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ENVIRONMENT

Classroom Study Material

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ENVIRONMENT

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1.1. GLOBAL SCENARIO

1.1.1. EMISSIONS GAP REPORT

Why in News?

Recently, **UN Environment Programme (UNEP)** launched its tenth edition of **Emissions Gap Report 2019.**

Key Findings in the report

- The report assesses the gap between anticipated emissions in 2030 and levels consistent with the 1.5°C and 2°C targets of the Paris Agreement**'.**
- GHG emissions have **risen at a rate of 1.5% per year** in the last decade. G20 nations collectively account for 78% of all emissions.
- The top four emitters (China, USA, EU and India) contribute to over **55% of the total emissions over the last decade, excluding emissions from land-use change such as deforestation.**
- China, the EU28, India, Mexico, Russia and Turkey are projected to meet their targets with current policies. **India,** Russia and Turkey are projected to be **'over perform' their targets** by around 15%. https://t.me/UPSC_PDF
- **World has to cut its emissions by 7.6% each year** between 2020 and 2030 to get on track towards the 1.5°C temperature goal of the Paris Agreement.
- Even if all current unconditional commitments under the Paris Agreement are implemented, temperatures are expected to rise by **3.2°C.**
- Collective **ambition in NDCs must increase more than fivefold over current levels** to deliver the cuts needed over the next decade for the 1.5°C goal.

About 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.
- It is **Headquartered in Nairobi,** Kenya.
- It depends on **voluntary contributions** for 95% of its funding.
- **Other Flagship Publications:** Our Planet; Tunza; Atlas of Our Changing Environment; **Global Environment Outlook.**
- **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.
- **UNEP also host the secretariats of many critical multilateral environmental agreements.** These include:
  - The Convention on Biological Diversity
  - The Convention on International Trade in Endangered Species of Wild Fauna and Flora
  - The 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
- **Awards by UNEP**
  - **Champions of the Earth** is the United Nations **highest environmental honour.**
  - UN Environment is a founding partner of the **SEED Awards,** which support innovative, small-scale and locally driven entrepreneurs around the globe who integrate social and environmental benefits into their business models.
  - The UN Environment **Sasakawa Prize** recognizes outstanding individuals and organizations for their contributions to the protection of the environment and the promotion of sustainable development.
- **The Faith for Earth Initiative:** UNEP launched the Faith for Earth Initiative in November 2017. The goal of Faith for Earth is to **strategically engage with faith-based organizations** and partner with them to collectively achieve the Sustainable Development Goals (SDG) and fulfill the objectives of the 2030 Agenda.

Related news

U.N. Environment Finance Initiative (UNEP FI)

- It is a partnership between **United Nations Environment** and the global **financial sector** created in the wake of the 1992 Earth Summit with a mission to promote sustainable finance.
- The UNEP FI consists of 215 members from financial institutions, banks, investors and insurance companies among others.
- UNEP FI hosts its **Global Roundtable** every other year and has done so since 1994.
- The UNEP **Statement of Commitment by Financial Institutions on Sustainable**

Development represents the backbone of the Initiative.

- It is also a founding member of the United Nations **Sustainable Stock Exchanges** (SSE) initiative along with the **Principles for Responsible Investment** (PRI), the United Nations Conference on Trade and Development (**UNCTAD**), and the **UN Global Compact.**
- 20 institutional investors from 11 countries called as **Investor Pilot Group,** convened by the **U.N. Environment Finance Initiative (UNEP FI)** have come up with a report that helps investors understand how to calculate the risk companies face from climate change.

Related information

India's NDC Targets

- To reduce the emissions intensity of its GDP by 33 to 35 per cent by 2030 from 2005 level.
- To achieve about 40 per cent cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030, with the help of transfer of technology and low cost international finance, including from Green Climate Fund.
- To create an additional carbon sink of 2.5 to 3 billion tonnes of CO_2 equivalent through additional forest and tree cover by 2030.

1.1.2. WMO STATEMENT ON THE STATE OF THE GLOBAL CLIMATE IN 2019

Why in News?

Recently, **World Meteorological Organisation** released "WMO Statement on the State of the Global Climate in 2019".

Highlights of the report

- **Global mean temperature:** It increased in 2019 which was about 1.1±0.1 °C above pre-industrial levels.
  - 2015-2019 are the five warmest years on record, and 2010-2019 the warmest decade on record.
- **Global atmospheric concentrations of GHG:** Average global atmospheric concentrations **of carbon dioxide** in 2018 had touched 407.8 parts per million (ppm), which was **147% of pre-industrial levels.**
  - Whereas for **methane (CH_4) and nitrous oxide (N_2O)** it was 259% and 123% of pre-industrial levels respectively.
- **Sea ice:** The year 2019 saw low sea-ice extent in both the Arctic and the Antarctic.
- **Sea level rise:** In 2019, the global mean sea level reached its highest value since the beginning of the high-precision altimetry record (January 1993).
- **Ocean acidification:** Over the decade 2009–2018, the ocean absorbed around 23% of the annual CO_2 emissions, lessening the increase in atmospheric concentrations. However, CO_2 absorbed in sea water decreases its pH, a process called ocean acidification.
  - Observations from open- ocean sources over the last 20 to 30 years show a clear decrease in average pH at a rate of 0.017–0.027 pH units per decade since the late 1980s.

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.**
- It is **headquartered in Geneva, Switzerland,** and 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: High Mountain Summit

- Recently, The **World Meteorological Organization (WMO)** has convened a **High Mountain Summit at its headquarters in Geneva**
- The WMO organized HMS to **foster high-level dialogue and engage decision-makers and local actors** to develop a roadmap to science-based, user-driven knowledge and information systems supporting sustainable development and risk reduction in mountain and downstream regions.

Related News:

- Recently, for the first time, global concentration of carbon dioxide in the atmosphere have crossed 415 parts per million (ppm) mark as per **Mauna Loa Observatory**.
  - **Keeling Curve** is a graph of the accumulation of carbon dioxide in the Earth's atmosphere based on continuous measurements taken at the Mauna Loa Observatory.
  - **Mauna Loa Observatory (MLO)** is the oldest continuous carbon dioxide (CO_2) measurement station in the world situated in Hawaii.
- The observatory is part of the **National Oceanic and Atmospheric Administration (NOAA)** - Earth System Research Laboratory (ESRL) - Global Monitoring Division (GMD).

1.1.3. IPCC REPORTS

Why in news?

Recently, Intergovernmental Panel on Climate Change (IPCC) released it two special reports: **Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC)** and **Special Report on Climate Change and Land (SRCCL).**

Special Report on Climate Change and Land (SRCCL)

- This report presents the most recent evidence on how the different uses of land like forests, agriculture, urbanisation is affecting and getting affected by climate change.
  - This is the **first time** that the IPCC has focused its attention solely on the **land sector**.
- The IPCC report warns that clean energy, clean transport and reduction emissions alone will not cut global emissions enough to avoid dangerous warming beyond 2 degrees Celsius.
- **Focus Area**
  - **Climate Change and Food Security**
    - ✓ **Reduction in nutritional quality of staple crops**- due to increased atmospheric concentrations of carbon dioxide (CO_2).
    - ✓ The global food system is responsible for **21 to 37 per cent of the world's GHG emissions**. This includes **agriculture** (10-12 per cent), **land use** (8-10 per cent), and **storage, transport and processing** (5-10 per cent).
  - **How could 'negative emissions' affect land, food and wildlife?**
    - ✓ **Negative emissions** are a group of methods that aim to remove CO_2 from the atmosphere and store it in the land or ocean.
    - ✓ They range from the natural-sounding – planting trees, for example – to the technologically advanced, such as using machines to suck CO_2 from the air (known as direct air capture, or DAC).
    - ✓ Many of the modelled pathways for limiting global warming to 1.5°C rely heavily on a technique called **"bioenergy with carbon capture and storage"** (BECCS).
      - This technique involves growing crops, using them to produce energy and then capturing the resulting CO_2 emissions before storing them in the ground or sea.

Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC)

- It covers **how the ocean and cryosphere have and are expected to change** with ongoing global warming. https://t.me/UPSC_PDF
  - **Cryosphere** refers to frozen components of the Earth system that are at or below the land and ocean surface. These include "snow, glaciers, ice sheets, ice shelves, icebergs, sea ice, lake ice, river ice, permafrost and seasonally frozen ground".
- **Focus Areas of the Report**
  - **High-mountain regions**
    - ✓ By the end of the century, glaciers are projected to **lose around 18% of their mass** compared to 2015 levels under a low-emissions scenario and **around a third under a high-emissions scenario**.
    - ✓ Due to a "pronounced imbalance" between current glacier mass and climate, **glaciers will continue to melt even with no further climate change**.
  - **Sea Ice at the Earth's poles**
    - ✓ **Arctic surface air temperatures** over the past two decades have **increased at more than double the global average.** This rapid phenomenon is known as **"Arctic amplification".** In part, it stems from the rapid loss of sea ice cover in the region resulting into decreasing albedo.
    - ✓ In contrast to the Arctic, the **Antarctic continent** has seen **less uniform air temperature changes** over the past 30-50 years, with warming over parts of West Antarctica and no significant overall change over East Antarctica. Multiple factors contribute to this **regional variability in Antarctic sea ice extent including the** "meridional winds", which flow north-to-south or vice versa.
    - ✓ **Human-caused warming at the surface in Antarctica is delayed by the Southern Ocean circulation,** which transports heat downwards into the deep ocean.
    - ✓ Greenland ice sheet currently losing mass **at around twice the rate** of its Antarctic counterpart. **Melting in Greenland** has increased up to five times greater than the level seen in preindustrial times becoming the **largest terrestrial contributor to global sea level rise** between 2005 and 2016.
    - ✓ **Blooms in phytoplankton** occurring earlier in the year and even happening in autumn - a phenomenon rarely observed in Arctic waters previously.
  - **Permafrost**
    - ✓ **Permafrost is defined as** "ground (soil or rock containing ice and frozen

organic material) that remains **at or below Zero degrees Celsius for at least two consecutive years".** The northern hemisphere has an area of permafrost thrice larger than Antarctica's.

- ✓ There is **approximately twice as much carbon in permafrost than is currently in the Earth's atmosphere.**
- ✓ By 2100, **near surface permafrost area will decrease** by 2-66% and 30-99% under various projections.
- ✓ The stimulated plant growth in permafrost areas - from warmer conditions and CO_2 fertilisation could **help sequestering new carbon into plant biomass and increasing carbon inputs** into the surface soil.

- **Oceans**
  - ✓ The current rate of **Sea Level Rise (SLR)** is now larger than the mean rate of the previous two millennia. Human-caused climate change is "very likely" to have been the "dominant cause" of SLR seen since 1970.
  - ✓ **Surface warming** combined with a **surge in freshwater runoff** entering the top layer of the oceans is making the **oceans more stratified –** meaning the **top is less dense** than the deeper parts, and there is **less mixing** between the different levels.
  - ✓ In general, **future increases in stratification will trap nutrients** in the ocean interior and reduce upper ocean nutrient levels.
  - ✓ The areas known as **oxygen minimum zones,** where only specially adapted organisms can survive, are **projected to grow larger** in the future as the overall levels of oxygen in seawater drops.

About IPCC

- It is the **United Nations body** for assessing the science related to climate change.
- It was established by the **United Nations Environment Programme (UNEP) & the World Meteorological Organization (WMO)** in 1988 to provide policymakers with regular scientific assessments concerning climate change, its implications and potential future risks, as well as to put forward adaptation and mitigation strategies.
- **India is a member.**
- IPCC has so far published **5 Assessment reports** and will publish sixth assessment report (AR6) in 2021-22.
- IPCC has received Noble Peace Prize in 2007.
- IPPC has released a **series of special reports.** The aim of these special reports is to provide **"an assessment on a specific issue"**. They complement the main **"assessment reports"** that the IPCC publishes every five or six years.
  - These reports are sought by governments to get a **clearer picture of specific aspects** of climate change.
  - **Special reports published include**: Global Warming of 1.5°C (2018), Climate Change and Land (2019) & The Ocean and Cryosphere in a Changing Climate (2019).
  - The **next special report will be on "climate change and cities"**, which will be published during the seventh assessment cycle of the IPCC – and so will come after its sixth assessment report (AR6) in 2021-22.

1.1.4. OCEAN DEOXYGENATION

Why in news?

Recently, a report titled, **'Ocean deoxygenation: Everyone's problem'** was released by the **International Union for Conservation of Nature (IUCN).**

About IUCN

- IUCN is an **international organization working in the field of nature conservation** and sustainable use of natural resources. It is involved in data gathering and analysis, research, field projects, advocacy, and education
- IUCN was **established in 1948.** It was previously called the International Union for the Protection of Nature (1948–1956) and the World Conservation Union (1990–2008).
- IUCN **does not itself aim to mobilize the public** in support of nature conservation. It tries to influence the actions of governments, business and other stakeholders by providing information and advice, and through building partnerships.
- IUCN compiles and publishes the **IUCN Red List of Threatened Species,** which assesses the conservation status of species worldwide.
- IUCN has a membership of over **1400 governmental and non-governmental organizations.**
- It has its headquarters at **Gland, Switzerland.**

More on the news

- The report was released at the 25th session of the Conference of the Parties (COP25) to the UNFCCC.
- It highlights that **ocean are increasingly experiencing low levels of oxygen,** which threatens marine ecosystems and fish species that are already impacted by ocean warming and acidification.

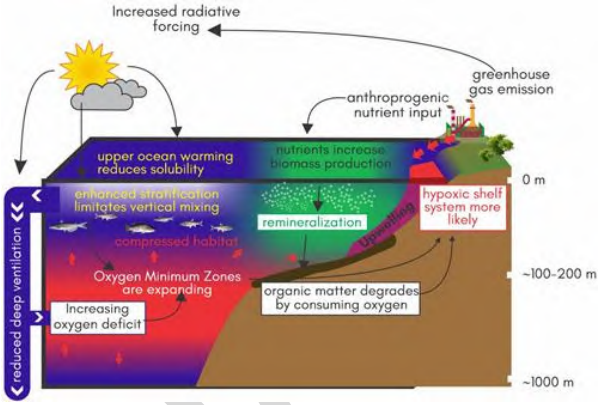
About Ocean deoxygenation

- Ocean deoxygenation refers to the **loss of oxygen** from the oceans.
- The **ocean gains oxygen** in the upper layer due to **photosynthesis** by autotrophic organisms and oxygen from the atmosphere **dissolving** in the under-saturated waters.
- The **ocean loses oxygen** throughout the whole water column:
  - **at the surface**- due to the outgassing of oxygen to the atmosphere in over-saturated waters,
  - **from the surface to depths**- due to the respiration of aerobic organisms and oxidation of reduced chemical species.
- This equilibrium has disturbed in the recent decades. The **global ocean oxygen inventory losses** from 1960 to 2010 are close to 2%.
- Volume of areas depleted of oxygen, known as **"anoxic waters"**, have quadrupled.
- **Examples:** Among the best-known areas subject to low oxygen are the **Baltic Sea** and **Black Sea**.

Causes behind Ocean Deoxygenation

The loss of oxygen in the ocean has **two major causes:**

- **Climate Change:** As the ocean warms due to global warming, it **induces Ocean warming-driven deoxygenation.**
  - Warmer ocean water **holds less oxygen** and is **more buoyant** than cooler water. This leads to **reduced mixing of oxygenated water** near the surface with deeper waters (deeper waters naturally contain less oxygen).
  - This further intensifies with changes in currents and wind patterns.
  - Warmer water also **raises oxygen demand** from living organisms (**increases the metabolic rates**). As a result, less oxygen is available for marine life.
  - Warming of bottom waters may result in **enhanced destabilization of methane gas hydrates**, leading to enhanced release of methane from sediments and subsequent aerobic respiration of methane to CO_2.
- **Nutrient pollution (Eutrophication)**- It causes oxygen loss in coastal waters as fertiliser, sewage, animal and aquaculture waste cause excessive growth of algae, which in turn deplete oxygen as they decompose.
  - The main **features of a coastal area** that becomes deoxygenated are:
    - ✓ **high biological production** from over-enrichment by high nitrogen and phosphorus loads;
    - ✓ a **stratified water column** from salinity, temperature or both, mostly in water depths < 100 m; and
    - ✓ **long water residence time** allows for development of phytoplankton blooms, containment of fluxed organic matter and the development of stratification.



Impact

- **On Climate Change**- decreasing oxygen concentrations will increase greenhouse gas emission with increased release of methane and N_2O.
- **On Feedback mechanisms**- Oxygen loss is directly related to carbon and other nutrient cycles in the sediments.
  - e.g. The **recycling of phosphorus (P) in marine systems is enhanced** when oxygen in sea water is low. The resulting increased availability of phosphorous can further enhance productivity and, upon sinking of the organic matter, enhance the oxygen demand in deeper waters. This positive feedback-loop between productivity, oxygen loss and increased P availability can contribute to further deoxygenation.

Related information

Eastern boundary upwelling systems (EBUS) are one of the ocean's most productive biomes.

- These ecosystems are defined by ocean currents that bring **nutrient rich but oxygen-poor water** to the eastern edges of the world's ocean basins.
- EBUS are key regions for the climate system due to the complex of oceanic and atmospheric processes that connect the open ocean, troposphere and land, and the fact that they host **Oxygen Minimum Zones (OMZs),** responsible for the **world's largest fraction of water column denitrification** and for the **largest estimated emission of the greenhouse gas nitrous oxide**.

- As **naturally oxygen poor systems**, EBUS are especially vulnerable to further changes in global ocean deoxygenation and so what happens to the oxygen content of EBUS will ultimately ripple out and affect many hundreds of millions of people.

1.1.5. CLIMATE CHANGE PERFORMANCE INDEX -2020

Why in News?

The Climate Change Performance Index was recently released.

About Climate Change Performance Index (CCPI)

- It is published by **Germanwatch, Climate Action Network International and the NewClimate Institute, annually.**
- It aims to **enhance transparency in international climate politics** and enables comparison of climate protection efforts and progress made by individual countries.
- The Index covers **57 countries and the EU.**
- The ranking results are defined by a country's aggregated performance in 14 indicators within the four categories
  - GHG Emission- 40%
  - Renewable Energy – 20%
  - Energy Use- 20%
  - Climate Policy- 20%

Indicators	India's Rank
GHG Emissions	11
Renewable Energy	26
Energy Use	9
Climate Policy	15

Findings of the CCPI 2020

- **Decreased Emissions:** Emissions decreased in 31 out of 57 High Emitting Countries. The major reason being, falling global coal consumption.
- **No Top 3 Performers:** As none of the countries assessed is already on a path compatible with Paris Climate Targets, the First Three Places of the Ranking remained unoccupied.
  - **Sweden**, with the 4th position, is the frontrunner and Denmark, with 5th position, is the best climber.
- **Only two G20 countries in Top 10:** The G20 countries, UK (7th rank) and India (9th rank) are "High" Category. Eight of the G20 countries are in the worst category of the Index ("Very Low")
  - **USA**, for the first time, has replaced Saudi Arabia as the **worst performing** country.
- **Improvement in Ranking:** India's ranking improved two places, from 11th (CCPI 2019) to 9th (CCPI 2020) entering into top ten rankings for the first time.

Related News: Global Climate Risk Index 2020 released by international environmental think tank **Germanwatch.**

Highlights of the report

- It assessed 181 countries and quantified impacts of climate change through economic losses, losses to GDP and fatalities to arrive at a ranking.
- **India's rank has worsened** from 14th spot in 2017 to 5th most vulnerable country to climate change in 2018.
  - India's high rank is due to severe rainfalls, followed by heavy flooding and landslides.
  - India has also recorded the **highest number of fatalities** due to climate change and the **second highest monetary losses** from its impact in 2018.
- **Japan topped** the list followed by the Philippines and Germany.
- Between 1999 and 2018, poor countries had to face much higher impacts, where **seven out of ten countries affected are developing countries.**

1.1.6. ENVIRONMENTAL MIGRATION

Why in news?

- According to Global Report on Internal Displacement (GRID, 2019), in 2018, of the total **new 28 million internally displaced people** in 148 countries, 61% were due to disasters. In comparison, 39% were due to conflict and violence.
- As per the estimates, climate change resulted in the displacement of 2.7 million Indians in 2019.

About Environmental Migrants

- According to **International Organization for Migration (IOM), Environmental migrants** are persons or groups of persons who, predominantly for reasons of **sudden or progressive change in the environment that adversely affects their lives or living conditions**, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad.

International Conventions on Environmental Migrants

- **New York Declaration for Refugees and Migrants, UNHCR (2016):** It seeks to protect the human rights of all refugees and migrants, regardless of their status.
- **The Global Compact on safe, orderly and regular migration,2018:** It is the first-ever UN global agreement on a common approach to international migration in all its dimensions. 'Climate refugees', migrants who move due to

natural disasters and climate change, are now recognised under its Objective.

- **The Peninsula Principles on Climate Displacement Within States (2013):** The Principles provide a comprehensive normative framework, based on principles of international law, human rights obligations and good practice, within which the rights of climate displaced persons within States can be addressed.
- **Nansen Initiative Protection Agenda for Cross-Border Displaced Persons (2015):** It's a state-led consultative process to build consensus on a protection agenda addressing the needs of people displaced across borders in the context of disasters and the effects of climate change.
- **Platform on Disaster Displacement (2016):** It was launched to implement the recommendations of the **Nansen Initiative Protection Agenda**.
- **Climate Migrants and Refugees Project:** It aims to spread the word about this challenge, its potential impacts, and to seek out solutions and connections that will help the people most threatened by climate change live safe, dignified, and prosperous lives.

Related information

Environmental Refugees

- Environmental Refugee is a specific term which covers only cross-border migrants forced to do so due to environmental factors. It has **not been defined till date**.
- **UN's Human Rights Committee** in its January 2020 ruling said that refugees fleeing the effects of the climate crisis cannot be forced to return home by their adoptive countries.
- In its ruling, the committee cited articles 6 and 7 of the **International Covenant on Civil and Political Rights, which ensure an individual's inherent right to life.**

UN Refugee Convention (1951)

- It grants certain rights to people fleeing persecution because of race, religion, nationality, affiliation to a particular social group, or political opinion.
- **Cross-border displaced** who have migrated due to climate change are not recognised as refugees under the **1951 Refugee Convention or its 1967 protocol**, and thus do not qualify for protection under national or international legal frameworks for refugee protection.

1.1.7. CARBON PRICING

Why in news?

A Report of the High-Level Commission on Carbon Pricing and Competitiveness by Carbon Pricing Leadership Coalition makes a strong case for carbon pricing.

About Carbon Pricing Leadership Coalition (CPLC)

- It is a **voluntary initiative** of 34 national and sub-national governments, over 163 businesses from a range of sectors and regions, and over 82 strategic partners representing civil society organizations, NGOs, and academic institutions etc.
- It brings together leaders from government, business, civil society and academia to support carbon pricing, share experiences and enhance the global, regional, national and sub-national understanding of carbon pricing implementation.
- The CPLC Secretariat is administered by the **World Bank Group.**
- From India, **Delhi Metro Rail Corporation and Indian Railways** are the government level partners.

What is Carbon Pricing?

- Carbon pricing is an instrument that **captures the external costs of greenhouse gas (GHG) emissions** - the costs of emissions that the public pays for, such as damage to crops, health care costs from heat waves and droughts, and loss of property from flooding and sea level rise - and ties them to their sources through a price, usually in the form of a price on the carbon dioxide (CO_2) emitted.

Types of Carbon Pricing: There are 2 major types of carbon pricing

- **Emissions Trading Systems (ETS):** ETS - also referred to as a cap-and-trade system - caps the total level of GHG emissions and allows those industries with low emissions to sell their extra allowances to larger emitters.
  - By creating supply and demand for emissions allowances, an **ETS establishes a market price for GHG emissions.** The cap helps ensure that the required emission reductions will take place to keep the emitters (in aggregate) within their pre-allocated carbon budget.
- A **carbon tax** directly sets a price on carbon by defining a tax rate on GHG emissions or - more commonly - on the carbon content of fossil fuels. It is **different from an ETS** in that the emission reduction outcome of a carbon tax is not pre-defined but the carbon price is.

Other mechanisms to price the carbon emission

- **Results-Based Climate Finance (RBCF)** is a funding approach where payments are made after pre-defined outputs or outcomes related to managing climate change, such as emission reductions, are delivered and verified.

- **Internal carbon pricing** is a tool an organization uses internally to guide its decision-making process in relation to climate change impacts, risks and opportunities.

Current status of carbon Pricing

- As of April 2019, there are 57 carbon pricing initiatives implemented or scheduled for implementation, consisting of 28 ETSs in regional, national, and subnational jurisdictions, and 29 carbon taxes, primarily applied on a national level.
- In total, these carbon pricing initiatives cover 11 gigatons of carbon dioxide equivalent ($GtCO_2e$), or about **20% of global GHG emissions**, compared to 15% in 2017.
- **Example:** China's ETS is expected to begin by 2020.
- **India's Case:** The **clean energy cess (or Coal Cess)** is levied on coal, lignite and peat as well as on imported coal. It was introduced in 2010-11 union Budget. It is now **renamed as "Clean Environment Cess".**
  - Gujarat launched **India's first emissions trading scheme** in Surat.

1.2. CONVENTIONS AND OTHER INITIATIVES

1.2.1. UN CONVENTIONS

1.2.1.1. COP 25

Why in news?

- Recently**, Conference of Parties (COP 25)** under the auspices of United Nations Framework Convention on Climate Change (UNFCCC) had concluded in **Madrid** under the **presidency of Chile**.
- Conference also included the 15th session of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP 15), and the second session of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA 2).

Agenda of COP25

COP25 in Madrid was mandated by the UNFCCC to resolve the outstanding issues in the Climate Package, including:

- **Carbon markets** dealt with in Article 6 of the Paris Agreement.
- **Loss and Damage under Paris Agreement** and **setting up of a fund** to help poor countries reeling from climate crisis.
- **Enhancing Nationally Determined Contributions (NDCs)** by all countries to curb emissions.

Significance of COP25

- As the Paris Agreement comes into force from January 1st, 2020 the COP 25 was important to finalize the "rulebook" for the Paris Agreement.
- It is no longer a climate crisis; it is a **climate emergency**. Delegates committed to limiting the global temperature rise to 1.5˚C, to achieve carbon neutrality by 2050, and to reduce greenhouse gas emissions by 45% of 2010 levels by 2030.
- Owing to its original location in Chile- a nation with around 4,000 miles of coastline - the leadership dubbed this year's event the **"blue COP",** laying out its intention to focus on oceans.

Key Outcomes: The COP adopted the **"Chile Madrid Time for Action"** document.

- **On Emission Reductions:** Rather than strong language setting out a clear timeline for nations to enhance their NDCs in 2020, it merely reiterated the invitation to parties to communicate. The text then "urges parties to consider that gap" when they "recommunicate" or "update" their NDCs, though it does not specify a fixed timeline.
- **On Loss and Damage:** The final texts essentially note that the Green Climate Fund (GCF) already supports activities that can be defined as relating to "loss and damage", with a suggestion that it – and other funds – could do more in this area in the future.
  - Also, the **Santiago Network was established**, as part of the WIM, to **catalyse the technical assistance** required by the most vulnerable countries.
- **On Climate Finance:** Negotiators were unable to agree on when they should take a decision on whether and how the **work programme for the Long Term Finance agenda** should continue post-2020.
- **On Carbon Market:** The conference closed without setting rules for carbon markets under Article 6 of the Paris Agreement. The decision was deferred till COP26 next year.
- **On Gender Action Plan:** Decision was made on a new **five-year gender action plan (GAP),** intended to "support the implementation of gender-related decisions and mandates in the UNFCCC process".

About Loss and Damage (L&D):

- Under L&D, rich countries who have historical responsibility for climate change are asked to be liable to the developing countries who are already facing climate change impacts.

- The **Warsaw International Mechanism (WIM)** on Loss and Damage came into being **in 2013(COP 19)**. It acknowledges that "loss and damage associated with the adverse effects of climate change includes, and in some cases involves more than that which can be reduced by adaptation".

In Paris Agreement 2015 (COP 21), developed countries agreed to include loss and damage in the agreement, but only with an added clause that the specific article which relates to loss and damage "does not involve or provide a basis for any liability or compensation".

Major COP decisions taken since Paris Agreement, 2015 https://t.me/UPSC_PDF

- **COP22@Marrakech in 2016: "Marrakech Action Proclamation for our climate and sustainable development"** was taken which initiated work on Adaptation Fund to serve the Paris Agreement.
- **COP23@Bonn (chaired by Fiji) in 2017:**
  - **Talanoa Dialogue:** Talanoa dialogue a facilitative dialogue in 2018, to take stock of the collective efforts of Parties in relation to progress towards the long-term goal referred to Paris Agreement and to inform the preparation of nationally determine contributions (NDCs) was launched.
  - **Pre-2020 implementation and ambition:** Parties agreed that there will be two stock-takes to discuss pre-2020 commitments - in 2018 and 2019 - before the Paris Agreement becomes operative in 2020.
  - **Gender Action Plan:** The first ever **Gender Action Plan to the UNFCCC was adopted** at COP23.
- **COP24@Katowice in 2018:** The COP24 climate conference finalised the "**work program for the implementation**" (guidelines/rulebook) for reaching the targets set in the Paris Agreement. However, no agreement could be reached on mechanism for Carbon trading and carbon markets.

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 on 21 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.
  - 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.**

1.2.1.2. CARBON MARKETS

- **Article 6 under Paris Agreement** contains **three separate mechanisms** for **"voluntary cooperation"** towards climate goals: **two based on markets** and a **third based on "non-market approaches".**

Carbon markets under the Paris Agreement (Article 6)

- **Market Mechanism 1 (Article 6.2)** – It sets up a carbon market which allows countries to sell any **extra emission reductions** {called as **Internationally Transferred Mitigation Outcomes (ITMO)}** they have achieved compared to their Nationally Determined Contributions (NDCs) target.
  - This is a **voluntary direct bilateral cooperation between the countries** aiming to promote sustainable development, while ensuring environmental integrity and transparency (the reporting requirements under Paris regime).

- **Market Mechanism 2 (Article 6.4) -** The second mechanism would create a **new international carbon market** for the trading of emissions reductions created anywhere in the world **by the public or private sector**.
    - This new market referred to as the **"Sustainable Development Mechanism" (SDM)** seeks to replace Kyoto Protocol's "Clean Development Mechanism" (CDM).
    - The delivery of an **Overall Mitigation in Global Emissions (OMGE)** is a key requirement of the SDM.
        - ✓ OMGE is voluntary and new element under the Paris Agreement, that takes carbon markets beyond the offsetting approaches of the existing markets like the CDM.
    - In contrast to direct bilateral cooperation under Mechanism 1, this mechanism will be **supervised by a body designated by the UN Conference of the Parties (CoP).**
    - Another unique aspect of this mechanism is **mobilizing the private sector to participate in climate change mitigation** by providing suitable incentives.

The non-Market Approach

- **Article 6.8** recognises "non-market" approaches to boost "mitigation, adaptation, finance, technology transfer and capacity-building", in situations where no trade is involved.
- This could involve similar activities to those under Article 6.2 or 6.4, **without the added element of trading**.

1.2.1.3. MONTREAL PROTOCOL

Why in News?

India achieved **complete phase out of HCFC-141 b,** one of the most potent ozone depleting chemical after Chlorofluorocarbons (CFCs).

More about news

- The complete phase out of HCFC-141 b is **among the first at this scale in** Article 5 parties (developing countries) **under the Montreal Protocol.**

Montreal Protocol on Substances that Deplete the Ozone Layer

- The Montreal Protocol is the landmark multilateral environmental agreement that regulates the production and consumption of nearly 100 man-made chemicals referred to as **ozone depleting substances (ODS).**
    - When released to the atmosphere, **ODS damage the stratospheric ozone layer,** Earth's protective shield that protects humans and the environment from harmful levels of ultraviolet radiation from the sun.
- Adopted in 1987, the Protocol is to date the **only UN treaty** ever that has been **ratified by all 197 UN Member States**.
- Under this treaty, **all parties have specific responsibilities** related to the **phase out** of the different groups of ODS, control of ODS trade, annual reporting of data, national licensing systems to control ODS imports and exports, and other matters.
- Developing and developed countries have **equal but differentiated responsibilities**, but both groups of countries have **binding**, time-targeted and measurable commitments.
- The Parties are assisted by the **Ozone Secretariat**, which is based at UN Environment Programme headquarters in Nairobi, Kenya.
- **Kigali agreement** amended the Montreal Protocol in 2016.
    - It aims to **phase out Hydrofluorocarbons (HFCs),** a family of potent greenhouse gases by the late 2040s.
    - Under it, India has to phase out HFC by 85% by 2047 over the 2024-2026 level (baseline).
    - It is **binding on countries from 2019.**
- **Vienna Convention also deals for the Protection of the Ozone Layer [1985]**
    - It acts as a framework for the international efforts to protect the ozone layer.
    - It paves the way for a legally binding treaty through protocol called Montreal protocol

About HCFC

- HCFCs are compounds containing carbon, hydrogen, chlorine and fluorine.
- They are **less stable than CFCs** because HCFC molecules contain carbon-hydrogen bonds.
- They have **shorter atmospheric lifetimes** than CFCs and deliver less reactive chlorine to the stratosphere.
- HCFCs are also part of a group of chemicals known as **the volatile organic compounds (VOCs).**
- **HCFCs are both ODS and powerful greenhouse gases:** the most commonly used HCFC is nearly 2,000 times more potent than carbon dioxide in terms of its global warming potential (GWP).
- **HCFC Phase out Management Plan (HPMP):** Ministry of Environment, Forests and Climate Change (MoEF&CC) through its Ozone Cell implements HPMP as per the reduction schedule agreed with the Protocol.
    - It aims to phase out use of **HCFCs by switching to non-ozone depleting substances by 2030.**

- Government has **launched Stage II of HPMP** for the 2017-2023 period which has a strong focus on HCFC phaseout in building sector.

