lions **highly susceptible to epidemics.**
    - **Gir Forest is unable to sustain** the steadily increasing numbers.
    - Infections, food poisoning and infighting among lions.
- However, till date, **not a single Gir lion has been transported to MP.** Gujarat government had stated that lions are:
    - **Pride of the state and like family members** to local communities and Barda Wildlife Sanctuary (Porbandar) was being prepared as a second home for lions.
    - Safe in Gujarat and that **their population and range was growing.**

About Asiatic Lions (Panthera leo persica)

- **IUCN status:** Endangered.
- Asiatic lions are **slightly smaller than African lions** (IUCN status: Vulnerable).
- Listed in Schedule I of Wildlife (Protection) Act 1972, in Appendix I of CITES.
- According to 2020 census, there are an estimated 674 Asiatic lions (increased by 29% in last 5 years) in Gir forest region, Gujarat and other revenue areas of coastal Saurashtra.
    - Geographically, distribution area is also up by 36%.
- They face the usual threats of poaching and habitat fragmentation.

3.2.6. AFRICAN CHEETAH RE-INTRODUCTION

Why in news?

Wildlife Institute of India (WII) experts evaluated sites in Madhya Pradesh for African cheetah re-introduction.

More on the News

- Experts looked for **best habitat based on prey base, safety and topography.**
- Cheetah was declared extinct in India in 1952.
- **Shortlisted sites include** Kuno Palpur sanctuary, Nauradehi sanctuary, Gandhi Sagar sanctuary and Madhav National Park (all lying in Madhya Pradesh).
- In 2010, **central government expert panel recommended** KunoPalpur, Velavadar National Park (Gujarat) and Tal Chapar sanctuary (Rajasthan) for reintroducing Cheetah.
  - KunoPalpur was the preferred location. It was also the place prepared by MP to house Asiatic lions.
- However in 2013, **Supreme Court quashed plan** for introducing African cheetahs to KunoPalpur **citing reasons like** possible conflict with a parallel project to introduce lions at same site, lack of prey base, man-animal conflict etc.
  - SC left the decision for relocation of the African cheetah **National Tiger Conservation Authority's discretion** to be taken after a proper survey and the action of introduction of the animal.
  - The Central government revived **plan in 2017**.
  - In January 2020, SC set up a three-member committee to guide National Tiger Conservation Authority in taking decision for relocation after a proper survey.

About Cheetah

- **IUCN status:** African Cheetah- **Vulnerable** and Asiatic Cheetah – **Critically endangered.**
- **Asiatic cheetah is much stronger** and faster than African cheetah.

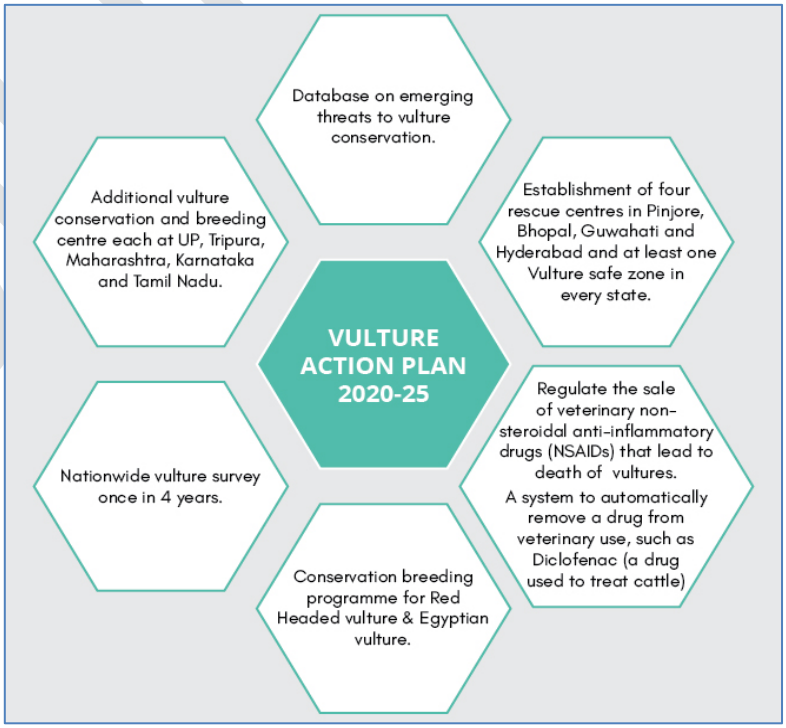
3.2.7. VULTURE ACTION PLAN 2020-25

Why in news?

Ministry of Environment, Forests and Climate Change (MoEFCC) launched Vulture Action Plan 2020-25.

More on the News

- While MoEFCC has been carrying out a conservation project for vultures since 2006, new plan now extend the project to 2025 **to not just halt the decline but to actively increase the vulture numbers.**
- **Threats to Vulture include** collision and electrocution, unintentional poisoning, etc.
  - **Between 1990s and 2007, numbers of three critically-endangered species** – Oriental white-backed, long-billed and slender-billed vultures — **declined by 99%.**



Vulture species in India	
Vulture	**IUCN Status**
Oriental white-backed Vulture	Critically-endangered
Long-billed Vulture	Critically-endangered
Slender-billed Vulture	Critically-endangered
Red-headed Vulture	Critically-endangered
Egyptian Vulture	Endangered
Himalayan Vulture	Near threatened
Bearded Vulture	Near threatened
Cinereous Vulture	Near threatened
Eurasian Griffon Vulture	Least Concern

3.2.8. GREAT INDIAN BUSTARD (GIB)

Why in news?

It is reported that Union Ministry of Power (MoP) and the Rajasthan government has **rejected Wildlife Institute of India (WII) proposal to put all power transmission lines passing through GIB habitat underground.**

More on the News

- Earlier, in 2019, on order of National Green Tribunal had suggested some recommendations to protect the GIB
  - **Mitigating all power transmission lines** passing through priority bustard habitats by undergrounding cables
  - **develop predator-proof enclosures in known breeding sites** and keep away nest predators such as dogs, pigs, foxes and other species using professional trappers.
  - Rajasthan Forest Department (RFD) could **engage with local communities to promote Bustard friendly agricultural practices** and grow crops that are preferred by them.
  - **Disallowing new wind turbines and solar farms** in the 13, 000 square kilometre priority GIB habitat in Rajasthan and Gujarat.

About Great Indian Bustard

- IUCN Status: **Critically Endangered**
- Listed in Schedule I of the Indian Wildlife (Protection) Act, 1972, in the CMS Convention and in Appendix I of CITES.
- It is **endemic to Indian Sub-continent**, found in central India, western India and eastern Pakistan.
- **Important Sites for the species are:** Desert National Park Sanctuary (Rajasthan), Naliya (Gujarat), Warora (Maharashtra) and Bellary (Karnataka)
- The habitat where it is most often found is **arid and semi-arid grasslands, open country with thorn scrub, tall grass** interspersed with cultivation. It avoids irrigated areas.
- It's one of the Species for the Recovery Programme under the **Integrated Development of Wildlife Habitats** of the Ministry of Environment and Forests.

Related News: Pokharan's firefly bird diverter

- It is an initiative of the Ministry of Environment Forest and Climate Change (MoEFCC) along with the Wildlife Conservation Society (WCS) **to protect the Great Indian Bustard (GIB) from overhead power lines.**
- Firefly bird diverters are flaps installed on power lines.

3.2.9. INDIA'S FIRST DOLPHIN OBSERVATORY

Why in news?

The Bihar government is setting up India's first observatory for the **Gangetic dolphins** in Bhagalpur district.

More about news

- The observatory is constructed at **Vikramshila Gangetic Dolphin Sanctuary (VGDS).**

- Observatory will aim to **promote eco-tourism.**
- There would be no adverse impact on the river's ecology as the observatory is being constructed on a **Sultanganj-Aguwani Ghat bridge** over the Ganga.

About Gangetic dolphin

- They **prefer deep waters, in and around the confluence of rivers.** They can **only live in freshwater** and are essentially blind**.**
  - They are reliable indicator of the health of the entire river ecosystem.
- It is also **National Aquatic Animal of India.**
- It can be found in the **Ganges-Brahmaputra-Meghna** and Karnaphuli-Sangu river systems of Nepal, India, and Bangladesh.
- They are also known as 'Susu' because of the sound it produces when breathing.
- In India, it covers seven states namely, **Assam, Uttar Pradesh, Madhya Pradesh, Rajasthan, Bihar, Jharkhand and West Bengal**.
- **Major threats to dolphins in I**ndia include overfishing in the habitat, pollution, infrastructure etc.
- Gangetic dolphins are one among the 21 species identified under the centrally sponsored scheme, **"Development of Wildlife Habitat".**
- **Conservation Action Plan for the Gangetic Dolphin (2010-2020),** which has identified threats to Gangetic dolphins and impact of river traffic, irrigation canals and depletion of prey-base on dolphin populations.
- Recently, **Prime Minister announced Project Dolphin,** to work as a catalyst to increase Dolphin population.

Other dolphins found in India

- **Indus River Dolphin**
  - IUCN Status: **Endangered**
  - They can only be found in the **lower parts of the Indus River in Pakistan and in River Beas,** a tributary of the Indus River in Punjab, India.
  - They have adapted to life in the muddy river and are functionally blind.
  - The dolphin is the **state aquatic animal of Punjab**.
- **Irrawaddy Dolphin (Snubfin dolphin)**
  - IUCN Status: **Endangered**
  - Besides the Irrawaddy River, it is also found in India's **Ganges, Chilika Lake and Southeast Asia's Mekong River.**
  - They prefers to live in estuaries and brackish water near coasts.
- **Indian Ocean humpback dolphin**
  - IUCN Status: **Endangered**
  - They prefer the shallow, near shore waters of countries in the Indian Ocean, ideally with a freshwater input.
  - They can be found not far from shore in the coastal waters of **South Africa in the south, northwards around the coast of East Africa, throughout the Middle East, and the west coast of India.**

3.2.10. FISHING CAT

Why in news?

The Chilika Development Authority (CDA) designated the **Fishing Cat as ambassador of Chilika Lake, Odisha** in a step towards conservation of the feline species.

About Fishing Cat

- **Fishing Cat** is an adept swimmer and is known to even dive to catch fish.
  - It is **nocturnal** and apart from fish also preys on frogs, crustaceans, snakes, birds and scavenges on carcasses of larger animals.
  - **Wetlands are the favourite habitats** of the fishing cat and are **mainly found in the mangrove forests of the Sundarbans**, around Chilika Lake, foothills of the Himalayas along Ganga and Brahmaputra river valleys and in the Western Ghats.
- **Conservation status**
  - IUCN status: **Vulnerable**
  - **Convention on International Trade in Endangered Species (CITES)** lists the fishing cat on **Appendix II**.
  - **Schedule I of the Indian Wildlife (Protection) Act, 1972** and thereby protected from hunting.
- **Threats faced by Fishing cat includes** Habitat loss due to development activities in wetlands; Intensive aquaculture; hunting for meat and skin etc.
- In **2012,** the West Bengal government officially declared the **Fishing Cat as the State Animal.**

About Chilika Lake

- It is a **brackish water lake and a shallow lagoon** with estuarine character in **Odisha**.
- It is the **largest brackish water lagoon in Asia** and **India's oldest Ramsar Site**.
- It is the **largest wintering ground for migratory waterfowl** found anywhere on the Indian sub-continent.
- **The Nalabana Island within the Chilika lake** is notified as a Bird Sanctuary under Wildlife (Protection) Act, 1972.
- It was included in the Montreux Record (Threatened list) in 1993 under Ramsar Convention but due to successful restoration of the lake ecosystem by Chilika Development Authority it was **removed from the Montreux Record in 2002 (first site from Asia).**

3.2.11. LICHENS

Why in news?

Uttarakhand forest department has developed the country's first lichen park in Munsiyari, Uttarakhand.

About Lichens

- Lichen is a **composite organism that emerges from algae or cyanobacteria** living among the filaments of the **fungi**, living in a **symbiotic relationship**.
- Whereas algae normally grow only in aquatic or extremely moist environments, lichens can potentially be found **on almost any surface (especially rocks)** or as **epiphytes** (meaning that they grow on other plants).
- More than 20,000 **species** of lichens are found in the world and **India has around 2,714** of them. Uttarakhand is home to more than 600 species of lichens.
- In local parlance, these are called **"jhula" or "pathar ke phool"**
- Lichens are slow growing and can live for centuries.
- **Some major uses of lichens:**
  - **Separation of minerals** by eroding rocks.
  - K**ey ingredient** in many cuisines.
  - Used for preparing an **indigenous perfume** in Kannauj.
  - Used in **sunscreen creams**, dyes, and some medicines.
  - **Act as bioindicators:** Some lichens are very **tolerant to pollutants such as nitrogen and sulphur compounds**, while others are very sensitive to the presence of one or both of these chemicals.
  - **Filters:** It absorbs and stores radioactive substances, such as cesium and strontium compounds, without apparent harm.

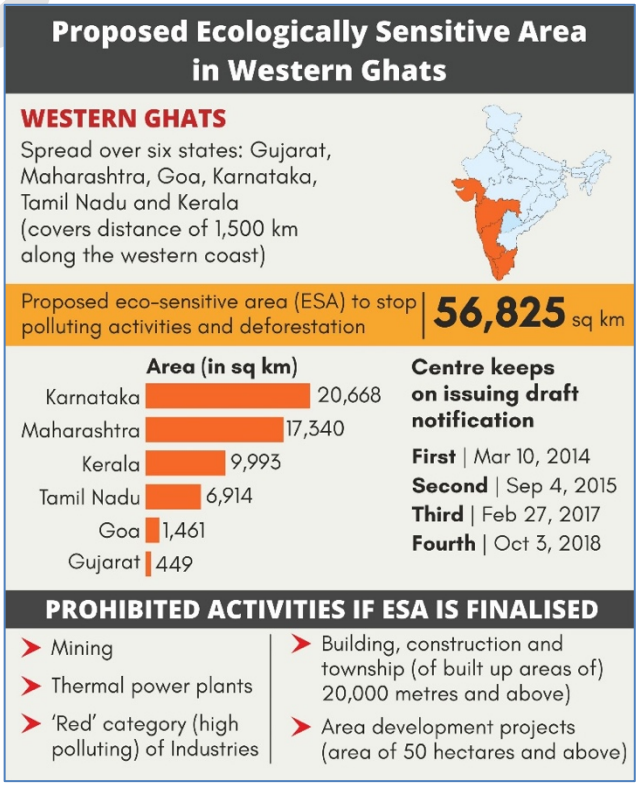
3.2.12. ECOLOGICALLY SENSITIVE AREA (ESA)

Why in news?

Several states have expressed desire to expedite early notification of Ecologically Sensitive Area (ESA) of Western Ghats (WG).

More on the News

- Six states, which form WG, asked **centre to expedite the process to notify the ESAs** in the global biodiversity hotspot for clarity.
  - In 2018, Centre issued a draft notification mentioning 56,825 sq km of WG in six states as ESA.
  - Six states **seek modifications to the notification** as it would create adverse effect on state's economy.
- Also, earlier two committees had recommended about ESA in WG, however both were rejected:
  - **K Kasturirangan committee** in 2012 recommended 37% of WGs to be declared ESAs.
  - **Madhav Gadgil Commission,** formed in 2010, recommended 64 % of WG to be declared ESAs.



About Eco Sensitive Zones (ESZ)/ ESA

- **ESZs or Ecologically Fragile Areas (EFAs)** are areas within 10 km around PA, National Parks and Wildlife Sanctuaries.
  - They are meant to be **shock absorbers and transition zones** from areas of high to low protection for wildlife and biodiversity.
  - It is **notified by the MoEFCC under the Environment Protection Act 1986** and Wildlife Conservation Strategy, 2002.
- Sensitive corridors, connectivity and ecologically important patches i.e. area beyond 10 km width can also be included in ESZ.
- It seeks to provide **special protection** to landscape, biodiversity, wildlife, historical value, **regulate developmental activities** and ensure sustainable development in the ESA.

Related News

Zonal Master Plan (ZMP) for Bhagirathi Eco-Sensitive Zone (Uttarakhand) approved

- Bhagirathi Eco-Sensitive Zone (ESZ) from Gaumukh to Uttarakashi was notified in 2012. It mandated the Uttarakhand government to prepare ZMP.
- ZMP is based on watershed approach and includes governance in the area of forest and wildlife, watershed management, irrigation, energy, tourism etc.

National Board for Wildlife (NBWL) nod not required for certain category of projects

- Railway projects, small-scale development works involving construction over less than 20,000 square metres, and under-25 MW capacity hydropower plants will not require approval from NBWL even if they are located within eco-sensitive zones (ESZs) of national parks or wildlife sanctuaries.
- As per the provisions of Wild Life (Protection) Act, 1972, any non-forestry activity inside a Sanctuary or National Park requires clearance from Standing Committee of NBWL.
- **NBWL is a statutory body** under Wildlife (Protection) Act, 1972 which adjudicates on industrial projects, road diversions or the like that could encroach into Protected Areas (PA) or ESZ of forests.
  - It is **chaired by Union Environment Minister**.

3.2.13. DEHING PATKAI

Why in news?

Assam Government has decided to **upgrade the Dehing Patkai Wildlife Sanctuary** to a **National Park.**

More on news

- It is reported that upgradation is to protect the sanctity of **the Dehing Patkai Wildlife Sanctuary from coal and oil mining exploration.**
  - **Wildlife sanctuaries are protected areas** which permit some activities, but no human activity is allowed in a National Park.

About Dehing Patkai Wildlife Sanctuary

- Dehing Patkai Wildlife Sanctuary **is referred as 'The Amazon of East'.**
  - **Dehing is the name of the river** that flows through this forest and **Patkai is the hill at the foot** of which the sanctuary lies
- It is the **only rainforest in Assam** which spreads across Tinsukia, Dibrugarh and Sivasagar districts of Assam and also stretches till the **State of Arunachal Pradesh.**
- This sanctuary consists of three parts: **Jeypore, upper Dihing River and Dirok rainforest**

- The Sanctuary is a **part of the Dehing-Patkai Elephant Reserve,** along with the Stillwell Road and the oldest refinery of Asia in Digboi and 'open cast' coal mining at Lido.
- **Fauna:** the **Malayan sun bear**, binturong, crab-eating mongoose, **marbled cat**, golden cat, fishing cat, and clouded leopard.
    - More commonly seen are mammals such as the **barking deer, Assamese macaque, capped langur, tree shrew**, and the famed **hoolock gibbons**.

3.2.14. PANNA TIGER RESERVE

Why in news?

Panna Tiger Reserve has been included in World Network of Biosphere Reserves (WNBR) under Man and the Biosphere (MAB) Programme.

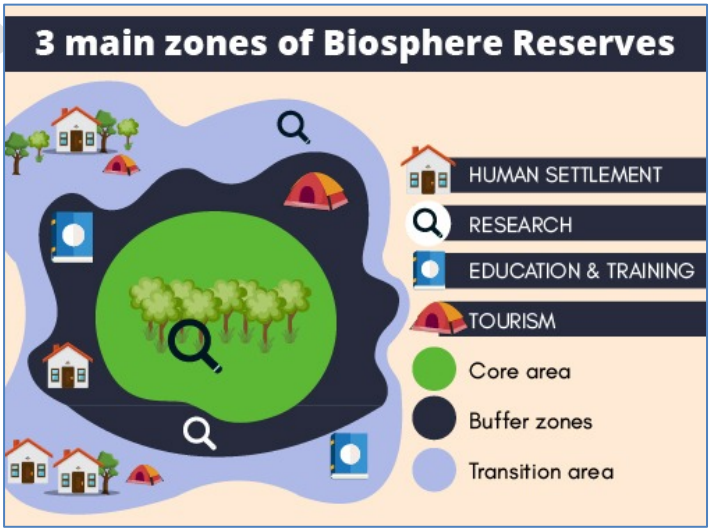
About Panna Tiger Reserve

- **Location:** It is situated in the Vindhyas nearer to the **confluence of the Deccan** Peninsula, Upper Gangetic Plain and Semi-Arid Gujarat Rajputana r**eflecting the influence of three bio-geographic regions.**
- Panna National Park was formed in 1981. In 2011 Panna was notified a biosphere reserve by the Union ministry of environment and forests.
    - Panna is the **third Biosphere Reserve included in WNBR from Madhya Pradesh after Pachmarhi and Amarkantak.**
- **River Ken** flows from the south to the north through the reserve.
- **Fauna**: Apart from the tiger, it is home to other animals like the leopard, nilgai, chinkara, chousinga, chital, rusty spotted cat, porcupine, and sambhar. Gharials (long snouted crocodiles) and muggars (marsh crocodiles) can be found in River Ken.

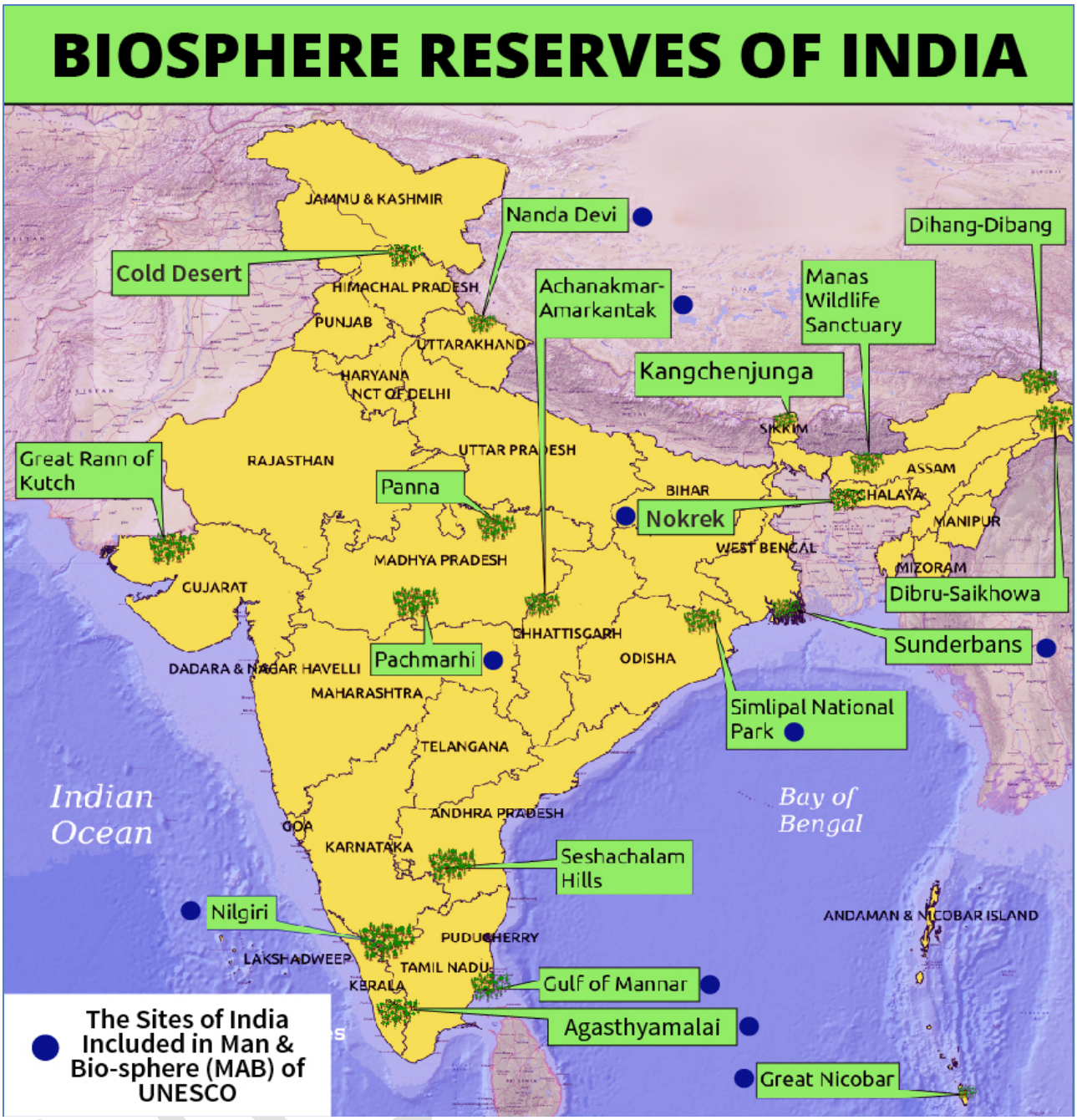
About Man and the Biosphere (MAB) Programme

- The MAB programme is an **intergovernmental scientific programme** that aims to establish a scientific basis for enhancing the relationship between people and their environments.
- **UNESCO's intergovernmental structure** provides MAB with a framework to help national governments support the planning and implementation of research and training programmes with technical assistance and scientific advice.
- Participating countries establish **MAB National Committees that ensure maximum national participation** in the international programme, defining and implementing each country's activities.
- MAB is funded through the **regular budget of UNESCO** and mobilizes funds-in-trust granted by Member States, bilateral and multilateral sources, and extra-budgetary funds provided by countries, the private sector and private institutions. MAB-related activities are nationally financed.

About Biosphere Reserves



- Biosphere reserves are sites established by countries and recognized under **UNESCO's MAB Programme** to promote sustainable development based on local community efforts and sound science.
    - World Network of Biosphere Reserves (WNBR) is a **unique global network of biosphere reserves (BR)** explicitly linking sustainable development and biodiversity conservation.
    - Presently, there are **18 notified biosphere reserves in India of which 12 are recognised** under MAB Program.
- **Biosphere Reserves** integrate three main "functions":
    - **Conservation of biodiversity** and cultural diversity
    - **Economic development** that is socio-culturally and environmentally sustainable
    - Logistic support, underpinning **development through research, monitoring, education and training**
- These three functions are pursued through the **Biosphere Reserves' three main zones:**



3.2.15. NEW RULES TO REGULATE EXOTIC ANIMAL TRADE

Why in news?

MoEFCC has issued an advisory **to streamline the process of importing and possessing exotic live species in India.**

More on the News

- Exotic live species are both **plants and animals that are moved from their source (original) habitat to a new one** mainly due to human intervention.
- **New rules**
  - Owners and possessors of such animals and birds must also **register their stock with Chief Wildlife Warden** of their States.
    - ✓ Currently, **Directorate-General of Foreign Trade** oversees its trade.
  - Wildlife Department will prepare an **inventory of such species** and have right to inspect facilities of such traders.

- Exotic live species will mean **animals named under Appendices I, II and III of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).** It will not include species from Schedules of the Wildlife (Protection) Act, 1972.
  - ✓ CITES is a **legally binding international agreement** to protect plants and animals.

Related News

Money Laundering and the Illegal Wildlife Trade (IWT) report by Financial Action Task Force (FATF)

- It described **IWT** as a "global threat", which **has links with other organised crimes** like modern slavery, drug trafficking and arms trade.
- Proceeds of IWT are around $23 billion per year globally.
- Suggested that money laundering laws should be applied to wildlife trade.
- FATF is an **inter-governmental body established in 1989** to **combat money laundering, terrorist financing and other related threats** to the integrity of the international financial system.

KURMA app

- It is a **mobile-based application aimed at turtle conservation.** It covers 29 species of freshwater turtles and tortoises of India.
  - **Tortoise and freshwater turtles are among the most trafficked** in the country.
- It not only provides users **a database to identify a species** but also provides the **location of the nearest rescue centre** for turtles across the country.
- Developed by**: Indian Turtle Conservation Action Network** in collaboration with **Turtle Survival Alliance-India and Wildlife Conservation Society**.

Operation Thunder 2020

- **Coordinated by INTERPOL and the World Customs Organization,** Month-long operation (September - October 2020) **rallied 103 countries against environmental crime.**
  - It is the **fourth in a series of Thunder operations** carried out annually since 2017.
- The participating countries focused mainly on the **species protected under the Convention on International Trade in Endangered Species of Wild Fauna and Flora.**

3.2.16. CENTRAL ZOO AUTHORITY

Why in news?

Recently, the Ministry of Environment, Forest and Climate Change has reconstituted the Central Zoo Authority (CZA) to include an expert from the School of Planning and Architecture, Delhi, and a molecular biologist.

About Central Zoo Authority (CZA)

- The CZA is a statutory body under the Ministry of Environment, Forest and Climate Change. It was **constituted in 1992 under the Wildlife (Protection) Act, 1972.**
- **Structure:** It consists Union Minister of Environment, Forest and Climate Change as **Chairperson,** 10 members and a Member Secretary.
- **Objective of CZA:**
  - 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
  - **Enforcing minimum standards and norms** for upkeep and healthcare of animals in Indian zoos and to control mushrooming of unplanned and ill-conceived zoos
- **Functions Of CZA**
  - **Evaluate and assess the functioning of the zoos** with respect to the prescribed standards or norms;
  - To **recognize or derecognize zoos**;
  - To **identify endangered species of wild animals** for purposes of captive breeding and assigning responsibility in this regard to a zoo;
  - To **coordinate the acquisition, exchange and loaning of animals** for breeding purpose;
  - To **provide technical and other assistance to zoos** for their proper management and development on scientific lines.

Related news

Nandankanan Zoological Park (NZP)

- It is situated in **Bhubaneswar near Kanjika Lake.**
- It is the **first zoo in the World to breed White tiger and Melanistic tiger** and is the **only conservation breeding centre of Indian Pangolins** in the world.
- Recently NZP has revived its **innovative 'Adopt-An-Animal' programme** to mobilise resources for animals.

- When one adopts an animal or a bird, the contribution goes to its care, feeding, enclosure enrichment and renovation.

3.2.17. MANAGEMENT EFFECTIVENESS EVALUATION (MEE) REPORT

Why in news?

Management Effectiveness Evaluation (MEE) report of 146 national parks and wildlife sanctuaries was released by MoEFCC.

More on the News

- MEE is **assessment of how well National Park and Wildlife Sanctuaries (NP&WLS) are being managed**—primarily, whether they are protecting their values and achieving the goals and objectives agreed upon.
  - Assessment process of India's NP&WLS was adopted from **IUCN World Commission on Protected Areas (WCPA) framework of MEE** based on elements such as Context, Planning, Inputs, Process, Outputs and Outcomes.
- **MEE can**
  - Enable and **support an adaptive approach to management**
  - Assist in **effective resource allocation**
  - Promote **accountability and transparency**
  - Help **involve the community and build constituencies**
  - Promote the **values of NP&WLS.**
- MEE is increasingly being **used by governments and international bodies to understand the strengths and weaknesses of the PA management systems**.
- **Highlights of the report**
  - The **overall mean MEE score is 62.01% which is higher than the global mean of 56%.**
  - Rating-wise, 13% PAs are in 'very good' category, 52% PAs are in 'good' category, 29% PAs in 'fair' category and only 6% PAs have been rated in 'poor' category.
  - Tirthan Wildlife Sanctuary and Great Himalayan National Park, Himachal Pradesh rated with the **highest MEE score.**
  - Turtle WLS, UP and Khaparwas WLS, Haryana **ranked at the bottom**.
- PAs are those in which human occupation or at least the exploitation of resources is limited. They have been **defined in the Wildlife (Protection) Act, 1972** which includes National Park, Sanctuary, Conservation/ Community Reserve.
  - At present, India has a **network of 903 PAs in the country covering about 5% of the total geographic area** of the country.