About HCFC-141 b use in India

- It is **used mainly as a blowing agent** in the production of rigid **polyurethane (PU) foams**. PU foam sector has links with cold storages and cold chain infrastructure, automobiles, commercial refrigeration, refrigerators, water geysers, etc.
- It is **not produced in the country** and all the domestic requirements are met through imports.

1.2.2. OTHER GLOBAL INITIATIVES

Climate financing mechanisms	• India got USD 43 million from **Green Climate Fund** to boost climate resilience in 3 coastal states: Andhra Pradesh, Maharashtra and Odisha. **Climate financing mechanisms** • **Green Climate Fund (GCF):** o GCF helps developing countries limit or reduce their greenhouse gas (GHG) emissions and adapt to climate change. o It was set up in **2010** as part of **UNFCCC's** financial mechanism. o When the Paris Agreement was reached in 2015, the Green Climate Fund was given an important role in serving the agreement and supporting its goal. o GCF aims to catalyze a flow of climate finance to invest in low-emission and climate-resilient development, driving a paradigm shift in the global response to climate change. • **Global Environment Facility (GEF):** o It was established on the eve of the 1992 Rio Earth Summit. The **World Bank serves as the GEF Trustee**, administering the Fund. o GEF funds are available to developing countries and countries with economies in transition to meet the objectives of the international environmental conventions and agreements. o 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. • **Special Climate Change Fund (SCCF):** o SCCF was **established under the UNFCCC** in 2001 to **finance projects in all developing country parties** relating to: adaptation; technology transfer and capacity building etc. o **GEF**, as an operating entity of the Financial Mechanism, has been entrusted to operate the SCCF. • **Adaptation Fund:** o It was 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. o It is financed with a share of proceeds from the clean development mechanism (CDM) project activities and other sources of funding.
Climate Action Summit	• The UN 2019 Climate Summit was **convened in New York** on the theme, **'Climate Action Summit 2019: A Race We Can Win. A Race We Must Win'** by UN Secretary General. • It has key **focus on raising ambition and accelerate action to implement the Paris Agreement.** • Countries were asked to present concrete and realistic plans to enhance their nationally determined contributions by 2020, in line with reducing GHG emissions by 45% over the next decade, and to **net zero emissions by 2050**. • **3 percent club** was launched which is a new coalition of countries, businesses and international organizations have committed to drive a **three percent global increase in energy efficiency** each year. o **India** is a member of this club.
C40 World Mayors' Summit	• The C40 World Mayors' Summit was held recently in Copenhagen, Denmark. • C40 is a network of the **world's megacities, started in 2005,** representing 700+ million citizens and one quarter of the global economy. • C40 supports cities **to collaborate effectively, share knowledge and drive meaningful, measurable and sustainable action on climate change.** • Six Indian cities are currently members of C40: **Bengaluru; Chennai; Delhi NCT; Jaipur; Kolkata and Mumbai.** **Major initiatives launched during C40 summit 2019** • **C40 Good Food Cities Declaration** • **C40 Clean Air Cities Declaration** • **C40 Cities Knowledge Hub**

	• **City-Business Climate Alliance**
Climate Emergency	• UK has become the **first national government to declare an Environmental and climate emergency.** • **Ireland** became **the second country** to declare climate emergency.
One Trillion Trees Initiative	• 1t.org is a **World Economic Forum** (WEF) **initiative**, designed to support the **UN Decade on Ecosystem Restoration 2021-2030, led by UNEP and FAO**. • 1t.org exists to connect, empower and mobilize a global reforestation community of millions, unleashing their potential to act at an unprecedented scale and speed, to ensure the **conservation and restoration of one trillion trees within this decade**.

Tropical Forest Alliance 2020	• The Tropical Forest Alliance 2020 was **founded in 2012 at Rio+20**.
	• It is a global **public-private partnership** dedicated to collaborative action to realize **sustainable rural development** and better growth opportunities based on **reduced deforestation** and sustainable land use management **in tropical forest countries**.
	  ○ It aims to halve deforestation by 2020 and end it by 2030.
	• TFA is funded by the governments of Norway, the United Kingdom and the Netherlands, and its **secretariat is hosted at the World Economic Forum**.
	  ○ Its action area for 2019 include 10 priority actions to reduce tropical deforestation from global agricultural supply chains (for e.g. beef, soy and palm oil production), as defined in **the Commodities and Forests Agenda 2020 of World Economic Forum.**

Governing Council Meeting of SACEP	• Recently, **15th governing council meeting of South Asia Cooperative environment Programme (SACEP) was held in Dhaka, Bangladesh.**
	• Along with SACEP, the 6th Inter-governmental Meeting of **South Asia Seas Programme (SASP)** was also held.
	• **About SACEP**
	  ○ **SACEP** is an inter-governmental organization which was established in 1982 (Headquarter: Colombo).
	  ○ Its member countries **Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka** aim to promote and support protection, management and enhancement of the environment in the region.
	  ○ SACEP also acts as the **Secretariat for the SASP**, which comes under the purview of **UNEP's Regional Seas Programme**.
	  ○ The **Malé Declaration on control and prevention of air pollution** and its likely transboundary effects for South Asia is another significant effort of SACEP.
	• **About SASP**
	  ○ SASP is a regional agreement adopted in 1995 – among the five maritime countries of South Asia, **Bangladesh, India, Maldives, Pakistan and Sri Lanka,** sharing the Indian Ocean.
	  ○ It aims to **protect and manage the marine environment and related coastal ecosystems of the region** in an environmentally sound and sustainable manner.

Global Carbon Project Report	• Recently, **a new study** by Global Carbon Project found that the growth in India's carbon dioxide emissions this year were likely to be **considerably lower** than the last few years.
	• **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 (CO_2), methane (CH_4), and nitrous oxide (N_2O)** - and complementary efforts in urban, regional, cumulative, and negative emissions.
	• **Findings of the Global Carbon Atlas 2019 of Global Carbon Project**
	  ○ CO2 emissions (Global): **China > USA > EU > India > Russia > Japan.**
	  ○ It has released a new assessment of the **global methane (CH_4) budget.**

Zero Carbon Law	• Recently, **New Zealand passed 'Zero Carbon' Law** to Combat Climate Change • The law aims to **reduce greenhouse gas emissions** to net zero by 2050. • The law has different regulations for methane emissions from animals versus other greenhouse gases, due to farming's important role in bringing in foreign income. However, it still aims to cut 10% of biological methane by 2030, and up to 47% by 2050.
Green Deal	• Recently, **European Union** launched Green Deal. • **Two major decisions are at the heart of the European Green Deal.**

	○ **Achieving climate neutrality by 2050.** Climate neutrality- a state of net-zero emissions- is achieved when a country's emissions are balanced by absorptions and removal of Green House Gases (GHGs) from the atmosphere. ○ **increasing emission reduction by 2030 to at least 50%** and work towards 55%. EU was committed to a 40% reduction in its emissions by 2030 compared to 1990 levels, under the Paris Agreement. • The **move is important** as despite being one of the leaders among the developed countries, even the EU is not on track as per the **Kyoto Protocol commitments**. **EU is still the third largest GHG emitter**.
Climate Vulnerability Forum	• It is an international partnership of **countries highly vulnerable to a warming planet.** • The Forum also **serves as a South-South cooperation platform** for participating governments to act together to deal with global climate change. • The Forum **has a rotating chairmanship** that has been held by Maldives, Kiribati, Bangladesh, Costa Rica, Philippines and Ethiopia.
International Platform on Sustainable Finance (IPSF)	• European Union launched the IPSF **with relevant authorities** from Argentina, Canada, Chile, China**, India**, Kenya, and Morocco. • This initiative is part of the international efforts to meet the Paris Agreement commitments. • It will focus on environmentally sustainable initiatives in particular in the areas of taxonomies, disclosures, standards and labels.

2. POLLUTION

2.1. AIR POLLUTION

2.1.1. DELHI AIR POLLUTION

Why in news?

Recently there has been debates over the contribution of various sources of air pollution in Delhi.

Steps taken to control Delhi's Air Pollution

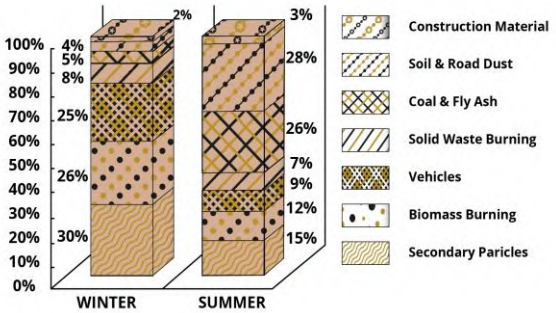
- **Delhi became first city** running on BS VI fuels.
- Delhi is scheduled to run **hydrogen-CNG (H-CNG) fuelled buses** to curb emission.
  - H-CNG is a **blend of hydrogen and CNG**, the ideal hydrogen concentration being 18%. Compared to conventional CNG, use of H-CNG can reduce emission of carbon monoxide up to 70%, besides enabling up to 5% savings in fuel.
- **High-Level Committee (HLC) Report:** A High-Level Committee (HLC), formed on the Supreme Court orders in its report gave recommendations on how to control air pollution levels in the national capital region (NCR). **The report has following technological solutions to fight air pollution.**
  - **Use of Light Detection and Ranging (LiDAR) and Wireless Sensor Networks (WSN) technology** for better pollution-monitoring.
    - ✓ **LiDAR** is a **high-end application of LASER-based technology** for monitoring pollution. The HLC has recommended that this technology may be adopted for vertical monitoring at a few places to track transport of pollutants at higher altitude.
    - ✓ **WSN** may be used as an indicative monitoring tool for a few activities like mining, large construction sites, to supplement air quality data and report to regulator for conducting further investigation.
  - **Adoption of oxy furnaces in industries**: Oxy furnace uses only oxygen as fuel instead of atmospheric air (which contains nitrogen), thus reducing the production of NOx by about 90% in industries.
  - **Photocatalytic paints to be used on roads**: These paints contain titanium dioxide (TiO_2) which has a good oxidising potential and can remove pollutants such as volatile organic compounds (VOCs) and nitrogen oxides from the atmosphere in the presence of sunlight and ultraviolet rays.
  - **Use of anti-smog guns**: Anti-smog gun is a device that sprays nebulized water droplets into the air through high pressure propellers which help particles to settle down.
  - **A pilot project to set up 'smog towers' as high as 20 feet**: Smog towers are basically structures designed as large-scale air purifiers to reduce pollution particles from the atmosphere.
- **Action Plan for Cleaner Industry:** NITI Aayog along with **Confederation of Indian Industry** launched the joint initiative **"Clean Air, Better Life"** in 2016 with an objective to address the issue of air pollution **in Delhi National Capital Region (NCR).**

Related information

- Overall based in Delhi NCR, **Transport sector is the largest emitter of PM2.5 particles** (17.9% to 39.2%) and **road dust is the largest contributor of PM10 particles** (35.6% to 65.9%).
  - **Fugitive Particulate Matter (PM) Emissions** are Air **pollutants** originating from spatially **distributed sources** and wide array of activities (non-point sources) as **opposed to specific discharge point** such as exhausts and stacks (such as a chimneys, pipe, vent, or duct) (point sources).

Air pollution in summers and winters

- The report addresses sources of air pollution and their contribution in summers and winters.
- The relatively large contribution from **road/soil dust and fly ash in summer** is because of dry weather conditions and high wind speeds including occasional dust storms which make dust and fly ash particles airborne.



Other ongoing Schemes/ Programmes

- **National Clean Air Programme (NCAP)**
  - Central Government has launched NCAP under the **Central Sector "Control of Pollution" Scheme** as a long-term, time-bound, national level strategy to tackle

the air pollution problem across the country in a comprehensive manner.
    - It targets to achieve **20 % to 30 % reduction in PM10 and PM2.5** concentrations by 2024 keeping 2017 as the base year for the comparison of concentration.
    - **102 non-attainment cities** (for city specific action plans) mostly in Indo-Gangetic Plains have been identified based on ambient air quality data for the period 2011 – 2015 and WHO report 2014/2018.
- **Graded Response Action Plan (GRAP)** was notified in January 2017, for prevention, control and abatement of air pollution in Delhi and NCR.
    - **Environmental Pollution (Prevention and Control) Authority (EPCA)** enforces Graded Response Action Plan (GRAP).
        - ✓ EPCA under **Environment Protection Act, 1986** was constituted 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.
    - It identifies graded measures and implementing agencies for response to four AQI categories, namely, Moderate to Poor, Very Poor, Severe and Severe + or Emergency.
- **WAYU (Wind Augmentation PurifYing Unit)-** It is an **air pollution control device** which can purify air in an area of 500m^2.
    - It was developed by Council of Scientific and Industrial Research – National Environmental Engineering Research Institute **(CSIR-NEERI)** as a part of Technology Development Project being funded by Department of Science and Technology.
    - The device mainly works on two principles: **Wind generation** for dilution of air pollutants and **Active Pollutants removal.**
- Several steps have been taken for **creating awareness amongst the general population**. These steps are as follows.
    - **SAMEER app** has been launched wherein air quality information is available to public along with provision for registering complaints against air polluting activities.
    - The Ministry of Environment, Forest and Climate Change is implementing **Environment Education, Awareness and Training Scheme**.
    - Under the **National Green Corps (NGC) programme** of MoEF&CC, about one lakh schools have been identified as **Eco-clubs**, wherein, nearly thirty lakh students are actively participating in various environment protection and conservation activities, **including the issues related to the air pollution**.

2.1.2. AGRICULTURE RESIDUE BURNING – A MAJOR CONCERN

Why in News?

India, being an **agro-based economy** with year-round crop cultivation, generates a large amount of agricultural waste, including crop residues.

Agricultural residue

- Varieties of surplus crop residues are burnt especially in northern States of Punjab, Haryana, UP, and Rajasthan depending on the agro-climatic region; however, **about 50% of all crop residue** burnt in the country are **residues of rice crop.**
- Use of **combine harvesters** leaves the crop residues in field, and in order to clear the fields for the next crop in easiest way, farmers burn the residues.
- Emission pollutants released due to burning depends on the type of crop residue e.g. PM2.5 emission (g/Kg) from the burning of different crop residues followed this order; Sugarcane (12.0), Maize (11.2), Cotton (9.8), Rice (9.3), wheat (8.5).
- There are studies which have reported that open burning of crop residues has **ill effects on soil organic carbon** and **soil fertility**.

Policy Response to tackle Crop Stubble Burning

- **National Green Tribunal (NGT**) had banned crop residue burning in the states of **Rajasthan, Uttar Pradesh, Haryana and Punjab.**
- **The Air Prevention and Control of Pollution Act, 1981; The Environment Protection** Act, 1986; The National Tribunal Act, 1995; and The National Environment Appellate Authority Act, 1997 have provisions pertaining to crop residue burning.
- Ministry of Agriculture recently developed a **National Policy for Management of Crop Residue (NPMCR), 2014** to ensure prevention of burning of crop residues.

- 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'** for the period from 2018-19 to 2019-20 has been launched to address air pollution and to subsidize machinery required for in-situ management of crop residue.

Related information

Torrefaction

- India is testing this **Swedish technology** that **can convert rice stubble into 'bio-coal'**.
- The technology involves heating up straw, grass, saw- mill residue and wood biomass to 250°C - 350°C.
- This changes the elements of the **biomass into 'coal-like' pellets**. These pellets can be used for combustion along with coal for industrial applications like steel and cement production.

Happy Seeder Machine

- It is a tractor-operated machine developed by the Punjab Agricultural University (PAU) in collaboration with Australian Centre for International Agricultural Research (ACIAR), for **in-situ management of paddy stubble (straw).**
- Super SMS (Super-Straw Management System) is an attachment fitted to the harvester which ensures that the straw gets cut and spread evenly on the field so that Happy Seeder can do it its work efficiently.

2.1.3. GREEN CRACKERS

Why in News?

In a bid to resolve the crisis of air pollution, Council of Scientific and Industrial Research (CSIR) led by Nagpur-based **National Environmental Engineering Research Institute (NEERI)** developed green firecrackers.

More on news

- The green crackers are named as **Safe Water Releaser (SWAS), Safe Thermite Cracker (STAR) and Safe Minimal Aluminium (SAFAL)** with **30% reduction in particulate matter on an average using Potassium Nitrate (KNO3) as oxidant.**
- These crackers have the unique property of **releasing water vapour, air as a dust suppressant** and diluents for gaseous emissions that match with the performance in sound with traditional conventional crackers.
- Some of the 'green crackers' **have also replaced barium nitrate** as an oxidiser for combustion. Barium nitrate hurts health when inhaled, causing irritation in the nose, throat and lungs.
    - They also do not contain other banned chemicals such as lithium, arsenic and lead.
- **Green logo** as well as **a Quick Response (QR) coding system** has been developed for differentiation of green crackers from conventional crackers. These are available at the same cost as the traditional ones, some of them even cheaper.
- Any kind of fire crackers are regulated by **Petroleum and Explosives Safety Organisation (PESO).**
    - It is a regulatory authority with autonomous status under **Department for the Promotion of Industry and Internal Trade** under Ministry of Commerce and Industry.

2.1.4. TAJ TRAPEZIUM ZONE (TTZ)

Why in news?

Recently, **Supreme Court lifted the ban** on construction, industrial activities and felling of trees in the Taj Trapezium Zone (TTZ).

About TTZ

- Taj Trapezium Zone (TTZ) is a defined area of 10,400 sq km around the Taj Mahal to protect the monument from pollution.
- It is **an 'eco-sensitive area' having three world heritage sites namely Taj Mahal, Agra Fort and Fatehpur Sikri**.
- It is spread over the districts of Agra, Firozabad, Mathura, Hathras and Etah in Uttar Pradesh and the Bharatpur district of Rajasthan.

2.1.5. OZONE POLLUTION

Why in News?

Recently, Delhi recorded an **ozone pollution which is 1.22 times higher** than the eight-hour average standard for ozone exposure that is 100 microgram per cubic meter.

About Ozone Pollution

- Generally, ozone is classified into two types:
    - **Good ozone:** Found in **stratosphere,** it protects the Earth's surface from dangerous ultraviolet light.
    - **Bad Ozone:** Found in the **troposphere (also known as ground level ozone),** it is man-made. The released **nitrogen oxide** (NOx)**, carbon monoxide** (**CO**) and **volatile organic compounds** (VOC), (NOx, CO, and VOCs are known as **ozone precursors**)

combine chemically with oxygen to form ozone during sunny days.

- ✓ During high-temperature conditions of late spring, summer and early fall, high levels of ozone are usually formed in the heat of the afternoon and early evening, dissipating during the cooler nights.
- ✓ The ground-level ozone and PM 2.5 play the most significant role in formation of smog.
- ✓ **Surface level ozone** is also the **third most potent greenhouse gas** after carbon dioxide and methane.

Effects

- Irritation to skin and the respiratory system, higher rates of pulmonary disease.
- When sufficient ozone enters the leaves of a sensitive plant, it **can reduce photosynthesis and slow the plant growth.**
- Damages some types of materials, especially objects made of rubber.

International Initiatives

- **Gothenburg Protocol**: It aims to abate Acidification, Eutrophication and **Ground-level Ozone** and is part of the **Convention on Long-Range Transboundary Air Pollution.**

Government Efforts

- Ozone has been classified and monitored as one of the **eight pollutants** under **National Air Quality index.**
- **System of Air Quality and Weather Forecasting (SAFAR)**: ozone is monitored as one of the pollutants.

2.1.6. SULPHUR DIOXIDE EMISSIONS

Why in News?

Recently, a report by Greenpeace has found that **India is the largest emitter of sulphur dioxide (SO_2) in the world**, contributing more than 15% of global anthropogenic emissions.

More on news

- The **largest source of SO_2** in the atmosphere is the **burning of fossil fuels** by power plants and other industrial facilities.
- **Smaller sources of SO_2 emissions** include: industrial processes such as extracting metal from ore; **natural sources** such as **volcanoes;** and locomotives, ships and other vehicles and heavy equipment that burn fuel with a high sulphur content. https://t.me/UPSC_PDF
- The primary reason for India's high emission output is the **expansion of coal-based electricity generation** over the past decade. The vast majority of power plants in India **lack flue-gas desulfurization technology** to reduce their air pollution.
- In combination with other pollutants and moisture, Sulphur dioxide is responsible for the formation of **high resistance, visible corrosion layers** on all except most noble metals (e.g. silver and gold) and alloys.
- The SO_2 gas contributes to **the formation of acid rain**. It is also a precursor for **sulphate aerosols, a type of suspended particle** that can **affect the properties of clouds** and also lead to **outbreaks of haze and other health and climate problems.**

2.1.7. SCIENTIFIC DISPOSAL AND UTILIZATION OF FLY ASH

Why in news?

The National Green Tribunal has recently directed **thermal power plants to take prompt steps toward the scientific disposal of fly ash.**

Fly ash

- It is a **fine powder**, which is the **by-product of burning coal** in thermal power plants.
- **Composition**: Fly ash includes substantial amounts of oxides of silica, aluminum and calcium. Elements like Arsenic, Boron, Chromium, lead etc. are also found in trace concentrations.

Fly ash Generation in India

- **Indian coal is of low grade with ash content of the order of 30-45 %** in comparison to imported coals which have low ash content of the order of 10-15%.
- Large quantity of ash is, thus being generated **at coal/lignite based Thermal Power Stations,** which not only requires large area of **land for its disposal** but is also one of the **sources of pollution** of both air and water.
- The fly ash generation in India stands about 217.04 million ton and **77.59% of it was utilized** in 2018-19.
- **Methods of scientific disposal**
  - **Dry Fly Ash Disposal system: Electrostatic precipitation (ESP)** enables collection of dry Fly Ash which is then transported by trucks or conveyors at a site and disposed of by constructing a dry embankment.
  - **Wet Fly Ash Disposal System**: Fly Ash is mixed with water and transported as slurry through pipe and disposed of in ash ponds or dumping areas near the plants.

Utilisation of Fly Ash

- **Used in agriculture:** It improves **water holding capacity and soil aeration**, thus increasing crop yield. It also contains micronutrients like **phosphorus, potassium and calcium.**
- **Used in variety of construction works-** Fly ash is a proven resource material for many applications of construction industries and currently is being utilized in manufacturing of **portland cement** (cement manufactured from chalk and clay), bricks/blocks/tiles manufacturing, road embankment construction and low-lying area development, etc.
  - **Concrete made with fly ash is stronger and more durable** than traditional concrete made with Portland cement.
  - Fly ash is a **lightweight material and therefore** can be used for embankment construction over weak substrate such as alluvial clay or silt where excessive weight could cause failure.
- **Manufacturing of Absorbents** that are suitable for purification of waste gases, drinking water purification, waste water treatment etc.

Government Measures to promote Fly Ash Utilization

- **Central Electricity Authority (CEA)** on behalf of Ministry of Power has been monitoring the fly ash generation and its utilization in the country at coal/ lignite based thermal power stations since 1996-97.
- The Ministry of Environment, Forests and Climate Change (MoEFCC) issued the first **directive for promoting fly ash utilisation** in 1999. It was subsequently amended with notifications issued in 2003, 2009 and 2016. **Notifications on Fly Ash Utilization in 2016** had following features-
  - **Mandatory uploading of details of fly ash** available on Thermal Power Station's (TPS) website and updating of stock position at least once in every month;
  - Increase in mandatory jurisdiction of area of application from 100 km to 300 km;
  - **Cost of transportation of fly ash** to be borne entirely by TPS up to 100 km and equally shared between user and TPS for more than 100 km and up to 300 km;
  - **Target of 100% Fly Ash utilization** by 2017;
  - **Mandatory use of fly ash based products** in all Government schemes or programmes e.g. Pradhan Mantri Gramin Sadak Yojana, Mahatma Gandhi National Rural Employment Guarantee Act, 2005, Swachh Bharat Abhiyan, etc.
- A mobile app for ash management- **ASH TRACK** was created to help establish a link between fly ash users and power plant executives.
- At state level, **Maharashtra** became first state to adopt **Fly Ash Utilisation Policy** in 2016.

2.1.8. CORPORATE AVERAGE FUEL EFFICIENCY/ECONOMY REGULATION

Why in News?

Corporate Average Fuel Efficiency/Economy (CAFE) Regulation to **curb the vehicular pollution** has become a concern amongst automobiles industry.

What is CAFE regulation?

- It aims at lowering fuel consumption (or **improving fuel efficiency**) of vehicles **by lowering carbon dioxide (CO_2)** emissions.
- Corporate Average refers to **sales-volume weighted average for every auto manufacturer**. The norms are applicable for petrol, diesel, LPG and CNG passenger vehicles.
- In India, **CAFE regulations come into force into 2017**, under which, average corporate CO_2 emission from vehicle must be less than 130 gm per km till 2022 and below 113 gm per km thereafter.
- CAFE norms require cars to be **30% or more fuel efficient** from 2022 and 10% or more between 2017 and 2021.

2.1.9. COP TO BASEL, ROTTERDAM AND STOCKHOLM CONVENTIONS

Why in News?

Recently, 2019 joint **Conferences of the Parties** to the Basel (COP-14), Rotterdam (COP-09) and Stockholm (COP-09) convention was held in Geneva.

Major decisions at COP include

- **Under Basel Convention:** Adoption of an amendment to include unsorted, mixed and contaminated **plastic waste** under **PIC (Prior Informed Consent) procedure** and improve the regulation of its transboundary movement.
  - **Establishment of a Partnership on Plastic Wastes** to encourage member countries to manage plastic wastes in an environmentally sound manner. The partnership will aim to collect information on the progress in member countries efforts for reducing plastic wastes, raise

public awareness of this issue and advance other activities. The partnership will embark on its activities after 2020.
    - Provisional adoption of **Technical Guidelines on Transboundary Movements of E-Waste and Used Electrical and Electronic Equipment**: The guidelines provide a list of criteria for member countries in objectively **distinguishing between waste and non-waste** under the Basel Convention when companies intend to import or export used electrical and electronic equipment for reuse.
- **Under the Rotterdam Convention: Establishment of a compliance mechanism** to assist Parties to identify and address gaps in complying with the Convention, with the aim of ensuring that governments have the information they need about hazardous chemicals to assess the risks and take informed decisions when importing chemicals.
    - Two chemicals, **the pesticide phorate** and the industrial chemical **hexabromocyclododecane (HBCD)** were added to Annex III of the convention, making them subject to the PIC Procedure, through which countries can decide on future imports of these chemicals.
- **Under Stockholm Convention: Listing for elimination of dicofol and perfluorooctanoic acid (PFOA),** its salts, and PFOA-related compounds under **Annex A of the Convention**, which obliges Parties to eliminate these chemicals from use.
    - **Dicofol** is used as **a miticide on a variety of field crops**, fruits, vegetables, ornamentals and tea and coffee and is known to cause skin irritation and hyperstimulation of nerve transmissions in humans as well as being highly toxic to fish, aquatic invertebrates, algae and birds.
    - **PFOA** is a widely-used **industrial chemical** used in the production of non-stick cookware and food processing equipment, as well as a surfactant in textiles, carpets, paper, paints and fire-fighting foams. It is known to be linked to **major health problems** including kidney cancer, testicular cancer, thyroid disease and hypertension in pregnancy.

Related news

Basel Ban Amendment

- Croatia became the 97th country to ratify the ban, which was adopted by the parties to the Basel Convention in 1995, to protect human health and the environment against the adverse effects of hazardous wastes.
- The **Ban Amendment prohibits all export of hazardous wastes,** including electronic wastes and obsolete ships from 29 wealthiest countries of the Organization of Economic Cooperation and Development (OECD) to non-OECD countries.
- It will become a new Article in the Convention and will enter into force in the 97 countries.
- However, countries like the **US, Canada, Japan, Australia, New Zealand, South Korea, Russia, India, Brazil, and Mexico are yet to ratify** the ban.

Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal

- It was adopted in 1989 and entered into force in 1992.
- The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes.
- Its scope of application **covers a wide range of wastes defined as "hazardous wastes"** based on their origin and/or composition and their characteristics, as well as **two types of wastes defined as "other wastes"** - household waste and incinerator ash.
- The **guiding principles of the Convention** are that transboundary movements of hazardous wastes should be: reduced to a minimum; minimized at the source; managed in an environmentally sound manner; and treated and disposed of as close as possible to their source of generation.
- The **regulatory system is the cornerstone** of the Basel Convention. Based on the **concept of prior informed consent**, it requires that, before an export may take place, the authorities of the State of export notify the authorities of the prospective States of import and transit, providing them with detailed information on the intended movement. The movement may only proceed if and when all States concerned have given their written consent.

Rotterdam Convention on the Prior Informed Consent Procedure (PIC) for Certain Hazardous Chemicals and Pesticides in International Trade

- It was adopted in September 1998 and entered into force in 2004.
- It's jointly administered by the United Nations Food and Agriculture Organization **(FAO) and UN Environment (UNEP).**
- It creates **legally binding obligations** for the implementation of the **Prior Informed Consent** (PIC) procedure. It built on the voluntary PIC procedure, initiated by UNEP and FAO in 1989.
- **Objectives:**
    - To promote shared responsibility and cooperative efforts among parties in the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm.

- To contribute to the environmentally sound use of those hazardous chemicals by: **facilitating information exchange** about their characteristics; providing for a **national decision-making process on their import and export**; and **disseminating** these decisions to parties.
- The Convention **covers pesticides and industrial chemicals** that have been banned or severely restricted for health or environmental reasons by Parties and which have been notified by Parties for inclusion in **Annex III for the purpose of PIC procedure.**

Stockholm Convention on Persistent Organic Pollutants (POP)

- It was adopted in May 2001 and entered into force in 2004.
- It's a global treaty to **protect human health and the environment from chemicals (POP)** that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the fatty tissue of humans and wildlife, and have harmful impacts on human health or on the environment.
- It calls for international action on three categories of POPs: pesticides, industrial chemicals, and unintentionally produced POPs.
- **Key provisions:** Elimination (POPs in annex A); Restriction (POPs in annex B) & Reduction or elimination (unintentionally produced POPs in annex C).
- It requires parties to prevent the development of new POPs and promote best available techniques (BAT) and best environmental practices (BEP) for replacing existing POPs.
- It initially addressed 12 substances (**known as "the dirty dozen"),** but now 30 chemicals of global concern are listed under it.

2.2. WATER POLLUTION

2.2.1. ARSENIC CONTAMINATION IN GROUNDWATER

Why in news?

Recently, Central Ground Water Board (CGWB) released report on **Groundwater Arsenic Contamination in India**.

Key findings of the report

- **21 states** across the country have **pockets with arsenic levels higher than** the Bureau of Indian Standards (BIS) stipulated permissible limit of **0.01 miligram per litre (mg/l).**
- The states along the **Ganga-Brahmaputra-Meghna (GBM) river basin** Uttar Pradesh, Bihar, Jharkhand, West Bengal and Assam are the worst affected.
- Arsenic contamination in groundwater has **penetrated the food chain.**

Consequences of arsenic contamination

- Drinking of arsenic-rich water results in **skin cancer, cancers of the bladder, kidney and lung, diseases of the blood vessels (Blackfoot disease) and reproductive disorders**.
- Regular extraction of ground water for irrigation **deposits arsenic in soil and consequently its uptake by the crops.** Also, paddy farms flooded with contaminated water eventually causes **accumulation of arsenic in the food crops.**
- Rice husk used as **fodder for livestock, exposes them to impacts of arsenic** contamination. This leads to **potential risk for humans when they consume cattle-based food products**.
- The entry of arsenic into the food chain, in addition to drinking water **increases possibilities of biomagnification.**
  - **Biomagnification** is concentration of a toxin (such as pesticides) at successively higher levels in a food chain.

CGWB (established in 1970) is a subordinate office of **Ministry of Water Resources** entrusted with the responsibilities of providing scientific inputs for management, exploration, monitoring, assessment, augmentation and regulation of ground water resources of the country.

Sources of arsenic contamination

- Natural processes in groundwater: **Weathering of rocks and minerals** comprising sand, silt and clay, **followed by leaching and runoff**.
- **Anthropogenic activities** like intense exploitation of groundwater, application of fertilizers, burning of coal and leaching of metals from coal-ash tailings.

Methods to tackle Arsenic contamination

- Treatment technologies based on **oxidation, co-precipitation, adsorption, ion exchange and membrane** process has been developed for removal of arsenic from contaminated water.
- Among the various removal technologies, **lime softening and iron coprecipitation have been reported to be the most effective.**
  - **Lime softening** is a water treatment process that uses calcium hydroxide, or limewater.
  - **Iron coprecipitation** implies that Arsenic is precipitated using an Iron based substrate.
- Innovative technologies, such as **permeable reactive barriers, phytoremediation, biological treatment and electro kinetic treatment** are also being used to treat arsenic contaminated water and soil.

- **Rainwater harvesting and recharging of ground water table** to avoid fall in groundwater level and check leaching of metals into groundwater.

Other contaminants, sources and effects

Metal	Sources	Toxic effects
Cadmium	coal, nuclear and coal power plant, batteries, ceramics, toys	Itai Itai disease
Chromium	Leather/tanner, thermal power plant, mining fertilizers, textile photography	Allergies, Bronchial asthma
Lead	Mining, coal, automobile, paper dyeing, petrochemicals	Learning disability, mental retardation
Mercury	Mining, paper and pulp, coal power plant, cement, electrical equipments, pesticides cosmetics	Minimata disease
Nickel	Mining, coal, power plant, phosphate fertilizers, chocolate, automobile electroplating	Dermatitis, Pneumonia
Uranium	Mining	Cancer
Zinc	Phosphate fertilizers, distillery pharmaceuticals	Fever

2.3. WATER CONSERVATION

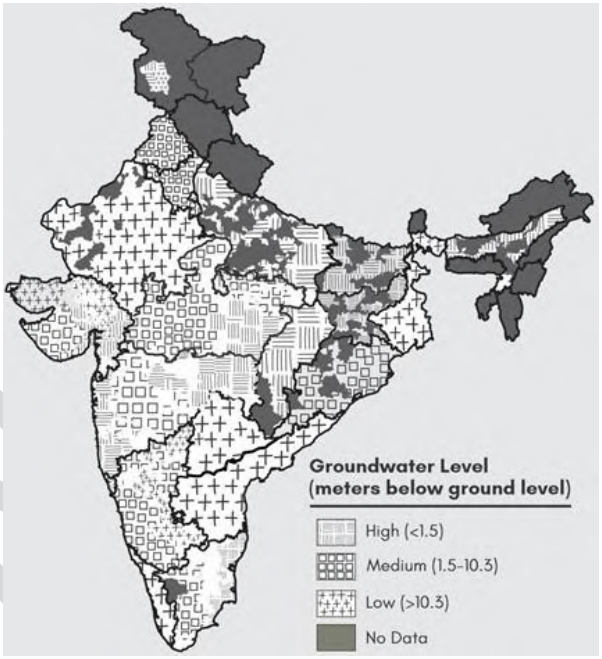
2.3.1. CURRENT STATUS OF NEEDS AND UTILIZATION

Some facts on the status of water in India

- As per NITI Aayog report, nearly 600 million Indians face **"high to extreme water stress"** and 75% households do not have drinking water on their premises. **81.67% of rural households** do not have tap **water connections.**
- India's **annual per capita availability** of water fell from 1,820 cubic meters in 2001 to 1,545 cubic meters in 2011, which may further fall to 1,341 cubic meters in 2025.
    - By CWC benchmarks, a **water-stressed condition** happens when per capita availability is less than 1,700 cubic metres, and a **water-scarcity condition** when per capita availability falls below 1,000 cubic metres.
    - This is against the rising water demand in the country, which is likely to double by 2030.
- India uses the **largest amount of groundwater** but is also the **third largest exporter of groundwater**.
- By some estimates almost **70% of drinking water is contaminated.**

Current status of ground water usage in India

- About 60% of the irrigation needs, 85% of rural drinking water needs and 50% of urban needs are met through **groundwater**.
- In decadal average for 2009-18, there has been **a decline in the groundwater level** in 61% of wells monitored by the Central Ground Water Board (CGWB) **(see map).**
- **Faulty cropping pattern:** As per the 'Dynamic Groundwater Resources of India 2017', **90% of ground water extracted is used in irrigation sector** followed by domestic use and industrial use (9.8%).
- The numbers of **over-exploited units** has increased to 1,186 in 2017, from 839 in 2004.
- **National Water Policy, 2012** has laid emphasis on periodic assessment of ground water resources on scientific basis.



2.3.2. JAL SHAKTI ABHIYAN

Why in news?

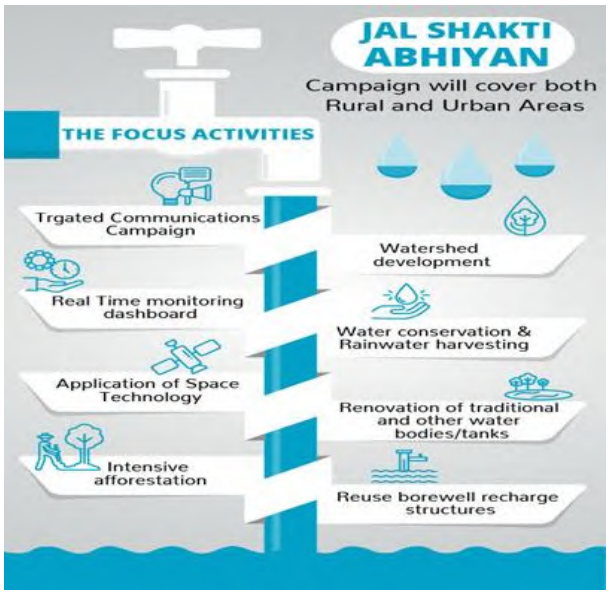
Recently, the Union Government launched the **Jal Shakti Abhiyan,** a campaign for water conservation and water security.

Details

- **Jal Shakti Abhiyan** is a time bound campaign with a mission mode approach. It run through **citizen participation** in two phases-
    - **Phase I:** 1st July to 15th September 2019 (all States)
    - **Phase II:** 1st October to 30th November 2019 (States with retreating monsoon - Andhra Pradesh, Karnataka, Puducherry and Tamil Nadu)
- The **focus** of the campaign is on **water stressed districts and blocks** with various focus activities as shown in the figure.
    - **Water-stressed districts:** Districts with critical or over-exploited groundwater levels as per Central Ground Water Board (CGWB) 2017. For states without critical and over-exploited groundwater levels, **districts with the least availability of**

groundwater in comparison to the rest of the districts in the state have been selected.

- There is **no additional funding** or specific targets for the campaign to achieve.



Plan of Implementation under the Jal Shakti Abhiyan (JSA)

- It is a **collaborative effort** of various Ministries of the Government of India and State Governments, being coordinated by the **Department of Drinking Water and Sanitation (Ministry of Jal Shakti).**
- During the campaign, **officers, groundwater experts and scientists from the Government of India work together** with state and district officials in India's most water-stressed districts for water conservation and water resource management by focusing on accelerated implementation of five target intervention.
- **3D Village Contour Maps** may be created and made accessible for efficient planning of interventions https://t.me/UPSC_PDF

Convergence with Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS)

- MGNREGA drives the JSA in the rural sector.
- The villages in all the water-stressed areas would also hold a **special pani panchayat** to identify and find solutions to water problems.

Successful Case Studies on Water Conservation

- **Madhya Pradesh's 'Bhagirath Krishak Abhiyan':** It has resulted in the construction of thousands of farm ponds to boost irrigation potential, through the efforts of local farmers, government officers, and financial institutions such as NABARD.
- **Dong Bundh System** in the North East, which ensures availability of drinking and irrigation water.

Related news

Union government has launched **'Samagra Shiksha-Jal Suraksha'** drive as an impetus to Jal Shakti Abhiyan. It aims to **create awareness about water conservation among all school students in the country.**

- The Department of School Education & Literacy, **Ministry of Human Resource Development** is the implementing agency.

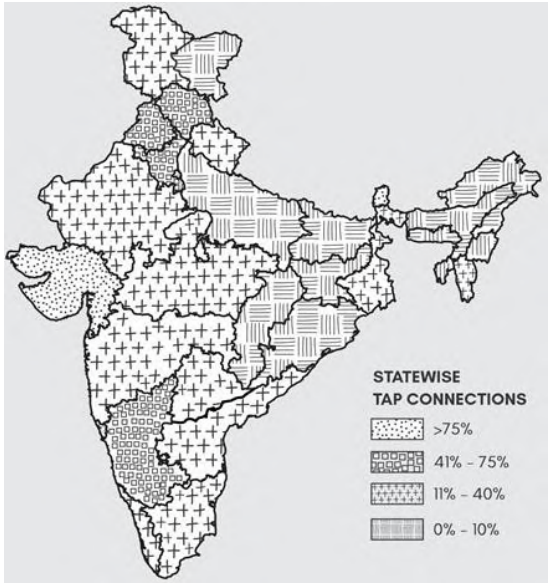
2.3.3. JAL JEEVAN MISSION

Why in News?

Recently, Operational Guidelines for **Jal Jeevan Mission (JJM)** were released. JJM is an upgraded version of the **National Rural Drinking Water Programme (NRDWP)** that was launched in 2009.

Jal Jeevan Mission (JJM)

- JJM aims at providing Functional Household Tap Connection (FHTC) to every **rural household (Har Ghar Nal Se Jal)** (with service level at the rate of 55 litres per capita per day (lpcd)) by 2024.
  - **FHTC** means a tap connection to a rural household for providing drinking water in adequate **quantity** of prescribed **quality** on **regular basis**.
- **Following works are to be taken up under JJM:**
  - In-village **water supply infrastructure** for tap water connection to every household
  - Development of **reliable drinking water sources** and/or augmentation of existing sources
  - **Technological intervention** for treatment to make water potable
  - **Greywater** (domestic non-faecal wastewater) **management**
  - Development of utilities, water quality laboratories, water quality testing & surveillance, R&D, knowledge centre, capacity building of communities, etc.
- **Community driven approach** with pivotal role to Gram Panchayats and local community. (As drinking water is in the 11th Schedule)
- **Fund sharing pattern:** 90:10 for Himalayan and North-Eastern States; 50:50 for other States and 100% for UTs.



About the guidelines

- **Planning:** Every village will have to prepare a **village action plan (VAP)** on three components: water source and its maintenance, water supply, and grey water management.
  - Village plans will be aggregated at district level and thereafter at state level to formulate a **state action plan**. The state action plan will cover projects like regional grids, bulk water supply etc. for ensuring drinking water security in the state.
- **Institutional Mechanism:**
  - **National Jal Jeevan Mission at the Central level** provides policy guidance, financial assistance and technical support, undertakes regular monitoring and necessary corrective actions.
  - **State Water and Sanitation Mission (SWSM) at State level provides:**
    - ✓ Finalization of State Action Plan (SAP).
    - ✓ Timely utilization of fund deciding charges for providing FHTC.
    - ✓ Support in creation of DWSMs, ensure capacity building, and its regular monitoring.
  - **District Water and Sanitation Mission (DWSM)** at district level:
    - ✓ Responsible for **overall implementation of JJM.**
    - ✓ Ensure preparation of Village Action Plan and finalizes a District Action Plan (DAP).
  - **Gram Panchayat sub-committees i.e. Village Water Sanitation Committee (VWSC)/ Paani Samiti at village Level:**
    - ✓ Plan, design, implement, operate and maintain the in-village water supply schemes and infrastructure and decide seasonal supply hours.
    - ✓ Procure construction services/ goods/ materials from agencies/ vendors as finalized by SWSM
    - ✓ Undertake **social audit**.
  - **Implementation Support Agencies (ISAs):** NGOs/ VOs/ women SHGs/ CBOs/ Trusts/ Foundations are to be identified and empanelled by state government and engaged by SWSM/ DWSM as per the requirement.
- **Implementation:**
  - **Priority to water quality affected habitations** and **time bound completion.**
  - **Community contribution:** To bring in sense of ownership and pride, **5% capital cost contribution by community** towards in-village water supply infrastructure in hilly, forested, and more than 50% SC/ ST dominant population villages, **and 10% in the remaining villages** is proposed.
    - ✓ Also**, community would be rewarded** to the tune of 10% of the capital expenditure on their respective in-village water supply scheme. This would serve as a **'revolving fund'** to meet emergency repair.
  - **Convergence with existing schemes** such as MGNREGS to implement measures like rainwater harvesting, groundwater recharge etc.
- **Financial Planning and Funding:**
  - **Incentives to good performance** of states out of the fund not utilised by other states.
  - **Rashtriya Jal Jeevan Kosh (RJJK)** to be **set up under NJJM** which will serve as a receptacle for charitable contributions and CSR fund to achieve goals of JJM.
- **Technological Interventions/ Innovations:**
  - A **digital data platform** would be created for planning, implementation and monitoring of Jal Jeevan Mission in States/ UTs.
- **Disaster Management:**
  - Stationing permanent **mobile water purification plants** at the nearest possible safe locations.

Related News

Recently, Odisha launched the '**Jalsathi'** programme in the state.

- JalSathi aims to ensure the supply of **clean drinking water** to consumers through **piped water connections.**
- The scheme is **implemented by women volunteers** who **serve as 'Jalasathis'** who will act as link between consumers and the government.

2.3.3.1. PRICING OF WATER IN INDIA

Why in news?

The Centre has allowed **gram panchayats** and local bodies to **decide on water usage charges** for supply of potable **piped water under the Jal Jeevan Mission.**

Role of Local Bodies in water management

- Under **11th Schedule (Article 243G)** of the Constitution, Panchayats can be entrusted with the Minor irrigation, water management

and watershed development activities and drinking water.
- Under **12th Schedule (Article 243W)** of the Constitution, Urban Local Bodies can be entrusted with the Water supply for domestic, industrial and commercial purposes.
- The state legislatures may devolve these powers and necessary authority to the local bodies to levy tax, fees etc. for the use of these resources.

Policy approach towards pricing of Water in Public System in India

- The **1987 policy** envisaged that the water rates should reflect the scarcity value of the resource and foster economy in water use.
- **The 2002 policy** envisaged that the water charges for various uses should cover at least the operation and maintenance charges of providing the service initially, and a part of capital costs subsequently.
- The **latest 2012 National Water Policy** envisages that pricing of water should **reflect its efficient use and reward its conservation.**

Related information
Dublin Principles
These were adopted at the **International Conference on Water and the Environment** in Dublin, Ireland, in 1992.
- **Fresh water is a finite and vulnerable resource,** essential to sustain life, development and the environment.
- Water development and management should be based on a **participatory approach,** involving users, planners and policy-makers at all levels.
- **Women play a central part** in the provision, management and safeguarding of water.
- **Water has an economic value** in all its competing uses and should be recognized as an economic good.

Related news
- **Recently, Meghalaya became first state to approve a draft water policy.** The state has brought the **Integrated State Water Policy of Meghalaya,** which intends to achieve sustainable development, management and use of Meghalaya's water resources with community participation.

2.3.4. COMPOSITE WATER MANAGEMENT INDEX

Why in news?

Recently, the NITI Aayog released the **Composite Water Management Index (CWMI) 2.0** to assess and improve the performance in efficient management of water resources.

About Composite Water Management Index

- NITI Aayog first launched and conceptualized the CWMI in 2018 as a tool to instil the sense of **cooperative and competitive federalism** among the states.
- This was a first ever attempt at creating a **pan-India set of metrics** that measured different dimensions of water management and use across the lifecycle of water.
- The **CWMI 2019** measures the **performance of States** on a comprehensive set of water indicators and reports relative performance in 2017-18 as well as trends from previous years (2015-16 & 2016-17).
- States and Union Territories (UTs) have been scored on the Index which comprises **nine themes**, and a total of **28 indicators** across themes, and have been divided into **three categories:** non-Himalayan states, North-Eastern and Himalayan states, and Union Territories (UTs).

CWMI THEMES AND WEIGHTS

	Sectors	Weight
1	Source augmentation and restoration of waterbodies	5
2	Source augmentation (Groundwater)	15
3	Major and medium irrigation - Supply side management	15
4	Watershed development - Supply side management	10
5	Participatory irrigation practices-Demand side management	10
6	Sustainable on-farm water use practices-Demand side management	10
7	Rural drinking Water	10
8	Urban water supply & sanitation	10
9	Policy and governance	15
	TOTAL	100

Key findings of the Report

- **Among non-Himalayan States, Gujarat hold on to its rank one,** followed by Andhra Pradesh, Madhya Pradesh, Goa, Karnataka and Tamil Nadu.
- **In North Eastern and Himalayan States, Himachal Pradesh ranks first** followed by Uttarakhand, Tripura and Assam.
- The **Union Territories** have first time submitted their data and **Puducherry** has been declared as the **top ranker**.
- **A majority of Indian states are demonstrating progress-** 80% of the states (19 out of 24) have shown improvement in their water management scores over the last three years.
- **The low-performing states bear the largest burden of national population and economic production-** The 16 low-performing states collectively account for ~48% of the population, ~40% of agricultural produce, and ~35% of economic output for India.

- **Source augmentation (Groundwater):** Overall, states have displayed improvement in recharge of their groundwater resources between FY 15-16 and FY 17-18, but the **median continues to remain below 50% of the total achievable score.**

Some Successful Case Studies

- **Mukhya Mantri Jal Swavlambhan Abhiyan (MUSA), Rajashtan-** It is multi-stakeholder programme which aims to make villages self-sufficient in water through a participatory water management approach.
- **Mission Kakatiya, Telangana-** It aims to restore over 46,000 tanks across the state and bring over 20 lakh acres land under cultivation.

Related information

Falkenmark Index: is most commonly **used measure of water scarcity.**

- It defines water scarcity in terms of the total water resources that are available to the population of a region; measuring scarcity as the amount of renewable freshwater that is available for each person each year.
- If the amount of renewable water per person per year in a country is below 1,700 m3, the country is said to be experiencing water stress.

2.3.5. ATAL BHUJAL YOJANA

Why in News?

Recently, **Atal Bhujal Yojana** has been launched by **Ministry of Jal Shakti**.

About Atal Bhujal Yojana (Atal Jal)

- It is a **Central Sector Scheme**, to improve **ground water management through community participation** in identified priority areas.
- It covers **seven States**- **Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Uttar Pradesh**.
- It is to be **implemented over a period of 5 years (2020-21 to 2024-25)**. It is **sponsored by World Bank** with 50% of the total outlay coming from it.
- **Scheme components:** ATAL JAL has two major components:
  - **Institutional Strengthening and Capacity Building component** including improving monitoring networks, capacity building, strengthening of Water User Associations, **allocating more funds for Panchayats** and making Panchayat-level plans etc.
  - **Incentive Component** for incentivising the States for achievements in improved groundwater management practices like data dissemination, preparation of water security plans, water budgeting, implementation of management interventions through convergence of ongoing schemes, adopting demand side management practices etc.

2.3.6. NATIONAL WATER MISSION AWARD

Why in news?

Recently**, first annual** National Water Mission awards were presented.

About National Water Mission Awards

- **National Water Mission** and **Department of Water Resources, River Development & Ganga Rejuvenation** under the Ministry of Jal Shakti have initiated the 'National Water Mission Awards' to **recognize excellence in water conservation**, efficient water use and sustainable water management practices.
- The awards are given **in ten categories** defined under five goals of NWM.
- **About National Water Mission:** The National Water Mission is one of the 8 missions under the **National Action Plan for Climate Change**. It envisages the following five goals:
  - Goal 1: Comprehensive **water data base** in public domain and assessment of the impact of climate change on water resource.
  - Goal 2: **Promotion of citizen and state actions** for water conservation, augmentation and preservation.
  - Goal 3: Focused **attention to vulnerable areas** including over-exploited areas.
  - Goal 4: Increasing water use **efficiency by 20%.**
  - Goal 5: Promotion of **basin level integrated water resources management.**

2.3.7. E-FLOW NORMS FOR RIVER GANGA

Why in news?

The **e-flow norms** notified by the **National Mission for Clean Ganga (NMCG)** were to be enforced from December 2019.

However, according to the Central Water Commission (CWC), 4 of the 11 hydro power projects on the upper reaches of the river Ganga's tributaries are violating Ganga ecological flow (e-flow) norms.

About the e-flow norms

- **E-flow** or **Environmental Flow** refers to the **minimum flow of water** considered necessary

for protecting the structure and function of an ecosystem and its dependent species.

- The ecological quality of rivers must be maintained by **maintaining a minimum flow**. Rivers must not dry-up or have their physical regimes significantly altered in order to **conserve the hydrological and ecological functions** of their drainage networks.
- The e-flow norms stipulate the volume of water that dams and barrages must release to **allow the river to naturally clean itself and protect its aquatic biodiversity**.
- **CWC is the designated authority** to **collect relevant data** and submit reports on a quarterly basis to the NMCG.

Namami Ganga Programme

- **'Namami Gange Programme'**, is an Integrated Conservation Mission, approved in June 2014 with budget outlay of Rs.20,000 Crore to accomplish the **twin objectives:**
  - effective abatement of pollution,
  - conservation and rejuvenation of National River Ganga.
- The Vision for **Ganga Rejuvenation** constitutes restoring the wholesomeness of the river defined in terms of ensuring
  - "Aviral Dhara" (Continuous Flow"),
  - "Nirmal Dhara" ("Unpolluted Flow"),
  - Geologic and ecological integrity
- **Main pillars of the Namami Gange Programme are**: Sewerage Treatment Infrastructure; Industrial Effluent Monitoring; River-Front Development; River-Surface Cleaning; BioDiversity; Afforestation; Public Awareness; Ganga Gram. https://t.me/UPSC_PDF
- Under the Environment (Protection) Act, 1986, a **five- tier structure** has been envisaged at national, state and district level to take measures for prevention, control and abatement of environmental pollution in Ganga
  - National Ganga Council under chairmanship of Prime Minister (replaced National Ganga River Basin Authority).
  - Empowered Task Force (ETF) on river Ganga under chairmanship of Union Minister of Jal Shakti.
  - National Mission for Clean Ganga (NMCG).
  - State Ganga Committees.
  - District Ganga Committees in every specified district abutting river Ganga and its tributaries in the states.
- **NMCG** is registered as a **society** under the Societies Registration Act 1860. It acts as implementation arm of National Council for Rejuvenation, Protection and Management of River Ganga (referred as National Ganga Council).

2.4. SOIL POLLUTION

2.4.1. BIOREMEDIATION AND BIOMINING

Why in News?

Delhi municipal corporation has started the process of "biomining and bioremediation" of the three landfills in Delhi namely Bhalswa, Okhla and Ghazipur.

Bioremediation and Biomining

- **Bioremediation is the treatment of pollutants or waste (as in an oil spill, contaminated groundwater, or an industrial process)** by the use of **microorganisms** (such as bacteria) that break down the undesirable substances.
- Biomining is the process of **using microorganisms** (microbes) to extract metals of economic interest from rock ores or mine waste. **Biomining techniques may also be used to clean up sites that have been polluted with metals.**
  - Biomining will **involve the use of separator machines or large sieves to separate waste material of different sizes,** thereby obtaining soil, plastic, wood and metal components in isolation for appropriate processing.

Alternative methods for Redemption of landfill

- **Thermal Treatment:** It refers to the processes that use heat to treat waste materials. Some of the most commonly used thermal waste treatment techniques are **Incineration, Gasification and Pyrolysis.**
- **Sub Surface cut-off walls:** The cut-off walls for solid waste dump sites are usually designed to separate the waste dump from any underlying water stream/ source.

2.5. MISCELLENEOUS

2.5.1. SINGLE USE PLASTIC

Why in News?

India has **held off imposing a blanket ban** on single-use plastics to combat pollution.

About single use plastic

- It refers to **disposable plastics** that are commonly used for plastic packaging and include items intended to be **used only once before they are thrown away or recycled.**
- There is a **no fixed definition** for single use plastic, and it varies from country to country (**India is in process of giving statutory definition to single use plastic**).

Steps taken

Plastic Waste Management Rules, 2016 (as 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 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)** is applicable only to MLP that are "non-recyclable or non-energy recoverable or have no alternate use".
- **National Marine Litter Policy:** To identify the source of litter, especially the plastic waste that flows into India's coastal waters.
- **India aims to get rid of single-use plastics by 2022.**

CATEGORIES OF PLASTIC

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

Global steps

- United Nations Environment Program (UNEP) had declared the theme for **World Environment Day 2018 as 'Beat Plastic Pollution'**.
- **G20 Implementation Framework for Actions on Marine Plastics Litter** which is aimed at facilitating further concrete action on marine waste, though on a voluntary basis.
- **UN Environment launched #CleanSeas campaign** to eliminate major sources of marine litter, microplastics in cosmetics and the excessive, wasteful usage of single-use plastic by the year 2022.
- **The Honolulu Strategy:** It is a framework for a comprehensive and global collaborative effort to reduce the ecological, human health, and economic impacts of marine debris worldwide.
- **Global Tourism Plastics Initiative:** aims to articulate, support and scale-up action by tourism stakeholders and is building a global alliance to fight plastic pollution.
    - It is part of the activities of the Sustainable Tourism Programme of the One Planet network and led by UN Environment and the World Tourism Organization, in collaboration with the Ellen MacArthur Foundation.

- Basel Convention and Stockholm Convention

Additional Information

- **Microplastics or Microbeads** are plastic pieces or fibre, which is very small, generally measuring **less than 1mm**. They enter water bodies they accumulate as act as carriers for other pollutants. They carry carcinogenic chemical compounds in the food chain.
- Microplastics are present in a variety of products, from cosmetics to synthetic clothing to plastic bags and bottles.

Plasticrust: New Kind of Pollution

- Researchers have found a new type of rock formation: a **thin coating of plastic** that's growing on the rocks at sea shore. It is being called 'Plasticrust'.
- Analysis of the crust indicated that it's **composed of polyethylene**, which is the most commonly used plastic, often found in food and product packaging.

2.5.2. INDIA'S FIRST E-WASTE CLINIC

Why in news?

Recently, the Bhopal Municipal Corporation (BMC) and the Central Pollution Control Board (CPCB) have signed an agreement **to set up the country's first e-waste clinic in Bhopal, Madhya Pradesh.**

About e-waste clinic

- It would **enable segregation, processing and disposal of waste from both household and commercial units.**
- The clinic is a **three-month pilot project**. If it would be a success, then the same would be replicated throughout the country.
- Electronic waste will be **collected door-to-door** or could be deposited directly at the clinic in exchange for a fee.
- The **CPCB** will provide **technical support** at the unit**.**
- The clinic is being conceived in **compliance with the Solid Waste Management Rules, 2016.**

What is E-waste?

The **discarded and end-of-life electronics products** ranging from computers, equipment used in Information and Communication Technology (ICT), home appliances, audio and video products and all of their peripherals are popularly known as Electronic waste (E-waste).

Hazards of e- waste: The **hazardous and toxic substances found in e-waste include**

- **Lead** is primarily found in all electronic products/ assembly, cathode ray tubes (CRT), printed circuit boards (PCBs) etc.
- **Cadmium** is found in monitor/ CRTs, PCBs, computer batteries, metal enclosures/ metal parts.
- **Mercury** in switches and flat screen monitors. Mercury is also found in CFL, relays etc.
- **Polychlorinated biphenyls** are found in capacitors and transformers.
- **Brominated flame retardant** on printed circuit boards, plastic casings, cable and polyvinyl chloride (PVC) cable sheathing for insulation and PBD/PBDE in plastic parts of electronics.

E-waste in India

- India generates about 2 million tonnes of e-waste annually and **ranks fifth** after US, China, Japan and Germany
- Centre has brought **E-waste Rules**, which require companies that make or sell electronic equipment to collect a certain percentage of e-waste generated from their goods.
- **About E-waste (Management) Rules, 2016**
  - It is applicable to all the stakeholders such as **Producer Responsibility Organisations (PROs),** 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 EPR.
  - It covered even components and spare parts of electric & electronic equipment. **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 also introduced Pan India **Extended Producer Responsibility (EPR)** Authorization by CPCB replacing the state wise EPR authorization.
- **E-Waste (Management) Amendment Rules, 2018**
  - It aims to **formalise the e-waste recycling sector** by channelizing the E- waste generated towards authorized dismantlers and recyclers.
  - **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. After 2023 onwards, the target has been made 70% of the quantity of waste generation as indicated in the EPR Plan.
  - **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.
- **Producer Responsibility Organizations (PROs)** shall **apply to the CPCB for registration** to undertake activities prescribed in the Rules.

Central Pollution Control Board

- It is statutory organization constituted under the **Water (Prevention and Control of Pollution) Act, 1974.**
- Further, it was entrusted with the powers and functions under the **Air (Prevention and Control of Pollution) Act, 1981.**
- It provides **technical services** to the Ministry of Environment and Forests under the provisions of the Environment (Protection) Act, 1986.

2.5.3. 2019 POLLUTION AND HEALTH METRICS

Why in news?

Recently, a report titled **'The 2019 Pollution and Health Metrics: Global, Regional and Country Analysis'** by the **Global Alliance on Health and Pollution (GAHP)** was released.

Global Alliance on Health and Pollution (GAHP)

- **GAHP is a collaborative body** made up of more than 60 members and observers that advocates for resources and solutions to pollution problems.
- **In 2012, Pure Earth initiated the alliance** together with prominent members like World Bank, UNEP, UNDP, UNIDO, Asian Development Bank, the European Commission and more than 25 low- and middle-income countries, and non-profit agencies **to address pollution and health at scale.**

Key highlights of report:

- **Pollution is the largest environmental threat to health:** In 2017, pollution was responsible for 15% of all deaths globally and 275 million **Disability Adjusted Life Years (DALY).**
  - **DALY** is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death.
- The report includes **three lists** on pollution-induced deaths. **India is the only country that features in the top 10 in all three lists.**
  - **Annual Premature Pollution related deaths: India** accounts for highest number of such deaths in the world- **about 2.3 million**, followed by China with **about 1.8 million.**
  - **Annual Premature Air Pollution related deaths:** India is at 2nd position with 1.240 million deaths, very close to China with 1.243 million deaths.
  - **Pollution deaths per 1,00,000 people:** India ranks 10th with 174 deaths per 1 lakh people.

3. BIODIVERSITY

3.1. WILDLIFE AND CONSERVATION

3.1.1. ALL INDIA TIGER ESTIMATE-2018

Why in News?

- The four-year 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. The 33% rise in tiger numbers is the **highest ever** recorded between cycles which stood at 21% between 2006 and 2010 and 30% between 2010 and 2014.
- Census was led by the National Tiger Conservation Authority and the Wildlife Institute of India, in collaboration with State Forest Departments. World Wildlife Fund India was the implementation partner.

Findings of All India Tiger Estimate-2018

- **Biggest increase in tigers:** The biggest increase has been in **Madhya Pradesh** from 308 in 2014 to 526. Now, MP has most number of tigers.
- **Continuing loss of tiger-occupied areas**: The net loss in tiger-occupied area is estimated to be 20% of the tiger habitat in four years.
    - The decline was spread over three out of India's five tiger landscapes: The Shivalik, Western Ghats and the North East, while Central India and the Sundarbans landscapes registered an increase.
- No tiger was recorded in **Buxa (West Bengal), Dampa (Mizoram) and Palamu (Jharkhand)** tiger reserves.

Technologies in the report

- **Monitoring System for Tigers – Intensive Protection and Ecological Status (M-STrIPES):** It is a software-based monitoring system launched across Indian tiger reserves by the NTCA.
- **CaTRAT (Camera Trap Data Repository and Analysis Tool):** It is an image processing software used for organizing and geotagging of photo-captures.
- **ExtractCompare for tigers and HotSpotter for leopards:** Individual identification of tigers and leopards was done using these pattern recognition programmes.
- **Spatially explicit capture–recapture (SECR) method:** used to estimate population density from camera trap data.
- **Cytochrome-b marker:** Where camera trappings were not possible due to low tiger numbers, scat (droppings) samples were collected to estimate minimum number of tigers through genetic analysis. Genomic DNA was extracted and samples were screened for species identification using a tiger specific **cytochrome-b marker.**
- **Maximum Entropy Models (MaxEnt):** In some north-eastern states with logistical concerns, MaxEnt was used which is based on photos taken within small intensively searched areas to model suitable tiger habitat.