Types of Protected Areas in India

Protected Area	Details
Wildlife Sanctuary	• A wildlife sanctuary is an area where animal habitats and their surroundings are protected from any sort of disturbance. • Any area other than area comprised with any reserve forest or the territorial waters can be notified by the State Government, under **Wildlife (Protection) Act (WPA) of 1972.** • Some restricted human activities are allowed inside the Sanctuary area details of which are given in WPA, 1972. • There are more than 500 wildlife sanctuaries in India.
National Park	• A national park is a park in use for conservation purposes. It is more protected vis-a-vis protection in wildlife sanctuaries. • **Wildlife (Protection) Act of 1972 also gives State Government power to declare certain areas as national parks.** • **No human activity is permitted** inside the **national park except for the ones permitted by the Chief Wildlife Warden** of the state under the conditions given in WPA 1972. • There are more than 100 national parks in India.
Community Reserve or Conservation Reserves	• It is a category of protected areas defined under the **'Wildlife (Protection) Act, 1972'** (**introduced in the Wildlife (Protection) Amendment Act of 2002**). • It is an inhabited area which typically act as buffer zone to or connectors and migration corridors between established national parks, wildlife sanctuaries and reserved and protected forests of India. Parts of the land in this area are privately owned. • Such areas are designated as conservation areas if they are uninhabited and completely owned by the Government of India but used for subsistence by communities.

	• State Government after consulting with the central government and the local communities, declares any area as community or conservation reserve. • Currently there are 127 community reserves in India and **maximum in the state of Meghalaya**.
Tiger Reserve	• A National Park or Wildlife Sanctuary that is considered significant for protecting tigers can be additionally designated as a Tiger Reserve. • They are governed **by Project Tiger which is administrated by the National Tiger Conservation Authority (NTCA).** • A Tiger Reserve consists of a **'Core' or 'Critical Tiger Habitat'**, which is to be managed as an inviolate area and a 'Buffer' or Peripheral area is immediately abutting a Core area, which may be accorded a lesser degree of habitat protection. • There are currently 50 tiger reserves in the country.
Marine Protected Areas	• A marine protected area (MPA) is essentially a space in the ocean where human activities are more strictly regulated than the surrounding waters - similar to parks on land. • These places are given special protections for natural or historic marine resources by local, state, territorial, native, regional, or national authorities.
Biosphere Reserve	• Biosphere Reserve is an international designation by UNESCO comprising terrestrial, marine and coastal ecosystems. • A biosphere reserve is divided into core, buffer and transition zone in decreasing order of protection. • There are **18 biosphere reserves in India, of which 13 are part of the World Network of Biosphere Reserves**, based on the UNESCO Man and the Biosphere (MAB) Programme
Bird Sanctuary	• Bird sanctuaries are nature facilities that ensure conservation of various species of birds and their natural habitats. • There are more than 70 Bird Sanctuaries in India.
Natural Conservation Zones (NCZ)	• NGT constituted a fresh committee to assess whether sub regional plans for the protection of NCZs were consistent with the regional plan prepared by the National Capital Region Planning Board (NCRPB). • The importance of the Natural Conservation Zone (NCZ) is that it is earmarked for conservation, rather than real estate. o Accordingly, construction is allowed only for 0.5 percent and that too for regional recreational activities like regional parks and sanctuaries. o This strictly precludes construction for commercial, residential, tourism, and other real estate purposes.
Protected Special Agriculture Zone (PSAZ)	• Tamil Nadu announced that the **Cauvery delta region would be declared a Protected Special Agriculture Zone** to prevent implementation of oil exploration projects in the state's rice bowl. • Cauvery delta zone comprises of Thanjavur, Tiruvarur, Nagapattinam, Pudukkottai, Cuddalore, Ariyalur, Karur and Tiruchirappalli districts. • Declaring PSAZ ensures that particular region will not be granted permission for any new projects like those related to hydrocarbons.

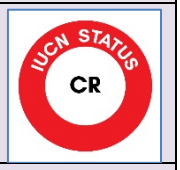
3.2.18. OTHER PROTECTED AREAS IN NEWS

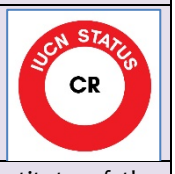
Assam	
Dibru-Saikhowa National Park & Biosphere Reserve	• Oil India Ltd's decision to drill seven wells inside this Park has raised concerns. • **Rivers**: Park is bounded by **Lohit and Brahmaputra river** on the north and by the **Dibru river** on the southern side. • **Forests:** semi-evergreen forests, deciduous forests, littoral and swamp forests and patches of wet evergreen forests**.** • **Largest Salix swamp forest** of North East India is located inside this reserve. • **Fauna**: Tiger, Elephant, Leopard, Small Indian Civet, Gangetic Dolphin, Slow Loris, etc. • It is identified as **Important Bird and Biodiversity Area.**
Pobitora Wildlife Sanctuary	• It is also known as the **'Mini Kaziranga'** as it harbors the **highest density of Rhino in the world** and second highest concentration of Rhino in Assam after Kaziranga National Park. • Pobitora WS can be divided into three distinct categories: forest, grassland and water bodies or beels. • **Rivers**: Its boundary is made by the **GarangaBeel on the south and the river Brahmaputra on the North.** • **Fauna**: Leopard, Asiatic Water buffalo, Jungle Cats, Flying fox, Wild boar, Fishing cat, Short nosed fruit bat, Barking deer, Grey mask shrew etc.
Kaziranga National park	• Kaziranga was recently facing a severe flood situation. • The park was declared as a **World Heritage Site** by UNESCO in 1985, a Tiger Reserve in 2006. • Also, the park is recognized as an **Important Bird Area by BirdLife International** for the conservation of avifaunal species. • **Rivers**: Brahmaputra, Diphlu, Mora Diphlu and Mora Dhansir.

	• **Forests:** alluvial inundated grasslands, alluvial savanna woodlands, tropical moist mixed deciduous forests, and tropical semi-evergreen forests. • **Fauna**: Indian Rhinoceros, Hoolock Gibbon, Tiger, Leopard, Indian Elephant, Sloth Bear, Wild water buffalo, swamp deer, etc. • **Flora**: Kumbhi, Indian gooseberry, the cotton tree, and elephant Apple. • **Migratory Birds**: lesser white-fronted goose, ferruginous duck, Baer's pochard duck and lesser adjutant, greater adjutant, black-necked stork, and Asian Openbill stork migrate from the Central Asia during the winter season.
Arunachal Pradesh	
Pakke Tiger Reserve (PTR)	• Recently, PTR has provided insurance cover against COVID-19 for frontline staff. It lies in the foothills of the Eastern Himalaya in the **East Kameng district of Arunachal Pradesh.** • It falls within the **Eastern Himalaya Biodiversity Hotspot** • **Rivers**: It is bounded by **Bhareli or Kameng River in the west and north, and by Pakke River in the east.** • **Forests: lowland semi-evergreen, evergreen forest and Eastern Himalayan** broadleaf forests. • **Fauna**: Barking deer, Hog deer, Horn Bill, Elephant etc.
Karnataka	
Bandipur National Park	• It is located in Chamarajanagar, **Karnataka and is a part of Nilgiri Biosphere Reserve.** • It is considered as the **largest habitat of Wild Elephants in South Asia.** • It shares its boundary with 3 other National parks namely **Nagarahole National Park (Karnataka), Wayanad National Park (Kerala) and Mudumalai National park (Tamil Nadu).** • **Rivers**: The park is flanked by the Kabini River in the north and the Moyar River in the south. • **Forests: Dry deciduous forest** is prominent here. • **Fauna:** It harbours 3rd highest Tiger density in India. Indian Elephants, Leopard, Dhole, Sambar, Sloth bear, Chital etc can be spotted in the Bandipur National park.
Nagarahole National Park (NNP)	• Forest department will place a traffic monitoring mechanism for roads adjacent to NNP (also known as Rajiv Gandhi National Park) to ensure better **compliance of forest laws by motorists and minimise road kills.** • NNP is **located in Kodagu and Mysore District of Karnataka.** • Bandipur, Mudumalai & Wayanad Wildlife Sanctuary are adjacent to NNP. • **Rivers: Nagarahole River** flows through the park and gradually joins the **Kabini River** which also is a **boundary between Nagarahole and Bandipur** • **Fauna**: **Chital** (**spotted deer**), Indian mouse deer, gaur, stripe-necked and ruddy mongooses, grey langur, bonnet macaque, Asian wild dog, leopard, tiger etc.
Kerala	
Periyar Tiger Reserve (PTR)	• **PTR is located in the high Ranges of the Western Ghat** at Thekkady, Kerala. Its **highest peak is Kottamala** (2016m). • It is **situated in the Cardamom Hills and Pandalam Hills** of the Southern Western Ghats. • **Rivers:** It is drained by Mullayar, Pamba and Periyar rivers. • **Tribal communities:** Mannans, Paliyans, Malayarayans, Mala Pandarams, Uralis and Ulladans. • **Forest:** Evergreen forests that also have the only south Indian conifer 'Podocarpus Wallichianus' • **Fauna:** Lion Tailed Macaque, Bonnet Macaques and Nilgiri Langur, Mahseer fish, Asian Elephant, Bengal Tiger, Indian Bison, Sambar Deer, Smooth-Coated Otter, etc.
Maharashtra	
Tadoba Andhari tiger reserve	• It is located in Chandrapur district of **Maharashtra** and is also Maharashtra's oldest and largest National Park. • **Rivers:** Andhari river • **Forests:** Southern Tropical Dry Decidious Teak Forests • **Fauna**: Leopard, cheetal, chinkara, langoors, nilgai, barking dear, blue bull, spotted dear, flying squirrel, sloth bears, gaur, dhole, etc.
Rajasthan	
Ranthambore Tiger Reserve	• It is situated in **Sawai Madhopur District of Rajasthan** at the **junction of the Aravali and Vindhya hill ranges.**

	• In 1973, it was declared as one of the Project Tiger reserves. • **Rivers:** It is bounded to the north by the Banas River and to the south by the Chambal River. • **Forest**: Tropical dry deciduous • **Fauna:** Bengal tiger, Indian leopard, wild boar, sambar, striped hyena, sloth bear, southern plains gray langur, rhesus macaque, mugger crocodile and chital.
Tamil Nadu	
Mudumalai Tiger Reserve	• It is in the **Nilgiris District of Tamil Nadu.** • It has a **common boundary with Wyanad Wildlife Sanctuary (Kerala)** on the West, **Bandipur Tiger Reserve (Karnataka)** on the North. • It is **part of the Nilgiris Biosphere Reserve**, the first Biosphere Reserve in India, declared during 1986. • **Rivers:** Moyar river • **Fauna**: Tiger, Elephant, Indian Gaur, Panther, Sambar, Spotted Deer, Barking Deer, Mouse Deer, Common Langur, Malabar Giant Squirrel, Wild Dog, Mangoose, Jungle Cat, Hyena etc.
Uttarakhand	
Gangotri National Park	• Recently, **Uttarakhand allowed forest land transfer in Gangotri National Park** for development of roads to make movement of ITBP personnel near China border. • **Gangotri glacier, the origin of river Ganga**, is located inside Gangotri National Park. • It is **typical of high-altitude ecosystems**, with decisive influence from Trans Himalayan elements in both physical and biological characteristics. • **Rivers:** Bhagirathi River • **Fauna**: Snow leopard, bharal or blue sheep, black bear, brown bear, Himalayan Monal, Himalayan Snowcock, Himalayan Thar, musk deer etc.

3.2.19. FLORA AND FAUNA IN NEWS

Species	Details
Terrestrial Species	
Black Panther	• Recently, a Black Panther was spotted in **Kabini Wildlife Sanctuary, Karnataka** • **Found in**: Kabini Wildlife Sanctuary, Anshi Dandeli Sanctuary (Karnataka), Nilgiri Biosphere Reserve (Tamil Nadu) and Tadoba Andhari Tiger Reserve (Maharashtra). • **Features**: • Black Panther refers to **large felines (family of cats)** that are characterized by a **coat of black fur or large concentrations of black spots.** • In each species, a certain combination of alleles stimulates the production of large amounts of the **dark pigment melanin** in the animal's fur and skin. A melanistic leopard is often called black panther or jaguar.
Sal forest tortoise or elongated tortoise (Indotestudo elongata)	• It is widely distributed over eastern and northern India and Southeast Asia. • **Threats:** It is heavily hunted for food and collected both for local use, such as decorative masks, and international wildlife trade. • IUCN status: **Critically Endangered** 
Indian pangolin	• Odisha Forest department has stressed stricter **monitoring of social media platforms to check pangolin poaching and trading.** • Pangolins are toothless, nocturnal, and live in burrows and feed mainly on ants and termites. • There are **eight species in Pangolins**: Chinese, Sunda, Philippine and Indian pangolins; and four African species. • **Distribution:** Bangladesh, India, Pakistan and Sri Lanka. • **Threats**: hunting and poaching for local consumptive use and international trade, its meat etc. • Indian Pangolin and Chinese Pangolin (critically Endangered) are found in India. Both are listed under Schedule I Part I of Wildlife (Protection) Act, 1972. • IUCN status for Indian Pangolin: **Endangered** 
Caracal	• Recently, National Board of Wildlife **included caracal into the list of critically endangered species.** • It will enable taking up conservation efforts under Centrally sponsored Scheme-**Integrated Development of Wildlife Habitat (IDWH).**

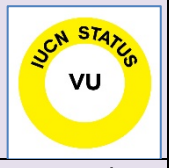
	• Now, there are **22 wildlife species under recovery programme** for critically endangered species. • Caracal is a **medium size wild cat** found in some parts of Rajasthan and Gujarat. • IUCN status**: Least Concern** (mainly because of their large numbers in Africa) 
Kharai camel	• It is a **unique breed of camel found only in Kutch (Gujarat).** They have the special ability to survive on both, dry land and in the sea. • They **can swim in seawater, up to three kilometers,** and feed on saline plants and mangroves. • It is one of the **most preferred choices of graziers** in the arid coastal region of Kachchh. • Kharai was **recognised as a separate breed in 2015** by the Indian Council of Agricultural Research.
Gaur or Indian Bison	• First population estimation exercise of the Indian gaur was carried out in the Nilgiris Forest Division in recent years. • It has revealed that more than an estimated 2,000 Indian gaurs inhabit the entire division. • Gaur is the **world's largest and tallest bovine**. It is native to Indian Subcontinent. • IUCN status: **Vulnerable** 
Dhole (Asiatic Wild Dog)	• Karnataka, Maharashtra and Madhya Pradesh rank high in the conservation of the endangered dhole, according to a study. • Dholes play an important role as **apex predators** in forest ecosystems. • Dhole is found in a wide variety of habitat types, including deciduous and evergreen forests and alpine steppe. India perhaps supports the highest number of dholes in the world. • IUCN status: **Endangered** 
Himalayan Brown Bear (Ursusarctosisabellinus)	• A recent study on the Himalayan brown bear has **predicted a significant reduction in suitable habitat and biological corridors of the species.** • It is **one of the largest carnivores** in the highlands of Himalayas. • **Range:** It occupies higher reaches of the Himalayas in mountainous areas of Pakistan, Nepal, Tibet and India • In India, they are also present in the **Great Himalayan National Park (Himachal Pradesh).** • IUCN status: **Endangered** 
Polar bears	• A new study has found that **polar bears could become extinct by 2100** unless greenhouse gas emissions are reduced. ○ Rising global temperatures, due to carbon emissions, have caused large amounts of Arctic sea ice to melt, **leaving polar bears with smaller habitats to sustain themselves on.** • Polar bears **rely on Arctic sea ice to hunt for seals** and have long been a symbol of the impacts of the climate crisis. • IUCN Status: **Vulnerable** 
Plant Species	
Pinanga andamanensis	• It is a **rare palm,** endemic to South Andaman Island. • Its entire population **naturally occurs only in a tiny, evergreen forest pocket** in South Andaman's **Mount Harriet National Park.** • IUCN status: **Critically Endangered** 
Pipeworts	• Scientists from Agharkar Research Institute (ARI), Pune (autonomous institute of the Department of Science & Technology), have recently found **2 new species of pipeworts in Maharashtra and Karnataka.** • The one reported from Sindhudurg district of Maharashtra was named as Eriocaulon parvicephalum **(due to its minute inflorescence size)**, and the other reported from Kumta, Karnataka was named as Eriocaulon karaavalense **(named after** Karaavali **= Coastal Karnataka region).** • **Pipeworts (Eriocaulon)** is a plant group which completes its life cycle within a small period during monsoon. • Most of these are **reported from the Western Ghats and Eastern Himalayas**, and around **70% of them are endemic to the country**.

	• They have **myriad medicinal properties** such as - anti-cancerous, analgesic, anti-inflammatory and astringent properties.
Himalayan trillium	• Also known as Nagchatri, it is a **common herb in temperate and sub-alpine zones of the Himalayas** (India, Bhutan, Nepal, China, Afghanistan and Pakistan). • In India, it is found **in Himachal Pradesh, Jammu and Kashmir, Sikkim, and Uttarakhand.** • The plant has become **one of the most traded commercial plants of the Himalayan region,** due to its high medicinal quality (anti-cancer and anti-aging agent). • **Over-exploitation, long life cycle, poor capacity for seed dispersal** is the main threat. • IUCN Status: **Endangered** 

Brahma Kamal Flower	• Recently, Brahma Kamal bloomed in **Uttarakhand's Chamoli district.**
	• Brahma Kamal is called **the King of Himalayan Flowers**, and is also **the state flower of Uttarakhand.**
	• It is the only **flower known to bloom after sunset** and blooms just once a year.
	  ○ Brahma Kamal is **named after God Brahma** and is known to bring good luck and prosperity.
	  ○ It finds **mention in the scriptures** and is offered in many holy shrines, including Kedarnath, Badrinath and Tunganath.
	• It takes about two hours to bloom to about **eight inches in diameter**.
	• It is scientifically known as **Saussurea Obvallata,** belongs to the thistle tribe of flowering plants.
	• It is highly valued in **Tibetan medicine and Ayurveda for its healing properties and is used to treat cuts and bruises**.
	• Its natural habitat has been facing shrinkage over the last few decades due to **Global warming, Human Encroachment & Over-harvesting.**

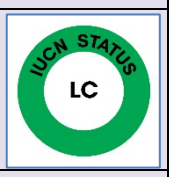
Aquatic Species	

Gharials (Gavialis gangeticus)	• Recently, 40 gharials were released in Ghaghara river by Bahraich forest division of UP.
	  ○ Ghaghara is a major left-bank tributary of the Ganges River.
	  ○ It rises as the Karnali River in high Himalayas of southern Tibet.
	• It is **found majorly in Chambal river**. Also, few **satellite population** is found in **Girwa river** (Katarniaghat Wildlife Sanctuary), **Ramganga river** in Jim Corbett National Park and **Sone river.**
	• IUCN status: **Critically Endangered**. 

Dugong	• **World Dugong Day 2020** was observed with theme "Save dugong, save livelihood". • Dugong (commonly known as sea cow) is **world's only vegetarian marine mammal.** • **Found in:** warm coastal waters from East Africa to Australia, including Red Sea, Indian Ocean, and Pacific. • **Threats**: destruction and modification of habitat, pollution, rampant illegal fishing activities, vessel strikes, unsustainable hunting or poaching and unplanned tourism. • IUCN status: **Vulnerable** 
Hilsa fish	• Bhadbhut project (in Gujarat), a **causeway-cum-weir barrage** across river Narmada is expected to interfere with the migration and breeding cycle of hilsa. • **Hilsa is a marine fish** which migrate upstream and arrives in the brackish water of the Narmada estuary near Bharuch for spawning usually during the monsoon months. • It is a type of **oily fish** which is common in Bengali and Oriya cuisines. In West Bengal and parts of Assam, it has a **religious value and is given as an offering to some gods.**
Hump-backed mahseer	• It is a large **freshwater fish and is endemic to the Cauvery river basin.** It is also known as the **'Tiger of the water'.** • Cauvery originates in **Brahmagiri Hill of Western Ghats in Karnataka** and passes through Tamil Nadu to Bay of Bengal. • **Threats:** Destructive fishing methods, building of dams that reduced the flow rates in the river, over-abstraction of water and pollution. • IUCN status**: Critically endangered** • **Other Critically endangered aquatic Species in India:** Ganges Shark, Pondicherry Shark, Largetooth sawfish etc. 
Band-tail scorpionfish	• It was recently found in **Gulf of Mannar.** • This was the first time this particular species was found live in the Indian waters. • Fish is called 'scorpionfish' because its spines contain neurotoxin venom.

(Scorpaenospsis neglecta)	• It can change colour and blend with its surrounding environment to escape from predators and while preying. • It is distributed in Indian and South Pacific Oceans; temperate waters.
Coccolithophores	• These are **single-celled algae** living in the upper layers of the world's oceans. • They **calcify marine phytoplankton** that produces up to 40% of open ocean calcium carbonate and responsible for 20% of the global net marine primary productivity. • In the process they help in **removing carbon dioxide from atmosphere and ocean**. • A recent study has found that increase in **algae known as diatoms** has decreased in calcium carbonate concentration in Southern Indian Ocean which will **affect the growth of coccolithophores.**

Noctiluca Scintillans	• The blooms of Noctiluca Scintillans, commonly known as sea sparkle are being witnessed along the coasts of Maharashtra and Karnataka.
	• N. Scintillans is a **free-living, marine-dwelling species of dinoflagellate** that exhibits bioluminescence when disturbed (popularly known as mareel).
	  ○ Bioluminescence is the production and emission of light by a living organism.
	  ○ The light emitted by a bioluminescent organism is produced by energy released from chemical reactions occurring inside (or ejected by) the organism.
	• It grazes on other micro-organisms such as larvae, fish eggs, and diatoms. Also, the unicellular phytoplankton that lives inside it can photosynthesize, turning sunlight into energy. They help their host cell survive even when food was scarce. Thus, N. Scintillans acts as both a plant and an animal.
	• The toxic blooms of N. Scintillans are being linked to massive fish and marine invertebrate kills.
	• Though the species does not produce a toxin, it was found to accumulate toxic levels of ammonia, which is then excreted into the surrounding waters, possibly acting as the killing agent in blooms.

Rodents, insects etc.	
Krishna Peacock (Papilio krishna), Indian Jezebel (Delias eucharis), and Orange Oakleaf (Kallima inachus)	• A citizen poll has identified **Krishna Peacock** (Papilio krishna), **Indian Jezebel** (Delias eucharis), **and Orange Oakleaf** (Kallima inachus) as contender for National Butterfly. • Krishna Peacock is generally found in large numbers in the Himalayas. • Indian Jezebel is known to **deter its predators with its flashy wing colours.** It can be spotted in gardens and other lightly wooded areas. • Orange Oakleaf is **known as 'dead leaf' for its ability to camouflage as a dry autumn** leaf. It is found in the moist forests of northern Western Ghats, central, northern and north-eastern parts.
Malayan Giant Squirrel	• It is an arboreal, herbivorous rodent found in the **evergreen and semi-evergreen forests of north-eastern India**. It is also considered to be a **'forest health indicator'** species. • According to the Zoological Survey of India (ZSI) **vanishing forests, & climate change have put threat** to its existence. ○ **By 2050,** the species may have access to only 3% of the suitable habitat and may face **challenges of getting extinct.** • Grizzled giant squirrels, and India (malabar) giant squirrels are other giant squirrels of India. • IUCN status: **Near Threatened**
Golden Birdwing (Troidesaeacus)	• It is a **Himalayan butterfly and India's largest butterfly**. Before this Southern Birdwing was the largest for past 88 years. • While the female Golden Birdwing was recorded from Didihat in **Uttarakhand**, the largest male was from the Wankhar Butterfly Museum in Shillong (**Meghalaya**). • It has a **wingspan of 194 mm.**
Avian species	
Amur falcon	• Amur falcon is a small raptor of falcon family that breeds in Siberia and Northern China and migrates to Southern Africa in winter. • **Doyang Lake in Nagaland** acts as a **stopover for Amur falcons** and Pangti village in Nagaland is considered as world's **Amur Falcon capital.** • IUCN status: **Least concern** 
Narcondam hornbill (Rhyticeros narcondami)	• This bird is **endemic to the Narcondam Island (volcanic island)** in Andamans.

	○ Narcondam Island has been identified as an Important Bird Area by BirdLife International and the Bombay Natural History Society. • These are **frugivores** that primarily eat fruits and berries. • IUCN status: **Endangered** • India has nine **hornbill** species, such as Great, Wreathed and Oriental Pied Hornbill, of which four are found in Western Ghats • Hornbills are referred to as **'forest engineers' or 'farmers of forest'** for playing a key role in dispersing seeds of tropical trees.
Greater Adjutant Stork	• In Bihar, community participation in conservation has **increased Greater Adjutant Stork population from 78 in 2007 to nearly 600 in 2020.** • This bird has **only three known breeding grounds in the world:**2 in India (Assam and Bihar) and one in Cambodia. • IUCN Status: **Endangered**
Blue-throated Macaw	• It is **a large parrot** and plumage on its upper parts and long tail is turquoise. • It was thought to be extinct for years until 1992, when a wild population of the species was found in South America. • **Habitat**: Forest, Savanna grass lands. • **Threats**: Hunting & trapping, Ranching operations etc. • IUCN status: **Critically Endangered**
Siberian primrose	• Researchers have claimed that Siberian primrose species **may not be able to adapt to quickly progressing climate change,** which could potentially lead to its extinction. • It is a **plant endemic to the Nordic countries** (Finland, Denmark, Norway, Sweden, and Iceland). • It is **specialised in growing on seashore meadows** with low vegetation.
Willow Warbler	• It is one of the longest migrating small birds that was **sighted for the first time in India in Thiruvanathapuram.** • **Usually seen in European and the Palearctic regions,** the birds migrate to sub-Saharan Africa during early winter. • IUCN status: **Least Concern**
Pied Cuckoo	• Wildlife Institute of India, Indian Institute of Remote Sensing and Department of Biotechnology have begun a **study of the migration of pied cuckoo from Africa to India and back** to **understand its relationship with climate patterns.** • Study is part of a larger project -**Indian Bioresource Information Network (IBIN),** funded by Department of Biotechnology. ○ IBIN is proposed to be **a single portal data provider on India's bioresource** - plant, animal, marine, spatial distribution and microbial resources. • There are **two populations of Pied Cuckoo found in India**- southern part (resident) and North and Central India (migratory). • It is one of the few species that come to India in the summer. • It is primarily arboreal (lives on trees), lays its eggs in nests that belong to other birds. • **IUCN status**: Least Concern
Pests, invasive species	
White grub (Holotrichia serrata) insect larvae	• It is an **agricultural pest that affects sugar cane crop**. The pests eat at the roots of sugarcane, decreasing the moisture and nutrient supply to the plant. • This leads to the **yellowing and wilting of leaves and causes damage to the base of the shoot.** • Earlier it attacked **sugarcane and groundnut crops**; now it is also devouring **soybean, cotton and turmeric crops.** • **Chemical pesticides are available** for controlling the white grub infestation.
Charru mussel (Mytella strigata)	• It is an **invasive mussel, native to South and Central American coasts,** that is spreading in backwaters of Kerala. • Mussels are often used as indicators of water quality. • It is threatening livelihoods of fishermen engaged in molluscan fisheries. • Rapid spread of Charru mussel may have been triggered by Cyclone Ockhi (2017).
Woolly whitefly	• It is an **invasive exotic pest of Caribbean-origin** that feeds on various kinds of food (**polyphagous**). • It spread from the Caribbean Island through **transportation of infested seedlings**.

	• In 2019, it was recorded from guava plantations in Kozhikode district of Kerala, Ramanagara, Mandya and Bengaluru Rural districts of Karnataka and Coimbatore district of Tamil Nadu. • Recently, two types of **ladybird beetles** are found to be the **biological weapons** against this pest.

3.3. FORESTS

3.3.1. STATE OF THE WORLD'S FORESTS REPORT 2020

Why in news?

Recently, **United Nations Environment Programme (UNEP) and Food and Agriculture Organization (FAO)** has jointly released a report titled The State of the World's Forests (SOFO) 2020.

About the report

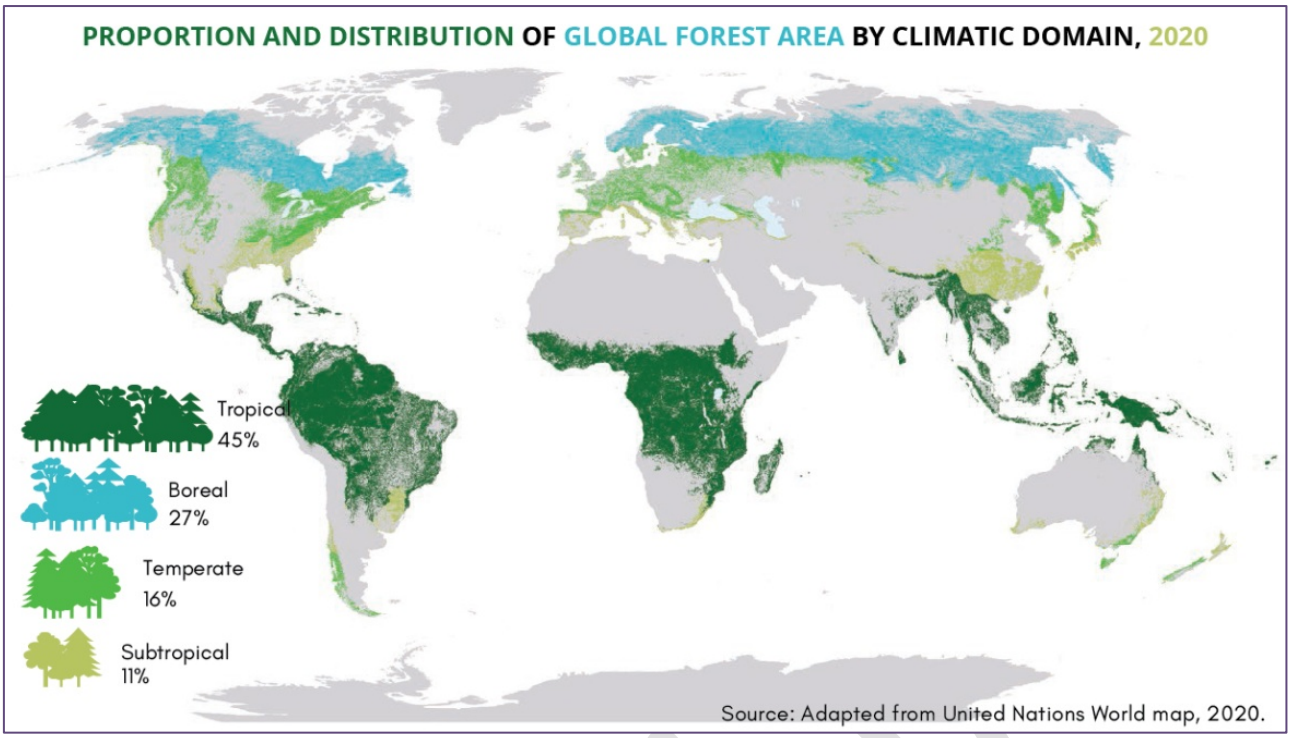
- It examines the contributions of forests, and of the people who use and manage them, to the conservation and sustainable use of biodiversity.
- This issue of SOFO draws on the results of **FAO's Global Forest Resources Assessment 2020 (FRA 2020).**
  - FRA 2020 examined the status and trends of more than 60 variables related to the extent, characteristics, condition, management and uses of forest across 236 countries and areas over the period 1990–2020.

Food and Agriculture Organization (FAO)
- It is a **specialized agency of the United Nations** that leads international efforts to defeat hunger.
- Its goal is to achieve food security for all and make sure that people have regular access to enough high-quality food to lead active, healthy lives.
- It was established in 1945 and has around 194 Member countries.
- It is headquartered in **Rome, Italy**.

Key Findings of the Report

- Forests provide **habitats for 80% of amphibian species, 75% of bird species and 68% of mammal species**. About 60% of all vascular plants are found in tropical forests.
- Forests cover **31% of the global land area**.
  - More than half of the world's forests are found in only 5 countries - **Brazil, Canada, China, Russia and US.**
- **Deforestation and forest degradation:**
  - Between 2015 and 2020, **the rate of deforestation had decreased** as compared in the 1990s.
  - **Agricultural expansion continues to be the main driver** of deforestation and forest fragmentation and the associated loss of forest biodiversity.
- **United Nations Strategic Plan for Forests:** The world is not on track to meet this target for Forests to increase forest area by 3% worldwide by 2030.