Tiger Conservation Efforts in India

- **Project Tiger:** The Government launched this **centrally Sponsored Scheme** in 1973 for in-situ conservation of wild tigers in designated tiger reserves.
- **National Tiger Conservation Authority (NTCA):** It is a **statutory** body established in 2006 under MoEFCC performing functions as provided in the Wildlife (Protection) Act, 1972. Presently It implements major tiger conservation initiatives like project tiger, Tiger conservation plan etc.

Global Conservation Efforts

- **Global Tiger Initiative (GTI):** It was launched in 2008 as a global alliance of governments, international organizations, civil society, the conservation and scientific communities and the private sector, with the aim of working together to save wild tigers from extinction. In 2013, the scope was broadened to include Snow Leopards.
- **St. Petersburg Tiger Summit in Russia, 2010:** All 13 tiger range countries came together for the first time with the commitment of doubling the number of wild tigers by 2022.
- **Global Tiger Recovery Program (GTRP):** It seeks to empower Tiger Range Countries to address the entire spectrum of threats, domestic as well as those that are transboundary in nature, and work toward increased financial sustainability through the integration of conservation objectives into development.
- The **Global Tiger Forum (GTF)** is the only inter-governmental international body established with members from willing countries to embark on a global campaign to protect the Tiger.
- **TX2:** Its goal was to double the number of wild tigers across their geographical areas. The WWF is implementing the programme in 13 tiger range countries.
- **Conservation Assured Tiger Standards CA|TS:** It is a set of criteria which allows tiger sites to check if their management will lead to successful tiger

conservation. It is an important part of Tx2 programme.

Related information

Indian Tiger or Royal Bengal Tiger (Panthera tigris)

- It is the **tiger species native to India**.
- 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 **80% of global tiger population.**
- Bengal tiger habitats usually are **tropical rainforests, marshes, and tall grasses.**
- The tigers are an **"umbrella" species** as by rescuing them, we save everything beneath their ecological umbrella - everything connected to them.
- **Conservation status of Tiger:** IUCN Red List: **Endangered,** Wild life protection Act: **Schedule I** and CITES: **Appendix I**.
- **Threat to Tiger in India:** Habitats loss, Poaching and Wildlife Crime and growing incidents of Man-Animal conflict.

Tiger corridors in Country

- The National Tiger Conservation Authority in collaboration with the Wildlife Institute of India has published a document titled "Connecting Tiger Populations for Long-term Conservation", which has **mapped out 32 major corridors across the country.**
- A tiger corridor is a **stretch of land linking tiger habitats, allowing movement of tigers, prey and other wildlife**.
- Its management interventions are operationalised through a Tiger Conservation Plan, **mandated under section 38V of the Wildlife (Protection) Act, 1972.**
- For demarcating these corridors, country has been divided into 4 landscapes:
  - **Shivalik Hills & Gangetic Plains**- 3 corridors
  - **Central India & Eastern Ghats**- 11 corridors
  - **Western Ghats**- 8 corridors
  - **North East**- 10 corridors

3.1.2. TIGER RESERVES IN NEWS

3.1.2.1. AMRABAD TIGER RESERVE, TELANGANA

Why in News?

Recently, Centre granted "in-principle" **clearance for uranium exploration** in Amrabad Tiger Reserve in Telangana.

About Amrabad Tiger Reserve

- It lies in **Nallamala hill** that stretch in **Mahbubnagar and Nalgonda districts of Telangana.**
  - The area lies along a patch where the Nallavagu and Dindi rivers merge, **forming a major tributary and catchment of the Krishna river.**
  - It is **India's second-largest tiger reserve,** next only to the **Nagarjunasagar Srisailam Tiger Reserve**, Andhra Pradesh.
- In 2017, the **endangered species of mouse deer** was reintroduced here.
- **Tribes:** Amrabad is dominated by the **Chenchus**, a Schedule Tribe.
- **Archaeological aspect:** It contains ruins of the **ancient Nagarjuna Viswa Vidyalayam** run by the great Buddhist scholar Nagarjunacharya (150 AD).

3.1.2.2. PAKKE OR PAKHUI TIGER RESERVE, ARUNACHAL PRADESH

Why in News?

Arunachal Pradesh government is planning to build a highway named **East-West Industrial Corridor** which includes a 40-km elevated stretch through the core areas of **Pakhui or Pakke Tiger Reserve (PTR).**

About Pakke Tiger Reserve

- PTR It is bounded by Bhareli or Kameng River in the west and north, and by Pakke River in the east.
- The habitat types are lowland semi-evergreen, evergreen forest and Eastern Himalayan broadleaf forests.

Related Information

- **NH 44** — India's longest highway from Srinagar to Kanyakumari — cuts through wildlife corridors connecting Kanha, Satpura, Pench, Bandhavgarh, Panna tiger reserves and at least four other protected areas.
- **NH 6** — India's second longest highway from Surat to Kolkata — passes through corridors around Melghat, Bor, Nagzira, Simlipal tiger reserves and seven other national parks and sanctuaries.

3.1.3. SNOW LEOPARD

Why in news?

Recently, Union Environment ministry released the **Snow Leopard Population Assessment in India (SLPAI)** at the fourth steering committee meeting of the **Global Snow Leopard and Ecosystem Program (GSLEP).**

Global Snow Leopard and Ecosystem Program (GSLEP)

- It is an **inter-governmental alliance** of all the 12 Snow Leopard range countries.
- The GSLEP is a range-wide effort that unites range country **governments, nongovernmental**

and inter-governmental organizations, local communities, and the private sector around a shared vision to conserve snow leopards and their valuable high-mountain ecosystems.
- The **Snow Leopard countries** namely, India, Nepal, Bhutan, China, Mongolia, Russia, Pakistan, Afghanistan, Kyrgyzstan, Kazakhstan, Tajikistan, and Uzbekistan.

Snow Leopard Population Estimation in India (SLPAI)

- SLPAI has been prepared by the **Wildlife Institute of India, Nature Conservation Foundation, GSLEP committee, Global Tiger Initiative Council, World Wide Fund for Nature, World Bank, Global Tiger Forum** and **Wildlife Conservation Trust**.
- National-level estimation processes are done for Tigers, Rhinos and Elephants. With this protocol, the same can now be done for Snow Leopards.
- Only **2% of the total habitats of snow leopards** have been sampled for population estimation due to difficult terrain and an elusive nature of snow leopards, according to SLPAI document.

About Snow Leopard

- It is classified as **Vulnerable** by IUCN and is **under Schedule I** of the Indian Wildlife (Protection) Act 1972.
- They are listed in **Appendix I of the Convention on International Trade in Endangered Species (CITES)** and the **Convention on Migratory Species (CMS).**
- In India, Snow Leopards are found in the Himalayan and trans-Himalayan landscape at an elevation between **3,000 meters and 5,400 m**, spanning over 100,000 square km across **Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh**
- **Threats:** Habitat Fragmentation, Illegal killing, poaching for fur, bones, claws etc., retaliatory attacks by locals.

Conservation Efforts

- **Project Snow Leopard-Centrally sponsored programme** for protection and preservation of Snow Leopard
- **Secure Himalaya** to ensure conservation of locally and globally significant biodiversity, land and forest resources in the high Himalayan ecosystem, while enhancing the lives and livelihoods of local communities. **It is funded by GEF and UNDP.**

3.1.4. CHEETAH

Why in news?

Supreme Court (SC) allowed the Centre to **introduce the African cheetah from Namibia in Africa to a suitable habitat in India**.

More on news

- The plan, first floated in 2009, was to **bolster the nearly extinct Indian cheetah population.**
- Iran has a sub-species of the Asiatic cheetah but has refused to share them with India, forcing the **government to look for African ones**.
- In 2010, **central government had set up an expert panel for reintroducing cheetah in India**. Panel recommended KunoPalpur (MP), Velavadar National Park (Gujarat) and Tal Chapar sanctuary (Rajasthan) for reintroducing Cheetah.
- Kuno Palpur was the preferred location for introduction of cheetah. It was also the place prepared by MP to house Asiatic lions.
- **SC now set up a three-member committee** to 'guide' National Tiger Conservation Authority (NTCA). Decision for relocation of African cheetah will be taken after a proper survey and the action of introduction of the animal will be left to the NTCA's discretion.

About Cheetah

- Cheetah is a **keystone species** of dry forests, scrub forests, and savannahs.
  - Keystone species are those which have an **extremely high impact on a particular ecosystem** relative to its population.
  - It has a **disproportionately large effect on its natural environment relative** to its abundance
- It was officially declared **extinct in India** in 1952.
- It is one of the **oldest of the big cat species**, with ancestors that can be traced back more than five million years to the Miocene era.
- It is also the **world's fastest land mammal.**
- **Problems like human-wildlife conflict, loss of habitat and loss of prey**, and illegal trafficking, have decimated their numbers.
- **IUCN status:** African Cheetah- **Vulnerable** and Asiatic Cheetah – **Critically endangered** (surviving only in Iran).

African Cheetah vs. Asiatic Cheetah
- **Asiatic cheetah is much stronger** and faster than African cheetah, while on the other hand people believe the **African cheetah are the fastest.**

- **Asiatic Cheetah (around 50-70) is only found in Iran** while African Cheetah is found in wild in Africa**.**

3.1.5. GREAT ONE-HORNED RHINOCEROS (INDIAN RHINO)

Why in News?

Recently, the **Special Rhino Protection Force (SRPF)** trained to combat poachers and understand animal behaviour was deployed in the Kaziranga National Park.

More on news

- The force has been raised by the **initiative of both the central and state governments** to control rhino poaching in tiger reserve.
- The process of setting up the special force was started in 2015 on the recommendations of the National Tiger Conservation Authority.

About Indian Rhino

- The great one-horned rhino or Indian Rhino is the **largest of the rhino species** found commonly in Nepal, Bhutan, Pakistan and India, with India being home to 2,200 rhinos, or over 85% of the population.
- Rhinos in India are found in parts of **Uttar Pradesh, West Bengal and Assam**.
- According to World Wildlife fund data of 2012, Assam has 91% of total Rhino population of India which is mainly concentrated in Kaziranga National Park, and a few in Pobitara Wildlife Sanctuary.
- IUCN: **Vulnerable,** Wildlife protection Act: **Schedule 1**
- **Threats**: poaching, habitat destruction, flooding etc.
- The Indian Rhino is **poached for its horn**.

Indian Rhino Vision 2020 (IRV 2020)

- Launched in 2005, it is an ambitious effort to **attain a wild population of at least 3,000** greater one-horned rhinos spread over seven protected areas in the Indian state of Assam by the year 2020.
- **Kaziranga National Park** in Assam, India, holds about 70% of the world population. IRV 2020 aims to translocate Rhinos from Kaziranga National Park and Pabitora Wildlife Sanctuary to five other protected areas namely Manas, Laokhowa, Buracharpori-Kochmora, Dibrusaikhowa and Orang.
- Translocations of Rhinos are being done in order to avert the risks associated with having an entire rhino population concentrated in one specific area.

3.1.6. GREAT INDIAN BUSTARD

Why in News?

The Ministry of Environment, Forests and Climate Change has initiated a project worth Rs 33.85 crore for the conservation and protection of the Great Indian Bustard. Only 130 such birds are left in India.

About Great Indian Bustard

- 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)
- Rajasthan has the highest population. **It is thought to have completely disappeared from the states of Haryana, Punjab, Orissa, Uttar Pradesh, Tamil Nadu and Madhya Pradesh.**
- 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.
- Great Indian bustard **is placed in Schedule I of the Indian Wildlife (Protection) Act, 1972**, the highest degree of legal protection in the country.
- IUCN: **Critically Endangered** (Threats: poaching, collisions with power lines)
- Great Indian Bustard is **Rajasthan's state bird**. The state government has started **"Project Godawan" for its conservation at Desert National Park (DNP) in Jaisalmer.**
- It is considered as the **flagship grassland species**, representing the health of the grassland ecology.

Conservation efforts

- It's one of the **Species for the Recovery Programme** under the **Integrated Development of Wildlife Habitats** of the Ministry of Environment and Forests.
  - The important objective of this programme is to build up captive population of Great Indian Bustard and to release the chicks in the wild for increasing the population**.**
  - Financial assistance is given for recovery programme of the species.
- Recently, GIB declared as **'Endangered Migratory Species'** at the Conference of the Parties to the **Convention on the Conservation**

of Migratory Species (CMS) of Wild Animals. It is included in Annex-I of CMS.

- Recently, Karnataka has decided to declare a large patch of area in Siraguppa taluk in Karnataka as the **Great Indian Bustard (GIB) Protected Zone.**
- Recently Supreme Court has constituted a high-powered committee to urgently frame and implement an emergency response plan for the protection of Great Indian bustard.

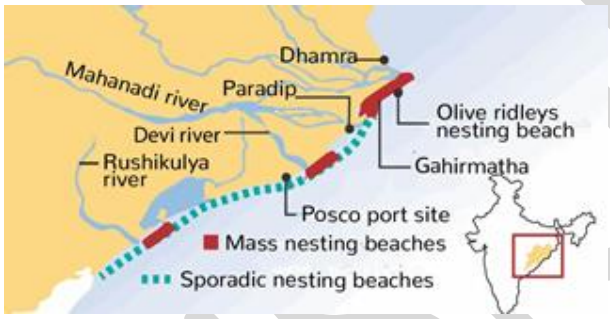
3.1.7. OLIVE RIDLEY TURTLES

Why in news?

Recently, the Odisha forest department banned fishing in the state's **Gahiramatha marine sanctuary** to protect Olive Ridley turtles.

More on News

- Gahiramatha, located in Odisha, is known as the **world's largest Olive Ridley rookery**.
- These animals come in lakhs in the waters surrounding the sanctuary in November for mating. The females lay eggs in March.
- Trawlers and boatmen have been directed not to fish within 20 kilometers of the coastline.



About Olive Ridley Turtles

- The Olive Ridley Turtles are one of the **smallest and most abundant of all sea turtles** found in the world, inhabiting warm waters of the Pacific, Atlantic and Indian oceans.
- These turtles, along with their cousin, Kemps Ridley turtle, are best known for their unique mass nesting called **Arribada,** where thousands of females come together on the same beach to lay eggs.
- IUCN Red list: **Vulnerable; CITES:** Appendix 1, **CMS:** Appendix 1.
- **They are carnivores**, and feed mainly on jellyfish, shrimp, snails, crabs, molluscs and a variety of fish and their eggs.
- These turtles spend their entire lives in the ocean, and migrate thousands of kilometers between feeding and mating grounds in the course of a year.

Government Initiatives

- The Coast Guard had launched the **'Operation Oliva'** exercise as part of its annual mission to ensure the safe mid-sea sojourn of breeding Olive Ridley sea turtles.
- **Operation Save Kurma:** species specific operation on Turtles by Wildlife Crime Control Bureau.
- **The Wild Life Protection Act, 1972** and its latest amendments in 2006 provide legal protection to all the sea turtle species occurring in the state.

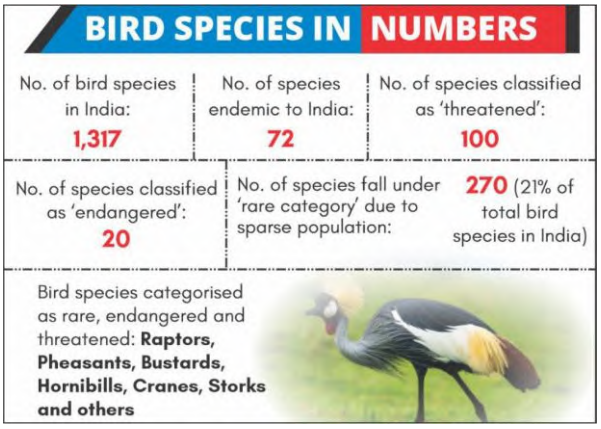
3.1.8. DRAFT VISIONARY PERSPECTIVE PLAN TO CONSERVE BIRDS

Why in news?

Recently, the Government of India has placed the draft **"Visionary Perspective Plan (2020-2030) for the conservation of avian diversity, their ecosystems, habitats and landscapes in the country"** in public domain.

More on the news

- The Visionary plan has proposed to carry out **15 major programmes** and various activities which should be implemented over short-term (2020-2024), medium-term (2024-2027) and long-term (2027-2030).
- This is an addition to India's **National Wildlife Action Plan** (2017- 2031).
- The MoEFCC had also come out with **'India's National Action Plan for Conservation of Migratory Birds and their Habitats along the Central Asian Flyway (2018-2023)'.**



Key highlights of the Vision Plan

- **Bird surveys in select landscapes** to identify new **IBAs (Important Bird Areas)** for conservation of birds and other biodiversity.
- **Species recovery programmes of critically endangered birds-** The plan has envisaged **landscape approach** to control their declining

population and protect birds in urban areas, and protection of their habitats from turning into wastelands.

- **Conservation of migratory birds-** through species-specific action plans, setting up of a national database on migratory birds and their habitats, assessment of threats to migratory birds and their habitats etc.
- **Implementing Agencies-** It will be implemented by different stakeholders including ministries, with the **Salim Ali Centre for Ornithology and Natural History (SACON)** being the nodal institution for this purpose. **Ministry of Environment, Forest & Climate Change (MoEFCC) is the focal Ministry.**

Important Bird Area (IBA)

An Important BIRD and Biodiversity Area (IBA) is an area **identified using an internationally agreed set of criteria** as being globally important for the conservation of BIRD populations.

- IBA was developed and sites are identified by **BirdLife International**.
- Currently there are over **12,000 IBAs** worldwide.

Salim Ali Centre for Ornithology and Natural History (SACON)

- It is one of the centres of excellence of the MoEFCC.
- It is registered as a society and **Union Environment Minister is the President** of SACON Society.
- SACON's mission is "To help conserve India's biodiversity and its sustainable use through research, education and peoples' participation with birds at the centre stage".
- SACON is located near Coimbatore city in Tamil Nadu.

3.1.9. MIGRATORY BIRDS DIE IN SAMBHAR LAKE

Why in News?

Recently, thousands of migratory birds died at Sambhar lake in Rajasthan due to **Avian botulism.**

More on News

- It is **caused by a bacterium called Clostridium botulinum.**
- **It affects the nervous system of birds,** leading to flaccid paralysis in their legs and wings and neck.
- It is found that biological oxygen demand in sambhar lake is above permissible limits, this led to rise of Clostridium botulinum.
    - **Clostridium botulinum** are heat-resistant and in the absence of oxygen they germinate, grow and then excrete toxins.
    - **Biological Oxygen Demand:** It is the amount of dissolved **oxygen** needed by aerobic **biological** organisms to break down organic material present in a given water sample at certain temperature over a specific time period.
- **About Sambhar Lake**
    - India's **largest inland saltwater lake** situated in Rajasthan.
    - It has been designated as **wetland of international importance under Ramsar Convention.**
    - The site is important for a variety of wintering waterbirds, including large numbers of lesser and greater flamingos. Human activities consist of salt production and livestock grazing.

Related News

Archaea

- Recently a new archaeon was discovered in **Sambhar Salt Lake in Rajasthan**.
- Archaea are a **primitive group of microorganisms** that thrive in extreme habitats such as hot springs, cold deserts and hypersaline lakes.
- These slow-growing organisms are also present in the human gut.
- They are known for producing antimicrobial molecules, and for anti-oxidant activity with applications in eco-friendly waste-water treatment.

3.1.10. NOT ALL ANIMALS MIGRATE BY CHOICE CAMPAIGN

Why in News?

UN Environment India and **Wildlife Crime Control Bureau (WCCB)** of India launched an awareness campaign **'Not all animals migrate by choice'** to be displayed at major airports across the country.

More on News

- The campaign aims at creating awareness and garnering public support for the protection and conservation of wildlife, prevention of smuggling and reduction in demand for wildlife products.
- The first phase of the campaign will focus on **Tiger, Pangolin, Star Tortoise and Tokay Gecko.**
- The campaign also complements worldwide action on illegal trade in wildlife through **UN Environment's global campaign, Wild for Life.**

Wildlife Crime Control Bureau

- It is a **statutory body** under the Ministry of Environment Forest and Climate Change to combat organized wildlife crime in the country

and was constituted in 2007 by amending the **Wildlife Protection Act, 1972.**

- It is mandated to **collect and collate intelligence related to organized wildlife crime activities** and to disseminate the same to State and other enforcement agencies for immediate action so as to apprehend the criminals.
- It also **assists and advises the Customs authorities** in inspection of the consignments of flora & fauna as per the provisions of Wild Life Protection Act, CITES and EXIM Policy governing such an item.

3.1.11. CONVENTION ON THE CONSERVATION OF MIGRATORY SPECIES OF WILD ANIMALS (CMS) OR BONN CONVENTION

Why in news?

Recently, the 13th Conference of Parties (CoP) to the CMS was held in Gandhinagar, India.

More on the news

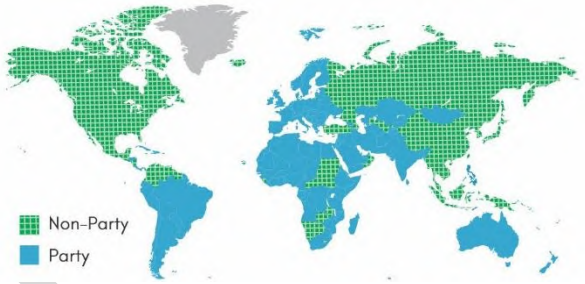
- India has officially taken over its Presidency for the next three years, till 2023.
  - CMS COP13 was the largest ever in the history of the Convention. The CoP is the decision making organ of the CMS.
- CMS COP13 was the first of a series of international nature-related meetings in 2020, which will culminate with the UN Biodiversity Conference in Kunming, China, in October, which is expected to adopt a new global biodiversity framework - the **Post-2020 Global Biodiversity Framework.**

Additional Information on COP 13

- **Theme-** "Migratory species connect the planet and together we welcome them home".
- **Logo-** Kollam- a traditional art form from Southern India, which has been used to depict key migratory species in India.
- **Mascot- GIBI** i.e. The Great Indian Bustard.
- This was the **first CMS COP** to be inaugurated by a host-country Head of Government.

Key highlights of CMS COP 13

- **Adoption of Gandhinagar Declaration-** which calls for migratory species and the **concept of 'ecological connectivity'** to be integrated and prioritized in the Post-2020 Global Biodiversity Framework, which is expected to be adopted at the UN Biodiversity Conference in October this year.
- **Decisions on new species- Ten new species were added** to CMS Appendices at COP13.
  - **Seven species were added to Appendix I,** which **provides the strictest protection:** the Asian Elephant, Jaguar, Great Indian Bustard, Bengal Florican, Little Bustard, Antipodean Albatross and the Oceanic White-tip Shark.
  - The Urial, Smooth Hammerhead Shark and the Tope Shark were **listed for protection under Appendix II,** which **covers migratory species** that have an unfavourable conservation status and would benefit from enhanced international cooperation and conservation actions.
- **Relaunch of the CMS Ambassadors Programme-** where three CMS Ambassadors - for **terrestrial, avian,** and **aquatic species** were named to help raise awareness about the important work of CMS and the plight of migratory species.
- **Recognition of Seven Migratory Species Champions-** including Germany, India, Italy, Monaco, Norway, the European Commission, and the Environment Agency, who were acknowledged for their generous contributions to CMS initiatives.



About CMS

- It aims to protect terrestrial, aquatic and avian migratory species throughout their ranges.
- CMS was signed in Bonn, Germany, in 1979 as an intergovernmental treaty **under the aegis of the United Nations Environment Programme (UNEP).**
- CMS brings together the governments of the countries through which migratory species pass - the Range States; it lays the legal foundation to conduct conservation measures on a global scale.
- The legal instruments under CMS may range from **legally binding Agreements** to less formal **Memoranda of Understanding** and can be adapted to fit the requirements of each region.
- CMS is the only worldwide convention that was founded exclusively for the preservation of migrant animals.
- **CMS has two Appendices** listing migratory species to which the Convention applies.
  - Migratory species **threatened with extinction** are listed on **Appendix I** and Parties strive towards strictly protecting these animals, conserving or restoring the

places where they live, mitigating obstacles to migration and controlling other factors that might endanger them.
- Migratory species that need or would significantly benefit from international co-operation are listed in **Appendix II** of the Convention.

Related information
State of India's Birds 2020 Report released at 13th COP of Convention on Migratory Species
- It has been compiled by over ten institutions and numerous citizen scientists.
- It assesses long-term trend, current trend, distribution range size, and the overall conservation status of 867 Indian bird species.
- **Key Highlights**
  - 101 species are **'High Conservation Concern'** for India e.g. raptors, migratory shorebirds, and habitat specialists like Indian Vulture etc.
    - ✓ **Indian vulture's** catastrophic population declines started in early 1990s and are almost entirely attributable to drug **diclofenac**.
    - ✓ **4 species of bustards in India**- Great Indian Bustard, Macqueen's Bustard, Lesser Florican and Bengal Florican - have declined because of historical hunting and widespread habitat loss, compounded with their slow growth and reproduction.
  - 319 species are under **'Moderate Conservation Concern' category and 442 species are under low conservation concern category**.
  - Number of **birds in the Western Ghats** declined by almost 75% since 2000.
    - ✓ **Reasons for decline:** Habitat loss due to human activity, widespread presence of toxins, including pesticides; hunting and trapping for pet trade.
  - 126 species, including peafowl (peacock), house sparrow, Asian Koel are expected to increase in numbers, primarily due to their ability to survive in human habitats.

3.1.12. PROTECTED AREAS

Protected Area	Details (Designation, Number etc.)
Wildlife Sanctuary	• A wildlife sanctuary is an area where **animal habitats** and their surroundings **are protected** from any sort of disturbance. • **Wildlife (Protection) Act of 1972** gives State Government power to declare certain areas as wildlife sanctuaries. • There are **more than 500 (~543)** 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. • There are **more than 100 (~104)** national parks in India.
Community Reserve or Conservation Reserves	• It is a **category of protected areas** which was 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.**
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 **11 are part of** the World Network of Biosphere Reserves, based on the UNESCO Man and the Biosphere **(MAB) Programme.**
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.
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.

3.1.13. TIGER RESERVES, WILDLIFE SANCTUARY IN NEWS

Andhra Pradhesh	
Nagarjunasagar Srisailam Tiger Reserve	• Due to concerted efforts by the Tiger Conservation Foundation (TCF), the number of tigers in the Nagarjunasagar Srisailam Tiger Reserve (NSTR) **in Andhra Pradesh** has gone up. • It is spread over 3,800 sq.km. covering Guntur, Prakasam, and Kurnool districts in Andhra Pradesh and Nalgonda and Mahabubnagar in Telangana**.**
Atapaka bird sanctuary	• The Atapaka bird sanctuary in Kolleru lake has become a safe breeding ground for two migratory bird species- grey pelicans and painted storks. • Kolleru, one of the largest freshwater lakes, was accorded a sanctuary status under the Wildlife Protection Act,1972. It is a Ramsar site and also identified as an "Important Bird Area" of India
Odisha	
Nalbana Bird Sanctuary	• Nalbana Bird Sanctuary or Nalbana Island is **the core area of the Ramsar designated wetlands of Chilika Lake.**
Arunachal Pradesh	
Tally Valley Wildlife Sanctuary	• Recently, Trachischium apteii, a new snake species which is a non-venomous burrowing snake was found in Tally Valley Wildlife Sanctuary near town of Ziro in Arunachal Pradesh.
Namdapha National Park	• It is the largest protected area in Eastern Himalaya biodiversity hotspot and is located in **Arunachal Pradesh**. • It is also **third largest national park** in India in terms of area. • It harbours northernmost lowland evergreen rainforests in the world at 27°N latitude. • It is home to Four big cat species: snow leopards, clouded leopards, common leopards and tigers.
Madhya Pradesh	
Bandhavgarh reserve forest	• For the first time, Bandhavgarh reserve forest in Madhya Pradesh has a colony of elephants and is an unusual occurrence in Bandhavgarh. • Bandhavgarh National Park is **spread at Vindhya hills in Umariya district of Madhya Pradesh.** • It was declared a national park in 1968 and then became Tiger Reserve in 1993.
Nauradehi Sanctuary	• It is situated in Madhya Pradesh and spreads across **two major river basins**, namely the Narmada and Ganges. • It was in news for **successful tiger relocation** program. It is also a **potential site for the Cheetah Reintroduction** in India from Africa.
Van Vihar National Park	• It is **located in Bhopal**, Madhya Pradesh. • Here, in **natural habitat**, a variety of herbivores and carnivores are managed in line with the **modern concept of Zoo Management**. • **Carnivores include** tiger, white tiger, leopard, hyena and sloth bear. These animals are kept in captivity in large enclosures.

	• It also harbors **free ranging animals** like chital, sambhar, black buck, blue bull, chousingha, common langur etc. • Park also houses gharial, crocodile, turtle and a number of snake species.
Satpura Tiger Reserve	• Satpura Tiger Reserve is located in Satpura landscape, **south of Narmada River** in Madhya Pradesh. • Satpura tiger reserve comprises of three protected areas namely, **Satpura National Park, Bori Sanctuary and Pachmarhi Wildlife Sanctuary.** • **Denwa river** is the main water source of the park. • Other than Tigers the prime species that are found here are Black Buck, Leopard, Dhole, Indian Gaur, Malabar Pied Hornbill, Malabar Whistling Thrush. • **State Bird of Madhya Pradesh, Asian Paradise Flycatcher (Dhudraj) is also found here.**
Telangana	
Papikonda National Park	• It is located in East Godavari and West Godavari districts of **Andhra Pradesh** and Khammam district of **Telangana**. • It is an **Important Bird and Biodiversity Area**.
Amrabad Tiger Reserve	• It is one of the **largest tiger reserve in the country** situated in Nallamala hill of Telangana. • Earlier, it was part of **'Nagarjunasagar-Srisailam Tiger reserve'** but post-bifurcation, the northern part of the reserve is vested with Telangana and renamed as 'Amrabad Tiger Reserve'. • It is dominated by the **Chenchus, a PVTG** which has been coexisting with tigers and wild animals for long without disturbing the ecological balance. • In 2017, the endangered species of **mouse deer** was reintroduced here.
Kawal Tiger Reserve	• It is located along Sahyadri Mountain Ranges in Telangana. • Godavari and Kadam rivers flow towards the south of the sanctuary. • It is increasingly getting threatened by growing human encroachments, rampant poaching, illegal wood felling and habitat loss.
Goa	
Mahadayi Wildlife Sanctuary	• It is a protected area in Goa in the Western Ghats lying in Mahadayi river basin. • There is a proposal to make it into a 'Project Tiger' tiger reserve because of the presence of Royal Bengal Tigers. • It has been identified as an Important Bird Area by BirdLife International.
Karnataka	
Bandipur Tiger Reserve	• It is **located in Karnataka** • It has the **second highest Tiger population** in India. • It is the **part of Nilgiri Biosphere Reserve**. • It **shares its boundary with 3 other National park**, namely Nagarahole National Park, Wayanad wildlife sanctuary and Mudumalai National park.
Assam	
Kaziranga National Park	• It is located on the edge of the Eastern Himalayan biodiversity hotspots – Golaghat and Nagaon district in Assam. Brahmaputra forms its northern boundary. • Along with one-horned rhinoceros, the park is the breeding ground of elephants, wild water buffalo, and swamp deer. • In 1985, it was declared as a **World Heritage Site by UNESCO** and was declared a Tiger Reserve in 2006. • It has also been identified as an Important Bird Area by BirdLife International.

3.1.14. OTHER FAUNA & FLORA IN NEWS

Species (Flora and Fauna)	Details (Conservation status/ Habitat etc.)
World's Fastest Ant	• Recently, scientists have discovered the world's fastest ant-**The Saharan silver ant**, which runs at speeds of 108 times their body length per second which is equivalent of 360mph in humans. • The Saharan silver ant is found in the sand dunes of the **northern Sahara**. • The ants **scavenge the corpses of other** creatures during the hottest part of the day. • To survive the heat, the ants have silvery hairs that reflect the sun's rays.
Tamil Yeoman (Cirrochroa thais)	• **Tamil Yeoman (Cirrochroa thais),** a butterfly species **endemic to Western Ghats** has been declared as the **state butterfly of Tamil Nadu**. It is also known as **Tamil Maravan**, which means warrior. • Maharashtra was the first state to declare **Blue Mormon** as its state butterfly; followed by **Uttarakhand (Common peacock)**, **Karnataka (Southern bird wings)** and **Kerala (Malabar banded peacock)** and now Tamil Nadu.

Purple Frog	• Purple frog (**Nasikabatrachus sahyadrensis**) could soon be designated as **Kerala's state amphibian.** • It is **endemic to the Western Ghats**. • It can be called as a **'living fossil'** as its evolutionary roots suggest it could have shared space with dinosaurs almost 70 million years ago. • It is also known as the **'Maveli' frog/pig-nosed frog**, and spends most of its time under the soil, **emerging for a few days each year at the start of the monsoons to breed.** • Unlike other frogs, it has a peculiar set of limbs and a pointy nose to survive underground. **Conservation Status** • IUCN**: Endangered** • **EDGE (Evolutionarily Distinct and Globally Endangered) list:** Ranked third in the list of threatened amphibians. • **About EDGE:** o **Evolutionarily Distinct and Globally Endangered (EDGE) species** are animal species which have a high **EDGE score**, a metric combining endangered conservation status with distinctiveness of taxon. o The **Zoological Society of London (ZSL)** launched a global conservation initiative, the EDGE of Existence Programme in 2007. o Other major species in the list are **Bengal Florican, Ganges River Dolphin, Hawksbill Turtle** and **Gharial.**
India's Starry Dwarf Frog	• The thumbnail-sized species was **discovered in India's Western Ghats**. • Scientists have named the **frog Astrobatrachus kurichiyana** for its constellation-like markings and the indigenous people of Kurichiyarmala, the hill range where it was found. • The researchers have nicknamed **them starry dwarf frogs because they're around the size of an adult's thumb**, have an orange belly, a brown back and are covered in white spots. • The new species is the **only member of an ancient lineage that goes back tens of millions of years and also represents the discovery of a new subfamily.** • Researchers still do not know its life cycle, the sound of its call or whether the species is threatened or endangered.
Indian flapshell turtle and Indian peacock softshell turtles	• Recently, under **Operation Turtshield,** the Wildlife Crime Control Bureau along with West Bengal forest department personnel, seized 983 **Indian flapshell turtles** and two **Indian peacock softshell turtles** from a West Bengal's market. o **Operation Turtshield** is a new Central programme to protect endangered turtles. • The **flapshell turtle**, which is smaller in size, is killed for its meat which is considered a delicacy in both Bengal and Bangladesh. It is listed as **Least Concerned** under IUCN Red list. • **Indian peacock softshell turtles** are categorised as **Vulnerable** in IUCN Red list. It is also listed in schedule-I of the Wildlife Protection Act and Appendix – I of CITES. The species is heavily exploited for its meat and calipee (the outer cartilaginous rim of the shell).
Ganges Dolphin	• It is among the **four freshwater dolphins** in the world. Its presence indicates the health of the riverine ecosystem. It is **national aquatic animal** of India. • It is known to make strange sounds when it breathes, earning it the common name **'Susu'**. • It is **also called a blind dolphin** because it doesn't have a crystalline eye lens and uses echolocation to navigate and hunt. • **Threats:** dumping of single-use plastic, industrial pollution, fishing and dredging. • **IUCN Status:** Endangered (EN). • It is found in Ganga and Brahmaputra and their tributaries. • The **annual** Ganges river dolphin census (2019) was undertaken by **World Wide Fund for Nature**-India in collaboration with the Uttar Pradesh Forest Department. o It was done along about **250-km-long riverine stretch** of Upper Ganga between Hastinapur Wildlife Sanctuary and Narora Ramsar site. o In 2019, the **tandem boat survey method** is being used unlike the direct counting method being used earlier.
Irrawaddy dolphins	• 146 endangered Irrawaddy dolphins were sighted in **Chilika Lake**. • Lake is home to their **highest single lagoon population**. • It lives in brackish water near the coasts or mouths of the rivers in South and Southeast Asia. • Their total population is estimated to be less than 7,500 (almost 80% in Bangladesh). • **IUCN status**: Endangered (EN)
Houbara bustard	• It is a large bustard that lives **in arid climates**, residing in **North Africa and Asia.** • **IUCN status**: Vulnerable • **Threats:** poaching, unregulated hunting, habitat degradation

Duck- billed Platypus	• IUCN recently downgraded the platypus' conservation status to **Near Threatened**. • It is a small amphibious Australian mammal. Australia's drought, and effects of climate change are pushing duck-billed platypus, a globally unique mammal, towards extinction.
Chinese Paddle Fish (Psephurus gladius)	• It has been declared extinct after no new sightings reported since 2009. • It was one of the world's largest freshwater fish and was known for its long nose and huge mouth. It had existed since 200 million years ago.
Drosophila Red brittle star (Ophiocoma wendtii)	• Asia Pacific Drosophila Research Conference is being organised in India for the first time. • Drosophila is a genus of two-winged flies commonly known as fruit flies that are used in evolutionary and developmental studies. Also genomes of fruit fly and human genes are very similar.
Red brittle star	• It becomes only the second creature, after a sea urchin species, known to have extraocular vision (ability to see without eyes). • Another feature of the red brittle star is its signature colour change. While the creature is deep red during the day, it changes its colour to beige at night.
Chlamydomonas nivalis	• Recently, **red snow** was seen on **coast of Antarctica's** northernmost peninsula. • Red snow is being caused due to a unicellular photosynthetic alga species, Chlamydomonas nivalis which exists in snow in the polar and glacial regions, and carries a red pigment (carotenoids) to keep itself warm. • The algae thrive in freezing water and spend winters lying dormant in snow and ice; when summer comes and the snow melts, the algae bloom, spreads red, flower-like spores.
Orangutan	• Recently, India's only orangutan died in **Odisha's Nandankanan Zoological Park.** • She was brought from **Singapore** to Pune's Rajiv Gandhi Zoological Park and later shifted to Odisha. • Orangutans are **one of the world's three surviving species of great apes** and are **native to Indonesia and Malaysia.** • Considered to be **among the most intelligent primates**, they use a variety of sophisticated tools and construct elaborate sleeping nests each night from branches and foliage and also play a vital role in seed dispersal in their habitats. • **Threats:** Habitat loss, Human-Animal Conflict, Illegal wild life trade etc. **Conservation Status** • IUCN (International Union for Conservation of Nature): **Critically Endangered (CR)** • **CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora):** Appendix 1
Chinkara gazelles	• Chinkara gazelles survives in the dry habitats and does not require much water for their survival. They get their moisture from dew, eating vegetation, fruits and other similar sources. • **IUCN Status: Least Concern** • **About Chinkara Wildlife Sanctuary:** o Karnataka's State Board for Wild Life has notified **Bukkapatna Chinkara Wildlife sanctuary** in Tamakuru District. o This will be the **southernmost tip** of the distribution range of Chinkara in India. The first wildlife sanctuary for chinkaras was established at Yadahalli in Bagalkot district (Karnataka). o Karnataka is home to 3 species out of the 6 species of antelopes in India including black bucks, four-horned antelope and Chinkaras. • Bukkapatna forest area is perhaps the **only documented** place in Karnataka for all the three antelope species.
Indian Pangolins	• On the eve of the **ninth World Pangolin Day**, the Madhya Pradesh forest department announced the first-ever successful radio-tagging of the Indian pangolin. Two rescued animals were radio-tagged and released in the **Satpura tiger reserve** six months ago. • Pangolins are the **most trafficked wildlife species** in the world (CITES Appendix 1). • Commonly known as **scaly anteaters**, the **toothless** animal evolved an **armour of scales** which has now become the **main cause of its disappearance**. • They are the **only mammals wholly-covered in scales**. • Out of the eight species of Pangolin, the **Indian Pangolin** and the **Chinese Pangolin** are found in India. The Chinese pangolin is found in North-East India while the Indian Pangolin is distributed across India, except the extreme arid zones, Himalayas and the North-East. • **Major threats to pangolins in India:** hunting and poaching for local consumptive use (e.g. as a protein source and traditional medicine) and international trade, for its meat and scales in East and South East Asian countries, particularly China and Vietnam. • The **Indian Pangolin** is under **"Endangered"** category of IUCN Red List whereas **Chinese Pangolin** is **"Critically Endangered"**.

	• Both the Pangolins are listed in **Schedule I of Wildlife (Protection) Act, 1972**.
Largest Subterranean Fish	• World's largest known **subterranean (occurring under the earth's surface)** fish has been found recently in a cave in a remote forested area of **Meghalaya's Jaintia Hills**. • It is **40 cm long** which is nearly five times the mean length for all known subterranean fish to date. • It is an **almost-blind species** that seems similar to the Golden Mahseer (Tor Putitora). • **Subterranean ecosystems** are considered extreme, high-stress environments characterised by darkness, truncated food webs and food scarcity. • Despite this, they harbour exceptional vertebrate and invertebrate taxa (21,000+ species), many of which are evolutionarily unique, and relics of ancient fauna given their long-term isolation.
Flame Throated Bulbul	• The flame-throated bulbul, also called as **Rubigula**, was **chosen as the mascot** for 36th National Games to be held in Goa. • Flame-throated Bulbul is the **State bird of Goa** and is **endemic to southern peninsular India**. • The bird **prefer habitats like rocky, scrub covered hills** mostly in the Eastern Ghats and central peninsular India and in some places in the Western Ghats. • It is **locally distributed in** southern Andhra Pradesh, eastern Karnataka, Goa, Orissa, eastern Kerala and northern Tamil Nadu. • It is a **Schedule – IV bird,** according to Wildlife (Protection) Act, 1972. • Its IUCN status is **Least Concern.**
Henneguya salminicola	• Researchers have found a **multicellular animal** with no mitochondrial DNA. • The organism **'Henneguya salminicola'** a microscopic parasite is a **non-oxygen breathing animal.** It is only known animal to exist without the need to breathe oxygen. • It is seen as a **process of de-evolution**, as it has **shed unnecessary genes responsible** for aerobic respiration and become an even simpler organism.
Assam Roofed Turtle	• Also known as Sylhet roofed turtle, it is found in the Brahmaputra-Meghna drainage in India (Assam) and parts of eastern Bangladesh. • IUCN Conservation Status: Endangered (EN)
Philippine Eagle	• Philippine Eagle, endemic to Philippines, is one of the world's biggest and most powerful birds. • Population: Around 800 are believed left in the wild. • IUCN Conservation Status: **Critically Endangered (CR)** • Threats: Destruction of tropical rainforest and relentless hunting
Gold-Coated Fungi	• It is a naturally occurring strain of the **Fusarium oxysporum** (fungi), discovered recently in Australia. • The fungi attaches gold to their strands by dissolving and precipitating particles from their surroundings through a process of oxidization. • Moreover, here gold serves as a catalyst, helping the fungus digest certain carbon foods which makes it **grow larger and spread faster** than those that don't interact with gold.
Steppe eagle (Aquila Nipalensis)	• It is believed to be the second-largest migratory eagle species to India. It was recently sighted in Andhra Pradesh. • Conversion of open habitats for aquaculture, pesticides and various effluents pose threat to the species. • It nests in Northern Eurasia in an area stretching from the Black Sea coast to the hills in Eastern Kazakhstan and Russian Altai. • IUCN Conservation Status: **Endangered (EN)**

IUCN and IUCN Red List Criteria

IUCN Categories	Criteria (Red list)
Extinct (EX)	A designation applied to species in which the **last individual has died** or where systematic and time-appropriate surveys have been unable to log even a single individual.
Extinct in the Wild (EW)	A category containing those species whose **members survive only in captivity** or as artificially supported populations far outside their historical geographic range.
Critically Endangered (CR)	A category containing those species that possess an e**xtremely high risk of extinction** as a result of rapid population declines of 80 to more than 90 percent over the previous 10 years (or three generations, whichever is longer), a **current population size of fewer than 50 individuals**, or other factors.
Endangered (EN)	A designation applied to species that possess a **very high risk of extinction** as a result of rapid population declines of 50 to more than 70 percent over the previous 10 years (or three generations), a **current population size of fewer than 250 individuals**, or other factors.

Vulnerable (VU)	A category containing those species that possess a **very high risk of extinction** as a result of rapid population declines of 30 to more than 50 percent over the previous 10 years (or three generations), a c**urrent population size of fewer than 1,000 individuals,** or other factors.
Near Threatened (NT)	A designation applied to species that are **close to becoming threatened** or may meet the criteria for threatened status in the near future.
Least Concern (LC)	A category containing species that are pervasive and abundant after careful assessment.
Data Deficient (DD)	A condition applied to species in which the amount of available data related to its risk of extinction is lacking in some way. Consequently, a **complete assessment cannot be performed**. Thus, unlike the other categories in this list, this category does not describe the conservation status of a species
Not Evaluated (NE)	A category used to include any of the species described by science but **not assessed** by the IUCN.

3.1.15. CRITICALLY ENDANGERED SPECIES IN INDIA

Category	Animals
Mammals	• **Shrew:** Andaman White-toothed Shrew, Jenkin's Andaman Spiny Shrew, Nicobar White-tailed Shrew. • **Rat:** Large Rock Rat or Elvira Rat. • **Squirrel:** Namdapha Flying Squirrel. • **Civet:** Malabar Civet. • **Rhinoceros:** Sumatran Rhinoceros and Javan Rhinoceros.

Birds	• **Migratory Species**: Baer's Pochard, Siberian Crane and Spoon-billed Sandpiper.
	• **Non-migratory Species**: White-bellied Heron.
	• **Grassland Species**: Bengal Florican, Great Indian Bustard, Jerdon's Courser and Sociable Lapwing.
	• **Vultures**: Indian Vulture, Red-headed Vulture, Slender-billed Vulture and White-backed Vulture.
	  ○ Uttar Pradesh government will set up state's first vulture conservation and breeding centre- **Jatayu Conservation and Breeding Centre in Maharajganj district. in U.P.**
	  ○ Jatayu Conservation Breeding Centre at Pinjore in Haryana was the first conservation centre in the country.
	• **Others:** Himalayan Quail and Pink-headed Duck.

Reptiles	• **Crocodilian:** Gharial. • **Turtle:** Hawksbill Turtle, Four-toed River Terrapin or River Terrapin, Red-crowned Roofed Turtle or the Bengal Roof Turtle.
Amphibians	• **Frog:** Anamalai Flying Frog, Gundia Indian Frog, Kerala Indian Frog , Charles Darwin's Frog, Kottigehar Bubble-nest Frog , Amboli Bush Frog, Chalazodes Bubble-Nest Frog, Small Bush Frog, Green-eyed Bush Frog, Griet Bush Frog, Kaikatt's Bush Frog, Mark's Bush Frog, Munnar Bush Frog, Large Ponmudi Bush Frog, Resplendent Shrub Frog, Sacred Grove Bush frog, Sushil's Bush Frog and Shillong Bubble-nest Frog. • **Toad:** Tiger toad
Fishes	• **Shark:** Pondicherry Shark and Ganges Shark. • **Sawfish:** Large-tooth Sawfish and Long-comb Sawfish or Narrow-snout Sawfish.
Corals	• **Fire Corals**
Spiders	• Rameshwaram Ornamental or Rameshwaram Parachute Spider. • Gooty Tarantula, Metallic Tarantula or Peacock Tarantula.
Recent changes in the IUCN Red List	• **Pygmy Hog:** Status changed from Critically Endangered (CR) to **Endangered (EN).** • **Kondana Rat:** Status changed from Critically Endangered (CR) to **Endangered (EN).** • **Forest Owlet:** Status changed from Critically Endangered (CR) to **Endangered (EN).** **Sispara Day Gecko:** Status changed from Critically Endangered (CR) to **Near Threatened (NT).** • **Leatherback Turtle:** Status changed from Critically Endangered (CR) to **Vulnerable (VU).** • **Knife-tooth Sawfish:** Status changed from Critically Endangered (CR) to **Endangered (EN).**

3.2. FORESTS

3.2.1. INDIA STATE OF FORESTS REPORT 2019

Why in news?

The **Forest Survey of India** released the India State of Forest Report for the year 2019.

About ISFR

- FSI undertakes biennial assessment of country's forest resources, the results of which are presented as the India State of Forest Report (ISFR).
- Forest Survey of India (FSI), a premier national organization under the union Ministry of

Environment and Forests is responsible for assessment and monitoring of the forest resources of the country.

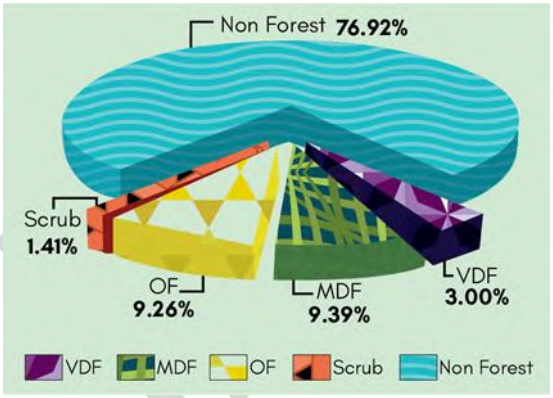
- Since 1987, 15 such assessments have been completed and the current assessment is the 16th in the series.

- **Forest Cover:** Forest Cover refers to all lands more than one hectare in area, with a tree canopy density of more than 10% irrespective of ownership and legal status. Such lands may not necessarily be a recorded forest area. It also includes orchards, bamboo and palm.
- **Recorded Forest Area (RFA):** It refers to all the geographic areas recorded as 'Forests' in government records. It consists of Reserved Forests and Protected Forests which have been constituted under the provisions of the Indian Forest Act, 1927.
- **Green Wash:** The extent of wooded areas generally shown in light green colour on the Survey of India topological sheets.
- **Tree Cover:** Tree patches outside recorded forest areas exclusive of forest cover and less than the minimum mappable area of one hectare.
- **Carbon Stock:** Forest carbon stock is the amount of carbon that has been sequestered from the atmosphere and is now stored within the forest ecosystem, mainly within living biomass and soil, and to a lesser extent also in dead wood and litter.
- **Open Forest (OF):** Lands with forest cover having a canopy density between 10 to 40 percent.
- **Dense Forest:** All lands with a forest cover having a canopy density of 40% and above.
    - **Moderately Dense Forest (MDF)**: All lands with forest cover having a canopy density between 40 - 70%
    - **Very Dense Forest (VDF)**: Lands with forest cover having a canopy density of 70% and above.

Key Highlights of the report

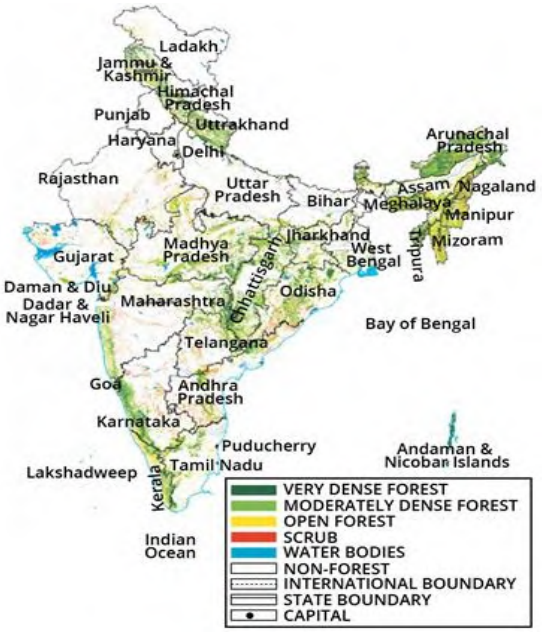
Forest and Tree Cover at national level:

- The **total forest cover of the country** is **21.67% of the total geographic area of the country**. The **tree cover** of the country is estimated as 2.89% of the geographical area.
- The **total Forest and Tree cover** of the country is **24.56% of the geographical area** of the country. In the last assessment it was 24.39%.
- There is an increase of 0.56% of forest cover, 1.29% of tree cover and 0.65% of forest and tree cover put together, at the national level as compared to the previous assessment i.e. ISFR 2017.
- **Very Dense Forests (VDF),** which represents the lushest vegetation and has canopy density above 70%, **increased by 1,120 sq km** over the assessment of 2017.
- Forest cover within the Recorded Forest Area (RFA) / Green Wash (GW) has shown a slight decrease of 0.05% whereas there is an increase of forest cover outside the RFA/GW as compared to ISFR 2017.
- **Forest cover in the hill districts of the country** is 40.30% of the total geographical area of these districts. The current assessment shows an increase of 0.19% in 140 hill districts of the country.



Forest Cover in States

- **Madhya Pradesh has the largest forest cover** in the country followed by Arunachal Pradesh, Chhattisgarh, Odisha and Maharashtra.
- **In terms of forest cover as percentage of total geographical area,** the top five States are Mizoram (85.41%), Arunachal Pradesh (79.63%), Meghalaya (76.33%), Manipur (75.46%) and Nagaland (75.31%).
- **Total forest cover in the North Eastern region** is 65.05% of its geographical area showing a decrease of forest cover to the extent of 0.45% in the region since 2017. Except Assam and Tripura, all the States in the region show decrease in forest cover.
- The **top five States in terms of increase in forest cover** are Karnataka (1,025 sq km), Andhra Pradesh (990 sq km), Kerala (823 sq km), Jammu & Kashmir (371 sq km) and Himachal Pradesh (334 sq km).
- **States showing maximum loss in forest cover** are Manipur (499 sq km), Arunachal Pradesh (276 sq km) and Mizoram (180 sq km).
- The **total forest cover in the tribal districts** is 37.54% of the geographical area of these districts.



Wetlands:

- Among the big States, **Gujarat** has the largest area of the wetlands within RFA in the country followed by West Bengal.
- Among the smaller States/UTs Puducherry followed by Andaman & Nicobar (A&N) Islands have large areas of wetlands within RFA.
- In the country as a whole there are **62,466 wetlands covering 3.83% of the area** within RFA/GW of the country and 8.13% of the total number of wetlands are located within the RFA/GW.

Mangrove Cover:

- There has been a net increase of 54 sq km in the mangrove cover of the country as compared to 2017 assessment.
- The mangrove cover in the country is 4,975 sq km, which is 0.15% of the country's total geographical area.
- **West Bengal** has 42.45% of India's mangrove cover, followed by Gujarat 23.66% and A&N Islands 12.39%.
- About 40% of world's Mangrove Cover is found in South East Asia and South Asia. India has about 3% of the total Mangrove cover in South Asia.

Forest Fire:

- 21.40% of the forest cover of the country is highly to extremely fire prone. Most of the fire prone forest area are found in the northeastern region and the central part of the country.
- Most of the forest fires have occurred in open forests followed by moderately dense forests.

Carbon stock:

- The total carbon stock of the country was estimated at 7,124.6 million tons, which is an increase of 42.6 million tons from 2017. India's NDC goal is to create additional carbon sink of 2.5 to 3.0 billion tonnes of CO_2 equivalent through additional forest and tree cover by 2030.
    - **Soil Organic Carbon** contributes 56% to the total forest carbon stock of the country.

Biodiversity:

- **Maximum tree diversity** has been found in tropical wet evergreen and semi-evergreen forests of Western Ghats (Tamil Nadu, Kerala and Karnataka) followed by northeastern states.
- **Karnataka has maximum species richness for trees**, Arunachal Pradesh has maximum species richness for shrubs and Jammu & Kashmir has maximum species richness for herbs.
- Arunachal Pradesh has the maximum richness of species when all the three types of plants (trees, shrubs and herbs) are considered, followed by Tamil Nadu and Karnataka.

Bamboo cover:

- The total bamboo bearing area was estimated to be 1,60,037 sq km and increased by 3,229 sqkm, compared to the 2017 estimate.
- Madhya Pradesh has maximum bamboo bearing area followed by Maharashtra, Arunachal Pradesh and Odisha.

Dependence of fuelwood on forests is highest in the State of Maharashtra, whereas, for fodder, small timber and bamboo, dependence is highest in Madhya Pradesh.

Growing Stock: It is the sum (by number or volume) of all the trees growing/living in the forest or a specified part of it. The **total growing stock of wood in the country** is estimated 5,915.76 million cubic metre (cum). The average growing stock per hectare in forest has been estimated as 55.69 cum.

Related information
Forest Fire in India

- A number of **37,059 fires were detected in year 2018 using MODIS (Moderate Resolution Imaging Spectro-radiometer)** sensor data.
- Based on the forest inventory records, **more than 60% of forests in India are vulnerable** to some form of Forest Fire.
- **More than 90%** of forest fires in India are on account of **human activity**.
- Steps taken by Government to prevent and mitigate forest fires:

- National Plan for forest fire management.
- Forest fire prevention and management scheme.
- **Forest Fire alert system 2.0** (Developed by **Forest Survey of India**).

Australian Bushfires

- Australia's deadly fires have been fueled by a **combination of extreme heat, prolonged drought and strong winds**.
  The bushfires are now so big that they are **generating their own weather**, in the form of giant thunderstorms that start more fires.
- They are generating **'pyrocumulonimbus' (pyroCbs) clouds**. It is a type of cumulonimbus cloud that **forms above a source of heat**, such as a wildfire or volcanic eruption.
- Intense fires can create a **localized updraft** powerful enough to create its own changes in the atmosphere above.
- As the heat and smoke rise, the **cloud plume** can cool off, generating a large, puffy cloud full of potential rain.
- Eventually, water droplets in the cloud condense, and may generate a downburst of rain. But the **"front"** between the calm air outside the fire zone and a pyrocumulonimbus storm cloud is so sharp that it **also generates lightning - and that can start new fires.**

Special features in ISFR 2019:

- **Extent of Trees outside Forest (TOF) in the country:** TOF are trees found outside the recorded forest areas. Extent of TOF has been derived for the first time in the ISFR 2019.
- **Assessment of plant biodiversity in forests:** FSI in a first ever attempt has carried out a rapid assessment of biodiversity for all the States and UTs (except two) and for all the sixteen Forest Type Groups.
- **Refined Forest Type Map of India:** A new exercise for refining and updating the forest types as per the latest baseline forest cover was initiated in the year 2016 and has been completed in 2019.
- **Mapping of Fire Prone Forest Areas:** Fire prone forest areas of different severity classes were mapped in the grids.
- **Wetlands in Forest Areas:** FSI has undertaken a new exercise of overlaying spatial layer of wetlands obtained from Space Application Center over the boundaries of RFA.
- **Forest Cover on Slopes:** An exercise has been undertaken to assess forest cover on different slope classes for each State & UT of the country. High forest cover on steep slopes may be a good indicator of stability of mountains.
- **Major Invasive Species:** Invasive species pose serious threat to the sustainable management of forests. Information on important invasive species of each State & UT is collected for determining five major invasive species in each State & UT and also an estimate of area affected by them.
  - It includes Chromolaena odorata, Lantana Camara, Cassia Tora, Ginsoga Parviflora, Ageratum Conizoydes, Prosopis Juliflora etc.
- **Important NTFP species:** A new information has been generated from the forest inventory data about the top five Non- Timber Forest Produce (NTFP) species. NTFPs are important source of livelihood for many tribal communities and villagers living in the proximity of forests.

3.2.2. DEEMED FOREST

Why in News?

Forest Advisory Committee (FAC) recently asked **states to come up with a criterion and identify deemed forests.**

More on News

- There are forests that are notified either with the forest department or revenue department. Then there are those areas that are like forests but are **neither recorded, nor notified**. The Supreme Court had ordered that the states identify and **classify these as deemed forests.**
- Forests defined under this criteria, constitutes **about 1% of the country's forests**.
- Deemed forests are already **a legal category of forests in some states**.
- They are a category of forest mentioned in the **Odisha State Forest Act and the Madhya Pradesh's state amendment to the Indian Forest Act. However, their status in several states is still unclear.**

3.2.3. FOREST LANDSCAPE RESTORATION (FLR)

Why in news?

Reiterating its commitment to **fight desertification,** India has launched a pilot project to restore degraded forest landscapes in five states to enhance the capacity **on forest landscape restoration (FLR).**

More on News

- The announcement came in the wake of the **14th session of the Conference of the Parties (COP 14) of UNCCD (United Nations Convention to Combat Desertification)** to be hosted by India, in 2019. India will **take-over the COP presidency from China** for two years until the next COP is hosted in 2021.
- The project will be implemented by **National Afforestation and Eco-Development Board**

(NAEB) in partnership with the **International Union for Conservation of Nature (IUCN).**

- In the first phase, the pilot will be conducted in **Haryana, Madhya Pradesh, Maharashtra, Nagaland and Karnataka.**

National Afforestation and Eco-Development Board (NAEB)

NAEB in the **Ministry of Environment and Forests,** set up in 1992 is responsible for promoting afforestation, tree planting, ecological restoration and eco-development activities in the country.

About Forest landscape restoration (FLR)

- It is an ongoing process of **regaining ecological functionality** and enhancing human well-being across **deforested or degraded forest landscapes** which involves restoring a whole landscape. https://t.me/UPSC_PDF
- FLR manifests through different processes such as: new tree plantings, managed natural regeneration, agroforestry, or improved land management to accommodate a mosaic of land uses, including agriculture, protected wildlife reserves, managed plantations, riverside plantings and more.

Significance of the FLR Pilot project

- **Furthering India's environmental commitment** as according to Nationally Determined Contributions (NDCs), submitted under the UNFCCC, India has pledged to create an additional carbon sink of 2.5-3 billion tonnes of CO_2 equivalent through additional forest and tree cover by 2030.
- **Commitment to Bonn Challenge pledge:** At the UNFCCC's CoP 2015 in Paris, the government of India made **a Bonn Challenge pledge,** (a global effort to bring 150 million hectares of world's deforested and degraded land into restoration by 2020 and 350 million hectares by 2030)
    - **Under this, India** will bring into restoration 13 million hectares of degraded and deforested land by 2020 and additional eight million hectares by 2030- **one of the highest targets** among all Asian countries.

Related Information

Rural Development Minister Releases 'Wastelands Atlas' - 2019 With Robust Geospatial Information

- It is the fifth edition carried out by National Remote Sensing Centre using the Indian Remote Sensing Satellite data.
- This Atlas provides district and state wise distribution of different categories of wastelands area including mapping of about 12.08 Mha hitherto unmapped area of Jammu & Kashmir.
- Atlas effectively assist in rolling back wastelands for productive use through various land development schemes 6 programs.

3.2.4. FOREST-PLUS 2.0

Why in news?

Recently, **US Agency for International Development (USAID)** and India's Ministry of Environment, Forest and Climate Change **(MoEF&CC)** officially launched Forest-PLUS 2.0.

About Forest-PLUS 2.0

- **Forest-PLUS 2.0** is five year programme that focuses on **developing tools and techniques to bolster ecosystem management** and harnessing ecosystem services in **forest landscape management.**
- It was initiated in December, 2018 after Forest-PLUS completed its five years in 2017.
- The Forest-PLUS focused on capacity building to help India participate in **Reducing Emissions from Deforestation and forest Degradation (REDD+).**
- **Under Forest-PLUS**, field tests, innovative tools and approaches for Indian forest management were developed. Like **promotion of bio-briquettes in Sikkim,** introduction of **solar heating systems in Rampur** and development of an **agro-forestry model in Hoshangabad.**
- **To achieve these targets the Forest-PLUS 2.0 has three focal points of action**
    - **Developing Tools for Managing Forests for Multiple Services**
    - **Developing incentive based instruments for leveraging finance:** For example, a payment mechanism where a municipality or industry would pay upstream forest communities to use water flowing down because of improved forest management.
    - **Unlocking Economic Opportunities with Conservation:** Unlocking economic opportunities for forest dependent people by modelling and setting up conservation enterprises and mobilising investment from the private sector.

REDD+

- It is climate change mitigation solution developed by parties to UNFCCC to reduce emissions from deforestation and forest degradation.
- REDD+ **incentivise developing countries** to keep their forests conserved by offering **result- based payments** for actions to reduce and remove forest carbon emissions.

Achievements under Forest-PLUS

- **Ecosystem Health:** Fuelwood extraction is the biggest driver of forest degradation in India. USAID developed an innovative decision support tool for evidence based fuelwood management called iFoReST.
- **Forest Monitoring:** USAID developed innovative techniques to improve forest management and monitoring, reporting, and verifying carbon inventories, including mForest, a mobile phone app for forest inventory data.

Related information

Miyawaki-style afforestation technique

- Kerala government will adopt Miyawaki method of afforestation in schools, government buildings etc.
- The technique was pioneered by Japanese botanist Akira Miyawaki.
- It involves **raising indigenous and native trees in dense plantations mimicking forest settings**.
- The approach is supposed to ensure that plant growth is 10 times faster and the resulting plantation is 30 times denser than usual.

3.2.5. MOBILE APP M-HARIYALI

Why in News?

Recently, the Ministry of Housing and Urban Affairs launched **m-hariyali app to encourage public engagement in planting trees and Green drives.**

More on News

- The m-Hariyali application provides **automatic geo- tagging of plants.** It will hence enable the nodal officers to periodically monitor the plantation.
- People can now **upload information/photos of any plantation** done by them, which is linked to app and will be displayed on a website.

3.3. UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION (UNCCD)

Why in news?

Recently, the 14th Conference of Parties (CoP14) of the UNCCD was convened in New Delhi.

More on news

- This was the **first time that India** hosted a CoP of UNCCD.
- **India has taken over the COP Presidency for the next two years** from its previous host China, where the event was last held in 2017.