Some findings in FRA 2020
- **Forest regeneration:** Area of naturally regenerating forests decreased since 1990, but area of planted forests increased.
  - Asia had highest net gain of forest area while Africa had largest annual rate of net forest loss.
- **Protected areas:** 18% of forest worldwide is in protected areas.
  - 25% of forests worldwide are Primary forests i.e. forests with no clearly visible indications of human activities.
  - South America has the highest share of forests in protected areas, at 31%.
  - About 10% of the world's forests is allocated for biodiversity conservation
- **Forest fire:** Fire burned about 4 percent of the total forest area in tropics.
- **Decrease in Carbon Stock**: The total carbon stock in forests has decreased from 668 gigatonnes in 1990 to 662 gigatonnes in 2020.



- **Conservation of species:**
  - **Forest-Specialist index,** developed by **World Wildlife Fund,** has fell by 53% between 1970 and 2014 which highlights the increased risk of species becoming vulnerable to extinction.
- **Health risks:** Forests also pose health risks due to forest-associated diseases that include **malaria, Chagas disease leishmaniasis, Lyme disease, HIV and Ebola**.
  - The majority of new infectious diseases affecting humans including SARS-CoV2 virus that caused the current COVID-19 pandemic, are zoonotic and their emergence may be linked to habitat loss due to forest area change and the expansion of human populations into forest areas, which both increase human exposure to wildlife.

3.3.2. NAGAR VAN SCHEME

Why in News?

Recently, Ministry of Environment, Forest and Climate Change (MoEF&CC) selected Arunachal Pradesh capital **(Itanagar) for implementation of the 'Nagar Van' or Urban Forest scheme.**

About Nagar Van Scheme

- It envisages creating forests in **200 urban cities across the country in next five years** with a renewed focus on people's participation and collaboration between Forest Department, Municipal bodies, NGOs, Corporates and local citizens.
  - **Pune's Warje forest** offer good model for growth.
- Forest once established **will be maintained by State Government.**

About Urban Forestry

- It is an integrated, city wide approach to the **planting, care and management of trees, forests, and natural systems** in the city to secure multiple environmental and social benefits for urban dwellers.
- It **concentrates on all tree dominated as well as other green resources** in and around urban areas, such as woodlands, public and private urban parks and gardens, urban nature areas, street tree and square plantations, botanical gardens and cemeteries.

Related News: Harit Path

- It is a **mobile app** that will facilitate creation of Green Highways across the country.
  - It will monitor location, growth, maintenance activities, targets etc of every plant under all Highway plantation projects.
- It is developed by National Highways Authority of India (NHAI) under Ministry of Road Transport and Highways.
- Recently, NHAI had also undertaken a nation-wide plantation drive, **Harit Bharat Sankalp**, under which it planted over 25 lakh plants in 25 days along the stretches of National Highways.

3.3.3. COMMUNITY FOREST RIGHTS

Why in news?

Recently, Ministry of Tribal Affairs (MoTA) drafted **fresh guidelines for Community Forest Rights (CFR) and Habitat Rights.**

About Community forest rights

- **Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 or Forest Rights Act (FRA), 2006** recognises and vests two broad types of rights to scheduled tribes and other traditional forest dwellers: individual forest rights (IFR) and community forest rights (CFR).
  - **FRA 2006**, is one of the most important and popular Entitlement based laws favouring the tribal and other traditional forest dwellers' rights over forest land.
  - **FRA 2006** provides for a framework for recording of the forest rights so vested and the nature of evidence required for such recognition and vesting in respect of forest land.
- **FRA empowers Gram Sabha** to be the authority to initiate the process for determining the nature and extent of individual or community forest rights or both.
- Further, the **draft guidelines for CFR recently released aim to guide & empower the Gram Sabhas** in managing and conserving their CFR areas in a sustainable fashion.

Draft Guidelines for CFR

- It proposes to form **Community Forests Resource Management Committee (CFRMC)** as an executive arm of the Gram Sabha in managing CFR areas.
  - It shall consist of not less than 5 persons as members with at least 2/3rd members from the Scheduled Tribes.
- It **provides financial independence of the Gram Sabha through a fund,** which would get money from the sale of forest produce, development grant from the government and non-profits as well as compensatory afforestation funds.
- **Further empowerment of Gram Sabhas to:**
  - **integrate the committees for the protection of wildlife, forest and biodiversity,** catchment areas, water sources and other ecological sensitive areas located within which it has had traditional rights.
  - **Be empowered to carry out the powers and authority** as laid down under section 5 of FRA, which talks about duties of holders of forest rights.
  - **File complaint before the state level monitoring committee (SLMC)** in case of any violation of provisions of FRA 2006.
  - **Make rules and issue appropriate directions for governance and conservation of CFR,** including regulating powers, functions and activities of the CFRMC; conflict resolution; benefit sharing; issuance of transit permit; fund management etc.,
  - **Approve and modify CFR conservation and management plan**, prepared and suggested by the CFRMC.

Related news:
Habitat Rights

- Habitat rights under the FRA 2006 are **granted to the particularly vulnerable tribal groups (PVTG)**.
- Section 3(1)(e) of FRA mentions about rights that **include community tenures of habitat and habitation** for primitive tribal groups and pre-agricultural communities.
- **Draft Guidelines for Habitat Rights**
  - Draft defines **habitat as places where tribal and other traditional forest dwellers have ancient connections in spiritual, cultural, social** (burial grounds, birth places, temples, deities etc.) and livelihood matters (areas used for forest produce collection, fishing, seasonal cultivation and collection of medicinal plants).
  - Habitat Rights are **bundle of rights comprising of above connections** with the habitat.
  - **Some of habitat rights include:**
    - ✓ **Right to perform all customary religious** or cultural ceremonies in the landscape related to their clans
    - ✓ **Right to protect and conserve the natural entities** and sacred sites recognised under habitat rights
    - ✓ Right to protect and conserve places important for religious and spiritual purposes such as sacred groves etc.
    - ✓ **Right to practice traditional cultivation systems** and other livelihood generating activities including seasonal resource use.
    - ✓ Habitat **rights exclude any traditional right of hunting or trapping or extracting a part of the body** of any species of wild animal.

3.3.4. DEFORESTATION HOTSPOTS

Why in news?

In a new report, World Wide Fund for Nature (WWF) analysed **24 deforestation hotspots across Asia, Latin America and Africa.**

About WWF

- WWF is the **world's largest privately financed conservation organization**. It leads international efforts to protect endangered species and their habitats.
- WWF works in more than 100 countries to conserve the diversity of life on earth.
- WWF works to help local communities conserve the natural resources they depend upon; transform markets and policies toward sustainability; and protect and restore species and their habitats.

Highlights of the Report

- From 2000 to 2018 two-thirds of total **global forest cover loss occurred in the tropics and sub-tropics**.
- While forests covered about 50% of earth's land area 8,000 years ago, **today only 30% of land is forested.**
- Report provides **framework that links between drivers of deforestation globally** and the existing approaches to address them (refer infographic).
- **Commercial agriculture is the leading cause of deforestation globally,** particularly large-scale farming, with forested areas cleared for livestock grazing and crop cultivation.

3.4. LAKES, WETLANDS AND COASTLANDS

3.4.1. RAMSAR SITES

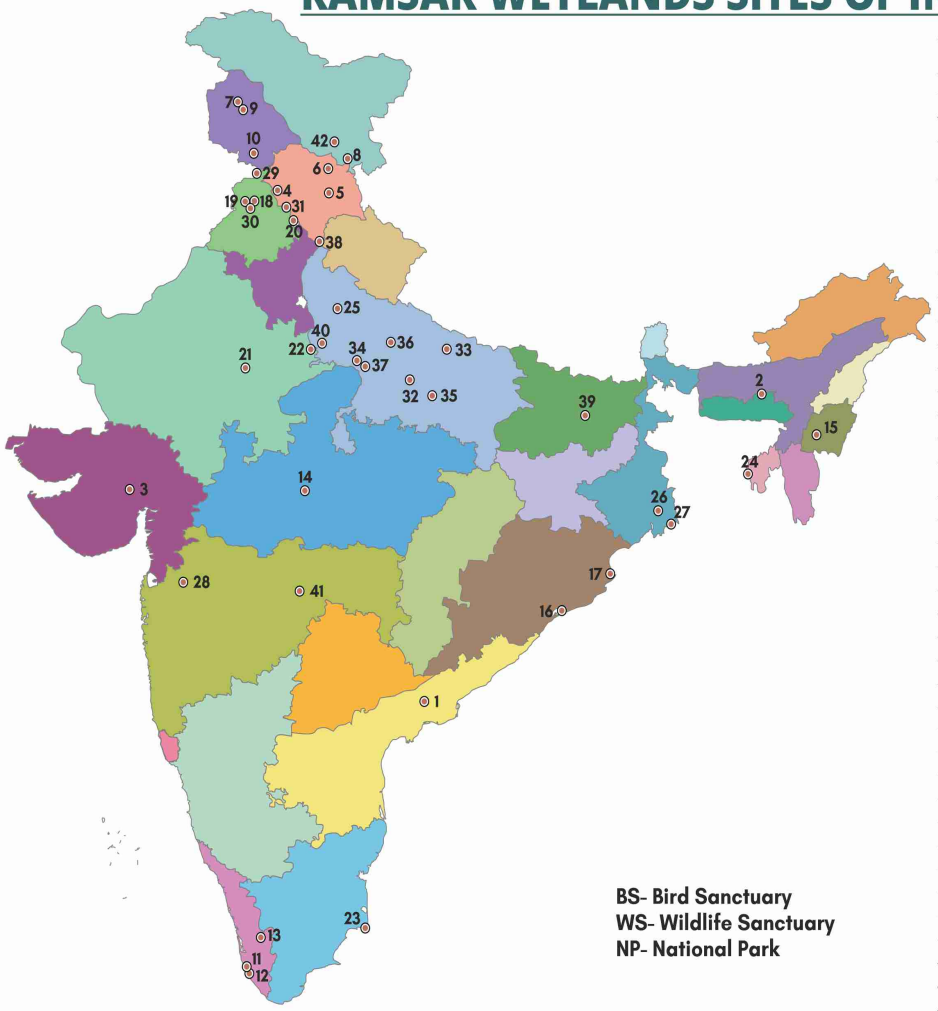
Why in News?

In 2020, five wetlands in India were added to the list of recognised sites under the Ramsar Convention.

About Ramsar convention, 1971

- It is an **intergovernmental international treaty**, signed in Ramsar (Iran) to preserve ecological character of selected wetlands across the globe.
- **India is a party to the Convention**.
- It aims to develop a global network of wetlands for conservation of biological diversity and for sustaining human life.
- The wetlands declared as Ramsar sites are **protected under strict guidelines of the convention.**
- Ramsar Sites are included in **List of Wetlands of International Importance.**
- The inclusion of a wetland in the List embodies the government's commitment to take steps necessary to ensure that its ecological character is maintained.
- **Largest Ramsar Site by area in India**- Sundarban Wetland in West Bengal
- **Smallest Ramsar Site by area in India**-Renuka Wetland in Himachal Pradesh

RAMSAR WETLANDS SITES OF INDIA



Nine criteria for identifying Wetlands of International Importance

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

Details about New Sites

Wetland	Location	Details
Asan Conservation Reserve (ACR)	**Uttarakhand** 	• ACR is **located on the banks of Yamuna river near Dehradun district** in Garhwal region of Uttarakhand. • **Species Inhabiting the Site**- white-rumped vulture, ruddy shelduck, red-headed vulture, Baer's pochard, crested pochard, Putitor mahseer etc.
Kabartal Wetland	**Bihar** 	• Also known as **Kanwar Jheel**, the wetland covers 2,620 hectares of the Indo-Gangetic plains in the northern Bihar State. • The Wetland is an important stopover along the **Central Asian Flyway** (area of Eurasia between Arctic and Indian Oceans and associated island chains). • **Five critically endangered species inhabit the site:** • three vultures – the red-headed vulture, white-rumped vulture and Indian vulture– and • two waterbirds, the sociable lapwing and Baer's pochard. • **Major threats to the Site**- water management activities such as drainage, water abstraction, damming and canalization.
Lonar lake	**Maharashtra** 	• It is located on the **Deccan Plateau** and is an endorheic or closed basin formed by a meteorite impact onto the basalt bedrock. • The Site includes the lake as well as escarpments, which form the crater walls, and forested zones. • The lake is high in salinity and alkalinity, as the lack of an outflow leads to a concentration of minerals as the lake water evaporates. • Specialized micro-organisms such as anaerobes, cyanobacteria and phytoplankton survive in this harsh chemical environment. • **Species Inhabiting the Site**- Asian woollyneck, common pochard, grey wolf etc. • **Major threats to the Site**- household sewage and urban wastewater, and unsustainable tourism. • Recently, **water of lake turned pink owing to presence of salt-loving Haloarchaea microbes** which lead to pigmentation

Sur Sarovar	**Uttar Pradesh**  	• Also known as **Keetham Lake**, it is a human-made reservoir; originally created to supply water to the city of Agra in summer, the wetland soon became an important and rich ecosystem. • The Site is important for bird species which migrate on the Central Asian flyway, with over 30,000 waterbirds known to visit the reservoir annually. It is also listed as **important bird area**. • **Species Inhabiting the Site**- greater spotted eagle, sarus crane and catfish. • **Major threats to the Site**- Unsustainable tourism, invasive species, and household sewage and urban wastewater.
Tso Kar Wetland Complex	**Union Territory of Ladakh**  	• This high-altitude wetland complex is found at more than 4,500 metres above sea level in the Changthang region of Ladakh. • The complex includes two connected lakes- the **freshwater Startsapuk Tso** and the larger **hypersaline Tso Kar**. • The name **Tso Kar refers to the white salt efflorescence** on the margins of the lake caused by the evaporation of the saline waters. • The local climate is arid, and glacial meltwater is the primary water source for the lakes. • The Site also acts as an important stopover ground for migratory birds along the **Central Asian Flyway** and is one of the most important breeding areas in India for the **black-necked crane.** • Tso Kar Basin is an **A1 Category Important Bird Area** as per Bird Life International **and a key staging site in Central Asian Flyway.** ○ **A1 category has Globally threatened species**. Other categories are: A2 for Restricted-range species, A3 for Biome-restricted species & A4 for Congregations (of ≥1% of global population of one or more species. • **Species Inhabiting the Site**-endangered saker falcon and Asiatic wild dog or dhole and vulnerable snow leopard.

3.4.2. SUKHNA LAKE DECLARED AS WETLAND

Why in news?

wtChandigarh Wetlands Authority issued a notification for the **declaration of Sukhna Lake as a wetland under Wetland (Conservation and Management) Rule 2017** (Wetland Rules)

More on the News

- List of wetlands in India is developed based on **wetlands definition of the Ramsar Convention (ratified by India).**
- **Wetland Rules, 2017 were notified under provisions of Environment (Protection) Act, 1986** to protect wetlands across the country.
  - Wetlands can be **notified by Centre, State and UT Administration.**
  - It **gives states/UTs powers** to keep a watch on prohibited activities.

Activities prohibited in Wetlands

- Commercial mining
- Setting up of industries
- Establishment of large scale commercial live-stock and poultry farms
- No permanent construction(execpt for boat jetties) within 50 metres
- Feeding of fish and migratory birds by public
- Solid waste dumping
- Discharge of untreated waste and effluents from industries, cities, towns, villages and other human settlements
- Poaching except angling with due permission from the department
- Use of plastic carry bags

About Sukhna Lake

- Sukhna Lake is a **man-made lake in Chandigarh** built-in 1958. It is situated at foothills of Shivalik Hills and was designed to collect runoff water from the Hills.
- Earlier, the lake **was also declared a living entity/legal person.**

3.4.3. MANGROVE ECOSYSTEM

Why in news?

Guidelines on Mangrove Ecosystem restoration for the Western Indian Ocean region were released.

More in News

- The guidelines were developed by the member states of **Nairobi Convention with support from UNEP–Nairobi Convention, the Western Indian Ocean Marine Science Association and the Western Indian Ocean Mangrove Network.**

Mangrove status in India

- Mangrove **cover 0.15% of the country's total geographical area.**

MANGROVES

Mangroves are diverse group of salt-tolerant plant community of tropical and subtropical intertidal regions of the world, occurring mainly between latitude 24° N and 38° S.

They are referred to as 'tidal forests' and belong to the category of 'tropical wetland rainforest ecosystem'.

They exhibit varied morphological and physiological evolutionary adaptations to survive the limiting factors imposed by lack of oxygen, high salinity and diurnal tidal inundation such as Succulent leaves, sunken stomata, aerial breathing roots called 'pneumatophores', vivipary, stilt roots, buttresses etc.

Types of mangrove formation in India

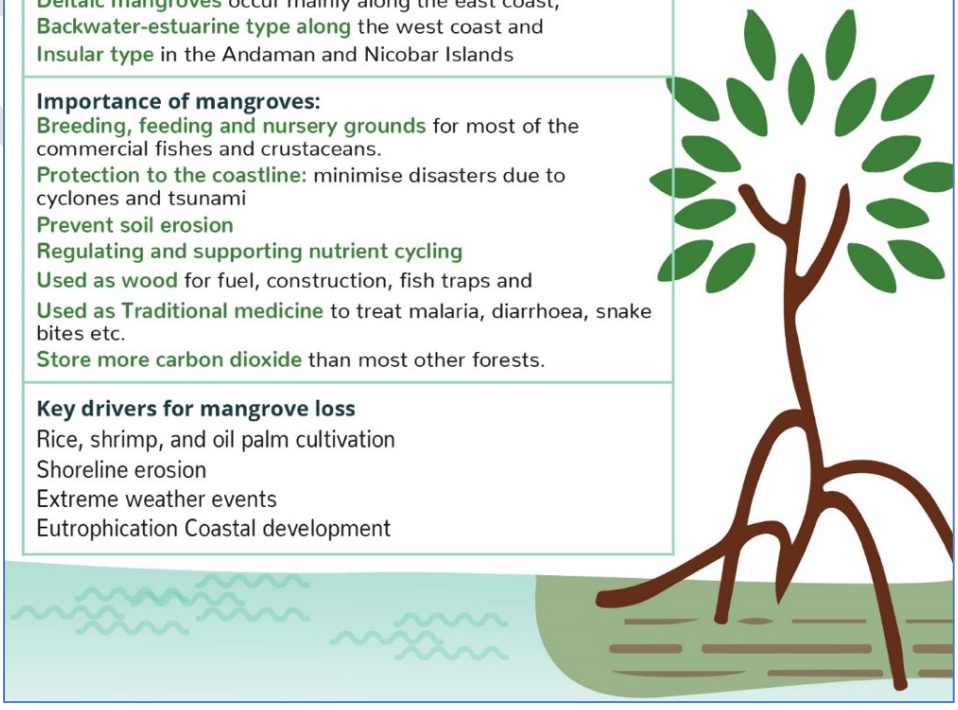
Deltaic mangroves occur mainly along the east coast,
Backwater-estuarine type along the west coast and
Insular type in the Andaman and Nicobar Islands

Importance of mangroves:

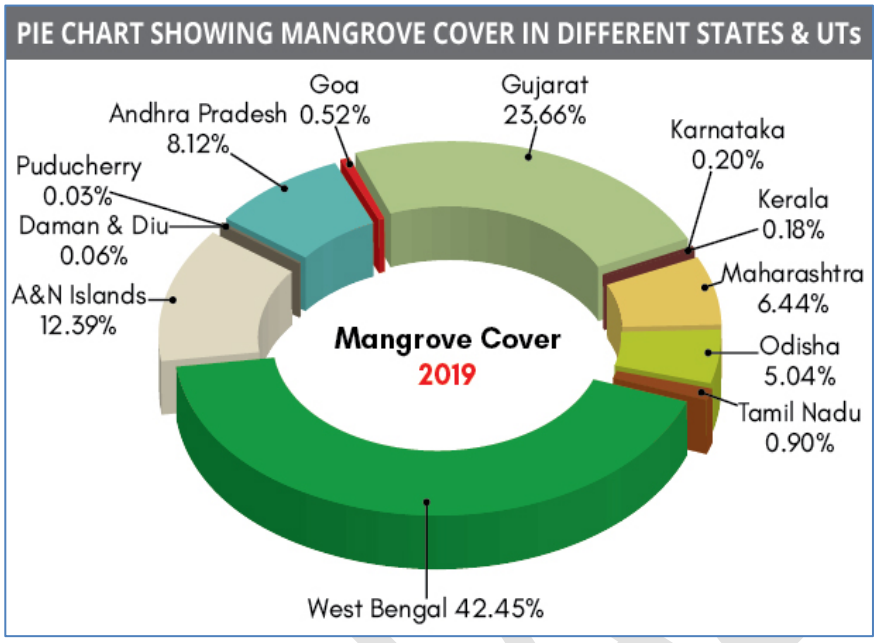
Breeding, feeding and nursery grounds for most of the commercial fishes and crustaceans.
Protection to the coastline: minimise disasters due to cyclones and tsunami
Prevent soil erosion
Regulating and supporting nutrient cycling
Used as wood for fuel, construction, fish traps and
Used as Traditional medicine to treat malaria, diarrhoea, snake bites etc.
Store more carbon dioxide than most other forests.

Key drivers for mangrove loss

Rice, shrimp, and oil palm cultivation
Shoreline erosion
Extreme weather events
Eutrophication Coastal development

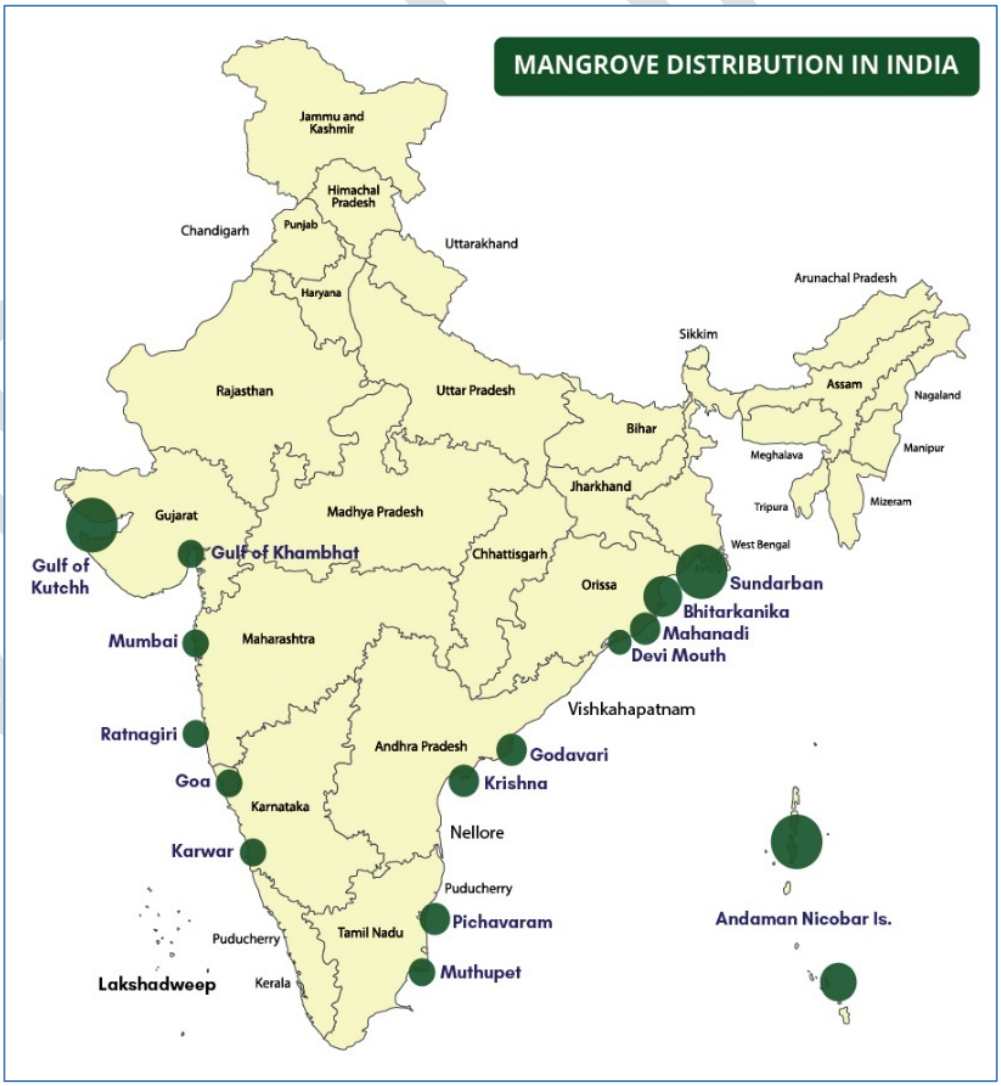


- **West Bengal has highest** of India's mangrove cover**,** followed by **Gujarat** and A&N Islands.
    - **Sunderbans Mangroves of West Bengal is largest mangrove forest in the world.**
    - Godavari-Krishna Mangroves, Baratang Island Mangroves in Andaman and Nicobar and Pichavaram Mangroves in Tamil Nadu are other important mangrove sites.
- **India has lost 40% of its mangrove area** in the last century, mainly due to agriculture, aquaculture, tourism, urban development and overexploitation.



Initiatives to conserve Mangrove ecosystem

- India has drafted a '**National Strategy and Action Plan'** to sustainably mitigate the mangrove and coastal ecosystem.
- **Coastal Regulation Zone (CRZ) notification under the Environmental Act, 1986,** declared all coastal stretches up to 500 m from the high tide line as CRZ, which is very essential for conservation and sustainable management of mangrove forests.
- Ministry of Environment, Forest and Climate Change put **restrictions on the expansion of shrimp farming.**
- **Mangrove for Future (MFF)** is Indian initiative with cooperation of IUCN to promote investment in coastal ecosystem conservation for sustainable development.



- **'Magical Mangroves – Join the Movement'** a nationwide campaign launched recently which highlights the significance of mangroves conservation in present times and urges citizens to join the conservation movement.
- In Andhra Pradesh, Forest Department has formed **Eco-Development Committees and Van Samrakshan Samithis** for joint implementation of projects in mangrove areas.
- Maharashtra became the first coastal state to declare a **state mangrove tree species** named **Sonneratia alba or mangrove apple** as a symbol to enhance conservation of mangroves.

Related Information:
Nairobi Convention

- It is a **partnership between governments, civil society and the private sector**, working towards a prosperous Western Indian Ocean Region with healthy rivers, coasts and oceans.
- It entered into force in 1996 and is part of **UNEP's Regional Seas Programme.**
- The **Convention offers a regional legal framework and forum for inter-governmental discussions** that lead to better understanding of regional environmental problems and the strategies needed to address them.
- To address emerging issues in the region, the Conference of Parties (COPs) have **established expert groups and task forces, such as the Mangove Network, the Coral Reef Task Force**, Marine Turtle Task Force, the Forum for Academic and Research Institutes (FARI), and the Legal and Technical Working Group.
- **India is not a party to the convention.**

Global Initiatives to protect Mangrove

- **Inclusion of mangroves in Biosphere Reserves, World Heritage sites and UNESCO Global Geoparks** contributes to improving the knowledge, management and conservation of mangrove ecosystems throughout the world.
- **International Blue Carbon Initiative** is a coordinated, global programme focused on mitigating climate change through the conservation and restoration of coastal and marine ecosystems.
- **Global Mangrove Watch (GMW)** is an online platform that provides the remote sensing data and tools for monitoring mangroves and gives universal access to near real-time information on where and what changes there are to mangroves across the world.

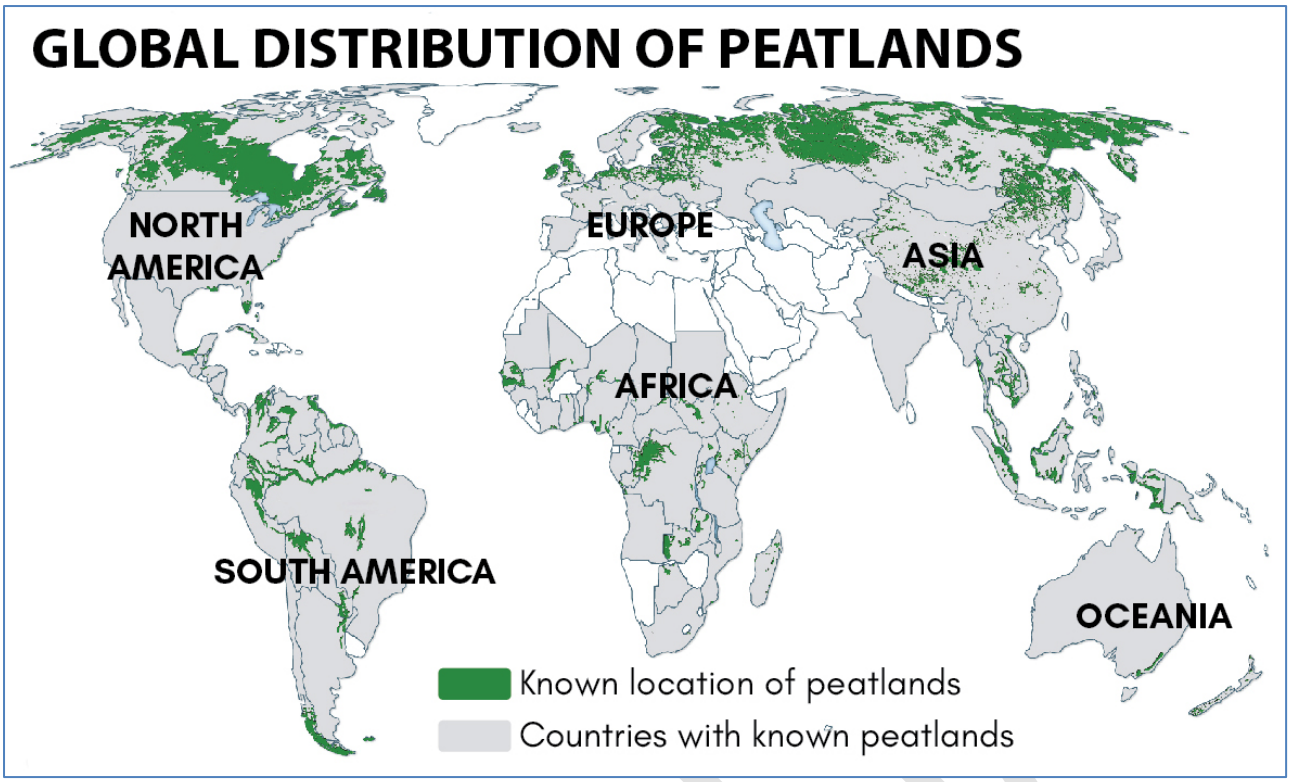
3.4.4. PEATLANDS

Why in news?

As per a recent study, Peatlands being rich in biodiversity **include many potential vertebrate and invertebrate vectors, or carriers of disease.**

About Peatlands

- **They are a heterogeneous mixture of plant material** (mosses, humus etc) that had accumulated **in a water-saturated area** and are only **partially decomposed due to absence of oxygen.**
- Peatland **covers 3% of global land surface** and are **largest natural terrestrial carbon store.**
- **They are found in** permafrost regions towards the poles and at high altitudes, in coastal areas, beneath tropical rainforest and in **boreal (taiga) forests**.
- **Importance of peatlands**
  - **Act as Natural firebreaks** between sections of forest. However, in the condition of **dehydration,** their dense carbon stores are **exposed to accelerated decomposition** and turns them **from firebreaks into fire propagators**.
  - Critical for **preserving global biodiversity, provide safe drinking water, minimise flood risk and help address climate change.**
  - **Largest natural terrestrial carbon store:** Damaged peatlands are a major source of greenhouse gas emissions, annually releasing almost 6% of global anthropogenic CO_2 emissions.