Important takeaways of the CoP 14

- The COP adopted over 30 decisions on, among other topics: how to implement four thematic policy frameworks addressing drought, gender, sand and dust storms, and desertification, land degradation, and drought (DLDD) as a driver for migration.
- The COP also agreed to **include land tenure as a new thematic area** under the Convention.
- **Adoption of Delhi Declaration:** in which parties expressed commitment for a range of issues, including gender and health, ecosystem restoration, taking action on climate change, private sector engagement, **Peace Forest Initiative and recovery of five million hectares of degraded land in India by 2030,** raising the land to be restored in India to 26 million hectares.
    - **Peace Forest Initiative** is an initiative by South Korea to provide a practical platform that will foster international collaboration by demonstrating the value of achieving land degradation neutrality in cross-border post-conflict situations.
    - Emphasis on need to participate in **United Nations Decade on Ecosystem Restoration (2021–2030),** which commits to adopting an integrated, best-practice approach to land restoration based on scientific evidence and traditional knowledge.
    - Country parties have agreed to make the Sustainable Development Goal target of achieving land degradation neutrality by 2030 a national target for action.
- **Drought Toolbox launched:** The Drought Toolbox is currently being developed as **part of the Drought Initiative** through the close partnership among UNCCD, WMO, FAO, GWP, National Drought Mitigation Centre (NDMC) of the University of Nebraska, and UNEP-DHI.
    - The Drought Toolbox provides drought stakeholders with easy access to tools, case studies, and other resources to support the design of National Drought Policy Plan.
    - The **toolbox is a sort of knowledge bank**, which contains tools that strengthen the ability of countries to anticipate and prepare for drought effectively and mitigate their impacts as well as tools that enable communities to anticipate and find the land management tools that help them to build resilience to drought.

Other related Initiatives on Controlling Land Degradation

Bonn Challenge

- The Bonn Challenge was launched in 2011 by the Government of Germany and IUCN.
- It envisages a global goal to bring 150 million hectares of degraded and deforested landscapes into restoration by 2020 and 350 million hectares by 2030.

New York Declaration on Forests (NYDF)

- NYDF is a voluntary and non-binding international declaration to take action to halt global deforestation.
- It was first endorsed at the United Nations Climate Summit in September 2014.
- The declaration includes ambitious targets to end natural forest loss by 2030, with a 50% reduction by 2020 as a milestone toward its achievement.
- In addition, the declaration calls for restoring 350 million hectares of degraded and deforested lands by 2030, supporting the private sector in eliminating deforestation from the supply chains of major agricultural commodities by 2020, and providing financial support to reduce emissions related to deforestation and forest degradation.
- In September 2019 the list of NYDF supporters has grown to include over 200 endorsers: national governments, sub-national governments, multi-national companies, groups representing indigenous communities, and non-government organizations.

About UNCCD

- Established in 1994, the convention is the **sole legally binding international agreement** linking environment and development to sustainable land management and to address the problem of desertification.
- The Convention addresses specifically **the arid, semi-arid and dry sub-humid areas,** known as the drylands, where some of the most vulnerable ecosystems and peoples can be found.
- It is **one of the three Rio conventions (1992)** adopted by United Nations, along with **UNFCCC and CBD**.
- **10-Year Strategy of the UNCCD (2008-2018)** was adopted in 2007 to forge a global partnership to reverse and prevent desertification/land degradation and to mitigate the effects of drought in affected areas.
- The new **UNCCD 2018-2030 Strategic Framework** is the most comprehensive global commitment to achieve **Land Degradation Neutrality (LDN)** in order to restore the productivity of vast expanses of degraded land, improve the livelihoods of more than 1.3 billion people, and reduce the impacts of drought on vulnerable populations to build.
- The **permanent secretariat** of the Convention is located in **Bonn,** Germany.
- **Publication:** Global Land Outlook

Other Initiatives at UNCCD COP 14

International coalition for action on Sand and Dust storms (SDS)	• It was launched at the UNCCD COP14 in New Delhi. • Its partners include WMO, UNCCD, UNDP, UNEP, UN Food and Agriculture Organization (FAO), the World Health Organization (WHO) and World Bank - among other institutions. • Sand and dust storms (SDS)-also known as sirocco, haboob, yellow dust, white storms, and the harmattan-are a natural phenomenon linked with land and water management, and climate change. The fluctuation in their intensity, magnitude or interaction with each other can make them unpredictable and dangerous. • SDS affect approximately 77% of UNCCD country Parties, or approximately 151 countries. Of these, 45 are classified as SDS source areas.
Initiative of Sustainability, Stability and Security (3S)	• To address migration driven by land degradation, **14 African countries launched the Initiative of Sustainability, Stability and Security (3S)** which aims at restoring land and creating green jobs for migrants and vulnerable groups. The 3S Initiative is starting its implementation phase engaging countries at the highest political level.
Youth Caucus on Desertification and Land	• Global Youth Caucus on Desertification and Land, **a formal constituency to the UNCCD** convened its first official gathering **(Desertification Youth Forum)** in conjunction with the UNCCD COP14 to bring together youth advocates from different parts of the world, to build their capacity, share knowledge, build networks and to engage them meaningfully in the UNCCD processes. • The Caucus is facilitated through voluntary support of youth and youth-led organisations whose staff is leading the preparation of the Youth Forum.

Adapt Now: A Global Call for Leadership on Climate Resilience' Report	• It was released at COP 14. • It has been written by the **Global Commission on Adaptation** — a group of 34 leaders in politics, business and science. It is led by former United Nations secretary-general Ban Ki-Moon, Microsoft Corp founder Bill Gates and former World Bank chief executive Kristalina Georgieva. • It focuses on making the case for climate adaptation, providing specific insights and recommendations in key sectors. • As per it, an investment of $1.8 trillion (Rs 2 lakh crore) in climate-adaptation measures over the next decade will bring about concrete transformation on the ground.
India's Announcement	• India has announced its commitment to restore nearly 50 lakh hectares of degraded land in the next ten years and set up a Centre of Excellence at the Forest Research Institute, Dehradun, for providing technical assistance to meet the challenges.

3.3.1. SOIL ORGANIC CARBON

Why in News?

The UNCCD's Committee on Science and Technology release a report which **emphasises the importance of soil organic carbon (SOC) in preventing land degradation and desertification.**

What is Soil Organic Carbon?

- Soil organic carbon (SOC) is the carbon associated with **soil organic matter (SOM)**.
  - SOM comprises the remains of plants and animals in the soil at various stages of decomposition, along with the microbial biomass and several by-products of complex biotic metabolic processes.
- It **affects many soil properties** such as hydrology, structure, and habitat. Soil organic carbon tends to be concentrated in the **topsoil**.
- SOC is one of the **three global indicators of Land Degradation Neutrality (LDN).** Hence, predicting and monitoring change in SOC is vital to achieving LDN targets.

Factors affecting soil carbon level

- **Temperature:** Decomposition normally occurs more rapidly in the tropics than in temperate areas. During decomposition, SOC is lost from soil because microorganisms convert about half of the SOC to carbon dioxide.
- **Erosion of Surface soil** result into losses of SOC.
- **Soil Moisture and water saturation:** Elevated levels of soil moisture result in greater biomass production, which provides more residues, and thus more potential food for soil biota.
- **Soil Texture:** Soil organic matter tends to increase as the clay content increases. This increase depends on two mechanisms. First, bonds between the surface of clay particles and organic matter retard the decomposition process. Second, soils with higher clay content increase the potential for aggregate formation.
- **Salinity and Acidity:** Salinity, toxicity and extremes in soil pH (acid or alkaline) result in poor biomass production and, thus in reduced additions of organic matter to the soil.
- **Vegetation and biomass production:** The rate of soil organic matter accumulation depends largely on the quantity and quality of organic matter input.

Land Degradation Neutrality

- Land Degradation Neutrality (LDN) has been defined by the Parties to the **Convention as a state whereby the amount and quality of land resources, necessary to support ecosystem functions and services and enhance food security,** remains stable or increases within specified temporal and spatial scales and ecosystems.

Three global indicators of LDN

- **Trends in land cover change (LCC):** Indicating more immediate changes in land use and vegetation
- **Land productivity dynamics (LPD) measured as net primary productivity (NPP):** Indicating relatively rapid responses of ecosystem function
- **Carbon stocks measured as soil organic carbon (SOC):** Indicating the longer term and cumulative responses/resilience to land degradation.

3.4. ECOSYSTEM AND GREEN ECONOMY

3.4.1. PAYMENT FOR ECOSYSTEM SERVICES

Why in news?

The results of the **India's** first-ever **Payment for Ecosystem Services (PES) agreement** in India have started showing up.

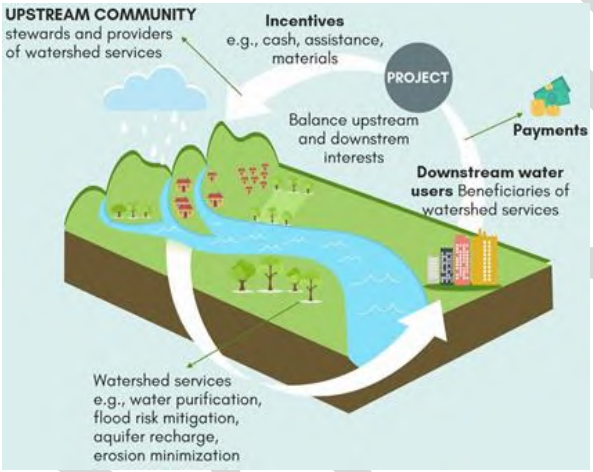
More on news

The first ever PES agreement was signed between the **Village Forest Development Society (VFDS)** and the **Palampur Municipal Council (PMC),**

Himachal Pradesh. Formalised in 2010, it is a rural-urban engagement model for the sustainable supply of water and protection of the catchment area.

Payment for Ecosystem Services (PES) Agreement

- It involves payments to the managers of land or other natural resources in exchange for the provision of **specified ecosystem services** over-and-above what would otherwise be provided in the absence of payment.
  - An ecosystem is a community of living organisms in conjunction with the non-living components of their environment, interacting as a system.
  - **Ecosystem services** are the benefits we derive from the natural environment, such as, the provision of food, water, timber and fibre; underlying functions such as soil formation and nutrient cycling.
- Stakeholders enter into PES agreements on a **voluntary basis** and are in no way obligated to do so.
- The novelty of PES arises from its focus on the **'beneficiary pays principle'**, as **opposed to the 'polluter pays principle'.**



3.4.2. GLOBAL ASSESSMENT REPORT ON BIODIVERSITY AND ECOSYSTEM SERVICES

Why in News?

Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) released its global assessment report on biodiversity and ecosystem services.

About IPBES

- It is an independent **intergovernmental body**, established by member States in 2012.
- **India is a member**.
- The objective of IPBES is to **strengthen the science-policy interface** for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development.
- Like IPCC, **IPBES does not produce any new science**, it only evaluates existing scientific knowledge to make assessments and projections.

Details

- It's a first-of-its-kind report released by the **IPBES, which is being hailed as the most comprehensive scientific evaluation ever made of the state of our nature**, and gives a detailed account of health of the species that inhabit this earth.
- According to the report, the rate of global change in nature during the past 50 years is unprecedented in human history. The **direct drivers of change** in nature with the largest global impact have been (starting with those with most impact): **changes in land and sea use; direct exploitation of organisms; climate change; pollution; and invasion of alien species.**
- It says that **75% of Earth's land surface** and **66% marine environments** have been "significantly altered", and that "over **85%" of wetland area** had been lost.
- However, on an average, these trends were **less severe** on areas controlled or managed by **indigenous people and local communities**.

Assessment on Aichi Targets

- There has been **good progress** towards the components of **4 of the 20 Aichi Biodiversity Targets** under the Strategic Plan for Biodiversity 2011–2020.
- **Moderate progress** has been achieved towards some components of **7 more targets**.
- For **6 others, poor progress** has been made towards **all components.**

Aichi Biodiversity Targets

A set of 20 global targets under the Strategic Plan for Biodiversity 2011-2020. They are grouped under five strategic goals:

- Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society.
- Reduce the direct pressures on biodiversity and promote sustainable use.
- Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity.
- Enhance the benefits to all from biodiversity and ecosystem services.
- Enhance implementation through participatory planning, knowledge management and capacity building.

Aichi Targets were adopted at Conference of Parties-10 (COP-10) of Convention of Biodiversity (CBD) in Nagoya, Japan.

3.4.3. GREEN ECONOMY

Why in news?

Recently, renowned environmental economist **Pavan Sukhdev** was awarded the 2020 Tyler Prize for his work in the domain of **green economy**.

About Tyler Prize for Environmental Achievement

- Established in 1973, it is one of the oldest international environmental awards, recognizing individuals who have contributed in an outstanding manner to the scientific knowledge and public leadership to preserve and enhance the global environment.
- Its recipients encompass the **spectrum of environmental concerns**, including environmental policy, health, air and water pollution, ecosystem disruption and loss of biodiversity, and energy resources.
- It is awarded by the **international Tyler Prize Executive Committee** with the administrative support of the University of Southern California.

About Green Economy

- As per the United Nations Environment Programme (**UNEP**), Green Economy is the one that "improves **human well-being** and **builds social equity**, while significantly reducing **environmental risks** and **ecological scarcities**."
- It has emerged as an alternative to today's dominant economic model, which exacerbates inequalities, encourages waste, triggers resource scarcities, and generates widespread threats to the environment and human health.
  - It aims to transition to an economy that is low-carbon, resource efficient, and socially inclusive.
  - It is based on the idea of qualitative growth where low-carbon and environmentally friendly technologies as well as international cooperation play a key role.
- Pavan Sukhdev's ground-breaking 2008 report on **The Economics of Environment and Biodiversity (TEEB)**, was hosted by UNEP and became the foundation for the Green Economy movement.
- In 2008, **UNEP launched** the **Green Economy Initiative (GEI)**, a programme of global research and country-level assistance designed to motivate policymakers to support environmental investments.
- Transition towards green economy has global importance, but it's more significant for developing countries like India with its associated benefits and costs.

The Economics of Environment and Biodiversity (TEEB)

- In 2007, **G8+5 countries (including India) proposed** to initiate the process of analyzing the global economic benefit of biological diversity, the costs of the loss of biodiversity and the failure to take protective measures versus the costs of effective conservation.
- In response to this, a global study was conducted by **Germany and the European Commission** under Pavan Sukhdev which led to the establishment of **TEEB**.
- Based in Geneva, Switzerland, at the International Environment House, the **TEEB office is hosted by the UNEP**.
- TEEB is a global initiative focused on **"making nature's values visible"**. Its principal objective is to mainstream the values of biodiversity and ecosystem services into decision-making at all levels.
- In October 2010 it released its report " **Mainstreaming the Economics of Nature: A Synthesis of the Approach, Conclusions and Recommendations of TEEB** " and launched the **Bank of Natural Capital** to communicate its findings to the general public.
- It is guided by three core principles-
  - **Recognizing value in ecosystems** can sometimes ensure conservation and sustainable use. E.g. the existence of sacred groves in some cultures has helped to protect natural areas and the biodiversity they contain.
  - **Demonstrating value in economic terms** is often useful for policy makers and others such as business in reaching decisions that consider the full costs and benefits of an ecosystem. E.g. By including the costs and benefits of conserving the ecosystem services provided by wetlands in controlling floods compared to building flood defences.
  - **Capturing value** involves the introduction of mechanisms that incorporate the values of ecosystems into decision-making through incentives and price signals. This can include payments for ecosystem services, reforming environmentally harmful subsidies or introducing tax breaks for conservation.

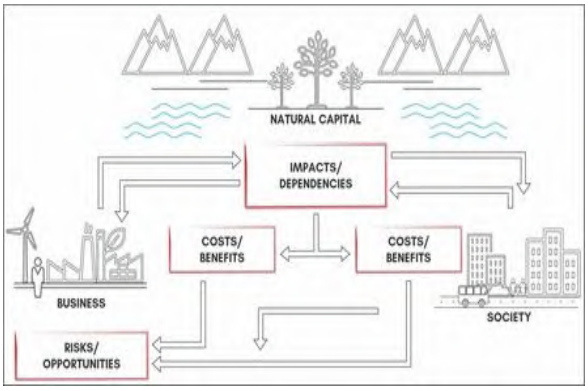
Additional Information

What is Natural Capital?

- It is the stock of **renewable and non-renewable resources** (e.g. plants, animals, air, water, soils and minerals) that combine to yield a flow of benefits to people.
  - It is a way of describing a resource, environment, habitat or ecosystem (sometimes called a **'stock'**) that underpins ecosystem service benefits (sometimes called a **'flow'**).
  - Example- a pollinator habitat can be thought of as natural capital, as are the pollinating insects themselves.

- It is based on the understanding that **nature underpins** human health, wealth, culture, identity and happiness.

- A natural capital approach works to illuminate this value and helps decision makers to understand the complex ways in which natural, social and economic systems interact, impact, and depend upon one another.



3.4.4. GLOBAL FUTURES REPORT

Why in news?

Recently, Global Futures: Assessing "The Global Economic Impacts of Environmental Change to Support Policy-Making" was released jointly by the **World Wide Fund for Nature, The Global Trade Analysis Project and the Natural Capital Project.**

About the report

- This report reveals for the first time **the countries whose economies would be worst affected** over the next 30 years if the world doesn't act urgently to address the global environmental crisis.
- It summarises the headline results and policy recommendations from the **Global Futures project.**
- In 2017, **WWF** initiated the **'Global Futures' project** to enhance awareness among global political and business leaders of the risks to economic prosperity due to global environmental degradation.
  - To make the economic case for reversing these trends, the initiative is developing and applying a new, cutting-edge **modelling approach** for assessing how potential future environmental change would affect the world's economies, trade and industry.
  - It links two **existing models**:
    - ✓ **Integrated Valuation of Ecosystem Services and Tradeoffs** (**InVEST**) model from the Natural Capital Project, which is a high-resolution global ecosystem service model.
    - ✓ Global Trade Analysis Project (GTAP) **Computable General Equilibrium** (**CGE**) model from Purdue University, which is used to analyse policy issues like trade, energy, etc.
- **Key Findings of the report**
  - In the **Business-as-usual scenario**, reduced supply of the six ecosystem services would lead to a **0.67 per cent drop in the annual global GDP by 2050**.
  - The **Sustainable Pathway scenario** which pursues the sustainability goals, will by 2050, result in GDP losses of **0.18% (US$129 billion)** per year.

3.5. LAKES, WETLANDS AND COASTAL AREAS

3.5.1. ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK

Why in news?

Recently, the Ministry of Environment, Forest and Climate Change released the **Environmental and Social Management Framework (ESMF)** in public domain.

Background

- The draft Environmental and Social Management Framework (ESMF) is part of a World Bank-funded project named **ENCORE (Enhancing Coastal and Ocean Resource Efficiency Program)** which aims to **strengthen integrated coastal zone management program (ICZMP)** in all coastal States and Union Territories of India.
- The ESMF has been prepared with an objective to **manage the social and environment impacts** through appropriate measures during the planning, design, construction and operation of various sub-projects of ENCORE.
  - It is a **tool for ENCORE Program** to screen the subprojects to categorise them based on defined criteria and to decide on how to manage these using either full-fledged ESIAs (**Environmental and Social Impact Assessment**) and ESMPs (**Environmental and Social Management Plan**).
- The **Society of Integrated Coastal Management** (SICOM), under MoEFCC is the **National Project Management Unit** (NPMU) for ICZMP and ENCORE Programs.

3.5.2. CORAL RESTORATION

Why in news?

The Zoological Survey of India (ZSI), with help from Gujarat's forest department, is attempting for the

first time a process to restore coral reefs using the bio rock technology. A bio rock structure was installed one nautical mile off the Mithapur coast in the Gulf of Kachchh.

About Bio rock technology

- Bio rock is the name given to the substance formed by **electro accumulation of minerals dissolved in seawater on steel structures** that are lowered onto the sea- bed and are connected to a power source.
- The technology works by **passing a small amount of electrical current through electrodes** in the water.
- When a positively charged anode and negatively charged cathode are placed on the sea floor, with an electric current flowing between them, calcium ions combine with carbonate ions and adhere to the structure (cathode).
- This results in calcium carbonate formation. Coral larvae adhere to the $CaCO_3$ and grow quickly.
- The fragments of broken corals are tied to the bio-rock structure, where they are able to **grow at least four to six times faster** than their actual growth as **they need not spend their energy in building their own calcium carbonate skeletons.**

Coral Reefs

- Coral reefs are one of the most biologically diverse marine eco-systems on the Earth.
- Ecologically, coral reefs are important because they are the **counterpart to the tropical rain forest** in terms of species diversity and biological productivity in the Ocean.
  - Coral reef enables the formation of associated eco-systems which allow the formation of essential habitats, fisheries and livelihoods.
- In addition, coral reefs are **climatologically** important because they provide an **accurate long-term record of the climate change** and help in extending our knowledge of seasonal climate variability in many remote tropical oceans.
- In India, Coral reefs are present in the areas of **Gulf of Kutch, Gulf of Mannar, Andaman & Nicobar, Lakshadweep Islands, Malvan (Maharashtra)**, Angria Bank (Maharashtra), Netrani Island (Karnataka) etc.
  - Recently, **new coral species** have been discovered in Angria Bank.
  - It is a shallow submerged atoll island located 100 miles off the western coast of India.
  - The peculiarity of Angria Bank corals is that it is in the middle of the sea unlike other corals which are either coastal or island corals.

Major threats for the corals

- **Natural:** Environmental-Temperature, Sediment Deposition, Salinity, pH, etc.
- **Anthropogenic:** Mining, Bottom Fishing, Tourism, pollution, etc.

Measures taken for Coral Restoration

Global Measures

- **Chapter 17 of "Agenda 21"** specifically addresses the protection and sustainable development of the marine and coastal environment within the context of the United Nations Convention on the Law of the Sea (UNCLOS).
- **International Coral Reef Initiative (ICRI) -** is an **informal partnership** between Nations and organizations which strives to preserve coral reefs and related ecosystems around the world.
- **UN Environment World Conservation Monitoring Centre (UNEP-WCMC) -** It works with scientists and policy makers worldwide to place biodiversity at the heart of environment and development decision-making to enable enlightened choices for people and the planet.

Measures taken in India

- Government of India has taken steps to protect its coral reefs under Coastal Ocean Monitoring and Prediction system (**COMAPS**), Land Ocean Interactions in Coastal zones (**LOICZ**) and Integrated Coastal and Marine Area Management (**ICMAM**).
- Government of India has notified Coastal Regulation Zones (**CRZ**) and has setup National Coastal Zone Management Authority and State Coastal Zone Management Authority to protect coral reefs.
- **Coral Bleaching Alert System (CBAS)-** a service initiated from **INCOIS** uses the satellite derived Sea Surface Temperature (SST) in order to assess the thermal stress accumulated in the coral environs.
- **Coral Reef Recovery Project-** is a joint venture of Wildlife Trust of India and the Gujarat Forest Department, supported by Tata Chemicals Limited (TCL).
- **ReefWatch India**- An NGO, has taken up two projects —**Re(ef)Build** and **Re(ef)Grow** - to conserve the reefs.
  - **Re(ef)build** involves the restoring and rehabilitation of coral reefs at the Andamans by rescuing naturally broken coral fragments that would otherwise get smothered in the sand and die, and re-attaching them to a robust substratum.

Palau is First Country to Ban 'Reef Toxic' Sun Cream

- **Palau** (located in the western Pacific Ocean) has become first country to ban sunscreen cream that is **harmful to corals and sea life.**
- An ingredient in sunscreen products - **oxybenzone** - is particularity harmful.
- According to **International Coral Reef Foundation,** the banned chemicals can cause:
  - corals to become **more susceptible to coral bleaching,**
  - **damage the DNA of coral,** and
  - deform and kill juvenile corals.

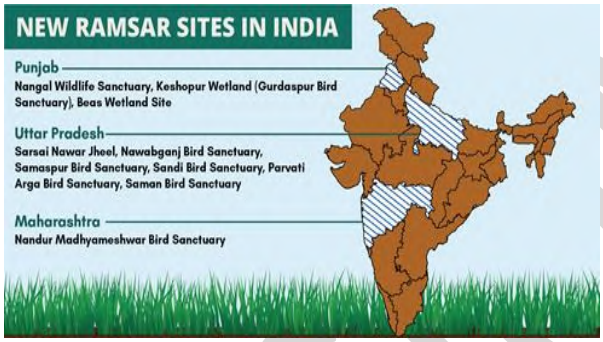
3.5.3. 10 NEW RAMSAR SITES IN INDIA

Why in news?

The Ramsar Convention has **declared 10 more wetlands in India** as sites of international importance.

Details of Wetlands

This brings the total **number of Ramsar sites in India to 37** from 27. The details of newly included wetlands are as follows-



- **Nandur Madhameshwar**
  - **It is the first Ramsar site in Maharashtra.**
  - It is a mosaic of lakes, marshes and riparian forest on the Deccan Plateau. Construction of the Nandur Madhameshwar Weir at the confluence of the **Godavari and Kadwa Rivers** helped create a thriving wetland.
  - Its diverse habitats contrast with the **surrounding semi-arid conditions** caused by the rain shadow of the Western Ghats mountain range.
  - It provides sanctuary to **critically endangered species** including **Deolali minnow** (a fish), Indian vulture and white-rumped vulture.
- **Saman Bird Sanctuary (Mainpuri, UP)**
  - It is a **seasonal oxbow lake** on the Ganges floodplain.
  - The Sanctuary is particularly important as a **wintering site for many migrants** including the **greylag goose**, with over 1% of the South Asian population present during winter.
- **Nawabganj Bird Sanctuary (Unnao, UP)**
  - It is a **shallow marshland.** Monsoon rains feed this diverse wetland while the Sarda Canal supplies additional water.
  - The highly invasive common water hyacinth poses a threat, as does the removal of timber from the forests.
  - It is known to host **Siberian cranes** among migratory bird species that rest here during the winter months.
- **Samaspur Bird Sanctuary (Raebareli, UP)**
  - It is a perennial **lowland marsh typical of the Indo-Gangetic Plains** in Uttar Pradesh.
  - Its **six connected lakes** are heavily dependent on monsoon rains.
  - The Sanctuary harbours threatened species such as the endangered **Egyptian vulture** and **Pallas's fish eagle** and more than 1% of the South Asian population of the **vulnerable common pochard.**
  - A **tall grass called "Sarpat"** is also found in bunches at every spot.
- **Sandi Bird Sanctuary (Hardoi, UP)**
  - It is a freshwater marsh, also designated as **Important Bird Area by Birdlife International.**
  - The Sandi Bird sanctuary is also known by its ancient name as **"Dahar Jheel"** (Jheel = Lake).
  - **River Garra, formerly known as Garun Ganga,** passes near the sanctuary.
  - It is home to over 1% of the South Asian populations of common teal, red-crested pochard and ferruginous duck while **vulnerable sarus crane** has a population of 200 individuals within the Sanctuary.
  - The Sanctuary dried out leading to a subsequent collapse in waterbird populations from 2014 to 2015.
- **Parvati Arga Bird Sanctuary (UP)**
  - It is a **permanent freshwater** environment consisting of two oxbow lakes.
  - They are **rain-fed lakes** in a deep natural depression in the **Gangetic plains of the terai region of Uttar Pradesh.**
  - The Sanctuary is a refuge for some of India's threatened vulture species: the critically endangered **white-rumped vulture and Indian vulture** and the endangered **Egyptian vulture** have all been recorded.
  - Invasive species such as the **common water hyacinth** along with the development of roads and railways present significant threats.

- **Sarsai Nawar Jheel (Etawah, UP)**
  - This typical wetland of the **Indo-Gangetic floodplain in Uttar Pradesh** is fed by precipitation run-off from the South West monsoon rains.
  - It is an example of **co-habitation of humans and wildlife**: farming practices across most of the Site play important roles in sustaining the waterbird habitats.
  - A particular beneficiary is the **vulnerable sarus crane**, with a population of 400 individuals making up the largest flock in the region. Other threatened species present include the critically endangered **white-rumped vulture** and endangered **woolly-necked stork.**
  - It is recognized by Birdlife International as an **Important Bird Area.**
- **Beas Conservation Reserve (Punjab)**
  - It is a 185-kilometre stretch of the **Beas River majorly in Punjab**. The River is dotted with islands, sand bars and braided channels creating a complex environment supporting substantial biodiversity.
  - The Reserve **hosts the only known population in India of the endangered Indus river dolphin.** Further threatened species include the endangered masheer and hog deer as well as the vulnerable smooth-coated otter.
  - A programme was initiated to **re-introduce the critically endangered gharial**.
- **Nangal Wildlife Sanctuary (Punjab)**
  - It is Located in the **Shiwalik foothills of Punjab** which is highly eco-sensitive.
  - It occupies a human-made reservoir constructed as part of the Bhakra-Nangal Project on **Sutlej River** in 1961.
  - The site is of **historic importance** as the Indian and Chinese Prime Ministers formalized the "Five Principles of Peaceful Coexistence" there in 1954.
- **Keshopur-Miani Community Reserve (Punjab)**
  - It is a mosaic of natural marshes, aquaculture ponds and agricultural wetlands maintained by the annual rainfall runoff.
  - It is heavily human influenced and includes a **series of managed fishponds and cultivated crops such as lotus and chestnut.**
  - The Site is an **example of wise use of a community-managed wetland,** which provides food for people and supports local biodiversity.
  - Threatened species present include the vulnerable common pochard and the endangered spotted pond turtle.

About Ramsar Convention

- It is an intergovernmental treaty that provides a framework for the conservation and wise use of all wetlands through local and national actions and international cooperation.
- The Convention, **signed in 1971** in the Iranian city of Ramsar, is one of the oldest inter-governmental accord for preserving the ecological character of wetlands.
- Under the **"three pillars" of the Convention**, the Contracting Parties commit to:
  - work towards wise use of all wetlands;
  - designate suitable wetlands for the list of Wetlands of International Importance (the "Ramsar List") and ensure their effective management;
  - cooperate internationally on transboundary wetlands, shared wetland systems and shared species.
- **Number of Contracting Parties:** 171
- **Montreux Record maintained as part of the Ramsar List** is a register of wetland sites where changes in ecological character have occurred, are occurring, or are likely to occur as a result of technological developments, pollution or other human interference. Currently, two Indian lakes namely Loktak Lake and Keoladeo National Park are in Montreux Record.
- The Ramsar Convention has **6 International Organisation Partners:**
  - **Birdlife International**
  - **International Union for Conservation of Nature (IUCN)**
  - **International Water Management Institute**
  - **Wetlands International**
  - **World Wide Fund for Nature (WWF)**
  - **Wildfowl & Wetlands Trust (WWT)**

Related information

Sunderbans mangroves

- The Sundarbans mangrove forest, one of the largest such forests in the world (140,000 ha), lies on the delta of the Ganges, Brahmaputra and Meghna rivers on the Bay of Bengal.
- Sundarban is **World Heritage site inscribed in 1987.**
- In, 2019 the Indian side of Sunderbans **'Wetlands of International Importance'** tag under the Ramsar convention.

3.5.4. GUIDELINES FOR IMPLEMENTING WETLANDS (CONSERVATION AND MANAGEMENT) RULES, 2017

Why in news?

Ministry of Environment, Forest and Climate Change (MoEF&CC) has notified the Guidelines for

implementing Wetlands (Conservation and Management) Rules, 2017.