3.4.5. MARINE PROTECTED AREAS (MPAS)

Why in News?

According to recent reports as 2020 draws near, **marine protected areas (MPAs) cover only 7.66% of the ocean across the globe** which falls short on targets defined under **UN SDG 14.**

About Marine Protected Areas (MPAs)

- MPA is essentially a space in the ocean **where human activities are more strictly regulated** than the surrounding waters - similar to parks on land.
  - These places are **given special protections for natural or historic marine resources** by local, state, territorial, native, regional, or national authorities.
  - Currently, the world's largest marine protected area is in **the Ross Sea region off Antarctica**.
- **Most MPAs are in national waters** where it's easy to implement and manage protection under provision of a single country.
  - However, in **the more remote areas of high seas, only 1.18% of marine ecosystems** is protected.
  - **66% of world's oceans fall on high seas** which are outside national jurisdiction of any country and human activities here are regulated by under 1982 **UN Convention on the Law of the Sea (UNCLOS).**

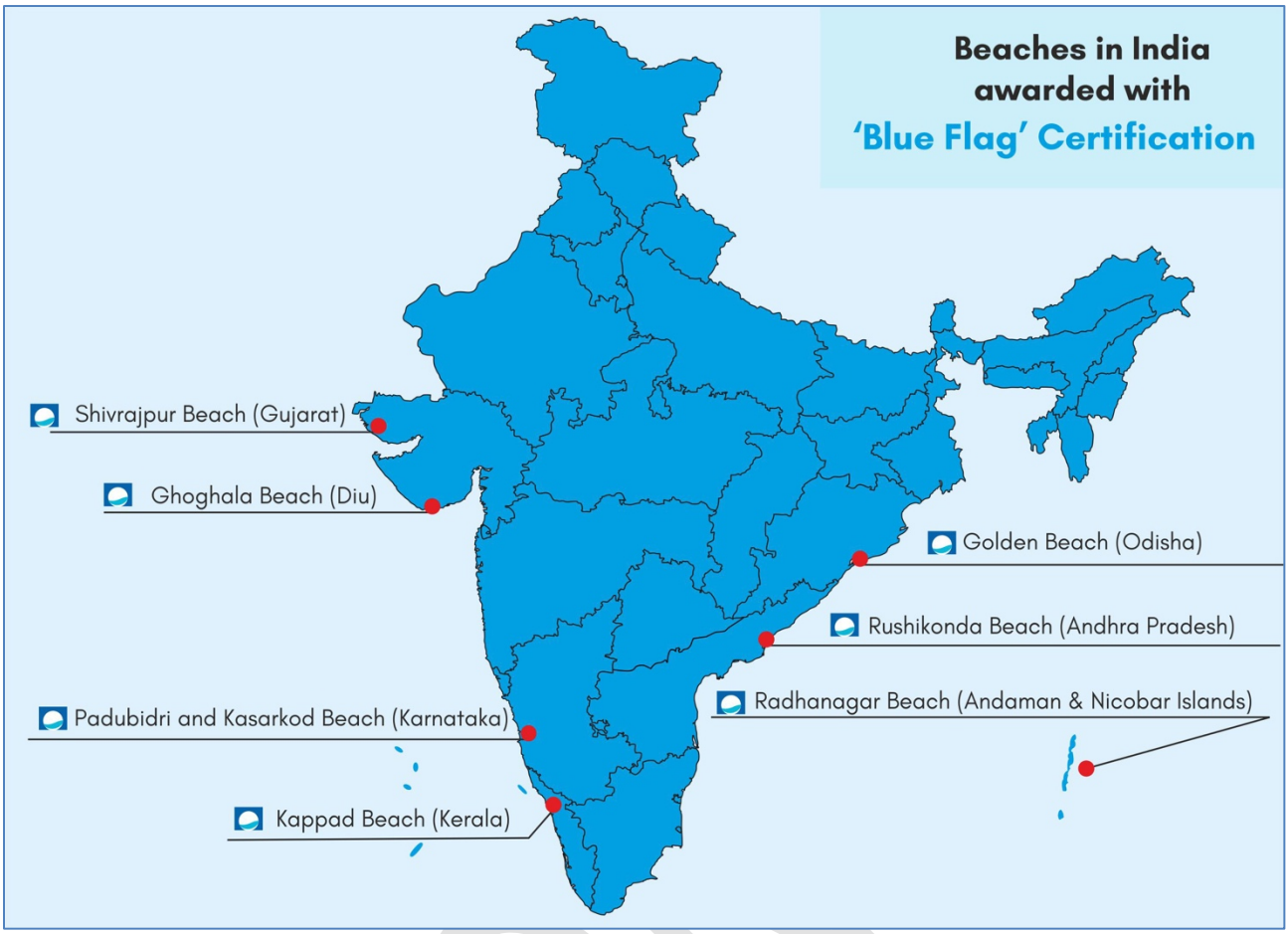
3.4.6. BLUE FLAG

Why in news?

Recently, Kasarkod and Padubidri beaches in Karnataka were accorded **'Blue Flag' tag** from the international agency **Foundation for Environment Education (FEE),** Denmark.

More about news

- The two beaches **Kasarkod beach and Padubidri beach** in the **Karnataka** are among the eight in the country that have bagged the coveted eco-label **'Blue Flag'** from FEE**.**
- **Kasarkod and Padubidri beaches have grey water treatment plants**, solid waste management plants, disabled-friendly equipment to enable them to enter seawater, clean drinking water, bathing facility, disabled-friendly and general toilets, solar power plant, solar lighting.



About Blue Flag Certification

- The 'Blue Flag' is a certification that can be obtained by a beach, marina, or **sustainable boating tourism operator, and serves as an eco-label.**
  - The certification is **awarded annually by the Denmark-based non-profit Foundation for Environmental Education (FEE).**
  - It **sets stringent environmental, educational, safety-related** and access-related criteria that applicants must meet and maintain.
- A **'Blue Flag' beach is an eco-tourism model** to provide tourists clean and hygienic bathing water, facilities/amenities, safe and healthy environment and sustainable development of the area.
- The certification is awarded by **the FEE based** on **33 stringent criteria** in four major heads:
  - **Environmental education and information**
  - **Bathing water quality**
  - **Environment management and conservation**
  - **Safety and services in the beaches**
- India had also **launched its own eco-label BEAMS (Beach Environment & Aesthetics Management Services)** under its ICZM (Integrated Coastal Zone Management) project to **abate pollution in coastal waters, promote sustainable development of beach facilities, protect & conserve coastal ecosystems & natural resources etc.**

3.5. MISCELLANEOUS

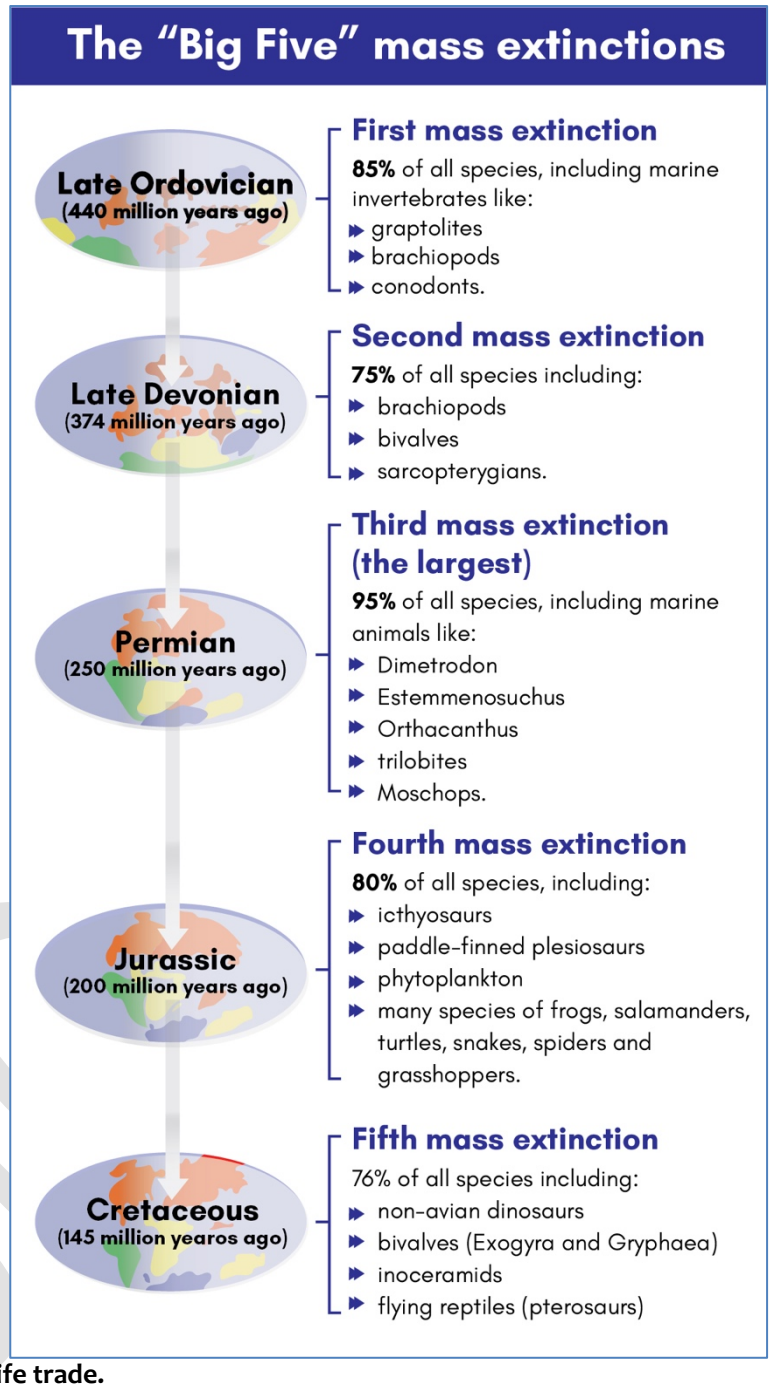
3.5.1. SIXTH MASS EXTINCTION

Why in News?

A research recently warned about Sixth Mass extinction.

About Sixth Mass extinction

- Mass extinction refers to a **substantial increase in degree of extinction** or when Earth loses more than three-quarters of its species in a geologically short period of time.
- So far **there have been five mass extinctions (refer infographics),** in last 450 million years, **that have led to destruction of 70-95% of species of plants, animals and microorganisms** that existed earlier.
    - These were caused by events 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.
- According to a new research, **ongoing sixth mass extinction may be one of the most serious environmental threats** to persistence of civilization as loss of species will be permanent.
    - It is referred to as **Anthropocene extinction.**
    - This **extinction is human-caused** and is more immediate than climate destruction.
    - **400 vertebrate species went extinct in last century,** extinctions that would have taken over 10,000 years in normal course of evolution.
    - There will be **more pandemics** if we continue destroying habitats and trading wildlife.
    - Suggested **complete ban on wildlife trade.**



3.5.2. LOCUST ATTACK

Why in news?

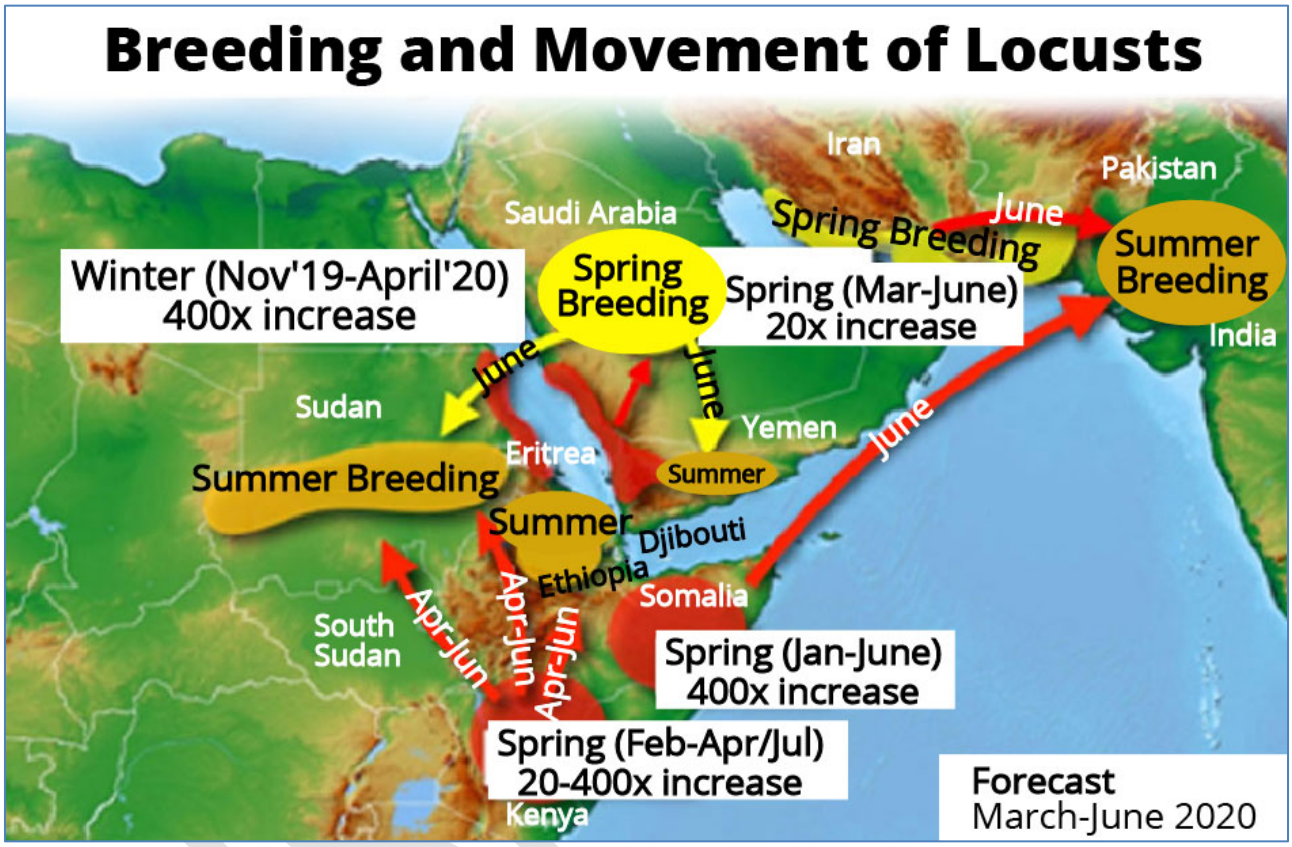
Recently, Swarms of desert locusts invaded vast swathes of land in various Indian states which entered via Pakistan's Sindh province

Desert Locusts

- They belong to the family of **grasshoppers** and have life span of 90 days.
- **Four species of locusts are found in India**: **Desert locust** (Schistocerca gregaria), **Migratory locust** (Locusta migratoria**), Bombay Locust** (Nomadacris succincta) and **Tree locust** (Anacridium sp.).
    - Desert locusts are usually restricted to the semi-arid and arid deserts of Africa, the Near East and South-West Asia that receive less than 200 mm of rain annually.
- They lay **eggs in damp soil** in the bare ground, which is rarely found in areas with dense vegetation.
- Desert locusts **are "biphasic" animals,** meaning they can take on two entirely different forms.
    - In their **"solitary" form**, they are drab brown in colour and relatively harmless to crops.

- Under certain conditions (such as optimum moisture and vegetation), the insects can switch into a "**gregarious form**" and start forming swarms – turning electric yellow and displaying swarming behaviour.

- **A swarm may contain 40 to 80 million adults** in one square km, and these can fly at 16-19 km an hour, depending on the wind, and cover up to 150 km in a day.
- They are **omnivorous** and one adult desert locust can eat roughly its own weight or about 2 gm of fresh food everyday.
- In all there are **three breeding seasons** for locusts -Winter breeding [November to December], Spring breeding [January to June] and Summer breeding [July to October]. **India** has only one locust breeding season and that **is Summer breeding**.



Reasons for recent locust attacks

- **Favourable weather conditions:** Most of the attacks by locust swarms in India since 1993 have been localised to Rajasthan.
  - But this time, favourable weather conditions have facilitated locusts' travel from Rajasthan to Gujarat, Madhya Pradesh, Uttar Pradesh and even Maharashtra.
- **Indian Ocean Dipole:** The desert locusts usually breed in the areas in the countries along the eastern coast of Africa in a region known as the **Horn of Africa.**
  - Rising temperatures due to global warming amplified the Indian Ocean dipole and made the western Indian Ocean particularly warm.
  - Heavy rain triggers the growth of vegetation in arid areas where desert locusts can then grow and breed.
- **Cyclones:** The cyclonic storms Mekunu and Luban that struck Oman and Yemen respectively transformed the empty desert tracts into large lakes providing damp soils where the locust swarms breed.
- **Wind Movement:** Locusts generally follow the wind, and are known to be passive flyers.
  - The low-pressure area created by **Cyclone Amphan** in the Bay of Bengal strengthened the westerly winds which aided the movement of the locusts into South Asia.
- **Westerlies:** The westerlies also brought with them several bouts of rainfall over north and western India which also helped the insects reproduce.

Steps taken by India

- **Locust Warning Organisation (LWO)**, under **Ministry of Agriculture & Farmers Welfare**, is responsible for monitoring, survey and control of Desert Locust in Scheduled Desert Areas mainly in the States of Rajasthan and Gujarat.
- **200 Locust Circle Offices have been set up** to conduct survey & control and monitor the attack in coordination with District Administration and agriculture field machinery of affected States.
- **Use of Pesticide:** While the use of BHC and dieldrin stopped after the government banned them, malathion is now the preferred insecticide by LWO. Agriculture officials who accompany them during control operations mostly use chlorpyrifos and lambda cyhalothrin.
  - The country is also **procuring pesticide sprayers from the UK** and has deployed fire brigades, tractors and other vehicles for spraying insecticides.
- The Centre has **compensated** some of the farmers who suffered **losses from the National Disaster Response Force (NDRF) Fund**.
- **Hindustan Insecticides Limited** is now in process of production and supply of 25 MT Malathion for supply to locust control programme to Iran under Government to Government arrangement.
- **Drones are used** to spray pesticides on tall trees and inaccessible places for effective control of locusts.
- **Regular coordination with South-West Asian countries** like Afghanistan, Iran and Pakistan where locust attacks are common.

3.5.3. UN DECADE ON ECOSYSTEM RESTORATION

Why in news?

The United Nations General Assembly (UNGA) proclaimed **2021–2030** as the **Decade on Ecosystem Restoration**.

International Decades

- The United Nations (UN) **designates specific days, weeks, years and decades** as occasions to **mark particular events or topics** in order to promote, through awareness and action, the objectives of the Organization.
- **Some decades ending in 2020 are-**
  - United Nations Decade on Biodiversity
  - Decade of Action for Road Safety
  - United Nations Decade for Deserts and the Fight against Desertification.

About UN Decade on Ecosystem Restoration

- The UN Decade on Ecosystem Restoration aims to **massively scale up the restoration of degraded and destroyed ecosystems** as a proven measure to fight the climate crisis and enhance food security, water supply and biodiversity.
- **Ecosystems addressed** include forests, grasslands, croplands, wetlands, savannahs, inland water, coastal and marine ecosystems, and even urban environments.
- On land, restoration of **at least 350 million hectares of degraded landscapes by 2030** is targeted.
  - A target for coasts and oceans has yet to be set.
- This endeavour builds on regional efforts such as:
  - **Initiative 20×20 in Latin America** that aims to restore 20 million hectares of degraded land by 2020,
  - **AFR100 African Forest Landscape Restoration Initiative** that aims to bring 100 million hectares of degraded land under restoration by 2030.
- **UN Environment and the Food and Agriculture Organization (FAO)** will lead the implementation.

About Ecosystem Restoration

- It is the **process of assisting the recovery of an ecosystem** that has been degraded, damaged or destroyed.
  - An ecosystem is a functional unit of nature, where living organisms interact among themselves and also with the surrounding physical environment.
- **Restoration activities** may be designed to replicate a pre-disturbance ecosystem or to create a new ecosystem where it had not previously occurred.
  - It involves practices such as restoring vegetation, planting native trees, clearing invasive species, regenerative (perennial) agriculture, agroforestry etc.
- The concept has gained importance due to the **unprecedented pace of degradation** of world's landscapes and ecosystems because of over-exploitation of natural resources.

3.5.4. THE LIVING PLANET REPORT 2020 (LPR)

Why in News?

Recently, World Wildlife Fund (WWF), a leading **organization in wildlife conservation and endangered species,** released The Living Planet Report 2020 (LPR) along with the Living Planet index (LPI).

About Living Planet Report

- LPR, released every two years, is a **comprehensive study of trends in global biodiversity and health of the planet.**
- **Key Findings**
  - **It shows an average 68% decrease** in population sizes of mammals, birds, amphibians, reptiles and fish between 1970 and 2016.
  - Since the industrial revolution, **human activities have increasingly destroyed and degraded forests, grasslands, wetlands and other important ecosystems,** threatening human well-being
    - ✓ **75% of Earth's ice-free** land surface has been significantly altered.
    - ✓ More than **85% of global wetlands have been lost. India has lost nearly one-third of its natural wetlands**
  - **Destruction of ecosystems has led to 1 million species** (500,000 animals and plants and 500,000 insects) **being threatened with extinction.**
  - Most important direct driver of biodiversity loss in terrestrial systems has been **land-use change,** primarily the conversion of pristine native habitats (forests, grasslands and mangroves) into agricultural systems; while much of the oceans have been overfished.
  - **Largest wildlife population loss has been in Latin America** at an alarming rate of 94%.
  - Since 1970, our **Ecological Footprint has exceeded the Earth's rate of regeneration.**

About Living Planet Index (LPI)

- LPI is a measure of the **state of global biological diversity based on population trends of vertebrate species** from around the world.
- LPI **has been adopted by the Convention of Biological Diversity (CBD)** as an indicator of progress towards its 2011-2020 target to 'take effective and urgent action to halt the loss of biodiversity.
- The LPI tracks the **abundance of almost 21,000 populations** of mammals, birds, fish, reptiles and amphibians around the world.
- The LPI includes **data for threatened and non-threatened species.**
- The LPI **doesn't show numbers of species lost or extinctions.**

3.5.5. DISENGAGING PREMIER GREEN INSTITUTIONS

Why in news?

Recently, Ministry of Finance has recommended to 'disengage' from five premier environment- forest-wildlife institutions that are presently under the **Ministry of Environment Forests and Climate Change (MOEFCC).**

More about news

- **Disengagement** will involve two aspects
  - **phasing out government support** to the institution in a time-bound manner
  - **disassociating from the management** of the institutions and allowing the relevant industry/stakeholders to run them.
- The committee has recommended that MoEFCC disengage from these autonomous bodies:
  - **Indian Institute of Forest Management**
  - **Wildlife Institute of India**
  - **Indian Plywood Industries Research and Training Institute**
  - **CPR Environmental Education Centre**
  - **Centre of Environment Education**
- It has also recommended that **merger of Society of Integrated Coastal Management and National Centre for Sustainable Coastal Management** as both perform similar roles of promoting coastal management to avoid duplication of activities and attain economies of scale
  - Also **Salim Ali Centre for Ornithology and Natural History,** Coimbatore, which is under the MoEFCC, should be brought under the ministry's regular functioning.
- It also recommended that the Indian Council for Forest and Research Education, GB Pant National Institute of Himalayan Environment and Sustainable Development and **statutory bodies such** as **Central Pollution Control Board, Central Zoo Authority (CZA), National Tiger Conservation Authority (NTCA), National Biodiversity Authority** continue to function under and with the financial support of MoEFCC.

About institutions

Indian Institute of Forest Management (IIFM)	• It is a sectoral management institute, which constantly **endeavors to evolve knowledge useful for the managers in the area of Forest,** Environment and Natural Resources Management and allied sectors. • It disseminates such knowledge in ways that **promote its application by individuals and organizations.** • It is located in **Bhopal.**
Wildlife Institute of India (WII)	• Established in **1982,** it is an internationally acclaimed Institution. • It offers **training program, academic courses and advisory in wildlife research** and management. • It is located in **Dehradun**
CPR Environmental Education Centre	• It strives to **increase awareness and knowledge of key target groups** (school children, local communities, woman etc.) about the various aspects of environment. • It is established jointly by the MoEFCC and The C.P. Ramaswami Aiyar Foundation. • It is located in **Chennai.**
Indian Plywood Industries Research and Training Institute	• It works for **development and adoption of efficient technologies in the field of wood and panel products from renewable fibres** including plantation timbers and bamboo while meeting the vital needs of the developing society. • It was initially formed as a co-operative research laboratory under the umbrella of Council of Scientific and Industrial Research (CSIR). • It is located in **Bengaluru.**
Centre for Environment Education (CEE)	• The organization works towards developing programmes and materials to **increase awareness about the environment and sustainable development.** • It was established in 1984 as a Centre of Excellence of the MoEFCC. • The head office is located in **Ahmedabad.**

4. SUSTAINABLE DEVELOPMENT

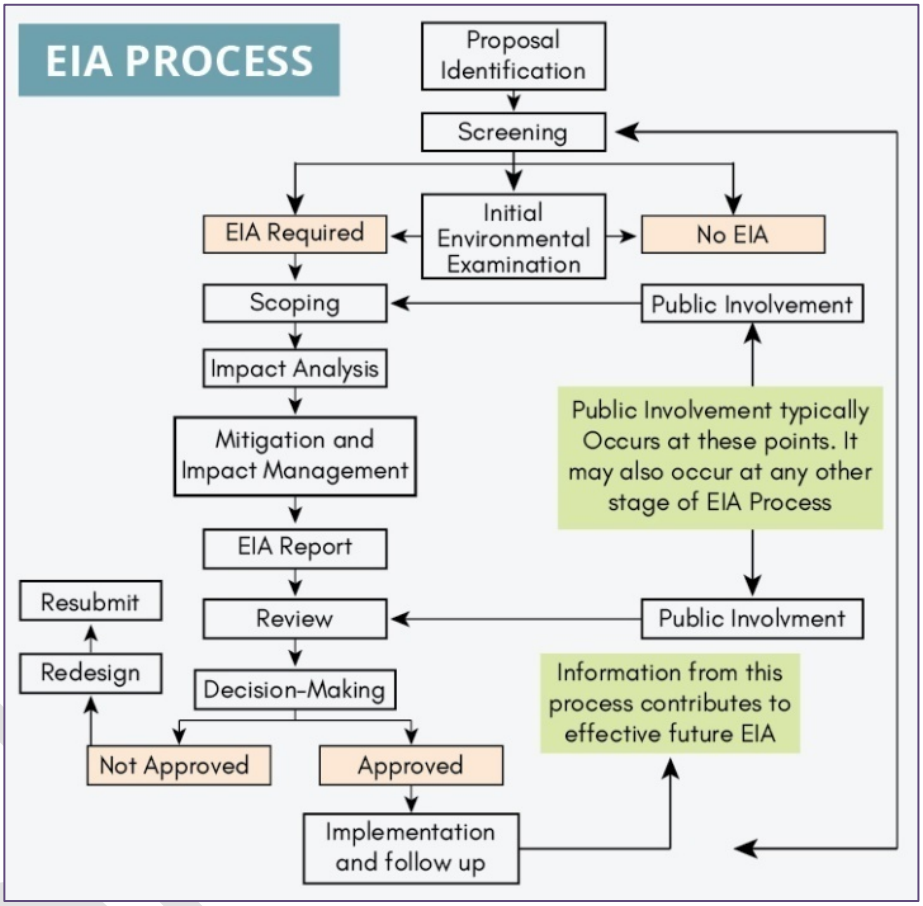
4.1. DRAFT ENVIRONMENT IMPACT ASSESSMENT (EIA), 2020

Why in news?

Ministry of Environment, Forest and Climate Change (MoEF&CC) has published the draft Environment Impact Assessment (EIA) Notification 2020, which replaces the existing EIA Notification, 2006 brought under the Environment (Protection) Act (EPA), 1986.

Background

- **India legislated an umbrella Act for environmental protection in 1986** i.e. the EPA after being signatory to the Stockholm Declaration (1972) on Environment and Bhopal gas leak disaster in 1984.
- **Under the Act, the country notified its first EIA norms in 1994** setting in place a legal framework for regulating activities that access, utilise, and affect (pollute) natural resources. **Every development project has been required to go through the EIA process** (under Section 3 of the EPA) for obtaining prior environmental clearance ever since.



- The **1994 EIA notification was replaced with a modified draft in 2006.** The government redrafted it again in 2020 to incorporate the amendments and relevant court orders issued since 2006, and to make the EIA "process more transparent and expedient."

About EIA

- Environmental Impact Assessment or EIA is the process or study which
  - **predicts** the effect of a proposed industrial/infrastructural project on the environment.
  - **prevents** the proposed activity/project from being approved without proper oversight or taking adverse consequences into account
  - **compares** various alternatives for a project and seeks to identify the one which represents the best combination of economic and environmental costs and benefits.
- Any project requiring environmental clearance, first needs to undergo a **thorough screening and scoping process by the regulatory authorities** and thereafter a draft EIA report is sent for public consultation.
- Under the existing 2006 law, **projects are categorised into category A and B** where all projects in the **category A need to undergo the process of EIA.** Category B projects are further classified into category B1 and B2, on the basis of their scope and potential impact and only the projects under **B2 are exempted**.

S No.	PARTICULARS	EIA, 1994	EIA, 2006	EIA, 2020
1.	Period for public consultation	30 days	45 days	40 days
2.	Monitoring period	The Project Authorities to monitor projects for compliance with environmental norms every 6 months.	Authorities to monitor projects for compliance with environmental norms every 6 months.	The monitoring frequency has been relaxed to once a year.
3.	Environmental clearance	i) Onus of providing environmental clearance for projects lay entirely on the Centeral Government ii) There was no division of category for projects mentioned in Schedule 1.	i) Power was decentralised wherein under the new notification the onous of providing environmental clearance for projects was shared between the Central and the State Government. ii) Projects in Schedule 1 were divided into two categories, i.e., Category A projects (national level appraisal) and Category B projects (state level appraisal). National and State Level Environment Impact Assessment Authority were responsible for it respectively.	i) The Onus of providing environmental clearance for projects was divided between the Centeral and the State Government as before. ii) Projects are divided into three categories- 'A', 'B1' and 'B2', based on the potential social and environmental impacts and the spatial extent of these impacts.
4.	Environmental clearance process	i) Screening ii) Public hearing iii) Obtaining No Objection Certificate ("NOC") from State Pollution Control Board iv) Evaluation of application v) Recommendations This process has to be completed within 90 days	i) Screening ii) Scoping iii) Public hearing iv) Appraisal Category A projects would have to mandatorily undergo environmental clearance and there is no screening process for it. Category B projects would have to undergo screening, to determine whether they belong to Category B1 or Category B2 Category B2 is exempted from EIA.	For Category A and B1 projects: i) Scoping ii) Preparing the draft environmental impact assessment ("EIA") report. iii) Public consultation. iv) Preparation of final EIA report. v) Appraisal Category B2 projects which require appraisal have to be placed before the appraisal committee which are: i) Preparation and appraisal of Environment Management Plan. ii) Verification of its completeness by the Authority appointed. iii) Grant/rejection of clearance. Category B2 which don't require appraisal would only have to follow last two steps.
5.	Provision for appeal against prior environment clearance	Not applicable	Not applicable	An appeal can be made to National Green Tribunal against prior environment clearance

Related News: Ministry of Environment, Forest and Climate Change (MoEFCC) issues fresh guidelines to accelerate environmental appraisal of projects

- New guidelines aim to expedite **environment appraisal of industrial projects.**
  - Appraisals are done by **Expert Appraisal Committee (EAC)** that has representatives from government and outside, trained in matters of ecology, wildlife and habitat preservation.
  - Their **advice is critical to MoEFCC's decision to either clear or red flag** a project.
  - There are **separate EAC committees for industrial projects, coal mining, non-coal mining**, river and hydroelectric projects.
- **Highlights of new guidelines:**
  - Ensure EAC meetings are held **at least once in 15 days.**
  - All proposals that are placed for approval **10 days before a meeting ought to be considered.**

4.2. NATIONAL GREEN TRIBUNAL (NGT)

Why in news?

The National Green Tribunal (NGT) recently completed 10 years.

About National Green Tribunal

- The NGT is a **statutory and quasi-judicial body** established under the National Green Tribunal Act, 2010.
- It aims for effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources.
- The Tribunal is not bound by the Code of Civil Procedure, 1908 or the the Indian Evidence Act, 1872 but is **guided by principles of natural justice**.
- **New Delhi is the Principal place of sitting** and Bhopal, Pune, Kolkata and Chennai are the other fou.

STRUCTURE

Term of members: 5 years

Members not eligible for Reappointment

CHAIR PERSON
Judge of SC or Chief Justice of HC

+

JUDICIAL MEMBERS
Judge of SC/Chief Justice of HC/Judge of HC

+

EXPERT MEMBER
Prescribed Technical Qualifications

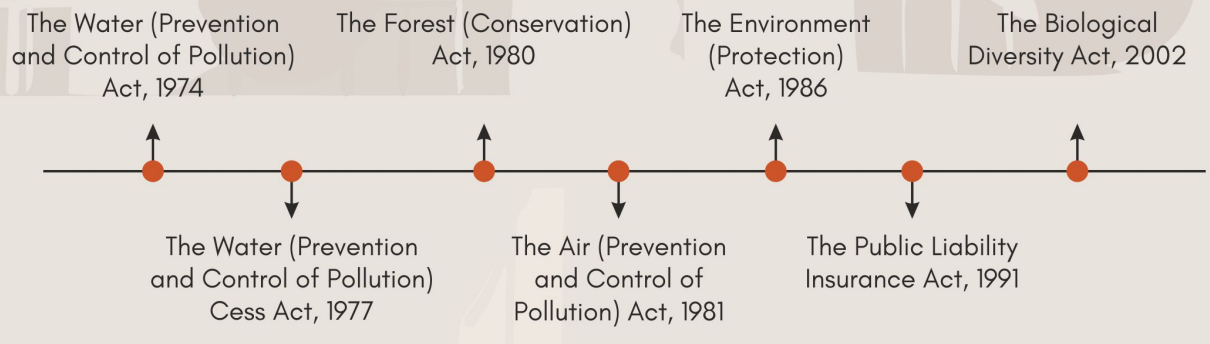
Appointment by Central Govt. in consultation with CJI

Appointment by Central Govt. on Recommendation of Selection Committee

POWERS OF NGT

- Power to **regulate its own procedure**.
- Its order/decision/award is **executable as a decree of a civil court.**
- Appeal against the order/decision/ award of the NGT can be filed in the **Supreme Court** (usually within 90 days).
- **Mandated to dispose applications\appeals within 6 months of filing.**
- NGT by an order, can provide-
  - Relief and compensation to the victims of air pollution and different environmental damage,
  - Restitution of property damaged
  - Restitution of the surroundings for such vicinity or areas
- **Penalty for not complying with the Tribunal's orders**: Upto 3 years imprisonment and/ or fine of Rs 10 crores for individuals (Rs 25 crores for companies)

JURISDICTION OF NGT



4.3. SUSTAINABLE OCEAN ECONOMY FOR 2050 REPORT

Why in News?

High Level Panel for a sustainable Ocean Economy commissioned this report to examine the global net benefit of implementing sustainable, ocean-based interventions over a 30-year period (2020-2050).

About High Level panel for Sustainable Economy (Ocean Panel)

- **It is a unique initiative of 14 serving world leaders** building momentum towards a sustainable ocean economy, where effective protection, sustainable production and equitable prosperity go hand-in-hand.
  - **India is not a member.**
- It is supported by the UN Secretary-General's Special Envoy for the Ocean.
- It was established in 2018 and **has been working with government, business, financial institutions,** the science community and civil society.
- It aims to provide **pragmatic solutions across policy, governance, technology and finance,** and ultimately develop an action agenda for transitioning to a sustainable ocean economy.

Key Highlights of report

- Report provides **benefit-cost ratio over a 30 year period** (2020-2050) by focusing on **four ocean-based policy interventions:**
  - Conserving and restoring mangrove habitats.
  - Scaling up offshore wind production.
  - Decarbonising the international shipping sector.
  - Increasing the production of sustainably sourced ocean based proteins.
- Sustainable **ocean-based investments will yield benefits at least five times greater** than the costs. **It can deliver on three dimensions:**
  - **Protect:** reduce greenhouse gas (GHG) emissions while safeguarding biodiversity
  - **Produce:** contribute to sustainably powering and feeding a planet of 9.7 billion people in 2050
  - **Prosper:** create better jobs and support more equitable economic growth, household income and well-being.

4.4. ALTERNATIVE FUELS AND ENERGY RESOURCES

4.4.1. SOLAR ENERGY

Why in News?

At the inauguration of 3rd **Global Renewable Energy Investment Meeting and Expo (Global RE-INVEST)**, PM highlighted that India's demand for solar energy is creating a market opportunity worth $20 billion annually.

Global RE-INVEST

It is renewable energy investors Meet & Expo, organised by Ministry of New and Renewable Energy in collaboration with the World Bank and others.

India's renewable energy capacity

- India's renewable energy generation capacity is the **fourth largest in the world (currently 136 GW which is 36% of total capacity)**. It is growing at the fastest speed among all major countries.
  - By 2022, **share of renewable capacity will increase to 220 GW**.
  - Demand for **locally-produced panels will also grow to 36 GW over three years**.
- **Government initiatives to support manufacturing**
  - **Production Linked Incentives (PLI)** given to high efficiency solar modules.
  - **Sustainable rooftop implementation of Solar transfiguration of India (SRISTI)** scheme
  - **National Solar Mission** to promote ecologically sustainable growth while addressing India's energy security challenge.

Main technologies utilised for harnessing solar energy

- **Solar Photovoltaics (PV):** It is based on the photovoltaic effect, by which a photon (the basic unit of light) impacting a surface made of a special material generates the release of an electron.
- **Concentrating Solar Power (CSP):** It uses sunlight to heat a fluid (depending on the particular application, it can be water or other fluid)

Other Initiatives for Solar Energy	
Roof Top Solar Scheme	• In 2019, Government approved **phase II of Grid-connected RTS Scheme with an objective to:** ○ **Promote grid connected RTS in all consumer segments,** viz., residential, institutional, social, Govt., commercial, industrial etc.

	○ Bring **DISCOMs as key drivers for rapid deployment of RTS.** ○ **Promote domestic manufacturing** of solar cells and module. • Solar power so generated **can be used either for captive consumption of premises or can be fed into grid** and be **adjusted in electricity bill.** • India has set the target of achieving 100 GW of solar power capacity by 2022 of which **40 GW to be achieved from RTS.**
Phase III of Off-Grid and Decentralised Solar PV (Photo Voltaic) Application Programme	• **Phase III of the programme was launched in August, 2018,** and was slated to be valid for **FY19 and FY20.**It aimed **to achieve additional 118 MWp(Mega Watt peak) off-grid solar PV capacity** by 2020. ○ Off-grid also known as a stand-alone power system (SAPS) which allows storing solar power in batteries for use when power grid goes down or if not on grid. • **Components:** ○ 3,00,000 numbers of **solar street lights** to be installed throughout country. ○ **Standalone Solar power plants** of up to 25 kWp (kilo Watt peak) will be promoted in areas where grid power has not reached. ○ 25,00,000 numbers of **solar study lamps** will be provided in North Eastern States and LWE affected districts.
Pradhan Mantri KisanUrja Suraksha evam Utthaan Mahabhiyaan (PM-KUSUM) Scheme	• PM-KUSUM was **launched in 2019 to encourage farmers to generate solar power in their farms** and use the clean energy to replace their diesel water pumps. • Scheme has 3 components: ○ **Component A:** setting up of 10,000 megawatts of decentralised ground/ stilt mounted grid connected solar or other renewable energy-based power plants. ○ **Component B:** Off grid solar pumps. Individual farmers will be supported to install 17.50 lakh standalone solar Agriculture pumps ○ **Component C:** Solarization of grid-connected electric pumps • **Recent changes in the scheme:** ○ Besides barren, fallow and agricultural lands, solar power plants can **also be installed on pasture land and marshy land of farmers.** ○ To support small farmers, solar projects **smaller than 500 kW may be allowed** (earlier not allowed) by states based on techno-commercial feasibility. ▪ MNRE will retain **33% of eligible service charges for nationwide Information, Education and Communication (IEC) activities.** ▪ There shall be **no penalty to Renewable Power Generator (RPG) for shortfall in solar power generation** from minimum prescribed Capacity Utilization Factor (CUF).
Floating solar project (FSP)	• The world's largest FSP (600 MW solar energy) will be **constructed at Omkareshwar dam on Narmada river** in Khandwa, Madhya Pradesh. ○ It will begin power generation by 2022-23. • **FSP doesn't take up valuable space on land,** however it is 25-30% costlier. • FSP in India include a **10 kW plant in Kolkata, a 100 kW by NTPC in Kerala and a 2 MW project by Greater Visakhapatnam Smart City Corporation Limited** (GVSCCL) in Visakhapatnam.
World's Largest Solar Tree	• It has been developed by CSIR- Central Mechanical Engineering Research Institute and is **installed in Durgapur.** • Its installed capacity is above 11.5 kWp. • **Solar tree** is made of metal structure and have solar panels at the top instead of branches of real tree. ○ One solar tree **can reduce ten to twelve tonnes of carbon dioxide emissions.**

4.4.2. ONE SUN ONE WORLD ONE GRID

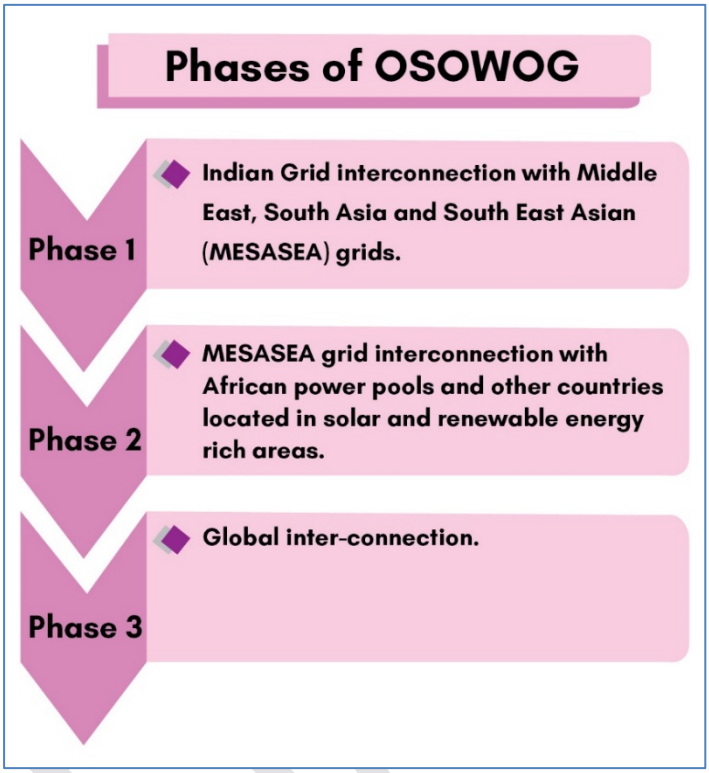
Why in news?

The Ministry of New and Renewable Energy (MNRE) recently issued a request for proposal (RfP) for developing a long-term vision, implementation plan, road map, and institutional framework for its **One Sun One World One Grid (OSOWOG) program.**

About OSOWOG

- The idea for OSOWOG was for the first time pitched by Indian Prime Minister in **2018** during the first General Assembly of International Solar Alliance (ISA).

- Through the OSOWOG initiative India plans build a **global ecosystem of interconnected renewable energy resources** that are seamlessly shared for mutual benefits and global sustainability.
- The vision behind the OSOWOG is **"The Sun Never Sets"** and is a constant at some geographical location, globally, at any given point of time. Hence solar energy can be utilized through **interconnected transmission.** The global grid plan may also leverage the ISA.
- The interconnected grid is envisioned **among more than 140 countries** with **India at the fulcrum** and two broad zones viz.
  - **Far East** which would include countries like Myanmar, Vietnam, Thailand, Lao, Cambodia etc. and
  - **Far West** which would cover the Middle East and the **African Region.**
- Phases of OSOWOG. **(refer infographic).**
- It has been taken up under **World Bank technical assistance programme.**
- **Benefits of OSOWOG:** attracting investments; utilizing skills and technology; reducing project costs; higher efficiency and increased asset utilization, scale-up in access to energy etc.



Related News: World Risk Mitigation Initiative (SRMI)

- **World Bank** has operationalised SRMI with $333 million for 22 African countries.
- SRMI aims to **support countries in developing sustainable solar programs** that will attract private investments and so **reduce reliance on public finances.**
- It is developed by World Bank-Energy Sector Management Assistance Program (WB-ESMAP) in partnership with, Agence Française de Développement (AFD), International Renewable Energy Agency (IRENA) and International Solar Alliance (ISA).

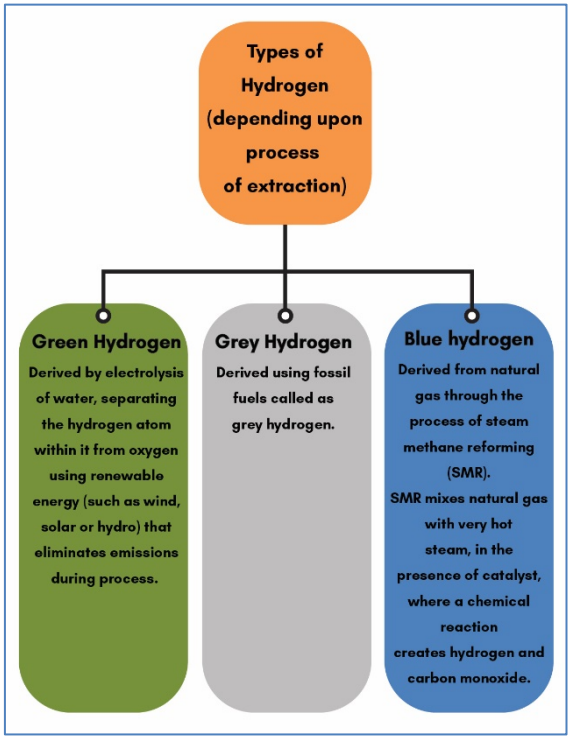
4.4.3. HYDROGEN BASED ENERGY

Why in news?

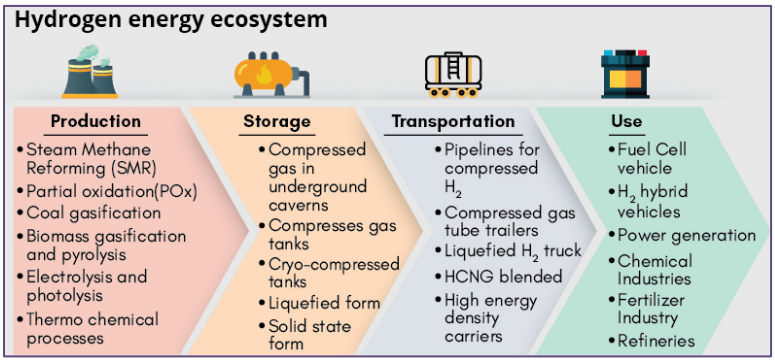
Indian firms such as NTPC Ltd, Indian Oil Corporation, Acme Solar and Greenko are looking at hydrogen as a new business opportunity for extracting energy.

About Hydrogen as fuel

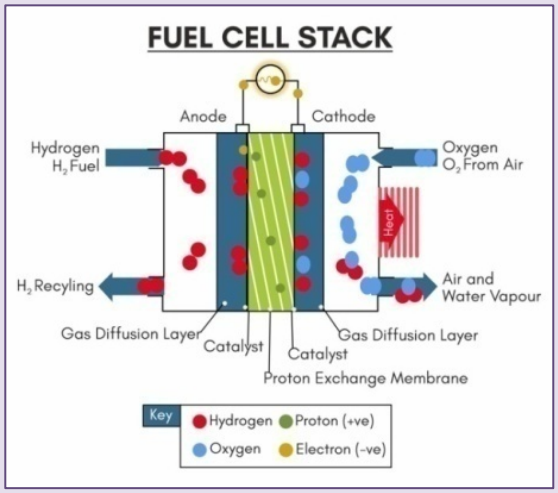
- Hydrogen (H_2) is an **alternative fuel** that can be produced from diverse domestic resources.
  - It is abundant in our environment and it's stored **in water (H_2O), hydrocarbons (such as methane, CH_4), and other organic matter.**
  - Hydrogen is an **energy carrier that can be used to store, move, and deliver energy** produced from other sources.
  - Hydrogen with its **abundance, high energy density, better combustion characteristics**, non- polluting nature etc. has vast advantages over the conventional fuels.
- Globally **hydrogen is being produced mostly from fossil fuels** — 76% from natural gas and around 23% from coal, with the remaining from electrolysis of water.



- In India, **hydrogen is being commercially produced in the fertilizer industry, petroleum refining and chemical industries** and also as a by-product in chlor-alkali industries.
- Cleaner methods of hydrogen production chiefly constitute **electrolysis, via chemical or photoelectrochemical routes.**



Applications of Hydrogen

Hydrogen Fuel cell	• Hydrogen fuel cell systems are used for generating electricity, in vehicular applications (Fuel cell cars, buses, etc.) and portable devices (Laptops, phones, etc.) ○ A **fuel cell is a device that generates electricity by a chemical reaction.** An electrolyte (membrane) carries electrically charged particles from one electrode to the other (anode and cathode), as well uses catalysts to speed up the reactions and produce electricity at the electrodes. • **Benefits:** ○ **Eliminates pollution: Only water vapour and heat** are emissions from fuel cell. ○ **Do not need periodically recharging** like batteries and produce electricity as long as long as supplied with a hydrogen and oxygen (usually air) source ○ Higher electrical efficiency ○ Noise-free operation • **Limitations of HFC:** High cost of catalysts (platinum), High cost of equipment, issues with storage of hydrogen gas, maintenance issues (like corrosion) etc. 
Hydrogen enriched CNG (H-CNG)	• Hydrogen can be used as an energy carrier directly in Internal Combustion engines and turbines in place of fossil fuels or as blended mixture with fossil fuels. • H-CNG is a **blend of hydrogen and CNG**, the ideal hydrogen concentration being 18%. ○ CNG is **compressed natural gas**. ○ As **natural gas mainly composed of methane**, CNG emits less air pollutants — carbon dioxide, carbon monoxide, nitrogen oxides and particulate matter — than petrol or diesel**.** • **Benefits of H-CNG:** ○ Compared to conventional CNG, use of H-CNG can reduce emission of carbon monoxide up to 70%. ○ **Safer than hydrogen** due to its lower energy content. ○ **Usable with existing CNG infrastructure**, no major engine modifications are required. ○ **Improves engine efficiency** etc. • **Challenges of using H-CNG:** determining optimized hydrogen/natural gas ratio, lack of storage and supply infrastructure, more expensive than CNG
In Chemical industries, Fertilizer industries, refineries	Hydrogen is used as a raw material in the fertilizer, chemical and petroleum refining industries as it is a fundamental building block for the manufacture of ammonia.

4.4.4. GAS-BASED ECONOMY

Why in News?

The Minister of Petroleum & Natural Gas and Steel recently laid down the foundation stone for the first 50 LNG fueling stations, across the golden quadrilateral and major National Highways for the vision of transforming India into a Gas based economy.

About Gas based economy

- A gas based economy means a major or larger share of natural gas in the energy mix of a country. It implies that in each consuming sector the share of Natural gas should grow substantially.
  - Currently, the share of natural gas in India's energy mix is around 6.7 percent which is a decrease from 10.5 percent in 2010-11 (global average - 23.4 percent).
  - The Government of India aims to **increase the share of natural gas to 15% of the energy mix by 2030.**
- Natural gas is a mixture of gases which are rich in hydrocarbons. All these gases (methane, nitrogen, carbon dioxide etc) are naturally found in the atmosphere. Natural gas reserves include conventional, as well as deepwater and unconventional resources.
  - Type of natural gas includes **Liquefied Petroleum Gas, Compressed Natural Gas, Liquefied Natural Gas, Biogas, Deep Natural Gas, Shale gas, Tight Gas, Coal Bed Methane** etc.

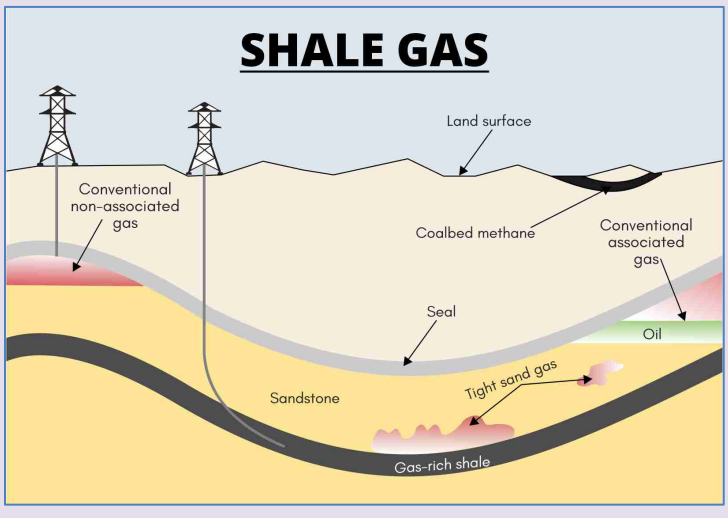
Measures taken

- **Indian Gas Exchange (IGX):** IGX is India's first automated national-level gas trading platform, to promote and sustain an efficient and robust gas market and foster gas trading in the country.
  - IGX is **set up by the Indian Energy Exchange (IEX).**
  - It allows **local market price discovery** through demand-supply matching in a transparent way.
  - Buyers and sellers will **trade in spot and forward contracts** at designated physical hubs.
- **Expansion of City Gas Distribution (CGD) network**: With Government's supports of capital grants for **Pradhan Mantri Urja Ganga (PMUG) and Indradhanush North Eastern Gas Grid** projects, gas grid is being expanded to new markets in eastern and north-eastern part of the country.
- **Sustainable Alternative towards Affordable Transportation (SATAT):** It was launched to establish an ecosystem for production of Compressed Bio Gas from various waste/ biomass sources in the country.
  - **It is aimed at setting up of CBG production plants** and makes it available in the market for use in automotive fuels by inviting Expression of Interest from potential entrepreneurs.
  - It envisages setting up of 5000 CBG plants by FY 2023-24.
  - It was launched by MoPNG in 2018
  - Petronet LNG signed a pact with Ministry of Petroleum & Natural Gas (MoPNG) **for setting up compressed bio gas (CBG) plants under SATAT initiative.**

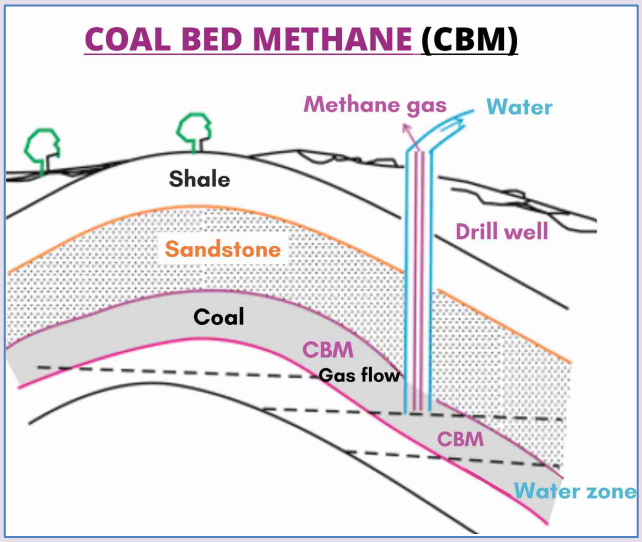
Related information

Shale gas

- Over the past decade, a combination of **horizontal drilling** and **hydraulic fracturing has allowed access to large volumes of shale gas** that were previously uneconomical to produce.
- Shale gas refers to **natural gas that is trapped within shale formations** i.e. fine-grained sedimentary rocks that can be rich sources of petroleum and natural gas.
  - While CBM is a form of **natural gas that is trapped in the carbon structure of coal seams.**
- **Reserves are identified** in Cambay, Krishna – Godavari basin, Cauvery, Gondwana basin, Upper Assam, Indo-Gangetic basin.



Coal Bed Methane (CBM)



- Government under Aatmanirbhar Bharat Abhiyaan allowed Coal India Limited (CIL) to auction CBM extraction rights.
  - **Central Mine Planning and Design Institute** is principal **implementing agency for all such projects**.
- **CBM is an unconventional form of natural gas found in coal deposits** or coal seams.
  - CBM is **formed during coalification process,** by transformation of plant material into coal.
  - Methane held underground within coal is **extracted by drilling into coal seam and removing groundwater.**
  - Resulting **drop in pressure causes methane to be released** from coal.
  - **It can be used for** power generation, as compressed natural gas auto fuel, as feedstock for fertilisers, etc.
- **CBM Policy, 1997** offers blocks for exploitation of CBM through open competitive bidding system.
- **Reserves in India: Gondwana sediments of eastern India** host bulk of India's coal reserves and all current CBM producing blocks.
  - Other CBM projects include: **Raniganj** coalfield (West Bengal), **Jharia** coalfield (Jharkhand), **East and West Bokaro** coalfields (Jharkhand) etc.

Methane hydrates

- A study by Agharkar Research Institute, Pune **finds massive methane hydrate deposits of biogenic origin in Krishna-Godavari (KG) basin** and near the coast of Andaman and Mahanadi.
- Methane hydrate is **formed when hydrogen-bonded water and methane gas come into contact at high pressures and low temperatures in oceans**.
  - It is estimated that one cubic meter of methane hydrate contains 160-180 cubic meters of methane.
  - It is estimated that Methane present in Methane hydrates in KG Basin is **twice that of all fossil fuel reserves available worldwide.**

Coal Gasification

- India has targetted 100 MT coal gasification by 2030.
- Coal gasification process **chemically transforms fossil fuel into synthetic natural gas (SNG),** instead of burning it.
  - SNG produced in the process is a mixture of hydrogen (H_2), carbon monoxide (CO) and carbon dioxide (CO_2).
  - Syngas can be **used to produce a wide range of fertilizers, fuels, solvent and synthetic materials.**
- **Benefits:** It will boost production of energy fuel, urea for fertilisers and production of other chemicals; transporting gas is cheaper than transporting coal, reducing energy imports etc.
- **Issues:** coal gasification actually produces more CO_2 than a traditional coal plant, more water-intensive forms of energy production, low calorific and high levels of inorganic impurities (35-45%) of Indian coal etc.

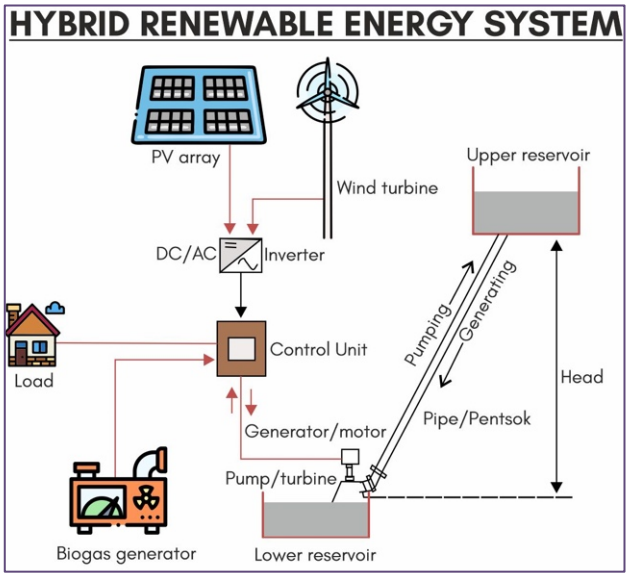
4.4.5. HYBRID RENEWABLE ENERGY

Why in news?

Ministry of New and Renewable Energy (MNRE) recently proposed the scheme for **"Development of Wind Parks/ Wind-Solar Hybrid Park"**.

About the proposed scheme

- Sites have been identified across seven states**, Tamil Nadu, Andhra Pradesh, Karnataka, Telangana, Gujarat, Rajasthan and Madhya Pradesh.**
- The capacity of each park proposed is **around 500 MW and more** but shall not be less than 50 MW.
- **Centre will provide financial assistance** for development of parks.



- **State Government** will select park developer and facilitate the park developer in acquisition/ leasehold of the identified site, in obtaining all statutory clearances.

- Wind Energy Park will provide a plug and play solution (availability **of land, transmission, necessary infrastructure and necessary approvals) to the investors** for installing wind/ wind-solar power projects.
  - **Jaisalmer Wind Park, Rajasthan with installed capacity of 1,064 MW** is largest wind park in India.
- Also, MNRE issued **tariff-based competitive bidding guidelines** for power procurement from grid-connected solar-wind hybrid projects (hybrid renewable energy).
- Recently, government also cleared land allotment for a **mega renewable energy hybrid park in Kutch region with capacity 41,500-megawatts** (solar and wind) which will be the World's largest renewable energy park.

About hybrid renewable energy

- Hybrid renewable energy usually **comprises of two or more renewable energy sources combined in such a way to provide an efficient system** with appropriate energy conversion technology connected together to feed power to local load or grid.
- Renewable Energy Hybrids are the **solution to a reliable, affordable and dispatchable integration of renewable energies**, from the combination and integration of renewable energy generation sources with one another, such as wind and solar.
- There are different types of hybrid renewable energy systems **like Biomass-wind-fuel cell, Photovoltaic-wind, Hydro-wind and Photovoltaic-Biomass** etc.

Related information
National wind-solar hybrid policy

- The main objective of the Policy is to **provide a framework for promotion of large grid connected wind-solar PV hybrid system** for optimal and efficient utilization of transmission infrastructure and land and achieving better grid stability.
- Policy aims **to encourage new technologies, methods and wayouts involving combined operation** of wind and solar PV plants.
- **Implementation strategy**
  - **Configurations and use of technology**
    - ✓ **Wind-Solar Hybrid- AC integration:** In this configuration the AC output of the both the wind and solar systems is integrated either at LT side or at HT side.
    - ✓ **Wind-Solar Hybrid- DC integration:** In this DC output of the both the wind and solar PV plant is connected to a common DC bus and a common invertor suitable for combined output AC capacity is used to convert this DC power in to AC power.
  - **New Wind-Solar Hybrid Plants and** hybridisation of existing wind/solar PV plants.
  - **Battery Storage:** Battery storage may be added to the hybrid project to reduce the variability of output power and higher energy output as well as to ensure availability of firm power for a particular period.
- **Regulatory requirements:** The Central Electricity Authority and CERC shall formulate necessary standards and regulations for wind-solar hybrid systems.

4.4.6. GREEN MARKET

Why in News?

Central Electricity Regulatory Commission (CERC) has approved Indian Energy Exchange (IEX)'s proposal for transactions in the Green Term-Ahead Market (G-TAM) contracts.