Background

- The MoEF&CC has notified **Wetlands (Conservation and Management) Rules, 2017 (Wetlands Rules)** under the provisions of the Environment (Protection) Act, 1986 as regulatory framework for conservation and management of wetlands in India.
- The **present guidelines** have been drafted to support the State Governments / Union Territory (UT) Administrations in the implementation of the Rules

Features of the Guidelines

- **Wetlands to be regulated**
  - Wetlands designated to the **List of Wetlands of International Importance under the Ramsar Convention.**
  - Wetlands notified under the rules by the Central Government, State Government and UT Administration.
  - **All wetlands**, irrespective of their location, size, ownership, biodiversity, or ecosystem services values, can be notified under the Wetlands Rules, **except** River channels; Paddy fields; and certain categories of Human-made waterbodies among others.
  - **Protected Areas** and **areas falling within the purview of Coastal Zone Regulation** have been **excluded** from notification under the Wetlands Rules.
- **Wetlands Authorities**
  - **State Wetland Authority**: The **minister in charge of environment in the state will act as chairperson** of the authority (Administrator or Chief Secretary would be the Chairperson in case of a UT). It has a diverse membership with experts also from Wetland ecology, Hydrology etc.
  - Each Wetlands Authority shall constitute-
    - ✓ **Technical Committee** to review Brief Documents, Management Plans and advise on any technical matter referred by the Wetlands Authority.
    - ✓ **Grievance Committee**, consisting of four members, to provide a mechanism for hearing and forwarding the grievances raised by the public to the Authority.
- **Preparing a list of wetlands** - The list is developed based on **wetlands definition of the Ramsar Convention**. The Convention, ratified by India, **defines wetlands as** 'areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which, at low tides, does not exceed six meters'.
- **Delineating wetlands** - For each wetland to be notified, a **zone of influence** is to be defined. The zone of influence of a wetland is an area, developmental activities wherein are likely to induce adverse changes in wetland ecosystem structure and (ecological) functioning.
- **Wetlands wise use and ecological character** - Management of notified wetlands is recommended to be based on 'wise use' approach. **Ramsar Convention defines the 'wise use' of wetlands** as "the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development".
- **Prohibited activities** - Conversion of Wetland including encroachment of any kind, setting up of any industry and expansion of existing industries; Solid waste dumping, Discharge of untreated wastes and effluents from industries, Poaching etc.
  - **Permission for carrying out any prohibited activity** within a notified wetland can only be given **by MoEF&CC** upon a specific request made by State Government based on recommendation of Wetlands Authority.
- **Regulated activities** - Subsistence level biomass harvesting (including traditional practices), Sustainable culture fisheries practices, Plying of non-motorized boats; Construction of temporary nature.
- **Account of pre-existing rights and privileges in a notified wetland** - Each wetland is likely to be associated with a range of pre-existing rights and privileges, and it must be ensured that such rights and privileges are **aligned with the 'wise use' approach.**
- **Violations and penal provisions** - The violations of the Wetlands Rules shall attract the **penal provisions as per the Environment (Protection) Act, 1986.**
- **Portal for information sharing** - The MoEF&CC has created a web-portal for sharing information regarding implementation of Wetlands Rules.
- **National Wetlands Committee:** Central Wetlands Regulatory Authority (CWRA) will be replaced with the committee to monitor the implementation of the rules.

Activities under wise use

- Ecological rehabilitation and rewilding of nature
- Wetlands inventory, assessment and monitoring
- Research
- Communication, environmental education and participation activities
- Management planning
- Habitat management and conservation of wetland-dependent species
- Community-based ecotourism

Functions of State wetland Authority

- **Prepare a list of all wetlands** of the State or UT
- Develop a **comprehensive list of activities, to be regulated** and permitted within the notified wetlands and their zone of influence;
- **Define strategies for conservation** and **wise use of wetlands** within their jurisdiction;
- Coordinate **implementation of Integrated Management Plans** based on wise use principle.
- Function as a **nodal authority for all wetland-specific authorities** within the State or UT Administration.

3.5.5. GOGABEEL

Why in news?

Recently, Gogabeel, has been declared as **Bihar's first 'Community Reserve'.**

About Gogabeel

- It is an **ox-bow lake** in Bihar's Katihar district.
- It is formed from the flow of the rivers **Mahananda and Kankhar** in the north and the **Ganga** in the south and east.
- Among the threatened species present on the site, the **Lesser Adjutant** falls in the **vulnerable** category; and three species, the **Black-necked Stork**, **White Ibis** and **White-eyed Pochard** are under the **near threatened** category.
- Other species reported from this site include Black Ibis, Ashy Swallow Shrike, Jungle Babbler, Bank Myna, Red Munia, Northern Lapwing and Spotbill Duck.
- In 2004, Gogabeel, including the neighbouring Baghar Beel and Baldia Chaur, were given the status of an IBA (Important Bird Area of India).

Related information
Singchung Bugun Village Community Reserve

- It is a community reserve launched by **Bugun community** of Singchung Village, **Arunachal Pradesh** by joining hands with the Forest Department. It borders the Eaglenest Wildlife Sanctuary, situated in Tezpur, Assam.
- The local Bugun tribe supported the formation of community reserve to conserve the **critically endangered** bird called **Bugun liocichla**.
- The area is home to unique flora and fauna including the **red panda, the clouded leopard and over 500 bird species.**
- It has been accorded the same legal protection as a Wildlife Sanctuary and the community reserve received the **India Biodiversity Award** for **Conservation of Wild Species** in 2018.

3.5.6. CRZ RULES EASED\ FOR 'BLUE FLAG' BEACHES

Why in news?

Environment Ministry has **relaxed Coastal Regulation Zone (CRZ) rules** that restrict construction near beaches. This has been done to help States construct infrastructure and enable them to receive 'Blue Flag' certification.

Details

- 'Blue Flag' beach is an 'eco-tourism model'.
- The Certification is accorded by the Denmark-based **Foundation for Environment Education**, with 33 stringent criteria under four major heads for the beaches: **Environmental Education and Information, Bathing Water Quality, Environment Management and Conservation and Safety and Services**
- It requires beaches to create certain infrastructure e.g. portable toilet blocks, grey water treatment plants, a solar power plant, seating facilities, CCTV surveillance etc.
  - However, CRZ **laws don't allow construction** of such infrastructure on beaches and islands.
- Earlier, Ministry had selected 13 beaches to compete for the certificate.
- These are: Ghoghala beach (Diu), Shivrajpur beach (Gujarat), Bhogave beach (Maharashtra), Padubidri and Kasarkod beach (Karnataka), Kappad beach (Kerala), Kovalam beach (Tamil Nadu), Eden beach (Puducherry), Rushikonda beach (Andhra Pradesh), Miramar beach (Goa), Golden beach (Odisha), Radhanagar beach (Andaman & Nicobar Islands) and Bangaram beach (Lakshadweep).

3.7. MISCELLANEOUS

3.7.1. LOCUST ATTACK

Why in News?

During the past few weeks, **major locust attacks have been observed in several countries** in western and southern Asia and in eastern Africa.

Areas affected by Locusts attack

- FAO has identified three hotspots of threatening locust activity- the Horn of Africa, the Red Sea area, and Southwest Asia.
- In India, locusts attacks emanating from the desert area in Pakistan have **struck parts of**

Rajasthan and Gujarat, causing heavy damage to standing crop.

About Locusts

- Locusts are a **group of short-horned grasshoppers** that multiply in numbers as they migrate long distances in destructive swarms (up to 150km in one day).
- The swarms devour leaves, flowers, fruits, seeds, bark and growing points, and also **destroy plants** by their sheer weight as they descend on them in massive numbers.
- **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.).
- The **desert locust is regarded as the most destructive pest** in India as well as internationally, with a small swarm covering one square kilometre being able to consume the same amount of food in one day as 35,000 people.
- 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.
- **Locust Warning Organisation (LWO),** Directorate of Plant Protection Quarantine and Storage**, 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.

Relationship between Ecological conditions and Locusts attack

- When **conditions are favourable for reproduction**, locust numbers increase and when they are not, numbers decrease either by natural mortality or through migration.
    - For the **Desert Locust, favourable conditions for breeding are**-moist sandy or sand/clay soil to depths of 10-15 cm below the surface, some bare areas for egg-laying, and green vegetation for hopper development.
- As per Scientists, **unusual weather patterns** exacerbated by **climate change** have created ideal conditions for insect numbers to surge.
    - **Warmer seas are** creating more rain, **wakening dormant eggs**, and **cyclones** that disperse the swarms are getting stronger and more frequent.

3.7.2. INTERNATIONAL SEED TREATY

Why in news?

Recently, the Union Agriculture Minister attended the Eighth Session of Governing Body of Seed Treaty at FAO Headquarters in Rome.

More on News

- The Governing Body sessions are **biennial.**
- The session sees **participation** of delegates from various countries, international organizations, civil societies, farmers' organizations, FAO officials and UN organizations.

About the treaty

- ITPGRFA (International Treaty of Plant Genetic Resources for Food and Agriculture) also known as Seed Treaty, is a comprehensive **international agreement for ensuring food security** through the conservation, exchange and sustainable use of the world's plant genetic resources for food and agriculture (PGRFA).
- It envisages fair and **equitable benefit sharing** arising from use of genetic resources.
- It also recognizes **farmers' rights**, subject to national laws.
- The Treaty establishes the Multilateral System of Access and Benefit-sharing to facilitate plant germplasm exchanges and benefit sharing through Standard Material Transfer Agreement (SMTA).

Protection of Plant Varieties and Farmers' Rights (PPV&FR) Act

- A farmer is entitled to save, use, sow, resow, exchange, share or sell his farm produce including seed of a variety protected under the PPV&FR Act, 2001 except brand name.
- The legislation is **compliant to Article 9 of the Seed Treaty.**

- Under the provisions of PPV&FR Act, 138 farmers/farming communities have been awarded with **Plant Genome Saviour Awards**.
- India has received about 16,620 **applications for Plant Variety Protection** out of which 66% have been received from farmers alone.

3.7.3. ASIA'S OLDEST BAMBOO FOUND IN INDIA

Why in News?

Recently, a new fossil record of bamboo has shown that **India is the birthplace of Asian bamboo**.

More on News

- The fossils were found in the **Tirap mine of Makum Coalfield in Assam.**
- This finding further strengthens the theory that bamboo came to Asia from India and not from Europe.
- Bamboo survives in a wide range of climatic conditions from as cold as 5 degree C to even 30 degrees C. And at sea level to heights of about 4,000 metres.
- They can survive in varying rainfall conditions too.
- In India, bamboo is found naturally growing in almost all parts of the country except Kashmir.

3.7.4. PARTHENOGENESIS

Why in news?

Recently, female anaconda has given a birth through the phenomenon of Parthenogenesis.

Details

- Parthenogenesis **is a reproductive strategy** that involves **development of a female** (rarely a male) **gamete** (sex cell) **without fertilisation** or development of an embryo from an unfertilised egg cell.
- It is an **adaptive strategy** when sexual reproduction is not possible due to environmental conditions.
- It occurs commonly among lower plants, pests of agriculture and horticulture, invertebrate animals (particularly rotifers, aphids, ants, wasps and bees) and rarely among higher vertebrates.
- Offspring from parthenogenesis **tends to be clones of the parent** because there has been no exchange and rearrangement of genetic information with another individual.

4. SUSTAINABLE DEVELOPMENT

4.1. WORLD ENERGY OUTLOOK (WEO), 2019

Why in news?

International Energy Agency (IEA) has released WEO 2019.

Details

- WEO provides critical analysis and insights on **trends in energy demand and supply**, and what they mean for energy security, environmental protection and economic development.
- The first WEO was published in 1977 and it has been **an annual publication** since 1998.

International Energy Agency

- It is an **autonomous intergovernmental organization** established in the framework of **Organization for Economic Cooperation and Development (OECD)** in 1974 to help countries collectively respond to oil supply disruptions.
- It is headquartered in Paris.
- The framework was anchored in the **IEA treaty** called the **"Agreement on an International Energy Program".**
- A candidate country to the IEA must be a member country of the OECD.
- The IEA family now represents about 75% of global energy consumption.
- **Members**: IEA is made up of 30 member countries and 8 association countries.
- **India became an Associate Member in 2017.**
- Other Publications: Global Energy & CO2 Status Report.

4.2. ALTERNATIVE ENERGY RESOURCES

4.2.1. BIO JET FUEL

Why in News?

Recently, a Russian-origin AN-32 transport plane was formally fleet certified by DRDO to fly with the 10 per cent bio-jet blended ATF (aviation turbine fuel) made **from Jatropha oil**.

More about the news

- The first AN 32 was flown in December 2018 using the bio-jet fuel which was a blend of jatropha oil and aviation turbine fuel.
- **India's first biofuel-powered flight** was successfully tested between Dehradun to Delhi in August 2018 by Spicejet Airlines.
- While developed countries like Canada, Australia and US have already conducted these test flights, **India would be the first developing nation** to experiment that.

Jatropha

- Jatropha is a **plant of Latin American origin**, which is now widespread throughout arid and semi-arid tropical regions of the world.
- It is a **drought resistant perennial plant** living up to 75 years.
- Jatropha seeds contain about **35% non-edible oil**.
- Jatropha oil can be used directly in diesel engines, added to diesel fuel as an extender or Trans-esterifies to a bio-diesel fuel.
- Jatropha seed cake makes an excellent organic fertilizer with a **high nitrogen content**. It can also be used as a livestock feed.
- It is also used as an insecticide and fungicide.

About Biofuels

- Biofuel is any hydrocarbon fuel that is produced from organic matter in a short period of time. **Different generations of biofuels are:**
- **First Generation Biofuels:** It uses the **food crops** like wheat and sugar for making ethanol and oil seeds for bio diesel by conventional method of fermentation.
- **Second Generation Biofuels:** It uses **non-food crops and feedstock** such as Jatropha, wood, grass, seed crops, organic waste.
- **Third Generation Biofuels:** It uses **specially engineered Algae** whose biomass is converted into biofuels.
- **Fourth Generation biofuel:** It aims at not only producing sustainable energy but also a way of capturing and storing CO2.

Programmes/Schemes to promote Biofuels

- **National Policy on Biofuels, 2018:** Categorisation of biofuels to enable extension of appropriate financial and fiscal incentives under each category. The two main categories are:
  - **Basic Biofuels**- First Generation (1G) bioethanol & biodiesel.
  - **Advanced Biofuels** - Second Generation (2G) ethanol, Municipal Solid Waste (MSW) to drop-in fuels, third Generation (3G) biofuels, bio-CNG etc.
- Government of India launched **Ethanol Blended Petrol (EBP) programme** in 2003 for undertaking blending of ethanol in Petrol to address environmental concerns due to fossil fuel burning, provide remuneration to farmers,

subsidize crude imports and achieve forex savings.
  - Presently, EBP is being run in 21 States and 4 UTs of the country.
  - Under EBP programme, OMCs are to blend upto 10% of ethanol in Petrol.
- **Pradhan Mantri JI-VAN (Jaiv Indhan-Vatavaran Anukool fasal awashesh Nivaran) Yojana :** for providing financial support to Integrated Bioethanol Projects using lignocellulosic biomass and other renewable feedstock.
  - Under this Yojana, 12 Commercial Scale and 10 demonstration scale Second Generation (2G) ethanol Projects will be provided a Viability Gap Funding (VGF) support in two phases in the period from 2018-19 to 2023-24.
  - Centre for High Technology (CHT), a technical body under the aegis of Ministry of Petroleum and Natural Gas, will be the implementation Agency for the scheme.

Related news

- Recently, the Directorate General of Civil Aviation (DGCA) issued draft guidelines for aeroplane operators flying on international routes for implementation of Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).
  - **CORSIA** is the International Civil Aviation Organization (ICAO) resolution for a global market based measure to address CO_2 emissions from international aviation from 2021 to 2035.
  - All civilian international operations undertaken by operators are covered by CORSIA with **exceptions for humanitarian, medical and fire-fighting flights.**

4.2.2. OCEAN ENERGY

Why in news?

Recently, the **Ministry of New and Renewable Energy** has declared **Ocean Energy** as renewable energy.

Background

- **Ocean Thermal Energy Conversion (OTEC)** has a theoretical potential of **180,000 MW** in India subject to suitable technological evolution.
  - The total identified potential of **tidal energy** is about **12,455 MW**, with potential locations identified at Khambat & Kutch regions, and large backwaters, where barrage technology could be used.
  - The total theoretical potential of **wave energy** in India along the country's coast is estimated to be about **40,000 MW.**
- Ministry of New and Renewable Energy has clarified to all the stakeholders that energy produced using various forms of ocean energy such as tidal, wave, ocean thermal energy conversion among others **shall be considered as renewable energy** and shall be eligible for meeting the non-solar **Renewable Purchase Obligations (RPO).**
  - **Under the RPO**, distribution companies (DISCOMs) are required to have certain proportion of clean energy supplies. The proportion is fixed by state power regulators. The DISCOMs can also buy renewable energy certificates in lieu of mandated clean energy supplies, from the developers or renewable power generators.

Technologies to harness ocean energy

- **Tidal Energy** The tidal cycle occurs every 12 hours due to the gravitational force of the moon.
  - The difference in water height from low tide and high tide is **potential energy**. Similar to traditional hydropower generated from dams, tidal water can be captured in a barrage across an estuary during high tide and forced through a hydro-turbine during low tide.
  - To capture sufficient power from the tidal energy potential, the height of high tide must be **at least five meters (16 feet) greater than low tide.**
  - The **Gulf of Cambay** and the **Gulf of Kutch** in Gujarat on the west coast have the locations in the country where potential exists.
- **Wave Energy-** is generated by the movement of a device either floating on the surface of the ocean or moored to the ocean floor.
  - Wave conversion devices that float on the surface have joints hinged together that bend with the waves. This **kinetic energy pumps fluid through turbines** and creates electric power. Stationary wave energy conversion devices use pressure fluctuations produced in long tubes from the waves swelling up and down.
  - This bobbing motion drives a turbine when critical pressure is reached. Other stationary platforms capture water from waves on their platforms. This water is allowed to runoff through narrow pipes that flow through a typical hydraulic turbine.

- **Current Energy-** Marine current is ocean water moving in one direction. Tides also create currents that flow in two directions.
    - Kinetic energy can be captured from marine and other tidal currents with submerged turbines that are very similar in appearance to miniature wind turbines. Similar to wind turbines, the movement of the marine current moves the rotor blades to generate electric power.
- **Ocean Thermal Energy Conversion (OTEC)**- uses **ocean temperature differences** from the surface to depths lower than 1,000 meters, to extract energy.
    - A temperature difference of only 20°C can yield usable energy. Research focuses on **two types of OTEC technologies** to extract thermal energy and convert it to electric power:
        - ✓ **Closed cycle method:** A working fluid, such as ammonia, is pumped through a heat exchanger and vaporized. This vaporized steam runs a turbine. The cold water found at the depths of the ocean condenses the vapor back to a fluid where it returns to the heat exchanger.
        - ✓ **Open cycle system:** Warm surface water is pressurized in a vacuum chamber and converted to steam to run the turbine. The steam is then condensed using cold ocean water from lower depths.

4.2.3. COAL GASIFICATION BASED FERTILISER PLANT

Why in news?

India's first coal gasification based fertiliser plant is being set up in Talcher, Odisha.

About Coal Gasification

- It is **one of the clean coal technologies** and involves the process of **converting coal into synthesis gas** (also called **syngas**).
- Syngas is a mixture of hydrogen (H_2), carbon monoxide (CO) and carbon dioxide (CO_2).
- The by-products of coal gasification include coke, **coal tar**, sulfur, **ammonia** and fly ash, all having their own potential uses.
- CO_2 and ammonia are further reacted to produce urea.
- Syngas can also be used in a variety of other applications such as in the production of electricity, fuel for Internal Combustion engines, making plastics, cement etc.

Clean coal technologies seeks to reduce harsh environmental effects by using multiple technologies to purify the coal before it burns and contain its emissions.

Some of the common clean coal technologies include:

- **Coal washing** removes unwanted minerals by mixing crushed coal with a liquid and allowing the impurities to separate and settle.
- **Wet scrubbers**, or flue gas desulfurisation systems, minimises sulfur dioxide emissions from burning of coal which is a major cause of acid rain.
- **Low-NOx (nitrogen oxide) burners** reduce the creation of nitrogen oxides, a cause of ground-level ozone.
- **Electrostatic precipitators** remove particulates that aggravate asthma and cause respiratory ailments.
- **Carbon capture and storage** capturing carbon dioxide usually from large point sources, such as a cement factory or biomass power plant, transporting it to a storage site, and depositing it where it will not enter the atmosphere, normally an underground geological formation.

Recently, National Centre for Clean Coal Research and Development has been inaugurated at Indian Institute of Science (IISc) in Bengaluru **by Ministry of Science and Technology.**

4.3. ENERGY EFFICIENCY

4.3.1. STATE ENERGY EFFICIENCY PREPAREDNESS INDEX 2019

Why in News?

Bureau of Energy Efficiency (BEE) recently released the 'State Energy Efficiency Index 2019'.

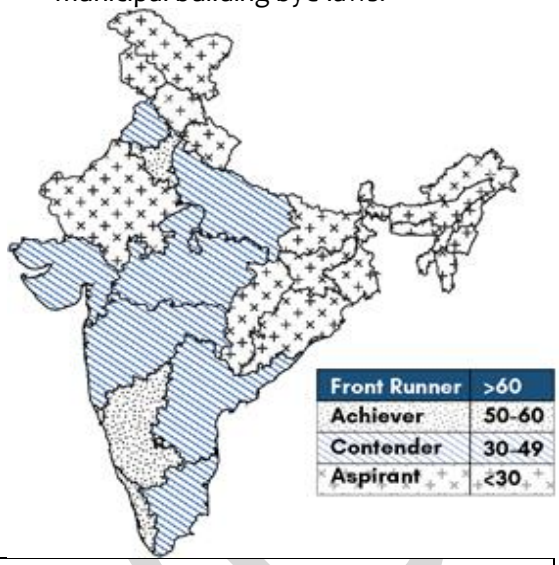
About Bureau of Energy Efficiency (BEE)

- It is a **statutory body under the Ministry of Power,** created under the provisions of the **Energy Conservation Act 2001.**
- It **assists in developing policies and strategies** with the primary objective of reducing the energy intensity of the Indian economy.
- It **co-ordinates with designated consumers and designated agencies** to identify and utilize the existing resources and infrastructure, in performing the functions assigned to it under the **Energy Conservation Act, 2001.**

About Index

- It tracks the **progress of Energy Efficiency initiatives in 36 states and union territories** based on 97 significant indicators.
- **The first such Index** was launched in 2018.
- Index was **developed by the Bureau of Energy Efficiency (BEE)** in association with the **Alliance for an Energy Efficient Economy (AEEE).**

- It incorporates qualitative, quantitative and outcome-based indicators to assess energy efficiency initiatives, programs and outcomes in five distinct sectors – **buildings, industry, municipalities, transport, agriculture, and DISCOMs.**
- It categorises states as **'Front Runner', 'Achiever', 'Contender' and 'Aspirant'** based upon their efforts and achievements towards energy efficiency implementation.
- New indicators for this year include adoption of **Energy Conservation Building Code (ECBC) 2017, energy efficiency in MSME clusters**, etc.
- There are **no 'Front Runner' states**, and the top performing states Haryana, Karnataka and Kerala are in the 'Achiever' category.
- 6 states have amended **Energy Conservation Building Code (ECBC) 2017** to suit regional and local conditions and have notified the code in the state's official gazette.
    - Four states have incorporated ECBC 2017 in municipal building bye-laws.



Related Information

- **India Cooling Action Plan (ICAP)** and BEE's draft strategy plan for accelerating energy efficiency in India – **UNNATEE (Unlocking NATional Energy Efficiency potential)** was launched in 2019.
    - ICAP aims to reduce cooling demand across sectors by 20% to 25% by 2037-38 and cooling energy requirements by 25% to 40% within the same period.
    - UNNATEE provides a roadmap for meeting India's goals on climate change through energy efficiency.
- Both plans are a call to action **to accelerate the implementation of energy efficiency initiatives** to reduce energy demand and energy intensity in all sectors, while still powering growth in India.

Related news: BEE Notifies New Energy Performance Standards for Air Conditioners

- The **24-degree Celsius default setting has been made mandatory** from Jan 1, 2020 for all room air conditioners (RAC) covered under the ambit of Bureau of Energy Efficiency (BEE) star-labelling program.
    - **Star-labelling program** seeks to provide consumer an informed choice about energy saving and thereby the cost saving potential of the marketed household and other equipment.
    - The scheme targets display of energy performance labels on high energy end use equipment & appliances and lays down **minimum energy performance standards**.
    - It is mandatory for all RACs along-with LED lamps, Color TV, Electric Geysers etc.
- Additionally, standards for **Indian Seasonal Energy Efficiency Ratio (ISEER)** have also been revised for RACs.
    - ISEER is the ratio of the total annual amount of heat that the equipment can remove from the indoor air when operated for cooling in active mode to the total annual amount of energy consumed by the equipment during the same period.

Energy Conservation Building Code (ECBC), 2017

Recently, Government made Energy Conservation Building Code (ECBC), 2017 mandatory for approval of commercial buildings.

- The code is given by **Bureau of Energy Efficiency (BEE)**, Ministry of Power.
- The purpose of the Code is to provide **minimum requirements for the energy-efficient design** and construction of buildings.
- It is applicable to buildings or building complexes that have a connected load of 100 kW or greater and are intended to be used for commercial purposes.
    - Buildings intended for **private residential purposes** only are **not covered** by the Code.
- It also provides **two additional sets of incremental requirements** for buildings to achieve enhanced levels of energy efficiency that go beyond the minimum requirements. These are:
    - **ECBC+ Building.**
    - **SuperECBC Buidling.**
- The **National Building Code of India 2016 (NBC)** is the **reference standard** for lighting levels, heating, ventilating, and air conditioning (HVAC) etc. addressed in this Code.

4.4. KUSUM

Why in News?

Recently, Union Ministry of New and Renewable Energy (MNRE) has issued **operational guidelines for the implementation** of Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM KUSUM) Scheme.

About KUSUM Scheme

- The scheme aims to **provide energy security along with financial and water security to farmers.**

- It would **encourage farmers to generate solar power in their farms** and use the clean energy to replace their diesel water pumps.
- It targets to **add decentralised solar power capacity of 25,750 megawatt** by 2022.
- The approved scheme comprises three components:

Components	Details
Component A: setting up of 10,000 megawatt of decentralised ground/ stilt-mounted grid-connected solar or other renewable energy-based power plants.	• **Mandate**- Under this component, solar or other renewable energy based power plants (REPP) of capacity 500 kW to 2 MW will be setup by individual farmers/ group of farmers/ cooperatives/ panchayats/ Farmer Producer Organisations (FPO) referred as Renewable Power Generator (RPG). • **Transmission of Power-** The RPG will be responsible for laying of transmission line and will comply with grid connectivity and other regulations. • **Power Purchase Agreement**- shall be executed between the DISCOM and RPG with all the necessary conditions. The RPG shall also provide the bank guarantees to the DISCOMs. If the RPG is not able to generate minimum energy then it will be liable to pay compensation. • DISCOMS to be **provided performance-based incentives of Rs 0.40 per unit for five years.** • **1,000 MW to be taken up on pilot basis first.**
Component B: Off-grid solar pumps	• **Mandate-** Under this Component, individual farmers will be supported to install 17.50 lakh standalone solar Agriculture pumps of capacity up to 7.5 HP for replacement of existing diesel Agriculture pumps in off-grid areas. • **Requirements of Solar Pumps**- It will be mandatory to use indigenously manufactured solar panels with indigenous solar cells and modules. • **Centre and state to share 30 per cent of pump cost each**; farmer to provide the remaining 40 per cent (can access bank loan for up to 30 per cent of the cost)
Component C: Solarization of grid-connected electric pumps	• **Mandate**- Under this Component, individual farmers having grid connected agriculture pump will be supported to solarise pumps. The farmer will be able to use the generated solar power to meet the irrigation needs and the excess solar power will be sold to DISCOMs. • **Quality Assurance and Evaluation Mechanism**- Systems installed under this Programme should meet technical specification and construction standards as specified by BIS and MNRE from time to time. • **Allowed solar Photo Voltaic capacity up to two times the pump capacity in kW** terms, to enable sale of excess power to discoms. • **Procurement based incentive** of Rs 0.60 per unit for discoms to purchase of surplus power • Both net-metering and on-way transfer of power allowed. • Centre and state to share 30 per cent of pump cost each; farmer to provide the remaining 40 per cent (Can access bank loan for up to 30 per cent of the cost)

4.5. ENFORCEMENT & MONITORING GUIDELINES FOR SAND MINING

Why in news?

The Ministry of Environment Forest & Climate Change (MoEFCC) has released the Enforcement & Monitoring Guidelines for Sand Mining (EMGSM-2020).

Sand Mining in India

- Sand is a **minor mineral** defined under Mines and Minerals (Development and Regulation) Act, 1957 (MMDR Act).
- **The present guidelines list following as major sources:** River (riverbed and flood plain, Lakes and reservoirs, Agricultural fields, Coastal/ marine sand, Palaeo-channels and Manufactured Sand (M-Sand).
- MMDR Act, 1957 **empowers state governments to frame rules** to prevent illegal mining, transportation and storage of minerals (both major minerals and minor minerals) and for purposes connected therewith.
  - **Control of illegal mining** is, therefore, **under the legislative and administrative jurisdiction of state governments.**
- Despite **Sustainable Sand Management Guidelines (SSMG) 2016** to curb the practice, illegal and unsustainable sand mining has continued to be common.
- **The negative impact of illegal sand mining has** both economic (Revenue loss to the exchequer) as well as environmental impacts like it forces the river to change its course, stream bank erosion, lowers groundwater

tables, impacts the habitat of micro-organisms etc.

About the Guidelines

- **District Survey Report (DSR)** is to be prepared to identify and **define** the **mining and no mining zones** considering various environmental and social factors.
- All district to prepare a **comprehensive mining plan for the district** as per the provision of DSR.
- **Abandoned stream channels** on the floodplains should be **preferred** rather than active channels and their deltas and floodplains.
- No riverbed mining operation allowed in monsoon period.
- It suggested the **use of technology such as drones, mobile application and/or bar code scanners** etc. for checking illegal mining, reserves estimation etc.
- **Annual audit of each mining lease** shall be carried out wherein three independent members of repute, nominated by District administration shall also participate.
- State Government should develop an **online portal for sale and purchase** of sand and river-bed material.
- State Government shall constitute a **District Level Task Force (DLTF)** under the Chairmanship of Deputy Commissioner/District Magistrate/Collector to keep regular watch.

4.6. THE WORLD OF ORGANIC AGRICULTURE: STATISTICS & EMERGING TRENDS 2020

Why in News?

The survey was released by Switzerland-based Research Institute of Organic Agriculture and Germany-based International Federation of Organic Agriculture Movements — Organics International **(IFOAM).**

Key Global Findings

- Currently, **1.5 percent of world's agricultural land is organic.** The regions with **largest areas of organic agricultural land are Oceania** (almost 50 percent of the total organic area) and **Europe** (22 percent).
  - **Australia (35.6 million hectares) has most agricultural land under organic farming.**
  - There was an **increase in organic agricultural land in all regions.** In Europe, the area grew by 8.7 percent and in Asia by almost 8.9 percent.
  - Of the **2.8 million organic producers** 47 per cent were in Asia, followed by Africa, Europe and Latin America.
  - **Countries with most producers are India,** Uganda and Ethiopia.
  - Nearly **80 per cent of the world's organic producers are smallholders** mostly from low- and middle-income countries.
- **United States the single-largest market** (42 per cent share) for organic food and drink.

About Organic Farming

Organic Farming: As per definition of the United States Department of Agriculture (USDA), "organic farming is a system which avoids or largely excludes the use of synthetic inputs (such as fertilizers, pesticides, hormones, feed additives etc) and to the maximum extent feasible rely upon crop rotations, crop residues, animal manures, off-farm organic waste, mineral grade rock additives and biological system of nutrient mobilization and plant protection".

Scheme to promote Organic Farming

"Paramparagat Krishi Vikas Yojana" (PKVY) is an elaborated component of Soil Health Management (SHM) of major project National Mission of Sustainable Agriculture (NMSA).

Under PKVY Organic farming is promoted through adoption of organic village by cluster approach and Participatory Guarantee System (PGS) certification.

Organic Product certification in India

- A product is allowed to be exported as organic product only when accompanied by a Transaction Certificate issued by a Certification Body accredited by National Accreditation Body (NAB) for organic products under the **National Programme for Organic Production (NPOP)** of the Department of Commerce.
  - The **NPOP** involves the **accreditation programme** for Certification Bodies, standards for organic production, promotion of organic farming etc.
  - The NPOP standards for production and accreditation system have been recognized by European Commission and Switzerland for unprocessed plant products as equivalent to their country standards. Similarly, USDA has recognized NPOP conformity assessment procedures of accreditation as equivalent to that of US. https://t.me/UPSC_PDF
  - With these recognitions, Indian organic products duly certified by the accredited

certification bodies of India are accepted by the importing countries.

- The **Agricultural & Processed Food Products Export Development Authority (APEDA),** an autonomous organization under the administrative control of Department of Commerce, has been mandated with the export promotion of organic products.
  - APEDA undertakes various activities to **promote exports of organic products** viz. addition of new products under NPOP, making efforts to get NPOP standards recognized by the importing countries, promoting 'India Organic' brand through participation in international trade fairs and exhibitions, organizing Buyer-Seller Meets (BSMs), organizing capacity building and outreach programmes etc.
- **PGS-India (Participatory Guarantee System of India)** is a quality assurance initiative that is locally relevant, emphasizes the participation of stakeholders, including producers and consumers and operates outside the frame of third party certification.
  - It is a **Decentralized Organic Farming Certification System** being implemented by Department of Agriculture & Cooperation, Ministry of Agriculture and Farmers Welfare.

4.7. SUSTAINABLE LIVELIHOODS AND ADAPTATION TO CLIMATE CHANGE

Why in News?

National Institute of Rural Development and Panchayati Raj (NIRDPR) has launched a training programme- a certificate course for Sustainable Livelihoods and Adaptation to Climate Change (SLACC).