About Green Term-Ahead Market (G-TAM)

- G-TAM will provide an **exclusive platform for trading of renewables** and it would be the first physical trading of renewable energy (RE).
  - Green market confers **recognition on a trade as 'green' power.**
  - Thus, **obligated entities be able to discharge their 'renewable purchase obligations'** (RPO) by buying power from renewable energy companies in the exchange.

Related information
Indian Energy Exchange (IEX)

- It is the **first and largest energy exchange in India** providing a nationwide, automated trading platform for physical delivery of electricity, Renewable Energy Certificates and Energy Saving Certificates.

Renewable Purchase Obligation (RPOs)

- RPO is a mechanism by which the obligated entities (which includes Discoms, Open Access Consumers and Captive power producers) are **obliged to purchase certain percentage of electricity from Renewable Energy sources**, as a percentage of the total consumption of electricity.
- **RPOs are categorized as Solar and Non-Solar** RPO.

- Earlier, the obligated entities of the power from wind or a solar company **could not claim that he had met RPO.**
- There will be **separate contracts for Solar and Non-Solar energy** to facilitate Solar and Non-Solar RPO fulfilment.

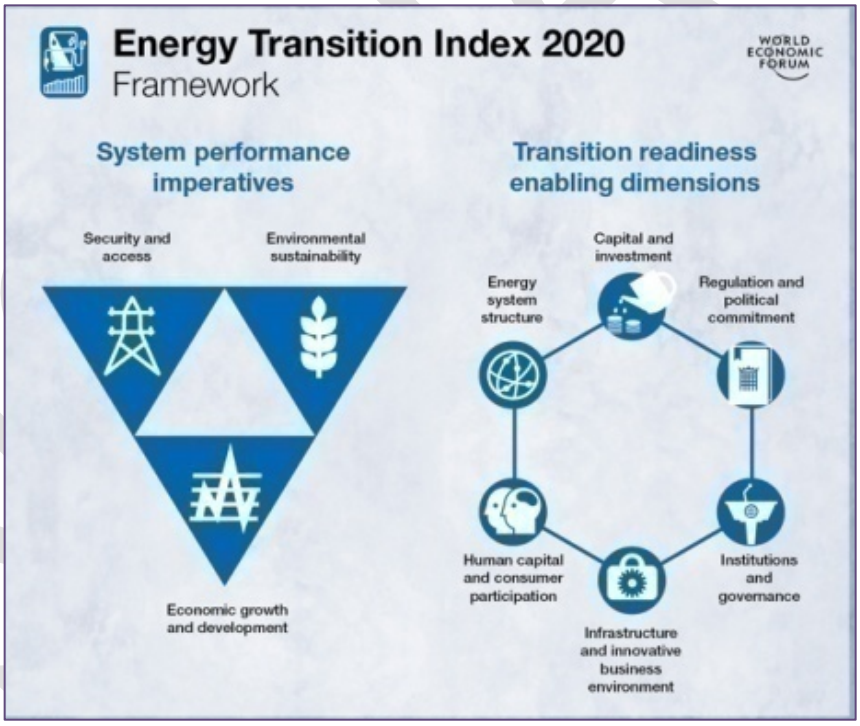
Related News
Renewable Energy Certificates (RECs)
- Sales of RECs **fell by 35 %** in April 2020 compared to April 2019.
- RECs are a type of **market-based instrument to provide an economic incentive** for electricity generation from renewable energy sources.
  - One REC is created when **one megawatt hour of electricity** is generated from an eligible **renewable energy resource**.
  - Generators can sell electricity from renewable sources just like conventional electricity and offer RECs separately to obligated entities to fulfil their **renewable purchase obligation.**
- RECs are traded on **Indian Energy Exchange and Power Exchange of India.**

Indian Energy Exchange (IEX) introduces real-time trading of electricity
- Under this, **auctions will be held 48 times a day**, once every half an hour.
- **Benefits:** allows electricity producers to sell surplus energy, consumers to buy in case of shortage, better utilization of renewable energy (which is prone to fluctuations), enhance overall grid security etc.

4.4.7. FOSTERING EFFECTIVE ENERGY TRANSITION REPORT

Why in News?

Recently, Fostering Effective Energy Transition report was released by World Economic Forum (WEF)



About the Report

- Report is based on findings from **Energy Transition Index (ETI) 2020.**
  - ETI benchmarks countries on their **current energy system performance**, and also **measures their readiness for 'energy transition'** to a secure, sustainable, affordable, and inclusive future energy system.
- It is intended to enable policy-makers and businesses to plot course for a successful energy transition.
- **Sweden has topped the index,** while **India moved up two positions to 74th** with **improvements on all key parameters** of economic growth, energy security and environmental sustainability.
- Gains for India have come from renewable energy expansion programme & focus on Energy efficiency.

4.5. ELECTRIC VEHICLES

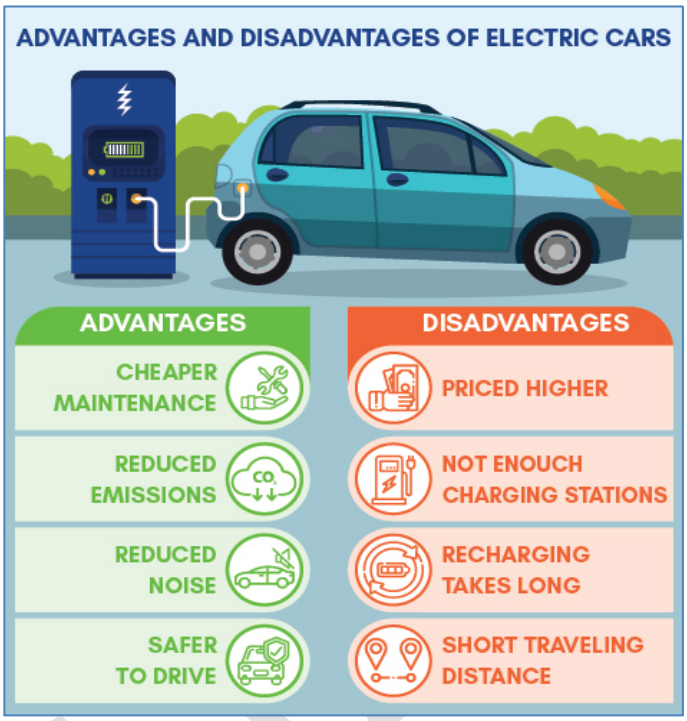
Why in News?

Government is planning to set up at **least one electric vehicle charging kiosk at around 69000 Petrol Pumps across the country** to induce people to go for electric mobility.

Various steps taken till now by the central government/ state government to promote EVs

- **Reduction in GST to 5% on EVs**
- **Allowing delinking of battery cost of 2-3 wheelers from vehicle cost** as it accounts for nearly 30% of the cost.

- **Launched of the FAME India Scheme** [Faster Adoption of Electric (& Hybrid) Vehicles in India](refer the infographics)
- Government has earmarked over **Rs51000crore for EV sector under Production Linked Incentive (PLI).**
- ISRO has **commercialized indigenously developed lithium ion battery technology.**
- EESL in collaboration with NDMC has established **India's first public EV (Electric Vehicle) charging plaza in New Delhi**.
- Government is also working for making e-Highway on Delhi and Mumbai Expressway.
- **Delhi government launched an electric vehicle policy**: It offers financial incentives for buying EVs. Also, a state EV fund to bear all expenses related to the policy will be set up along with an EV board.
    - Karnataka was the first state in the country to introduce a policy dedicated to electric vehicles.
    - The **Karnataka Electric & Energy Storage Policy, 2017**, operational for five years, is expected to give the necessary impetus to the electric mobility sector in the state, and attract investments. The Government of Karnataka intends to make **Bengaluru the Electrical Vehicle Capital of India.**



About Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME India)

- FAME aims **to promote manufacturing of electric and hybrid vehicle technology** and to ensure sustainable growth of the same.
- Government has sanctioned 670 Electric buses and 241 Charging Stations in various states/UTs under Phase-II of FAME India Scheme.
- As **part of the National Electric Mobility Mission Plan (NEMMP) 2020**, Department of Heavy Industry formulated FAME India Scheme in the year 2015.
- Phase-I of the scheme ended on 31st March 2019 and **Phase-II has commenced from 1st April 2019** with an outlay of Rs. 10,000 Crore for a period of 3 years.

4.6. SUSTAINABLE AGRICULTURE

4.6.1. ORGANIC FARMING

Why in News?

Recently, India has been ranked first in number of organic farmers as per the 'The World of Organic Agriculture, 2020' report.

Status of Organic Farming in India

- India is home to **30% of the total organic producers in the world** and ranks **ninth in terms of area under organic farming**, 2.59% of the total organic cultivation area (57.8 million hectares).
    - **Major organic exports from India:** flax seeds, sesame, soybean, tea, medicinal plants, rice, and pulses etc
    - Sikkim is first fully organic state in the world.

About Organic farming

- Organic farming is a production system which **avoids or excludes use of synthetically compounded fertilizers, pesticides,** growth regulators etc. It relies upon **crop rotations, use of crop residues, animal manures, legumes**, green manures, biofertilizers etc.

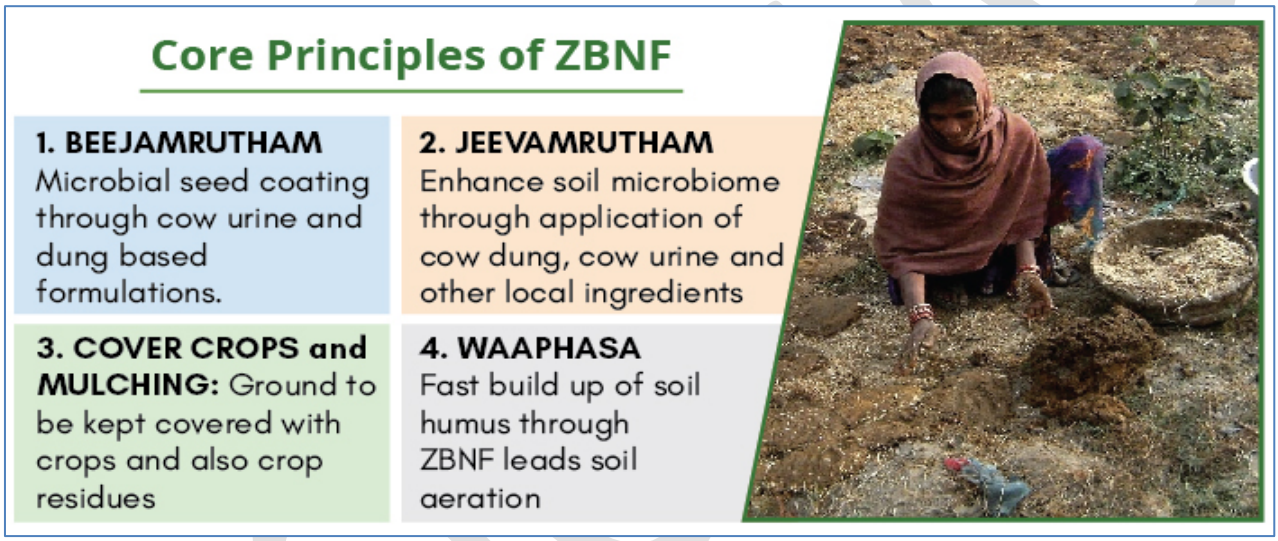
Organic farming	
ADVANTAGES	**DISADVANTAGES**
• Reduces soil erosion • Decreases nitrate leaching into groundwater and surface water • Maintains level of organic matter • Protects soil fertility • Higher Shelf life	• Production declines in initial years • Increased pest attacks • Rising input costs • Limited market • More labour intensive

- **Initiatives for adopting organic farming:**
  - **Paramparagat Krishi Vikas Yojana** under National Mission of Sustainable Agriculture aims at development of sustainable models of organic farming.
  - Mission **Organic Value Chain Development for North East Region**
  - **Organic e-commerce platform Jaivikkheti** for directly linking farmers with retail as well as bulk buyers.

4.6.2. ZERO-BUDGET NATURAL FARMING (ZBNF)

Why in News?

A recent study found that Zero-budget natural farming brought big gains for Andhra farmers.



About the News

- Findings were part of a study that **compared ZBNF and non-ZBNF techniques in crops like paddy, groundnut etc. It compared 6 parameters:** Water, electricity, energy consumption, greenhouse gas emissions, yield and net revenue.
  - ZBNF provided **saving of water per acre** per paddy cropping period.
  - **Electricity consumption** of farms relying on groundwater **reduced.**
  - ZBNF hindered microbial activity and **cut methane emissions by 88%.**
  - Study **did not observe much impact on crop yield.**

About ZBNF

- ZBNF is a **method of chemical-free agriculture** drawing from traditional Indian practices. It was originally promoted by Maharashtrian agriculturist Subhash Palekar. **ZBNF was introduced in Union Budget 2019-20.**
- The ZBNF method also promotes soil aeration, minimal watering, intercropping, bunds and topsoil mulching and **discourages intensive irrigation and deep ploughing**.
- Mr. Palekar is **against vermicomposting**, which is the mainstay of typical organic farming, as it introduces the most common composting worm, the European red wiggler to Indian soils. He claims these worms absorb toxic metals and poison groundwater and soil.
- ZBNF is **based on 4 pillars (refer infographic).**
- **Benefits of ZBNF:** Requires very less amount of water and electricity than what is required under chemical farming, reduces farming costs by using in-situ resources, manage soil nutrition, fertility, pests and seeds.

4.6.3. AQUAPONICS

Why in News?

Recently, a pilot Aquaponics facility developed by Centre for Development of Advanced Computing (C-DAC), Mohali was inaugurated.

About Aquaponics

- Aquaponics is a form of **agriculture that combines raising fish in tanks** (recirculating aquaculture) **with soilless plant culture (hydroponics).**
- In aquaponics, the **nutrient-rich water from raising fish provides a natural fertilizer** for the plants and the plants help to purify the water for the fish.
- An aquaponics system **uses 90% less water versus traditional farming.**

Related Terms

- **Hydroponics** is a method of growing food in water using mineral nutrient solutions without soil.
- **Aeroponics**: There is no growing medium and hence, no containers for growing crops involved in aeroponics. Mist or nutrient solutions are used instead of water.

Related News: Vertical farming

- Vertical farming is the practice of **producing food in vertically stacked layers and vertically inclined surfaces.**
  - Crops are grown indoors, **under artificial conditions of light and temperature.** It uses soil-less methods such **as hydroponics, aquaponics and aeroponics.**

Advantages of vertical farming	Challenges in vertical farming
• **Can yield 390 times higher food per square foot while using 95% less water** than traditional agricultural methods. • **Crops aren't subject to seasons** and hence give high productivity year-round • **Pesticide free** or organic food is produced • Offers a plan **to handle future food demands.**	• High Initial **cost for establishing** the vertical farming system • Difficult and costly Pollination • **Higher labor costs** • **Relies too much on technology** and power loss would result in devastating impacts

4.7. SUSTAINABLE HABITAT

4.7.1. CLIMATE SMART CITIES ASSESSMENT FRAMEWORK (CSCAF 2.0)

Why in News?

CSCAF is a **first-of-its-kind assessment framework** on climate relevant parameters launched in 2019 by Ministry of State for Housing and Urban Affairs (MoHUA).

About the Framework

- Its objective is to **provide a clear roadmap for Indian cities towards combating climate change** while planning their actions within city including investments.
  - It intends to **inculcate a climate-sensitive approach** to urban planning and development.
- Framework has 28 indicators across **five categories**:
  - Energy and Green Buildings
  - Urban Planning, Green Cover & Biodiversity
  - Mobility and Air Quality
  - Water Management
  - Waste Management
- **Climate Centre for Cities** under National Institute of Urban Affairs is supporting MoHUA in implementation of CSCAF.

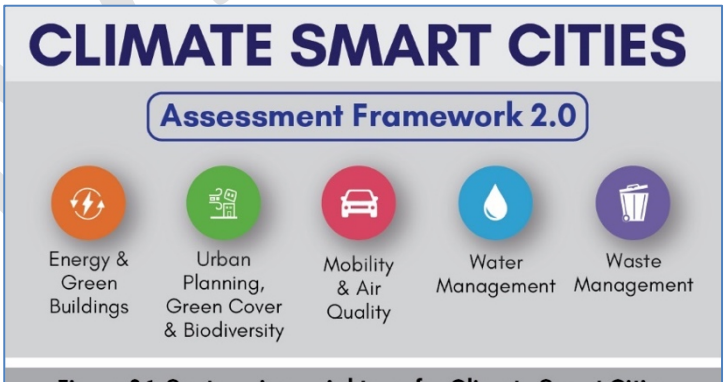
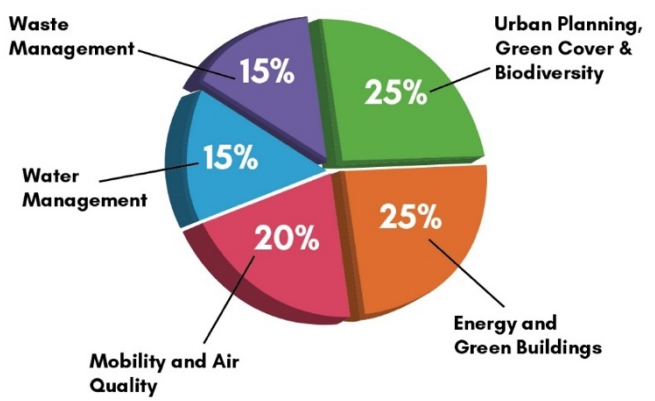


Figure 2.1. Sector wise weightage for Climate Smart Cities Assessment 2.0



CSCAF 2.0 vs CSCAF 1.0

- Improved indicators with feedback from cities and thematic experts
- Simplified for easy understanding
- Alignment with Swach Survekshan & Ease of Living
- Standard evidence templates and data input templates to support in data collection
- Centralized portal for data entry with dashboard to view real time updates

4.7.2. GREEN BUILDINGS

Why in news?

Vice President of India, inaugurated the Confederation of Indian Industry's Green Building Congress 2020.

What is a green building?

- A **'green' building is** a building that, in its design, construction or operation, **reduces or eliminates negative impacts,** and can create positive impacts, on our climate and natural environment.
- Some **features which can make a building 'green' include**:
  - Efficient use of energy, water and other resources
  - Use of renewable energy, such as solar energy
  - Pollution and waste reduction measures, and the enabling of re-use and recycling
  - Use of materials that are non-toxic, sustainable
  - Consideration of the environment in design, construction and operation etc.
- Currently **India has over 7.61 Billion Sq. Ft of green building footprint** and amongst the top 5 countries in the world.

Steps taken towards Green buildings promotion in India	

Energy Conservation Building Code (ECBC)	• It was launched in 2007 by the **Bureau of Energy Efficiency (BEE)**.
	• Its main objective is to establish minimum requirements for energy efficient design and construction of buildings.
	  ○ It was revised in 2017 (ECBC 2017) that prescribes the energy performance standards for new commercial buildings to be constructed across India.
	  ○ Adoption of ECBC 2017 for new commercial building construction throughout the country is estimated to achieve a 50% reduction in energy use by 2030.

Eco-Niwas Samhita 2018	• It is Energy Conservation Building Code for Residential Buildings launched by Ministry of Power.

Ratings for Green Buildings	• **BEE developed Star Rating Programme for commercial buildings** that rates buildings on a five-star scale based on actual performance in terms of energy usage.
	• Other two rating systems are operating for rating green buildings in India:
	  ○ **Green Rating for Integrated Habitat Assessment (GRIHA):** Jointly developed by **The Energy and Resources Institute (TERI) and the Ministry of New and Renewable Energy,** it evaluates the environmental performance of a building holistically over its entire life cycle, thereby providing a definitive standard for what constitutes a 'green building'.
	  ○ **Leadership in Energy & Environmental Design (LEED):** It is an international recognized certification system for the green buildings developed by the U.S. Green Building Council

Indian Green Building Council	• It is part of the Confederation of Indian Industry (CII) formed in the year 2001, offers services like developing new green building rating programmes, certification services and green building training programmes.

Other Initiatives related to Sustainable Habitat

Streets for People Challenge	• It is an initiative of **Smart Cities Mission (SCM)** that aims to inspire cities to create walking-friendly and vibrant streets through quick, innovative, and low-cost measures. • Challenge requires each city to test at least one flagship walking project and enhance livability in one neighbourhood. ○ Streets with high footfall zones can be considered as potential locations for flagship project. • **Fit India Mission along with India program of Institute for Transport Development and Policy** have partnered with SCM to support the challenge
G20 Global Smart Cities Alliance	• Four Indian cities — **Indore, Bengaluru, Hyderabad and Faridabad** — feature in a list of 36 cities across 22 countries to pioneer a new roadmap for smart cities as part of the G20 Global Smart Cities Alliance. ○ G20 Global Smart Cities Alliance, established in June 2019, establishes and advances global policy norms to help accelerate best practices, mitigate potential risks, and foster greater openness and public trust. • The **World Economic Forum, the International Organization for Public-Private Cooperation**, serves as secretariat for the Alliance

5. DISASTER MANAGEMENT

5.1. GAS LEAK AT VIZAG

Why in news?

Styrene gas leaked from Vishakhapatnam based LG Polymers India Pvt Ltd. factory causing multiple deaths. This brought again the issue of Industrial disasters in the country.

About Styrene gas

- Styrene is an **organic compound** used in the manufacture of polymers/plastic/resins. It is manufactured in petrochemical refineries.
- It is actually a **colourless liquid, and not a gas**.
- According to India's Manufacture, Storage and Import of Hazardous Chemical Rules 1989, **styrene is classified as a 'hazardous and toxic chemical'.**
- It is unstable and has a **high propensity for autopolymerisation**, meaning it tries to combine with itself to make long chains, especially at temperatures over 65°C. This process is exothermic and can become uncontrollable. For these reasons, **styrene is always stored at relatively low temperatures** (between 15°C and 20°C).
- **Dangers associated with the gas**
  - It is a **likely carcinogenic substance**.
  - **It can react with oxygen in the air to mutate into styrene dioxide which is more lethal.**
  - **Acute (short-term) exposure** to styrene in humans results in mucous membrane and eye irritation and gastrointestinal effects.
  - **Chronic (long-term) exposure** results in impacts on the central nervous system (CNS), leading to headaches, fatigue. If the amount of styrene goes beyond 800 ppm, then the person exposed to it can go into a coma.

About Industrial Disasters

- Industrial disasters are **large scale industrial accidents**, large scale environmental pollution, and product injury cases that have the potential for killing, injuring or otherwise affecting large numbers of people and natural environment.

Legal Provisions related to Industrial Disasters

Environment (Protection) Rules, 1986	• Set **discharge and product standards** – source standards for restricting pollution; product standards for manufactured goods and ambient air and water standards – for regulating quality of life and environmental protection.
Hazardous Waste (Management Handling and Transboundary Movement) Rules, 1989	• Industry is required to **identify major accident hazards**, take preventive measures, and submit a report to the designated authorities.
Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989	• **Importer must furnish complete product safety information** to the competent authority and must transport imported chemicals in accordance with the rules.
Chemical Accidents (Emergency, Planning, Preparedness and Response) Rules, 1996	• Centre is required to constitute a **central crisis group** for management of chemical accidents; set up quick response mechanism termed as the **crisis alert system**. Each state is required to set up a crisis group and report on its work.
Factories Amendment Act, 1987	• **Extended Risk scope:** 1987 Amendment Act extends the scope of risk from hazardous industries. The narrowly defined scope covering only workers and the premises of the factory was **extended to the general public in the vicinity of the factory**.
Public Liability Insurance Act, 1991	• Imposes a **no-fault liability on the owner of hazardous substance** and requires the **owner to compensate victims** of accident irrespective of any neglect or default. For this, the owner is required to take out an insurance policy covering potential liability from any accident.
National Green Tribunal (NGT)	• NGT was set up by an Act of Parliament in 2010. The Act provides for the **"principle of no fault liability"**, which means that the company can be held liable even if it had done everything in its power to prevent the accident.

NDMA Guideline on Chemical Disasters (Industrial) 2007	• These guidelines call for a proactive, participatory, multi-disciplinary and multi-sectoral approach at various levels for chemical disaster preparedness and response. • The guidelines have been prepared to provide the directions to ministries, departments and state authorities for the preparation of their detailed disaster management plans. • The Guideline, through the seven chapters, discusses various aspects including existing gaps in the management of chemical accidents, regulatory framework, preparedness, transportation of hazardous chemicals etc.

Related news:

Strict Liability vs Absolute Liability

- At first, NGT has invoked the principle of **Strict Liability** to impose a fine on the LG Polymers India for Vizag Gas leak which was being termed to be in contravention of the principle of **Absolute Liability**. NGT later held that LG Polymers India has absolute liability for the loss of life caused by a gas leak at its factory in Visakhapatnam.

Doctrine of Absolute Liability	The rule of strict liability
• This concept evolved in India after the case of **M.C Mehta vs Union of India (1986),** famously known as **Oleum Gas Leak case**. • According to this doctrine as defined by the Supreme Court, the **enterprise owes an absolute and non-delegable duty** to the community to ensure that no harm results to anyone on account of hazardous or inherently dangerous nature of the activity which it has undertaken.	• Till the MC Mehta case, India also followed the concept of 'strict liability'. • Under the "strict liability principle", a **party is not liable and need not pay compensation** if a hazardous substance escapes his premises by accident or by an **"act of God"** among other circumstances.

5.2. CYCLONE WARNING SYSTEM

Why in News?

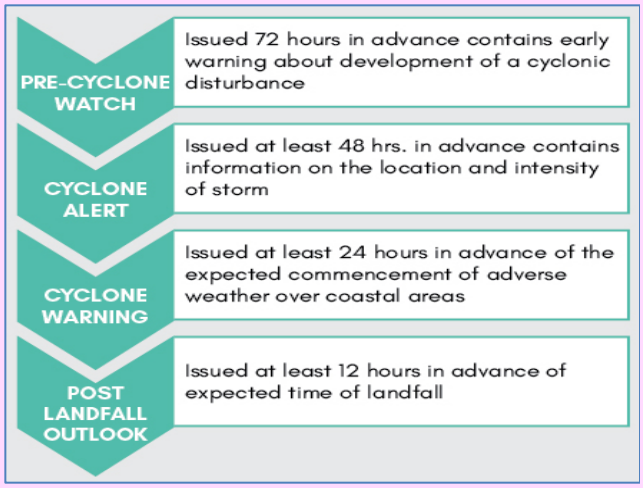
Recently, India Meteorological Department announced to launch a dynamic, impact-based cyclone warning system.

About the impact-based cyclone warning system

- It will use meteorological data in combination with geospatial and population data to assess the impact of the cyclone in a particular area.
- As part of the new system, **location or district-specific tailored warnings, which factor in the local population, infrastructure, settlements, land use** and other elements, will be prepared and disseminated.
  - This aims to reduce the damage and economic losses to property and infrastructure.
- All disaster management agencies will make extensive use of cartographic, geological and hydrological data available for the district concerned.
- IMD is partnering with National Disaster Management Authority, Indian National Centre for Ocean Information Services and respective state governments for this.

Cyclone warning in India

- Currently, **Cyclone warnings are provided** from the Area Cyclone Warning Centres (ACWCs) at Calcutta, Chennai and Mumbai and Cyclone Warning Centres (CWCs) at Bhubaneswar, Visakhapatnam and Ahmedabad.
- **India Metereological Department (IMD)** is the nodal agency for **providing cyclone warning services and communicate cyclone warnings** from IMD to communities and important officials in affected areas.
- **Warnings are issued to state government in following four stages:**



What is Impact-Based Forecasting (IBF)?

- IBF enables anticipatory actions and revolutionizes responses to weather and climate crises. It provides information on the level of risk a hazard poses to a specific area.

- IBF assess the impacts of the forecasted climate and weather phenomenon and consider their warnings based on **the level and severity of those impacts** at that particular location and /or for the target users/groups.
- It provides the information needed to act before disasters to minimise the socioeconomic costs of weather and climate hazards.
- **How IBF is different from normal forecast:**

Hazard	Forecast	IBF for Individuals/ members of public
Tropical Cyclone	A tropical cyclone category 3, windspeed of 125 km/h is expected in the next 48 hours	A tropical cyclone category 3, windspeed of 125 km/h is expected to make landfall in 12 hours, in X and Y regions, likely to damage critical infrastructure such as bridges, blocking transport from region X to region Y.

India Meteorological Department

- It was established in 1875. It is the **National Meteorological Service of the country** and the principal government agency in all matters relating to meteorology and allied subjects.

Functions

- To take meteorological observations and to provide current and forecast meteorological information for optimum operation of weather-sensitive activities like **agriculture, irrigation, shipping, aviation, offshore oil explorations, etc.**
- To warn against severe weather phenomena like tropical **cyclones, norwesters, duststorms, heavy rains and snow, cold and heat waves, etc.**, which cause destruction of life and property.
- To provide meteorological statistics required for **agriculture, water resource management, industries, oil exploration and other nation-building activities.**
- To conduct and promote research in meteorology and allied disciplines.

5.3. IFLOWS-MUMBAI

Why in news?

Recently, **Ministry of Earth Sciences (MoES) in coordination with Municipal Corporation of Greater Mumbai** developed an Integrated Flood Warning System for Mumbai called **'IFLOWS-Mumbai'**.

About IFLOWS-Mumbai

- IFLOWS-Mumbai is a state of art Integrated Flood Warning system for Mumbai to enhance the resilience of the city of Mumbai by making it possible to have an **estimate of the flood inundation three days in advance**, along with immediate weather updates.
- It will provide **early warning** for flooding specially during **high rainfall events and cyclones** which would include alerts on **rainfall information, tide levels, storm surge for low-lying areas** anticipated to be affected.
- It is built on a modular structure comprised of seven modules, namely **Data Assimilation, Flood, Inundation, Vulnerability, Risk, Dissemination Module and GIS based Decision Support System**.
- The system incorporates-
  - **weather models** from National Centre for medium Range Weather Forecasting (NCMRWF), India Meteorological Department (IMD),
  - **field data** from the rain gauge network stations setup by Indian Institute of Tropical Meteorology (IITM), Municipal Corporation of Greater Mumbai (MCGM) and IMD,
  - **thematic layers on land use, infrastructure** etc provided by MCGM.
- **Mumbai is the second city** after Chennai to get this system. Similar systems are being developed for Bengaluru and Kolkata.
- These systems are significant since many Indian cities like Mumbai, Chennai, Delhi, Kolkata etc. have been experiencing **urban flooding with increased periodicity**.

About Urban Flooding

- Urban flooding is the inundation of property in a built environment, particularly in densely populated urban areas, caused by intense rainfall (on impermeable surfaces) which **overwhelms the capacity of drainage systems**.

- It is significantly different from rural flooding as urbanisation leads to developed catchments which **increases the flood peaks from 1.8 to 8 times** and **flood volumes by up to 6 times.** Consequently, flooding occurs very quickly due to faster flow times, sometimes in a matter of minutes.
- Urban flooding has wide ranging **impacts:**
  - Damage to vital urban infrastructure causing disruptions in transport and power
  - Loss of life and damage to property
  - Risk of epidemics due to exposure to waterborne and vector borne infections
  - Deterioration of water quality
  - Economic losses due to disruption in industrial activity, supply chains etc.
  - Displacement of population in low lying areas
  - Accidents and fires due to short circuit

Factors Contributing to Urban Flooding

Meteorological Factors	Hydrological Factors	Human Factors
• **Heavy Rainfall** • **Cyclonic storms** • **Small-scale storms** • **Cloudburst** • **Bursting of glacial lakes**	• Synchronization of runoffs from various parts of watershed • High tide impeding drainage • Presence of impervious/ impermeable cover • High Soil moisture levels • Low Natural surface infiltration rate • Absence of over bank flow, channel network	• **Land use changes** (e.g. surface sealing due to urbanization, deforestation) increase runoff and sedimentation • **Encroachment** of the flood plain and thereby obstructing flows • Inefficiency or non-maintenance of **flood management infrastructure** • **Climate change** affects magnitude and frequency of precipitation and floods, and also causes **extreme weather events** • Changing Urban micro-climate due to **urban heat island effect** may enforce precipitation events • **Sudden release of water from dams** located upstream of cities/towns • **Indiscriminate disposal of solid waste** leading to blocked drainage systems.

5.4. FLASH DROUGHTS

Why in News?

A recent study identified **39 flash droughts during 1951-2018 and found that 82% of those occurred during monsoon** season in India.

About Flash Droughts

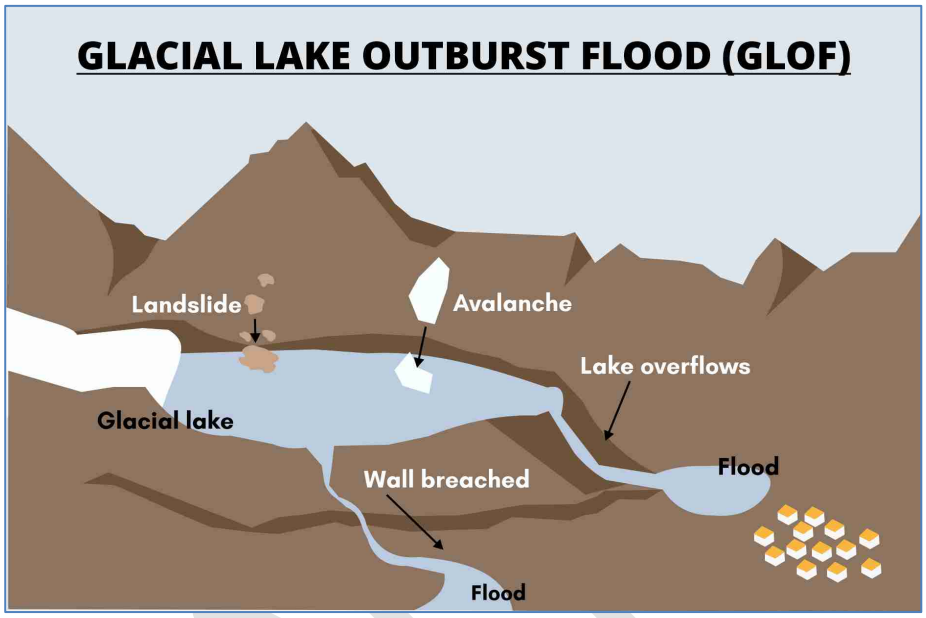
- Unlike conventional drought that propagates slowly, **flash drought is characterized by rapid onsetand intensification** caused by high evapotranspiration rates due to abnormally high temperatures, winds, and high incoming solar radiation.
  - It **can be classified as agricultural droughts** due to their direct association with soil moisture and crop stress.
  - Flash droughts can be **driven by lack of precipitation** (precipitation deficit flash drought) or **by anomalously high temperature** (heatwave flash drought)..
- **Four regions** (Central North East, North East, North West and West Central) that fall in core monsoon zone, **witnessed a majority of flash droughts,** primarily caused by monsoon breaks.
  - Increased air temperature and precipitation deficit together (during breaks) cause a rapid depletion of soil moisture leading to flash drought.
- **Peninsular Region and Himalayan region experienced flash droughts during non-monsoon season** due to precipitation caused by western disturbance and northeast monsoon.
- **Impact of flash drought:** reduced yields of rice and maize (monsoon season crops), increase in irrigation water demands, can indirectly influence groundwater storage etc.

5.5. GLACIAL LAKES OUTBURST FLOODS (GLOFS)

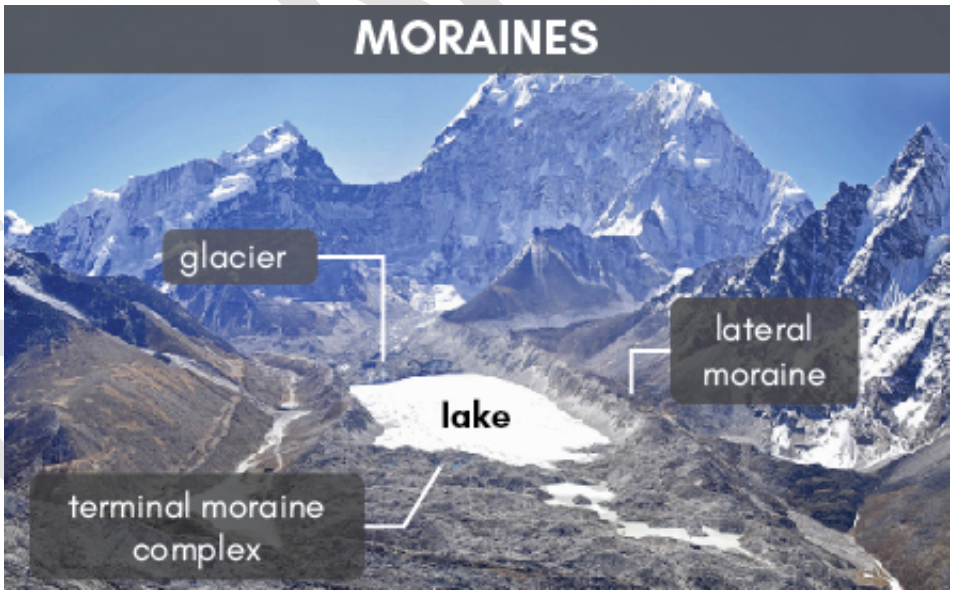
Why in news?

Using remote sensing data, researchers from Germany have mapped the evolution of Gya glacial lake outburst flood (GLOF) of 2014 in Ladakh.

More about news

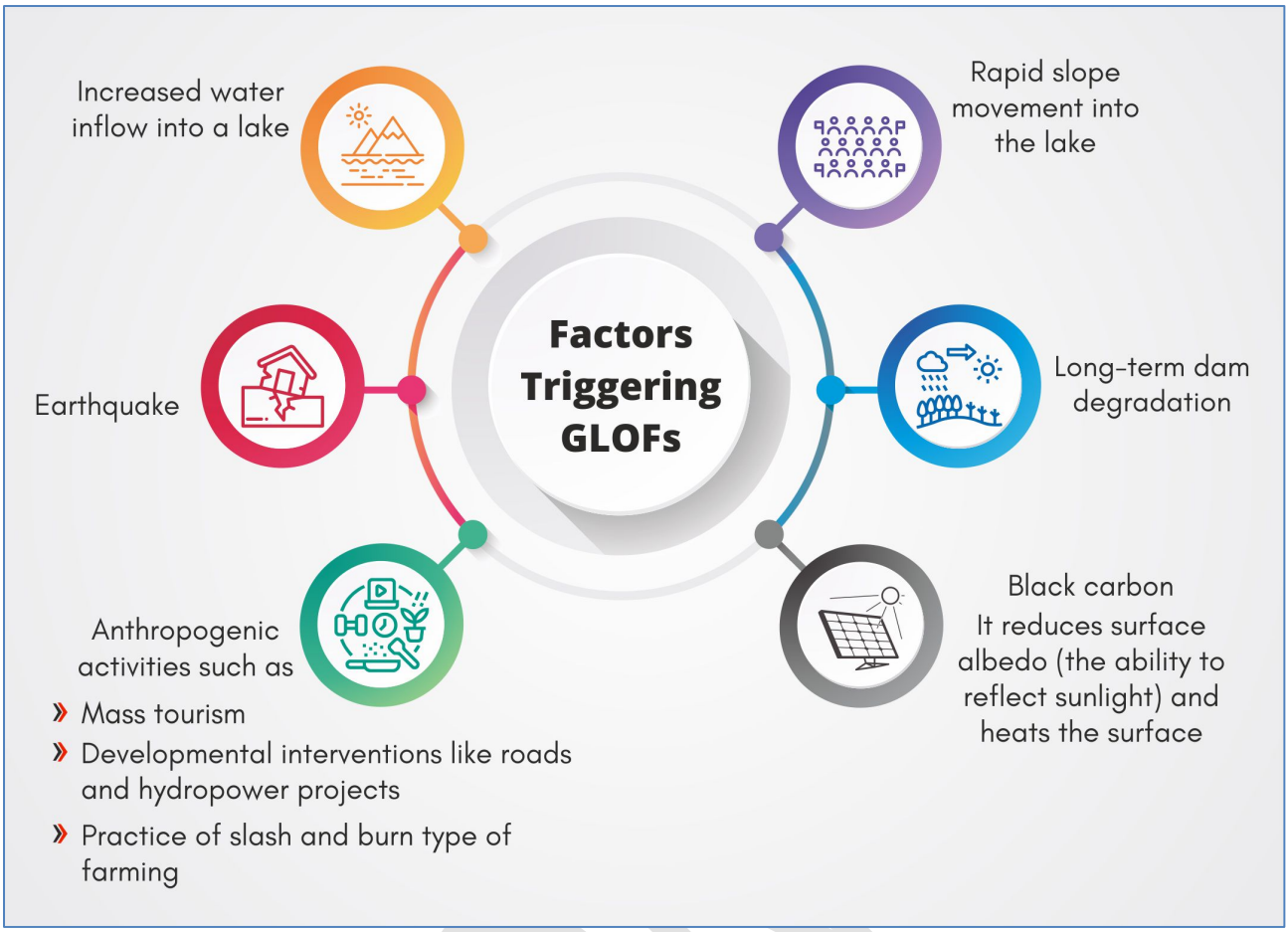


- Report by researchers mentions that cause of GLOF was not a spillover due to an avalanche or landslide, rather **there was a thawing of the ice cores in the moraine which drained through the subsurface tunnels.**
  - **Moraine is any accumulation of unconsolidated debris,** sometimes referred to as glacial till, that has been previously carried along by a glacier or ice sheet.
- According to report, **bathymetric studies are needed to analyse lake volumes and its dynamics.**



About Glacial Lakes and GLOFs

- Glacial lakes are **ice-dammed, moraine-dammed, and bedrock-dammed lakes.**
  - These lakes are formed by the **trapping of melt water from the glacier** within dammed structure.
  - Due to global warming glaciers are retreating and **glacier lakes are expanding** in the size and numbers.
- **Glacial lake outburst flood (GLOF)** is a sudden release of a significant amount of water retained in a glacial lake, irrespective of the cause.
  - The formation of moraine-dammed glacial lakes and glacial lake outburst flood (GLOF) is major concern in the Himalayan states of India.



5.6. LANDSLIDES

Why in news?

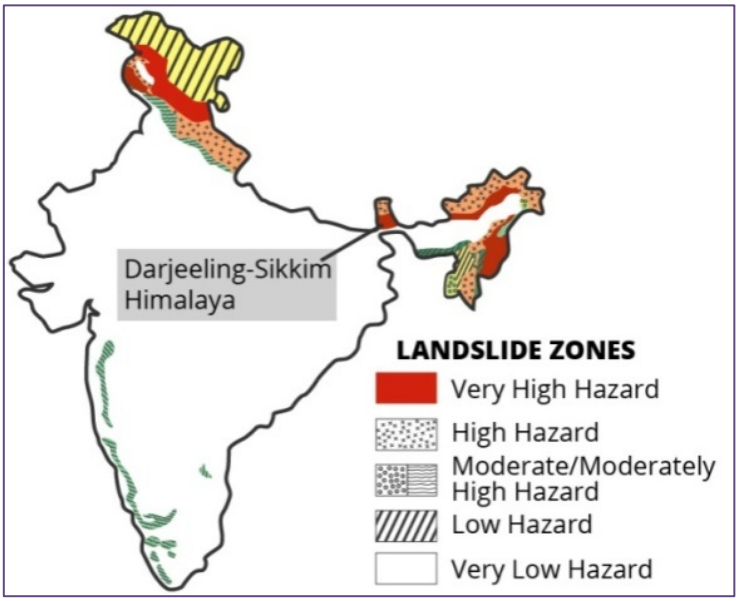
Recently, unusually high rainfall and unscientific land use caused landslides at a settlement of tea estate workers in Munnar in Idukki, Kerala.

About Landslide

- **Landslides are a type of "mass wasting,"** which denotes any down-slope movement of soil and rock under the direct influence of gravity.
- It encompasses five modes of slope movement**: falls, topples, slides, spreads, and flows.**
- As per **Geological Survey of India (GSI),** about 0.42 million km^2 covering nearly 12.6% of land area of our country is prone to landslide hazards.

About Geological Survey of India (GSI)

- GSI's main function is creation and updation of national geoscientific information and mineral resource assessment.
- It was set up in 1851 primarily to find coal deposits for the Railways.
- Presently, it is an attached office to the **Ministry of Mines.**
- GSI is headquartered in Delhi.



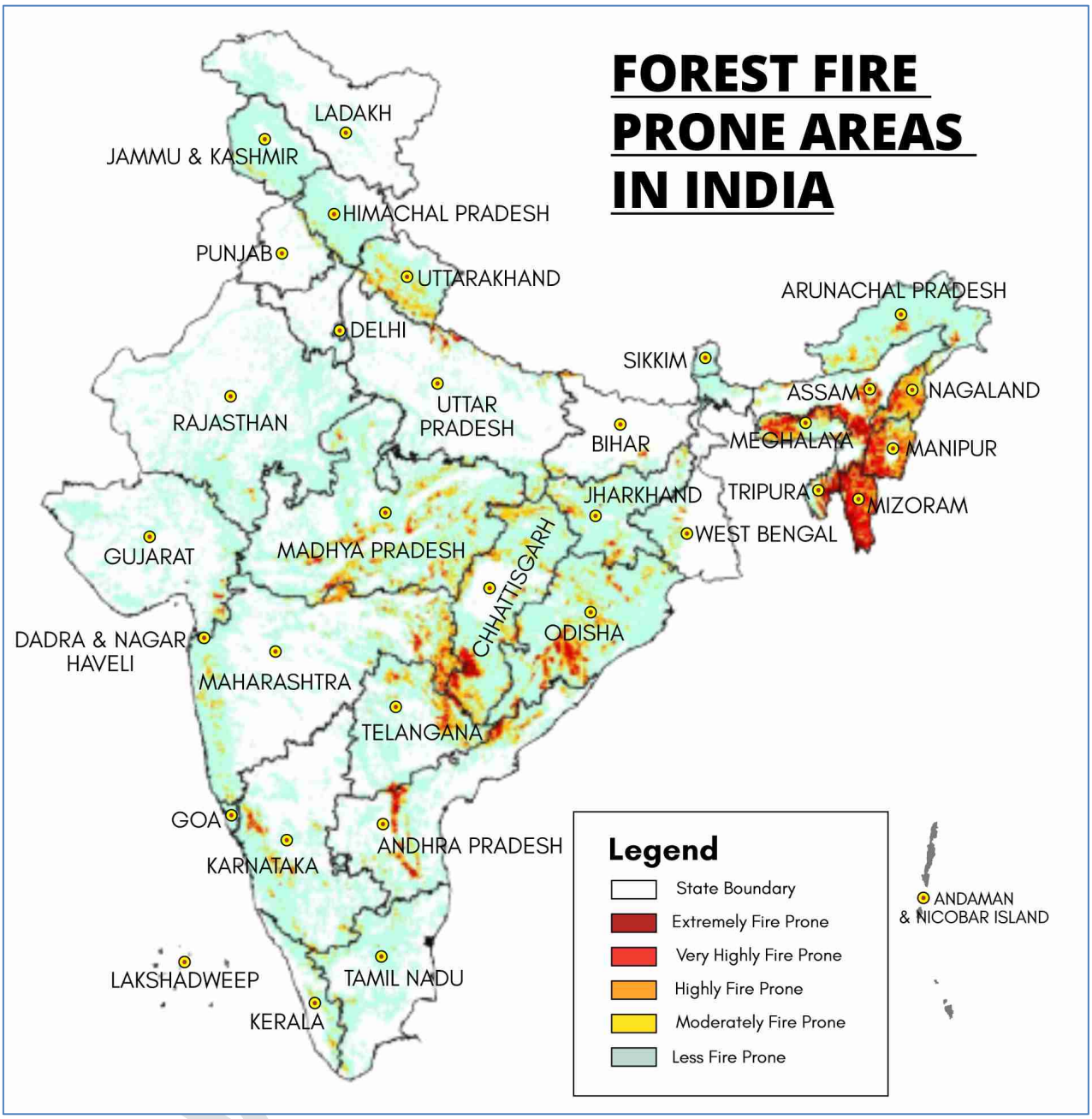
Causes of landslide

- Water and flooding
- Earthquakes
- Wildfires and deforestation
- External loads such as buildings, reservoirs, highway traffic, stockpiles of rocks
- Accumulation of alluvium on slopes

5.7. FOREST FIRES

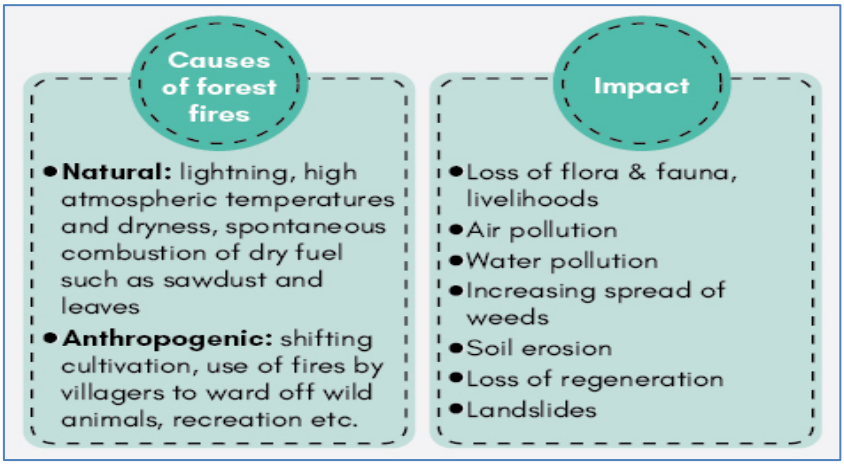
Why in News?

Recently, Forest department has clarified that No Major Forest Fire breakout happened in Uttarakhand.



More on News

- According to **India State of Forest Report 2019,** over **30,000 incidents** of forest fires were **reported in 2019.**
  - About **half of India's forests** are prone to fires. 43% were prone to occasional fires and 5% to frequent fires, and 1% were at high or very high risk.



- Most fire prone areas are found in north eastern and central part of the country.

- **Steps taken:** Monitoring through satellites like NASA's **MODIS** (or Moderate Resolution Imaging Spectroradiometer), **National Action Plan on Forest Fires 2018,** Centrally Sponsored Forest Fire Prevention and Management (FPM) Scheme etc.

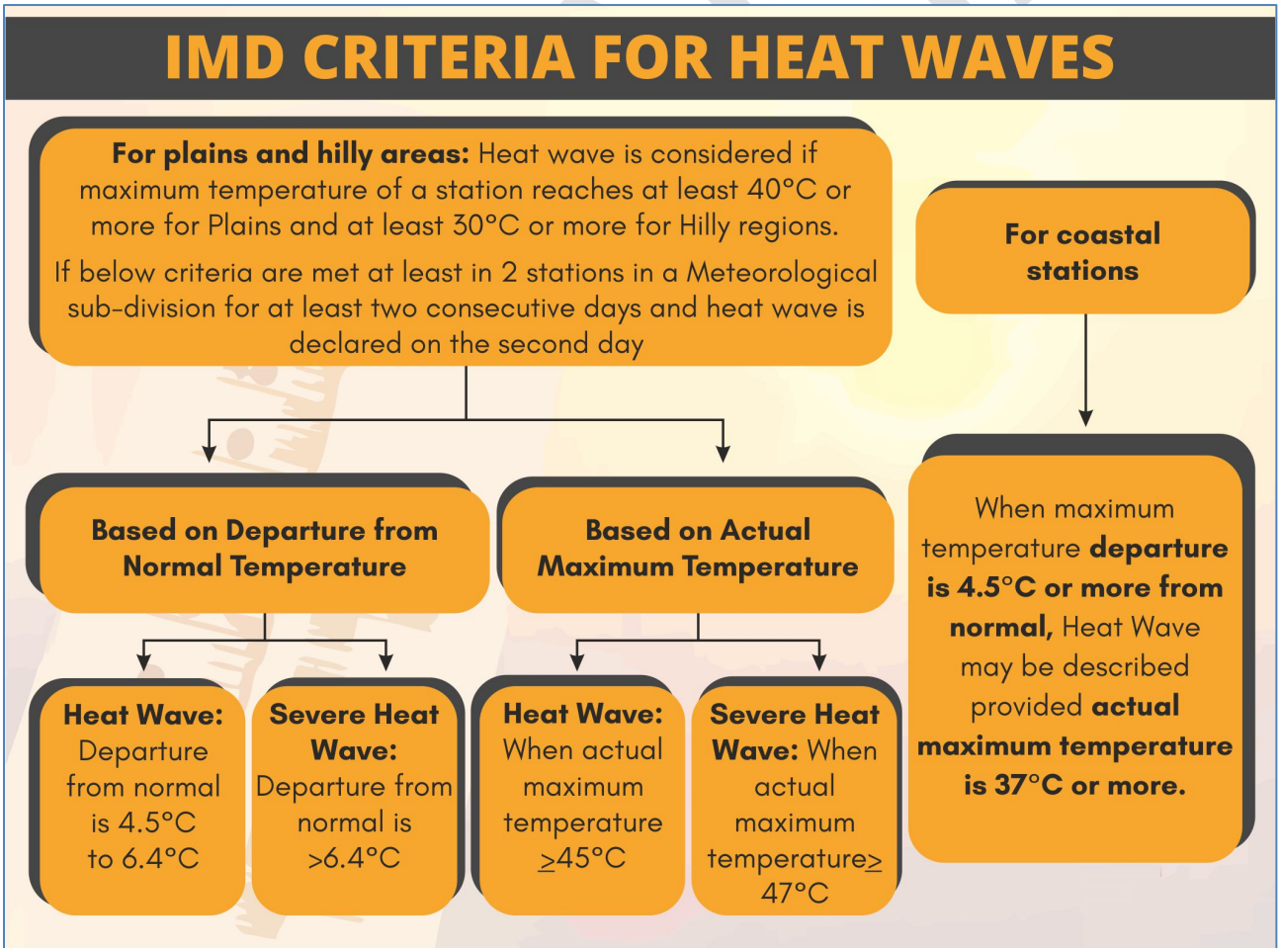
5.8. HEAT WAVES

Why in News?

IMD has issued **'red'** and **'orange warning'** for heat waves in various states.

About Heat Wave

- It is a **period of abnormally high temperatures** which typically occur between March and June, and in some rare cases even extend till July.
- **World Meteorological Organization identifies** a heat wave '**when daily maximum temperature** of more than **five consecutive days exceeds** average **maximum temperature by 5 degree Celsius,** normal period being 1961-90.
- **Causes:** sparser pre-monsoon season rain coupled with El-Niño effect, Hot and dry winds moving into the mainland from the northwest etc.
- **Health impacts:** dehydration, heat cramps, heat exhaustion and/or heat stroke.
- IMD issues **colour-coded warnings depending on intensity** of any weather system in ascending order, **green, yellow, orange and red.**
  - These warnings are mainly **meant for administrators to keep ready and position their resources** to handle situations arising out of weather-related disastrous events.



5.9. COALITION FOR DISASTER RESILIENT INFRASTRUCTURE (CDRI)

Why in News?

Recently, Union Minister for Health and Family Welfare addressed an event by CDRI.

About CDRI

- **CDRI is a multi-stakeholder global partnership** of national governments, UN agencies and programmes, multilateral development banks and financing mechanisms, private sector, and academic and knowledge institutions.
- It was **announced by India's PM at UN Climate Action Summit 2019.**
- It aims **to promote the resilience of new and existing infrastructure systems** to climate and disaster risks, thereby **ensuring sustainable development.**

6. GEOGRAPHY

6.1. AGROMETEOROLOGY IN INDIA

Why in news?

The Centre for Science and Environment has released a report titled, **'Agrometeorological services in India- An assessment'.**

What is Agrometeorology?

- Agrometeorology is the study and use of weather and climate information to improve the productivity of the agricultural sector.
- In India, **Indian Meteorological Department (IMD)** under the Ministry of Earth Sciences (MoES), is tasked with providing meteorological services. It does so through the **Agrometeorological Advisory Service** program.
- The **three sub-sectors** which work together to provide such services include
  - **Weather forecasting**; **Generation of agromet advisories** (identifying how weather forecasts affect farming); **Dissemination of advisories** (two-way communication with users).

Weather Forecasting	Generation of Agromet Advisories	Dissemination of Advisories
• It involves 2 major components: **Data Collection and Data modelling** ○ **Weather data collection-** Data is collected over land surfaces (rain gauges, weather stations etc.), oceans (weather buoys), in the lower atmosphere (weather balloons and sensors on airplanes), and from space (satellites). ○ **Weather Data Modeling** uses mathematical models of the atmosphere and oceans to predict the weather based on current weather conditions. • Both **public and private sector provide these services** in India. ○ IMD, National Institute of Ocean Technology, Chennai; National Institute of Oceanography, Goa; Indian Space Research Organization (ISRO) and state developed networks are involved. ○ Also, there are a few private players (Skymet) in the weather forecasting space.	• Localized weather forecasts must be combined with local crop data to generate advice for farmers. This involves coordination of the data and human resources of state and Central government agencies. • **Agromet Field Units (AMFUs),** under the IMD's Agrimet Division, are designed to specialize in converting weather information into usable advisories for farmers.	• A variety of dissemination methods are used. ○ **Central government a**s part of the **Gramin Krishi Mausam Seva (GKMS) programme,** sends farmers weather forecasts as well as crop and location specific agro advisories via SMSs. ○ IMD also disseminates agromet information to farmers through **public-private partnerships** with multiple companies such as Reuters Market Light, IFFCO Kisan Sanchar Limited, NOKIA etc. ○ State governments have their own Departments of Agriculture which are first-line executive institutions engaged in agriculture extension, in parallel with KVKs.

6.2. BOREAL SUMMER INTRA SEASONAL OSCILLATION

Why in news?

Researchers at the Indian National Centre for Ocean Information Services (INCOIS), Hyderabad have found a better way to forecast waves based on **Boreal Summer Intra Seasonal Oscillation (BSISO)**.

About BSISO

- BSISO is the **transfer of heat from Indian Ocean to western Pacific Ocean** roughly every 10-50 days during the monsoon (June-September).
- It represents the monsoon's **'active'** and **'break'** periods, in which **weeks of heavy rainfall give way to brilliant sunshine** before starting all over again.
- The active phase **enhances monsoon winds** and hence the surface waves.

- It is **one of the most prominent sources of short-term climate variability** in the global monsoon system.
- Researchers found that, some phases of BSISO **induce high wave activity** in north Indian Ocean and Arabian Sea.
- Waves induced by **active phases of BSISO are nearly 0.5 meters higher** than those which occur during other phases of BSISO.
- Studying BSISO will help improve wave forecasts along India's coasts and mitigate adverse impacts of high waves (coastal flooding, erosion, etc).
    - It also helps in better planning of Sea-navigation routes.

Indian National Centre for Ocean Information Services (INCOIS)

- It was established as an **autonomous body in 1999 under the Ministry of Earth Sciences (MoES)** and is a **unit of the Earth System Science Organization (ESSO).**
- It is mandated to provide **the best possible ocean information and advisory services** to **society, industry, government agencies** and the **scientific community.**
- It carries out **sustained ocean observations** and constant improvements through systematic and focussed research.

6.3. LA NIÑA

Why in News?

Recently, the World Meteorological Organization (WMO) has announced the arrival of La Niña in the central and eastern equatorial Pacific Ocean after nearly a decade's absence.

More about news

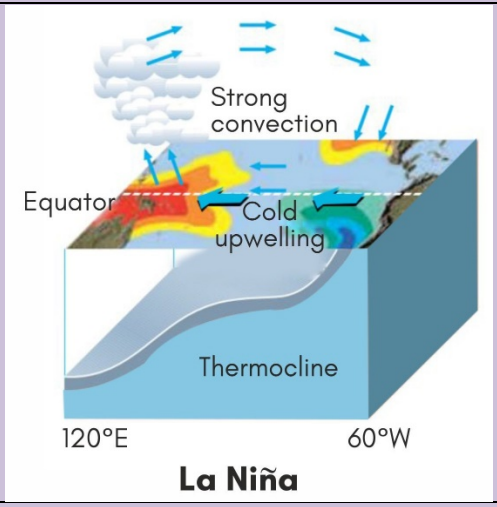
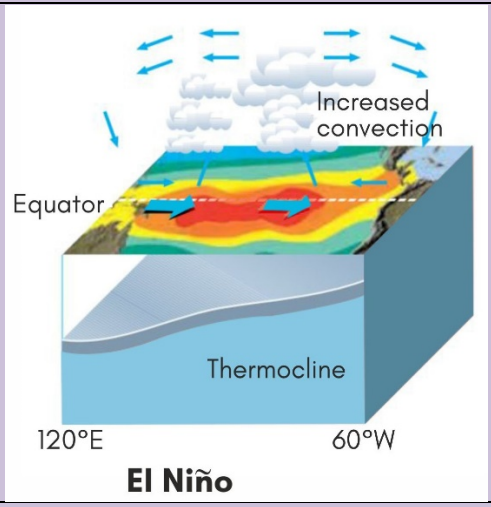
- The La Niña of 2020 is **expected to be moderate to strong** and could last into 2021.
- The **Horn of Africa could see below average rainfall; East and Central Africa will see drier** than usual conditions.
- WMO's weather models forecast **above-average rainfall for Southeast Asia,** some Pacific Islands and the northern region of South America.
- It will result **2-3 degrees Celsius cooler than average Sea Surface Temperature (SST).**
    - However, this may not prevent 2020 from being one of the warmest years on record.
    - Also 2016-2020 is expected to be the warmest five-year period on record.

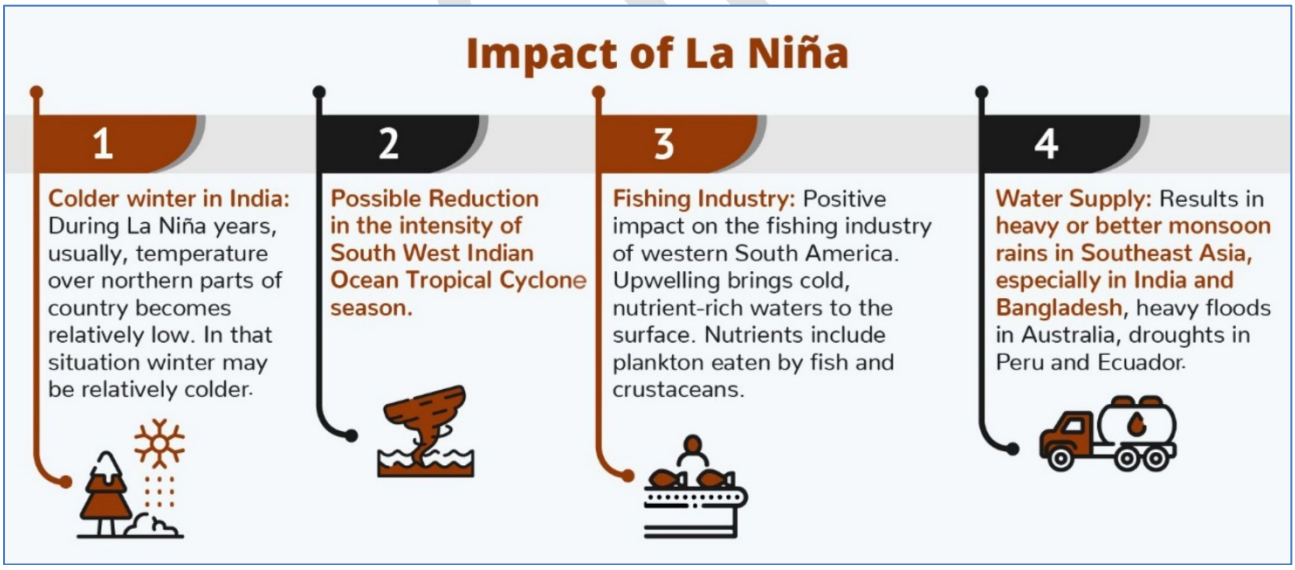
El Niño-Southern Oscillation (ENSO)

- **El Niño and La Niña are opposite phases of the ENSO.**
    - La Niña is sometimes referred to as the cold phase of ENSO and El Niño as the warm phase of ENSO.
- The ENSO cycle refers to the **fluctuations in temperature between the ocean and atmosphere in the east-central Equatorial Pacific** (approximately between the International Date Line and 120 degrees West).
    - Along with impact on Sea Surface Temperature (SST) the ENSO also has an **impact on rainfall, temperature and wind patterns across the world.**
- La Niña and El Niño **usually last between 9 and 12 months.** While their frequency is fairly irregular, they take place every two to seven years. **Typically, El Niño occurs more frequently than La Niña.**

La Niña vs. El Niño

- A La Niña phenomena generally affects the same regions that are impacted by El Niño, with opposite climatic consequences.
- **The following comparison can be seen with respect to a Normal year:** In a normal year, the easterly winds along the equator push warm water westward. Warm water at the surface of the ocean blows from South America to Indonesia.
    - As the warm water moves west, nutrient rich cold water from the deep rises up to the surface reaches on the coast of South America. This phenomenon is called **upwelling.**

Characteristics	La Nina	El Nino
Diagram		
SST in the central and east-central Equatorial Pacific	**Large-scale cooling** (Cold phase of ENSO)	**Large-scale warming** (Warm Phase of ENSO)
Up welling	Enhanced	Reduced
Trade winds (easterly winds) **in the Pacific**	Stronger than normal	Weaker than normal Winds may blow the other way i.e. from west to east (toward South America instead of Indonesia)
Indian Monsoon	Better than normal Monsoon in India (may cause floods)	Weakens the Indian Monsoon (may cause draught)
Frequency of occurrence	Less frequent	More frequent



6.4. MEDICANES

Why in News?

Recently, a medicane named Ianos made landfall along the coast of Greece.

About Madicanes

- Medicanes (MEDIterranean hurriCANES) refer to tropical stormlike cyclone observed **across the Mediterranean Sea.**
- Medicanes **occur more in colder waters than tropical cyclones**, hurricanes and typhoons. Hence, the **cores of these storms are colder in comparison to the warm cores of tropical cyclones**.

- Since warmer cores tend to carry more moisture (hence rainfall), are bigger in size and have swifter winds, **medicanes are weaker and smaller in size** than the tropical cyclones.
- Like tropical storms, medicanes have a symmetric structure and a clearly visible eye.
- The Mediterranean is a generally dry, evaporative sea and cyclonic storms don't grow as much. According to a study published in 2011, only one or two medicanes occur per year.
- However, recent studies have shown that **medicanes are likely to become a bigger problem** as the planet warms due to **climate change.**
    - Warmer sea surface temperatures in the Mediterranean can allow the storms to take on more tropical appearances and characteristics, increasing the wind speeds and making the storms more intense -- with stronger winds and heavier rainfall.
- **Impact of La Nina on Medicanes:** A La Niña produces more rain in the central eastern part, where most of the Mediterranean cyclones develop. The slopes and the convection rising from sea waters can combine to spin off these cyclonic storms that become a Medicane.

6.5. MULTIDISCIPLINARY DRIFTING OBSERVATORY FOR THE STUDY OF ARCTIC CLIMATE (MOSAIC)

Why in News?

Recently, **the largest Arctic science expedition MOSAiC expedition** in history came to a close, as the German research vessel Polarstern sailed into the port at Bremerhaven, Germany.

About MOSAiC

- MOSAiC is the largest first of its kind **one-year long polar expedition into the central Arctic exploring the Arctic climate** system that lasted from 2019 to 2020.
- The objective of the expedition is to m**easure the atmospheric, geophysical, oceanographic and all other possible variables in the Arctic,** and use it to more accurately forecast the changes in our weather systems due to climate change in Arctic.
- The project was **designed by the International Arctic Science Committee (IASC).**
    - IASC is a **non-governmental, international scientific organization** which aims to promote and support leading-edge interdisciplinary research in order to foster a greater scientific understanding of the Arctic region and its role in the Earth system.
- The mission involved collaborations from hundreds of scientists at research institutions around the world.
- It was led by the **Alfred Wegener Institute in Germany** with scientists from 19 countries.

- **India is not a member of the expedition**. However, Dr. Vishnu Nandan, a remote sensing scientist from India, was also a participant of this historical Arctic expedition.

6.6. CYCLONE AMPHAN

Why in News?

Amphan, a tropical cyclone, moving at a speed of 220 to 230 kilometers per hour, is forecast to be the worst storm over the Bay of Bengal since 1999 super cyclone that hit Odisha.

About Amphan

- India Meteorological Department has categorized **Cyclone Amphan as a super cyclone**.
- The storm is only the **second super cyclone to form in the Bay of Bengal (BoB)** since 1999.
  - According to Indian Meteorological Department (IMD), tropical cyclone with **wind speed more than 222 km/hr** is a super cyclone (highest in Classification).
- The rapid intensification of Amphan is an indication of warming of Bay of Bengal which registered maximum surface temperatures of 32-34°C. This is a **consequence of anthropogenic global warming.**

INDIAN METEOROLOGICAL DEPARTMENT

Tropical Cyclone Intensity Scale

Type of Disturbances	Wind Speed in Km/h
Low Pressure	Less than 31
Depression	31-49
Deep Depression	49-61
Cyclonic Storm	61-88
Severe Cyclonic Storm	88-117
Very Severe Cyclone Storm	119 to 221
Super Cyclone	More than 222

About Tropical Cyclones

- They are violent storms that **originate over oceans in tropical areas** and move over to coastal areas bringing about large scale destruction caused by violent winds, very heavy rainfall and storm surges.
- They have a spiral, **anticlockwise movement** in the **Northern Hemisphere.**
- **The Indian subcontinent experiences cyclones from two basins:** the Bay of Bengal basin and the Arabian Sea basin.
  - **BoB is more prone to cyclone than Arabian Sea** because it gets high SST, low vertical shear winds and enough moisture in middle layers of the atmosphere.
  - Once formed, cyclones in this area usually move northwest under the influence of Trade Winds.

Favourable conditions for Cyclone Development

- ✓ Large sea surface temperatures (SST) higher than 27° C
- ✓ Presence of Coriolis force
- ✓ Small variations in vertical wind speed
- ✓ A pre-existing weak- low-pressure area
- ✓ Upper divergence above sea level system

Related News: Bay of Bengal Boundary Layer Experiment (BOBBLE)

- It is a **project funded by Union Ministry of Earth Sciences and the Natural Environment Research Council of UK** to examine the impact of various features such as ocean temperature, salinity and currents in Bay of Bengal on the **monsoon.**

Impact of Cyclonic circulation on Monsoon

- IMD forecasted that development of a low-pressure area in Arabian Sea in the first week of June is expected to give a boost to southwest monsoon in its advance over India.
- **Anti-clockwise winds** of a cyclonic depression might pull monsoon trough towards India, making conditions favourable for the onset.
- However, it is **not necessary that a cyclone would always have positive impact on monsoon.**
  - For instance, last year, **Cyclone Vayu had formed**, just after the onset of monsoon over Kerala.
  - Monsoon winds were not able to move forward till the dissipation of the cyclone and the rains were arrested in Kerala, Karnataka and Tamil Nadu.

- Thus, it is the **track of cyclonic system that determines whether Indian subcontinent will receive rains or not**. So, if low-pressure system moves away from mainland, subcontinent may not receive much rain during the onset.

Other Cyclones in News

Cyclone 'Nivar'

- The India Meteorological Department (IMD) has forecasted the development of a cyclone in the **Southwest region of the Bay of Bengal,** off Tamil Nadu coast.
- After cyclone Gaja in 2018, this will be the second cyclone to cross Tamil Nadu in the last two years.
- **The name of the cyclone 'Nivar', has been proposed by Iran.**
- **Naming of cyclone in Indian Ocean**
  - **World Meteorological Organisation (WMO) and the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP)** started the tropical cyclone naming system in 2000.
  - **Eight north Indian Ocean countries** — Bangladesh, India, the Maldives, Myanmar, Oman, Pakistan, Sri Lanka and Thailand, gave eight names each which was combined into a list of 64 names. **Iran, Qatar, Saudi Arabia, the UAE and Yemen were also added to the panel in 2018.**
  - Nivar is one of the names on the list, released in April, that has 169 names of cyclones, a compilation of 13 suggestions each from 13 countries.
  - 'Amphan,' was suggested by Thailand in 2004.

Super typhoon Goni

- Recently, this typhoon killed 7 people in **Philippines.**
- A typhoon is defined as **a tropical cyclone in the western Pacific.**
  - Typhoons generally track in a westward or northern direction, and occur most frequently in a region of the western Pacific and east Asia.
  - Typhoon **season lasts from the early summer to early autumn**, often coinciding with the monsoon season in Southeast Asia and the wet season in eastern Japan.
  - **Hurricane is essentially the same thing as a Typhoons** that takes place in the North Atlantic, or central or eastern North Pacific.

6.7. DIGITAL OCEAN

Why in News?

Recently, the Ministry of Earth Sciences (MoES) has launched the 'Digital Ocean' platform

About the 'Digital Ocean' platform

- Digital Ocean is a state of the art data platform **to provide ocean data related services at one place.**
  - It includes a set of applications developed to **organize and present heterogeneous oceanographic data** by adopting rapid advancements in geospatial technology.
- It has been **developed by the Indian National Centre for Ocean Information Services (INCOIS)** of the MoES.
  - **INCOIS provides ocean information and advisory services to various stakeholders,** including Potential Fishing Zone (PFZ) advisories, Ocean State Forecast (OSF), high wave alerts, tsunami early warnings, etc.
- **Significance of the 'Digital Ocean'**
  - It will serve as a **one stop-solution for all the data related needs** of a wide range of users.
    - Data from **various projects like Deep Ocean Mission, 'Samudrayaan' project,** research on alternative sources of energy, etc would be included.
  - It will help to **assess the evolution of oceanographic features** through 3D and 4D data visualization.

INDIA'S PROJECTS ON OCEANS

- **'Deep Ocean Mission' (launched in 2018) envisages exploration of minerals, energy and marine diversity** of the underwater world, a vast part of which still remains unexplored. It is yet to be launched.
- **'Samudrayaan project' (launched in 2019)** proposes to send a submersible vehicle with three persons to a depth of about 6000 metres to carry out deep underwater studies.

6.8. SEABED 2030 PROJECT

Why in News?

Recently, researchers under Seabed 2030 project had finished mapping nearly one-fifth of the world's ocean floor.

About Seabed 2030 Project

- It is a collaborative project **between the Nippon Foundation of Japan and the General Bathymetric Chart of the Oceans (GEBCO).**
- It aims to bring together all available bathymetric data to **produce the definitive map of the world ocean floor by 2030** and make it available to all.
  - Bathymetry is the **measurement of the shape and depth of the ocean floor**.
- It was launched at **United Nations Ocean Conference in 2017**.
- It is **aligned with the UN's Sustainable Development Goal (SDG) 14** to conserve and sustainably use the oceans, seas and marine resources.
- Seabed 2030 project comprises four **Regional Centers and a Global Center** (in UK).

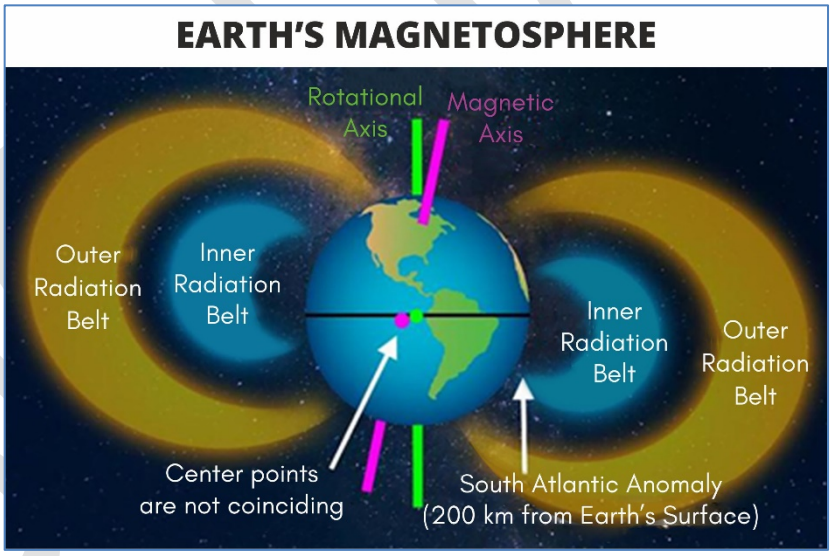
About GEBCO

- GEBCO is the only intergovernmental organisation with a mandate to map the entire ocean floor.
- It is an **international group of geoscientists and hydrographers,** working on the development of a range of bathymetric data sets and data products.
- GEBCO operates under the joint auspices of the **Intergovernmental Oceanographic Commission** (IOC) (of UNESCO) and the **International Hydrographic Organization** (IHO).

6.9. SOUTH ATLANTIC ANOMALY

Why in News?

- Recently, European Space Agency (ESA) scientists have warned that the earth's geomagnetic field is weakening in some areas area between Africa and South America. It has also been confirmed by NASA.
- ESA has termed the phenomenon of this change of geomagnetic field or the surface magnetic field as **'South Atlantic Anomaly'.**



About South Atlantic Anomaly

- South Atlantic Anomaly (SAA), also called as 'dent' in Earth's Magnetic Field is an unusually weak spot in the Earth's Magnetic Field that allows charged particles from Sun to dip closer to the Earth's surface than normal.
  - It is observed over **South America and the southern Atlantic Ocean**.
- The area of the South Atlantic Anomaly is characterized by a **significant reduction in the strength of Earth's magnetic field compared with areas at similar geographic latitudes**
  - The data gathered reveals that the area of the anomaly dropped in strength by over 8 per cent between 1970 and 2020.
- Also, recent data shows that **SAA is expanding westward and splitting into two lobes** which can result in weakening of magnetic field and **can impact:**
  - **Low-Earth orbit satellites** that travel through SAA will get hit by solar particles which can result in a short circuit and further lead to permanent damage.
  - **International Space Station,** which is in low-Earth orbit, instruments will also be impacted.

About Earth's magnetic field

- It exists due to **metal and liquid outer core** about 3,000 km below the surface which create electric currents that generate and change our electromagnetic fields.
- The surface magnetic field spans around tens and thousands of kilometers away from the earth and **protects us from cosmic radiations as well as aids the communication of satellites and spacecraft.**

- **Reasons**: Although still not clear, a possible explanation could be a **shift in Earth's magnetic field,** whereby North Pole and South Pole switch places as field reverses.
    - This reversal **last happened 7.8 lakh years ago,** with scientists believing that a shift is long overdue. These reversals **usually happen at an interval of 250,000 years.**

6.10. EARTH'S MAGNETOSPHERE

Why in News?

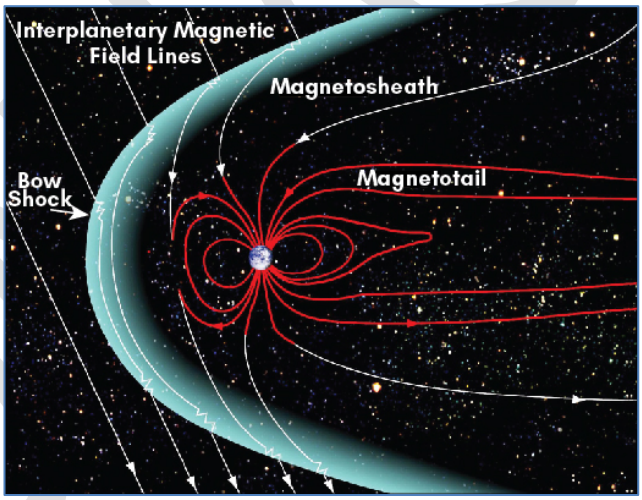
Indian Institute of Geomagnetism, an autonomous institution of the Department of Science and Technology has developed a simulation code capable of **studying electric field structures** in earth's **magnetosphere.**

More on News

- **It will help** advance the knowledge of **plasma waves** that are useful **in planning future space missions.**
- It can also lead **to precisely controlled fusion laboratory experiments** for energy needs of humanity. Controlled fusions use magnetic fields to confine a high-temperature plasma of deuterium and tritium.

Earth's magnetosphere

- It is a region surrounding Earth **where the dominant magnetic field is of Earth** rather than of interplanetary space.
- It is formed by **interaction of solar winds** (which carries with it a solar magnetic field, called an **Interplanetary Magnetic Field**) with **Earth's magnetic field.**
- Earth's **magnetosphere contains plasma** and plasma processes have the ability to hamper the working of a number of satellites that have been placed in orbit in the magnetospheric region.
    - Plasma is **a hot ionized gas** consisting of approximately equal numbers of positively charged ions and negatively charged electrons. **Plasma is the fourth state of matter.**
- Almost **99% of matter** in the universe is in the form of plasma.



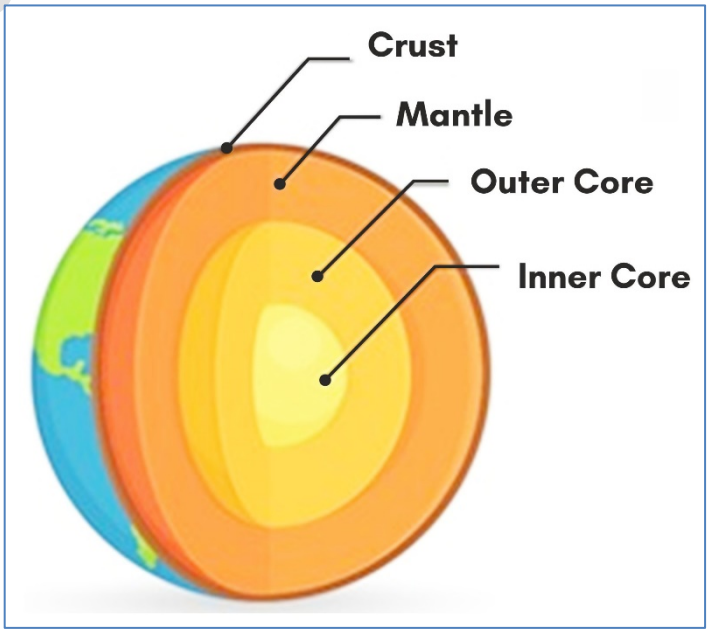
6.11. EARTH'S INNER CORE

Why in News?

Researchers **have revised the estimate of the age of Earth's solid inner core to 1-1.3 billion years old.**

More on the News

- Earlier it was reported that inner core was only about 565 million years old, quite young compared to the age of Earth (4.5-billion-year).
- **Earth's core is made mostly of iron,** with the inner core being solid and the outer core being liquid.
    - The **circulation of this liquid metal creates electric currents** and turns Earth into a giant electromagnet. This is how Earth's magnetic field is generated. The process is called **geodynamo.**



- **Earlier estimates have created a paradox,** where the core would have had to reach unrealistically high temperatures to maintain the geodynamo for billions of years before the formation of the inner core.
- **New research solves that paradox** by finding a solution that keeps the temperature of the core within realistic parameters.
    - It suggests that geodynamo was maintained by two different energy sources and mechanisms.

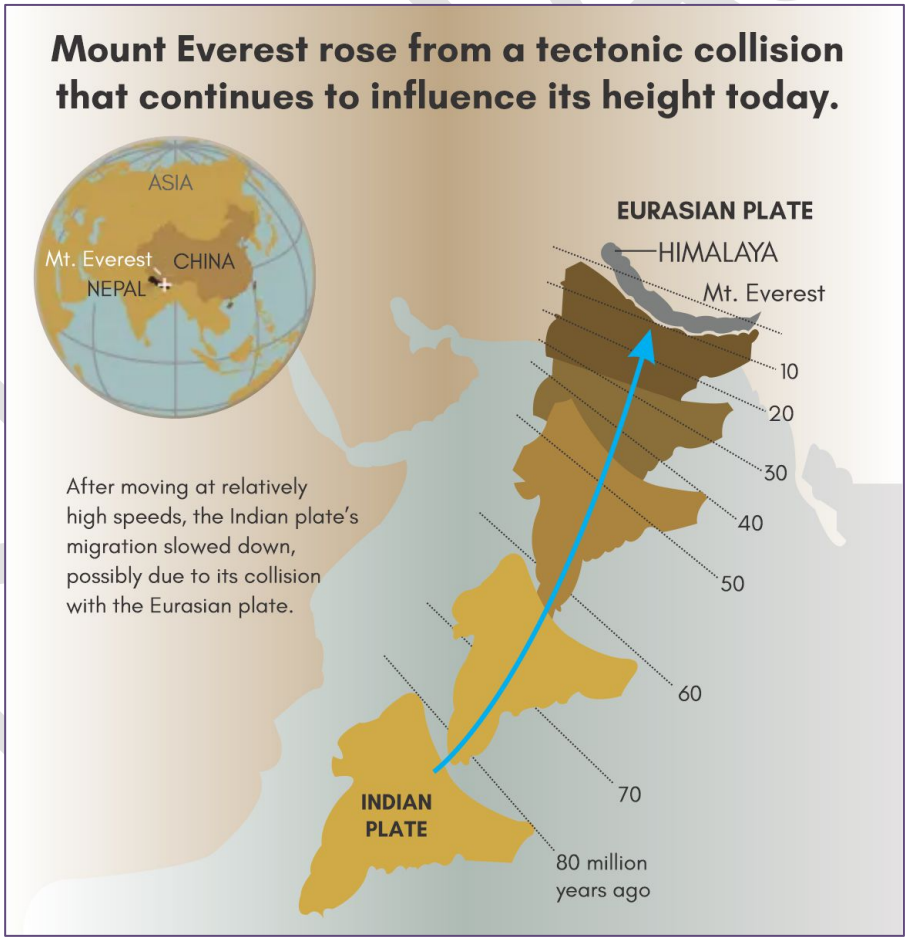
6.12. MOUNT EVEREST GROWS TO NEW HEIGHT

Why in News?

Recently, Foreign Ministers of Nepal and China jointly **certified the elevation of Mount Everest at 8,848.86 metres above sea level — 86 cm higher than what was recognised since 1954.**

About Mount Everest

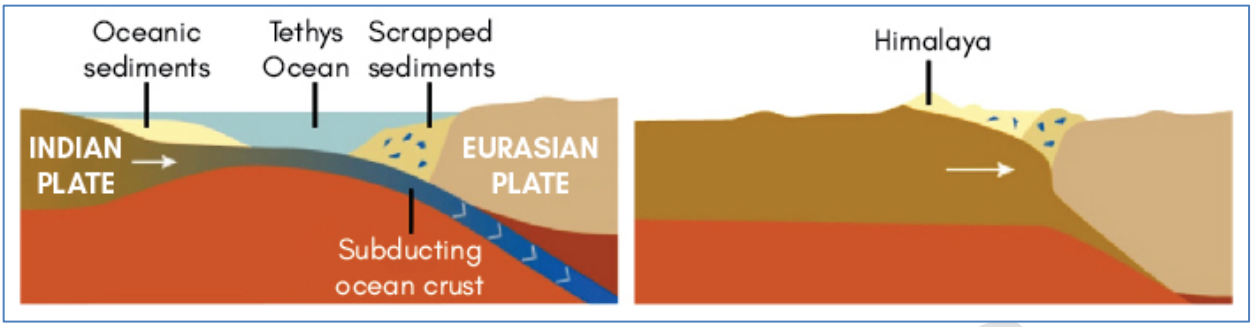
- Mount Everest is a peak in the Himalayan mountain range and is considered the highest point on Earth (measured with the **mean sea level as the base**).
    - In the nineteenth century, the mountain was named after George Everest, a former Surveyor General of India.
    - **As measured from the Earth's core, Ecuador's Mount Chimborazo is the world's highest,** with altitude of 6,263 meters, because the Earth bulges in the middle, mountains along the equator are farther from the core.
    - **Measuring from the foot of the mountain to the peak, Hawaii's Mauna Kea is the tallest** (10,210 meters- 4,205 meters above sea level and 6000 meters below the water's surface).
- Mt. Everest is **located between Nepal and Tibet,** an autonomous region of China**.**
    - The Tibetan name is Chomolungma, which means "Mother Goddess of the World." The Nepali name is **Sagarmatha,** which has various meanings.



Reasons for elevation of Mount Everest

- Mount Everest was **formed from a tectonic** collision **between the Indian and Eurasian tectonic plates** tens of millions of years ago.
- The **collision continues to this day, which is, in part, why Everest's altitude is always changing.**
    - India **creeps northward a couple inches each year**, and scientists estimate that the ongoing impact with Eurasia might force the mountains to ever greater heights, with an estimated average uplift of **roughly 10 millimeters a year in the northwestern sections of the range, and around a millimeter a year at Everest.**
    - **However, erosion and earthquakes work against their upward progression.**
        - Earthquake can cause the mountain to either grow or shrink small amounts depending on exactly how and where the ground shifts.

Formation of Himalayas



200 million years ago, the supercontinent of Pangea began to split into pieces

Indian plate started moving northward toward the landmass we now know as Asia (Indian plate has moved **nearly 30 feet** or more each century)

Tethys Ocean that existed between India and Eurasia begun to close as Indian plate moved northwards

The plate under the water made of **dense oceanic crust** moved beneath the southern edge of the more buoyant rocks that make up the **Eurasian continental plate,** creating a subduction zone

Movement of oceanic slab into the mantle scraped a thick layer of seafloor sediments into a pile at the edge of the Eurasian plate and this **sandy layer formed rocks and accumulated on the mountainous peaks**

As the continents compressed and India plate moved under Eurasian plate, the surface buckled and **the crust thickened to form the Himalayan mountain range** comprising of the Mount Everest

6.13. PLACES IN NEWS

Amery Ice Shelf (AIS)	• As per **National Centre for Polar and Ocean Research (NCPOR),** there would be a **24 % increase in expansion of AIS boundaries in Antarctica by 2021.** • AIS is one of the **largest glacier drainage basins** in world, located on **east coast of Antarctica.** AIS dynamics and mass balance help in understanding changes in global climate scenario. • **NCPOR,** under the Ministry of Earth Sciences, is located in Goa and is India's premier R&D institution responsible for research activities **in polar and Southern Ocean realms.**
Diamer-Basha Dam	• China and Pakistan signed an accord to construct this Dam in **Gilgit-Baltistan region.** • It is to be constructed on the **River Indus** with a capacity of 4,500 MW. • India had objected to the construction of the dam repeatedly as it falls into the Indian territory of **northern Gilgit-Baltistan region**. Also, it can cause water shortage in Ladakh.
Pantanal, Brazil	• It is **World's Largest Wetland and sprawls over more than 150,000 sq km in Brazil** and also extends into Bolivia and Paraguay. • It is burning as **vegetation compacted under the marshy flood** water during the wet season dries out as ponds and lagoons evaporate, **leaving flammable deposits underground**.
Mount Sinabung Volcano	• **Mount Sinabung** volcano in **Indonesia** erupted in August, 2020 spouting ash at least 5,000 metres high into the sky**.** • **Mount Sinabung** is an **active strato volcano** on **Indonesia's Sumatra island** • It erupted in 2010 after a 400-year-long break and has been continuously active since 2013. • It is prone to seismic upheaval due to its location on the **Pacific's Ring of Fire** or the Circum-Pacific Belt, which is an **area along the Pacific Ocean characterised by active volcanoes and frequent earthquakes.** • Strato volcano is a **tall, conical volcano** composed of one layer of hardened lava and volcanic ash. • These volcanoes are characterized by a steep profile and **periodic, explosive eruptions**. • The lava that flows from them is **highly viscous, and cools and hardens** before spreading very far.
Coral Triangle	• It is a **marine area located in the western Pacific Ocean** described as world's epicentre of marine diversity. • It includes waters of **Indonesia, Malaysia, the Philippines, Papua New Guinea, Timor Leste and Solomon Islands.** • It houses **nearly 600 different species** of reef-building corals. • It is **one of 3 mega ecological complexes** on Earth, together with **Congo Basin and Amazon Rainforest**
Grand Ethiopian Renaissance Dam (GERD)	• **Egypt and Ethiopia** are having disputes over this dam. • GERD (formerly known as the Millennium Dam) is **hydropower** project nearing completion on **Blue Nile River in Ethiopia**. When completed it will be **largest dam in Africa**. • **White Nile River, Blue Nile River** is one of the two major **tributaries of the Nile**. The Blue Nile supplies about 80% of the water in the Nile during the rainy season.
Katchall Island	• Recently, Indian Coast Guard averted mishap off at Katchall Islands by towing drifting fuel tanker to safe waters. • Katchal is **one of the Nicobar Islands** in the Bay of Bengal, India which was previously known as Tihanyu. • It is inhabited by **Nicobari Tribes and Migrated Tamilians** and languages spoken include Nicobarese, Hindi, Tamil and Telugu. • Important birds found in the region are **Indian white-eye, red – whiskered bulbul etc.**
Death Valley, USA	• Death Valley in California's Mojave Desert recorded **one of the hottest air temperatures of 54.4 degree Celsius.** • It is believed **this is the hottest daytime temperature ever recorded,** after previous records were shown to have errors. • At 282 feet below sea level, **Death Valley is the lowest point in North America**
Mariana Trench	• Recently, **China vessel Fendouzhe, descended more than 10,000 metres into Mariana Trench** with three researchers on board. • Mariana Trench is the **deepest part of the ocean** (11,034 meters deep) and the deepest location on Earth. ○ It is **located in the western Pacific east of the Philippines**. • **Challenger Deep in the Mariana Trench,** is the **deepest known spot in world's oceans** below the surface of the Pacific Ocean
K2	• A team of **climbers from Nepal become the first mountaineers to successfully complete a winter attempt** on the summit of K2. ○ K2 is the only mountain over 8,000 metres **that had not been summitted in winter**

	• It is **situated in the Karakoram Range** to the northeast of the Himalayas
	  ○ K2 is **surrounded by five of the world's 17 highest mountains.**
	  ○ K2 is the world's **second tallest peak after Mount Everest.** Located in Pakistan occupied Kashmir.

Sea of Galilee	• Sea of Galilee, also known as Lake Tiberias or Kinneret is one of the **lowest-lying bodies of water in the world.** • It **lies in northern Israel,** between the Israel occupied Golan Heights and the Galilee region. • It is a **freshwater body fed by underground springs,** but its major source is the Jordan river, which flows through the Sea of Galilee before ending in the Dead Sea. • Water is not extracted from the Sea of Galilee, but it is considered to be an important barometer of the water situation in Israel.
Pointe d'Esny region	• Mauritius has **declared a state of environmental emergency** after a grounded ship off its coast is said to be leaking tonnes of crude oil in the **Pointe d'Esny region.** • Pointe d'Esny is a Ramsar site and the largest remaining wetland in Mauritius. The Ile aux Aigrettes Nature Reserve, Blue Bay Marine Area and Mahebourg Fishing Reserves all lie close to the region.

Heartiest Congratulations to all successful candidates

7 IN TOP 10 SELECTIONS IN CSE 2019

FROM VARIOUS PROGRAMS OF VISION IAS

9 IN TOP 10 SELECTION IN CSE 2018