About the SLACC

- SLACC is funded by the **Special Climate Change Fund,** which was set up **under the UNFCC** for adaptation and capacity building projects.
- It is being implemented in convergence with the **Mahila Kisan Sashaktikaran Pariyojana,** Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) and other Centrally-sponsored schemes.
- The objective of SLACC is to create a cadre of over 200 certified 'climate-smart' Community Resource Persons (CRPs) including progressive farmers and over 100 young professionals in villages to secure their livelihood through climate-proof planning and adaptations.

NIRDPR

- It functions as **an autonomous organisation** supported by the Ministry of Rural Development.
- It is the **apex body for undertaking training,** research, and action research and consultancy assignments in the rural development sector in India.

Mahila Kisan Sashaktikaran Pariyojana

- It is a sub component of the **Deendayal Antodaya Yojana-NRLM** (DAY-NRLM).
- It seeks **to improve the present status of women in Agriculture,** and to enhance the opportunities available to empower her.

4.8. MISCELLANEOUS

Earth Over-shoot Day	• Recently, a report by the **Global Footprint Network** has revealed that the **Earth Overshoot Day** has moved up by two months over the past 20 years and this year's date is the earliest ever.
	• It is the date when **humanity annual demand** on nature exceeds what Earth can regenerate over the entire year. It is calculated by **WWF** and **Global Footprint Network**.
	  ○ **World Wide Fund for Nature (WWF)**- Switzerland based International NGO, established in 1961 and engages in conservation of wildlife and natural habitat.
	  ○ **Global Footprint Network**- It is an international nonprofit organization founded in 2003 to enable a sustainable future where all people have the opportunity to thrive within the means of one planet.
	• In 2019, it fell on **July 29th**, which is the earliest ever.
	• It means on July 29, humanity will have used nature's resource budget for the entire year. It adds up all of people's competing demands for biologically productive areas – **food, timber, fibers, carbon sequestration, and accommodation of infrastructure**.
	• This means that humanity is currently using nature 1.75 times faster than our planet's ecosystems can regenerate.

PACE-setter FUND	• Ministry of New and Renewable Energy awards grants to four projects in second round of PACEsetter Fund programme. • The PACEsetter fund was constituted by **India and the USA** in 2015 as a joint fund to provide early-stage grant funding to accelerate the commercialization of innovative off-grid clean energy products, systems, and business models.

5. DISASTER MANAGEMENT

5.1. GLOBAL ASSESSMENT REPORT (GAR)

Why in News?

Recently, Global Assessment Report on Disaster Risk Reduction (GAR) was launched.

About GAR

- It is **published biennially by the UN Office for Disaster Risk Reduction (UNDRR),** and is product of contributions of nations, public and private disaster risk-related science and research, amongst others.
  - UNDRR was **established in 1999**, as part of the United Nations Secretariat.
  - It **serves as the focal poin**t for the coordination of disaster reduction and to ensure synergies among the disaster reduction activities of the United Nations system and regional organizations.
  - It **supports** the implementation, follow-up and review of the **Sendai Framework for Disaster Risk Reduction**.
  - UNDRR is 99.2% **funded through voluntary contributions** from a diverse set of donors.
- **Findings**
  - Asia Pacific region accounts for 40% of the global economic losses due to extreme climate changes, with the greatest impact in the largest economies of Japan, China, Korea and India.
  - Economic losses to the extent of 4% of GDP annually are projected if countries don't invest in DRR.

Related news

1st 'National Conference on Coastal Disaster Risk Reduction and Resilience (CDRR&R) – 2020'

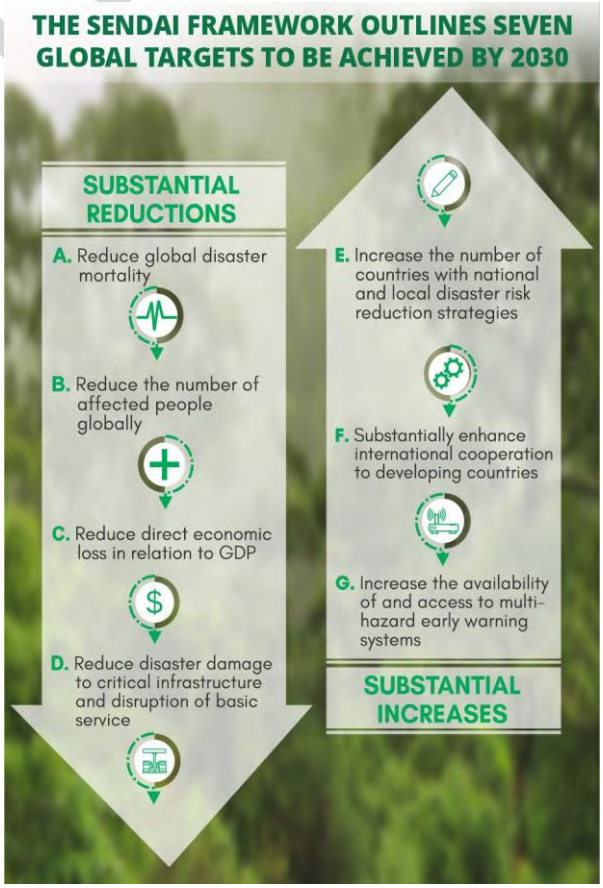
- Conference was **organised by the National Institute of Disaster Management** (NIDM), in New Delhi.
- The conference **focused on enhancing human capacity in terms of better understanding about coastal disaster risks and effective collaborative actions,** by implementing Prime Minister's 10-point agenda and Sendai Framework for Disaster Risk Reduction.
- NIDM, under **Ministry of Home Affairs** was constituted under the Disaster Management Act 2005.
  - It has been entrusted with the nodal national responsibility for human resource development, capacity building, training, research, documentation and policy advocacy in the field of disaster management.

Sasakawa Award

- **United Nations Office for Disaster Risk Reduction (UNDRR)** during 6th Session of Global Platform for Disaster Risk Reduction (GPDRR) in Geneva, conferred **Sasakawa Award** to Dr. Pramod Kumar Mishra.
- **United Nations Sasakawa Award** is the most prestigious international award in the area of **Disaster Risk Management.**
- **GPDRR is a biennial multi-stakeholder forum** established by the **UN General Assembly** to review progress, share knowledge and discuss the latest developments and trends in reducing disaster risk.

Related information: Sendai Framework for Disaster Risk Reduction 2015-2030

- It was endorsed by the UN General Assembly following the **2015 Third UN World Conference on Disaster Risk Reduction (WCDRR).**
- It recognizes that the **State has the primary role to reduce disaster risk** but that responsibility should be shared with other stakeholders including local government, the private sector and other stakeholders.
- The Sendai Framework is the successor instrument to the **Hyogo Framework for Action (HFA) 2005-2015: Building the Resilience of Nations and Communities to Disasters**.



5.2. NATIONAL LANDSLIDE RISK MANAGEMENT STRATEGY

Why in news?

The National Disaster Management Authority (NDMA) has released National Landslide Risk Management Strategy (NLRMS).

About Landslides

- **A landslide** is defined as the **movement of a mass of rock, debris, or earth down a slope**. Landslides are a type of **"mass wasting"** which denotes any down-slope movement of soil and rock under the direct influence of gravity.
- The Geological Survey of India has created a landslide zonation map of India.
  - Landslide Zoning is the division of hill or mountainous areas into homogeneous spatial areas/ slope according to their degrees of actual or potential landslide susceptibility, hazard or risk.
  - 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.
- As per global database on landslides, the **world's top two landslide hotspots exist in India:** the southern edge of the Himalayan arc, and the coast along south-west India where the Western Ghats are situated.

Highlights of the strategy

- **Landslide Hazard Zonation:** It recommends Landslide Hazard Zonation maps to be prepared at macro scale and meso level. It focuses on making use of advanced state-of-the-art tools such as Unmanned Aerial Vehicle (UAV), Terrestrial Laser Scanner, and very high-resolution Earth Observation (EO) data.
- **Landslide Monitoring and Early Warning System:** Technical recommendation for developing and implementing rainfall thresholds, Numerical Weather Prediction (NWP), Automatic Rain Gauges, etc. have been included.
- **Awareness Programmes:** A **participatory approach** has been defined so that each section of the community is involved in the awareness drive. Since the community is the first to confront the disaster before any aid reaches them, a mechanism of awareness is framed to involve and educate the community.
- **Capacity Building and Training of Stakeholders:** Creation of **Centre for Landslide Research Studies and Management (CLRSM)** to create a techno-scientific pool of expertise in the country.

5.3. NATIONAL GUIDELINES FOR PREPARATION OF ACTION PLAN - PREVENTION AND MANAGEMENT OF HEAT WAVE

Why in news?

Recently the National Disaster Management Authority (NDMA) has released National Guidelines for Preparation of Action Plan - Prevention and Management of Heat Wave.

About Heat Wave

- **According to Indian Meteorological Department (IMD),** heat wave is considered if maximum temperature of a station reaches at least 40°C or more for Plains, 37°C or more for coastal stations and at least 30°C or more for Hilly regions.
- **Following criteria are used to declare heat wave:**
  - **Based on Departure from Normal**
    - ✓ **Heat Wave:** Departure from normal is 4.5°C to 6.4°C
    - ✓ **Severe Heat Wave:** Departure from normal is >6.4°C
  - **Based on Actual Maximum Temperature (for plains only)**
    - ✓ **Heat Wave:** When actual maximum temperature ≥ 45°C
    - ✓ **Severe Heat Wave:** When actual maximum temperature ≥47°C
  - To declare heat wave, the above criteria should be met at least in 2 stations in a Meteorological sub-division for at least two consecutive days and it will be declared on the second day.
- Heat waves typically occur between March to June, and in some rare cases even extend till July.
- There have been **32 heat waves affecting 23 states in 2019**, the **second- longest spell** of high temperatures on record.
  - Rajasthan, Madhya Pradesh and Maharashtra were facing **"extreme"** heat

conditions having experienced the longest spell of dry weather this year.
    - The **delayed arrival of the southwest monsoon** delayed the respite from heat wave conditions in almost two-third of the country.
- **Climate change** is driving temperatures higher as well as increasing the frequency and severity of heat waves in India.
    - **Unplanned urban growth and development**, changes in land use and land cover, densely populated areas and increasing urban sprawl and unique challenges associated with it such as **Urban Heat Island** effect in cities are exacerbating the impact of heatwaves.
- Heat Wave has **not been notified as a Disaster** as defined under the Disaster Management Act, 2005 by the Government yet.
- Heat wave is **not even notified in the list of 12 disasters eligible for relief under National/ State Disaster Response Fund** norms.

Highlights of the Guidelines

- **Government Engagement:** Mandating participation from State and district government leaders, municipal health agencies, disaster management authorities and local partners.
- **Appointing State Nodal Agency and Officer** to conduct table-top exercises, simulations and drills before the heat season as well as to ensure coordination among various stakeholders.
- **Vulnerability assessment and establishing Heat-Health threshold temperatures:** The state should coordinate with IMD to develop threshold temperatures.
- **Drafting and developing Heat Action plan:** The State Nodal Officer can coordinate with local IMD office to start receiving summer season forecasts and release early warning and daily alert system with colour codes.
- **Implementation and monitoring:** Do's and Don'ts during a heat wave should be available in local language and disseminated through media including social media.
- **Evaluating and Updating the plan:** After every heat season, the city or state must assess the efficacy of the heat action plan, including processes, outcomes and impacts.
- **Strategies for reducing extreme heat exposures and adapting to climate change (Long Term):** States should consider mitigation strategies, such as increasing green cover in a city to reduce UHI effect or implementing cool roofs.

5.4. ROOM OF THE RIVER PROJECT

Why in news?

One of the flagship projects of the **Netherland government, "Room of the river"** is to be replicated in Kerala's **Kuttanad**, which remained submerged for weeks during Kerala floods.

About the project

- It is a **flood mitigation initiative** which is aimed at protecting areas adjoining rivers from routine flooding and improving water management systems in delta regions.
- **Key concept behind the project:** To provide **more space for the water body** so that it can manage extraordinary high-water levels during floods. The project involves **tailor-made solutions for each River.**
- **Important measures of the project are:**
    - lowering the flood plain,
    - strengthening and relocation of dykes,
    - reducing the height of the groynes (a rigid hydraulic structure built either from the shore or river bank to dissipate the wave energy or to protect the banks from erosion).
    - increasing the depth of the side channels and
    - removing obstacles.
- It will also **improve the surroundings of the river banks** through fountains and panoramic decks, for this the **landscapes are altered** in a way that they turn into **natural sponges** which can accommodate **excess water** during floods.

Kuttanad Below Sea Level Farming System

- Kuttanad is a **delta region situated below sea levels** along the west coast of Kerala, **known as state's rice bowl.**
- The **Kuttanad Below Sea-level Farming System (KBSFS)** is a unique cultivation system, as it is the only system in India that practices rice cultivation below sea level over 150 year ago.
- This system contributes remarkably well to the **conservation of biodiversity and ecosystem services** including several livelihood services for local communities.
- It was declared by the Food and Agriculture Organisation as a **GIAHS (Globally Important Agriculture Heritage System)**.
    - Other two GIAHS in India: Koraput Traditional Agriculture of Odisha and Pampore Saffron Heritage of Kashmir.

Related initiatives

Red Atlas Map and	• **'Red Atlas Action Plan Map'** is a first of its kind map to be prepared by the

CFLOWS App	**Ministry of Earth Sciences,** Tamil Nadu State Disaster Management Authority and Greater Chennai Corporation. ○ It will aid effective flood mitigation in Chennai which witnessed the worst deluge in 2015. ○ It **includes probable scenarios for different rainfall periods** while taking all historical datasets into account, for providing information on individual corporation wards ○ It aims at **flood mitigation, preparedness, operations and management aspects.** • **'Coastal Flood Warning System App'** (CFLOWS-Chennai) is a complete web GIS-based decision support system that involves coupling models of regional weather forecasts, storm surges and captures about 796 flood scenarios. ○ It can be used both for **mitigation planning operations before flooding and in real time** for aspects like relief work.
First Resilient Kerala Program	• The Government of India, the Government of Kerala and the World Bank signed a Loan Agreement of USD 250 million for the First Resilient Kerala Program. • **First Resilient Kerala Program** was launched **to enhance the State's resilience** against the impacts of natural disasters and climate change. • It is part of the Government of India's support to Kerala's 'Rebuild Kerala Development Programme'. • The Program represents the **First 'State Partnership'** of the **World Bank in India;** it is the First of two Development Policy Operations aiming to mainstream disaster and climate resilience into critical infrastructure and services.

6. GEOGRAPHY

6.1. CYCLONE FANI

Why in news?

Extremely severe cyclonic Fani recently hit the Odisha coast.

More in news

- With sustained winds of 240 kmph, the storm was the equivalent of a **Category 4 hurricane on the Saffir-Simpson Hurricane Wind Scale.**
  - The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 rating based on a hurricane's sustained wind speed.
  - This scale **estimates potential property damage.**
  - Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage.

What makes Fani unique?

- **Place of origin:** cyclonic systems in the Bay of Bengal usually originate around latitude 10°, in line with Chennai or Thiruvananthapuram. **Fani, on the other hand, originated quite close to the Equator, around latitude 2°,** well below the Sri Lankan landmass.
- **Lifespan:** Tropical cyclones over the Bay of Bengal have a lifespan of four-seven days, whereas Fani traveled long which allowed it to gather a lot of moisture and momentum, resulting in strong winds.
- **Route:** Fani was **initially headed north-westwards,** towards the Tamil Nadu coast but **changed its course midway** and moved northeast away from the coastline to reach Odisha. The **recurve** it has taken gave it more time over the sea and has ensured that it has gathered unusual strength.
  - In a **re-curving cyclone,** the cyclone gets a sort of second wind when it is on the wane.
  - This is due to air currents in the local atmosphere that push cold air from the poles towards the equator and interfere with cyclone formation. That's what make them 're-curving.' In the southern hemisphere, the cyclones spin clockwise and therefore also re-curve in the opposite direction.
- **Timing:** It started developing in April, a month that has historically seen very few cyclones that were categorised as extremely severe. According to the IMD, in the past 126 years (1891-2017) only 14 severe tropical cyclones have formed in April over the Bay of Bengal. Out of those, only one storm crossed the Indian mainland. Cyclone Fani will be the second storm to form in April and cross the mainland.

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.
  - Fani was named by Bangladesh.

Cyclones

- Tropical cyclones—also called typhoons or hurricanes—are intense water-rotating systems formed by strong winds around low-pressure areas.
- **Conditions required:**
  - The temperature of the top layer of the sea, up to a depth of about **60 metres, need to be at least 28°C** to support the formation of a cyclone.
  - Then, the low level of air above the waters needs to have an **'anticlockwise' rotation (in the northern hemisphere; clockwise in the southern hemisphere).**
- This explains why the April-May and October-December periods are conducive for cyclones.
- During these periods, there is an **ITCZ in the Bay of Bengal** whose southern boundary experiences winds from west to east, while the northern boundary has winds flowing east to west. This induces the anticlockwise rotation of air.
- Once formed, **cyclones in this area usually move northwest.** As it travels over the sea, the cyclone gathers more moist air from the warm sea, and adds to its heft.
- **Cyclones emerging in April-May usually are much weaker than those during October-December.**
- The Indian subcontinent experiences cyclones from two basins: the Bay of Bengal basin and the Arabian Sea basin.
- Of the two, **more cyclones are generated in the Bay of Bengal and cyclones here have also been more severe than the one generated over the Arabian Sea.**
  - The Bay of Bengal receives higher rainfall and constant inflow of fresh water from the Ganga and Brahmaputra rivers. This means that the Bay's surface water keeps getting

refreshed, making it impossible for the warm water to mix with the cooler water below, making it ideal for a depression.
    - On the other hand, the Arabian Sea receives stronger winds that help dissipate the heat, and the lack of constant fresh water supply helps the warm water mix with the cool water, reducing the temperature.

Category	Sustained winds (3-min average)
Super Cyclonic Storm	≥ 120 kt ≥ 221 km/h
Extremely Severe Cyclonic Storm	90-119 kt 166-220 km/h
Very Severe Cyclonic Storm	64-89 kt 118-165 km/h
Severe Cyclonic Storm	48-63 kt 89-117 km/h
Cyclonic Storm	34-47 kt 63-88 km/h
Deep Depression	28-33 kt 51-62 km/h
Depression	17-27 kt 31-50 km/h

6.2. SIMULTANEOUS CYCLONES IN ARABIAN SEA

Why in news?

Recently, two cyclonic storms namely **Cyclone Kyarr and Cyclone Maha have prevailed simultaneously over the Arabian Sea.**

More in news

- This event of simultaneous cyclones in Arabian Sea has **occurred for the first time since 1965.**
- It has also helped make **2019 the most active North Indian cyclone season** on record on the basis of Accumulated Cyclone Energy (ACE).
    - ACE is a **measure of the total destructive power of a cyclone season,** based on the number of days strong winds are observed. https://t.me/UPSC_PDF

Reasons behind growing cyclogenesis and formation of intense cyclones in the Arabian Sea

- **Geographical location of Arabian Sea and Global Warming:** Increased carbon emissions have led to warming up of Arabian Sea waters.
    - Unlike Bay of Bengal, Arabian Sea receives very less fresh waters from the rivers which is preventing the cooling effect.
    - Also more enclosed nature of the sea is promoting more evaporation and cloud formation activities leading to more cyclones.
- **Anthropogenic emissions of aerosols** have increased sixfold since the 1930s, leading to a weakening of the southwesterly lower-level and easterly upper-level winds that define the monsoonal circulation over the Arabian Sea. Previously, tropical cyclones in the Arabian Sea were restricted to Gujarat. In the past decade though, Kerala and Karnataka have also become more vulnerable to cyclones.
- **Indian Ocean Dipole:** The current positive IOD event is the strongest in at least 60 years and has boosted Sea Surface Temperatures (SSTs).
- **Wind Sheer** or the change in direction and speed of the winds from bottom to the top of the atmosphere. Generally, this wind shear is relatively strong in the Arabian Sea compared to the Bay of Bengal and it prevent cyclones from developing vertically. But with increased carbon dioxide in the atmosphere this wind shear is weakening in the Arabian Sea which is supporting formation of cyclones.
- **El-Nino modoki** conditions witnessed in the recent years change the atmospheric circulation over the north Indian Ocean and creates conditions which are conducive for cyclogenesis in the Arabian Sea.

El Niño Modoki is associated with strong anomalous warming in the central tropical Pacific Ocean and cooling in the eastern and western tropical Pacific Ocean.

6.3. DELAY IN MONSOON

Why in news?

The monsoon made a delayed onset over the Kerala coast on 8 June (one week delay) and had been advancing at a sluggish pace over the mainland.

Atmospheric circulations affecting Monsoon

- **El Nino/La Nina:**
    - El Nino is the **abnormal warming of sea surface temperature (SST)** of the Pacific Ocean off the coast of Peru in South America, while La Nina is the opposite, an abnormal cooling of SST.
    - While **El Nino leads to deficit rainfall, La Nina brings an above-average monsoon.**
- **Madden-Julian Oscillation**
    - The **location and strength of the Madden-Julian Oscillation (MJO)** wave play an important role in the development of monsoon over India.

- It can **modulate the timing and strength of monsoons**, influence tropical cyclone numbers and strength in nearly all ocean basins and result in jet stream changes that can lead to cold air outbreaks, extreme heat events, and flooding rains over the United States and North America.

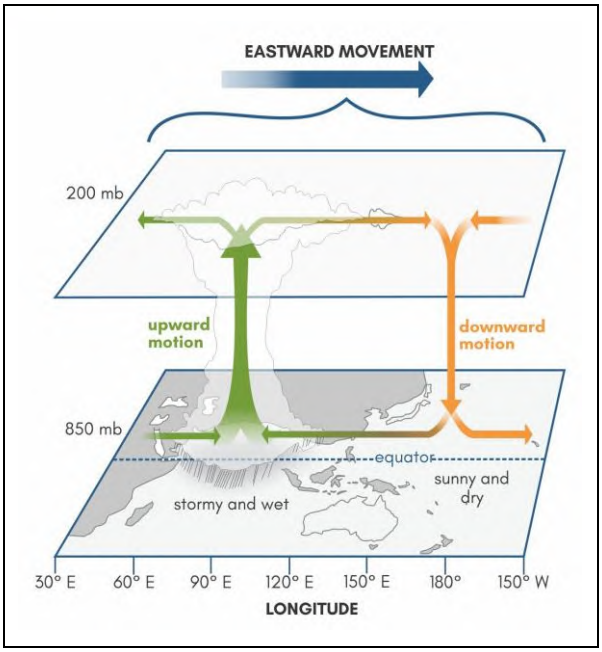
- **Indian Ocean Dipole (IOD)**
  - It is also referred to as the Indian Niño, is a condition when the **SST of the western region of Indian Ocean alternately becomes abnormally colder and then abnormally hotter than the eastern region.**
  - The Indian Niño can **neutralise or worsen the impact of El Niño/La Niña** depending on which phase it is in.
  - **A 'positive' IOD phase**, which means higher-than-usual temperatures in the western Indian Ocean, **brings more rain** to India than the 'neutral' or 'negative' (cooling) phase.
- **Cyclonic formations**
  - **Low-pressure areas**, when they develop near or over land, are instrumental in pulling **the monsoon winds over the country as well**.
  - The low-pressure area at the centre of the **cyclone is far more powerful than any local system that can pull the monsoon winds moving northeast**.
  - The **cyclones that develop in the Arabian Sea impact the monsoon more** than those in the Bay of Bengal because the monsoon winds enter the Indian Peninsula from the western coast along the Arabian Sea.
- **Jet streams**
  - Currents of strong winds blowing west to east about five to seven miles above the surface of the earth, **jet streams cause changes in wind and pressure in the atmosphere**, pushing air mass around and affecting the world's weather.
  - It is believed that there is a **direct connection between the movement of subtropical jet streams and the Indian monsoon**.

Models of monsoons prediction

- **Until about the 2010,** the only method employed by the India Meteorological Department (IMD) to forecast the monsoon was **statistical models**.
  - These essentially involved **identifying climate parameters linked to the performance of the monsoon** — for instance, the sea surface temperature gradient between North Atlantic and North Pacific, the volume of warm water in the equatorial Pacific, the Eurasian snow cover.
  - This has, however, **proved wrong and the IMD missed its mark on forecasting** major droughts and rain-deficits — particularly 2002, 2004 and 2006.
- **Around 2015** IMD started **testing a dynamical system.** This simulates the weather at a chosen set of locations on a given day — the land and ocean temperature, moisture, windspeeds at various heights, etc — and **powerful computers calculate how these weather variables will change over days, weeks, months** by solving physics equations that show how each of these weather variables is related to each other.
  - IMD uses a new **Ensemble Prediction Systems (EPS)** to provide probabilistic weather forecasts up to the next 10 days.
  - Rather than long-range forecasts that only give a broad tenuous picture of the likely performance of the monsoon, these **shorter forecasts are far more reliable and help farmers make decisions about sowing.**

Madden-Julian Oscillation (MJO)

- The MJO wave is a global band of **low-pressure area moving periodically from West to East** and determines the initiation and intensity of low-pressure areas/depressions/cyclones and also oversees monsoon onsets under its footprint.
- It is disturbance of clouds, rainfall, winds, and pressure that traverses the planet **in the tropics (between 30° N and 30°S)** and returns **to its initial starting point in 30 to 60 days**, on average.
- The MJO consists of two parts, or phases:
  - In the **enhanced convective phase**, winds at the surface converge, and air is pushed up throughout the atmosphere. At the top of the atmosphere, the winds reverse (i.e., diverge). Such rising air motion in the atmosphere tends **to increase condensation and rainfall.**
  - In the **suppressed convective phase**, winds converge at the top of the atmosphere, forcing air to sink and, later, to diverge at the surface. As air sinks from high altitudes, it warms and dries, which **suppresses rainfall**.
- When **MJO is over the Indian Ocean** during the Monsoon season, it generally brings **good rainfall over the Indian subcontinent**. On the other hand, when it witnesses a **longer cycle and stays over the Pacific Ocean**, MJO brings **bad news for the Indian Monsoon.**



Factors which affected delay in Monsoon recently

Impact of MJO

- In month of June, MJO was in suppressed phase over Indian Ocean due to which the cloudiness quotient and rainfall activity over India have diminished.

Impact of Cyclonic formations

- The **cyclonic storm Vayu** that **formed over the Arabian Sea** impacted the advancement of monsoon into many parts of India.
- This phenomenon of delayed monsoon due to the emergence of cyclonic system was also seen **in 2015 when Cyclone Ashobaa had delayed the monsoon.**

Impact of warming waters

- According to US agency, unusually warm waters in the Arabian Sea have set up a rare band of easterly winds over the Indian Ocean, which has significantly delayed the monsoon onset over the Kerala coast.
- Unfavourable cross-equatorial flow over the Arabian Sea that aids in the progress of the monsoon is also the other reasons for its delay.

6.3.1. NEW MONSOON DATES

Why in News?

- India Meteorological Department (IMD) had decided to **revise the normal onset and withdrawal dates for the monsoon** in some parts of the country.

About Monsoon dates

- The four-month southwest monsoon season, which brings as much as 70 per cent of the country's annual rainfall, officially begins on June 1, with the onset over Kerala, and ends on September 30.
- India had been adhering to June 1 and September 1 as 'normal' reference dates for onset and withdrawal of monsoon ever since it was **last set in 1941.**
- It takes about a month and half after onset on the Kerala coast to cover the entire country.
- And about a month, beginning from the northwestern parts of the country on September 1, to withdraw completely.

Why was revision in normal dates needed?

- **Changes in precipitation patterns:** Reference dates back to 1940s and it needed to be revised.
- **Concentrated rainfall:** Rainfall is getting increasingly concentrated within a narrow band of days within the monsoon season.
- **Change in patterns of regional variations in rainfall:** Areas that have traditionally received plenty of rainfall are often remaining dry, while places that are not expected to get a lot of monsoon rain have sometimes been getting flooded.
- **Break in monsoon:** It has shifted to July from August. This has increased the amount of rainfall received during August.

About IMD

- IMD established in 1875 and headquartered in New Delhi, is under the **Ministry of Earth Sciences**.
- It is the principal agency responsible for **meteorological observations, weather forecasting and seismology**.
- IMD is also one of the six Regional Specialised Meteorological Centres of the World Meteorological Organization.

6.4. ATLANTIC MERIDIONAL OVERTURNING CIRCULATION (AMOC)

Why in news?

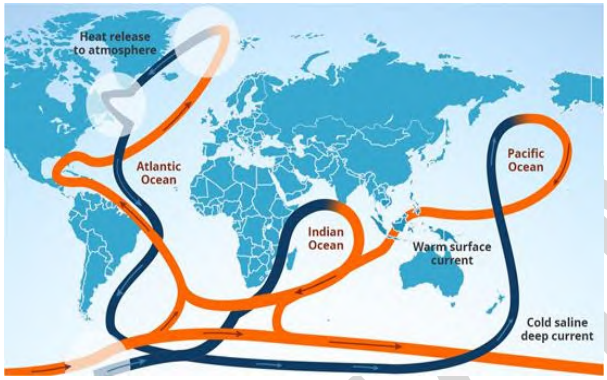
Recently, a study analysed that **warming up of the Indian ocean is likely to boost a system of currents in the Atlantic Ocean** (known as AMOC), that plays a key role in determining the weather across the world.

Thermohaline circulation

- These are **deep-ocean currents** driven by differences in the water's density, which is controlled by temperature (*thermo*) and salinity (*haline*).
- Thermohaline circulation **begins in the Earth's polar regions**. When ocean water in these areas gets very cold, sea ice forms. The surrounding seawater gets saltier, increases in density and sinks.
- The sinking water spreads around all the oceans.
- Surface water is pulled in to replace the sinking water, which in turn eventually becomes cold and salty enough to sink. This initiates the deep-ocean currents driving the global conveyer belt.

About Atlantic Meridional Overturning Circulation (AMOC)

- It is also known as **Atlantic Conveyor Belt.**
- It is part of the Earth's largest water circulation system known as **Thermohaline circulation.**
- It **transports a substantial amount of heat** from the Tropics and Southern Hemisphere toward the North Atlantic.
- It also aids in **absorbing and storing atmospheric carbon.**
- It has been observed that since the past 15 years, this circulation has been **weakening mainly due to global warming.**
- Changes in this circulation have a profound impact on the global climate system.
- These include changes in African and Indian monsoon rainfall, atmospheric circulation of relevance to hurricanes, and climate over North America and Western Europe.



6.5. ANTHROPOCENE EPOCH

Why in news?

Anthropocene Working Group (AWG) has voted in favour of designating a new geological epoch — **the Anthropocene.** The panel plans to submit a formal proposal for the new epoch by 2021 to the **International Commission on Stratigraphy**, which oversees the official geologic time chart.

About Anthropocene Epoch

- The term 'Anthropocene' was coined in 2000 by Nobel Laureate Paul Crutzen and Eugene Stoermer **to denote the present geological time interval in which human activity has profoundly altered many conditions and processes on Earth.**
- The phenomena associated with the Anthropocene include
  - **an order-of-magnitude increase in erosion and sediment transport** associated with urbanisation and agriculture,
  - marked and abrupt anthropogenic perturbations of the cycles of elements such as carbon,
  - environmental changes generated by these perturbations, including global warming, sea-level rise etc.
  - proliferation and global dispersion of many new 'minerals' and 'rocks' including concrete, fly ash and plastics, and the myriad 'technofossils' produced from these and other materials.

Geological Time Scale

- The geological time scale is the **"calendar" for events in Earth history.**
- It subdivides all time into named units of abstract time called—in descending order of duration—**eons, eras, periods, epochs, and ages**.
- The names of eras were chosen to reflect major changes of the development of life on the Earth: Paleozoic (old life), Mesozoic (intermediate life), and Cenozoic (recent life).
- Each period corresponds to significant events such as the break-up of continents, shifts in climate, and the emergence of particular types of animals and plant life.

ERA	PERIOD	EPOCH	BEGAN (Years ago)
Cenozoic	Quaternary	**ANTHROPOCENE**	??
		Holocene	11,700
		Pleistocene	2.5 M
	Tertiary	Pliocene	5.3 M
		Miocene	23 M
		Oligocene	34 M
		Eocene	56 M
		Paleocene	65.5 M
Mesozoic	Cretaceous		146 M
	Jurassic		200 M
	Triassic		251 M
Paleozoic			542 M
Proterozoic			4.5 B

6.6. DEEP OCEAN MISSION

Why in news?

India plans to launch **'Deep Ocean Mission'**.

About Deep Ocean Mission (DOM)

- It aims to explore the depths of the Ocean for the **possibilities of deep-sea mining**.
  - It would be an integrated programme where several scientific departments of the government such as ISRO, DBT, DST, DRDO and ICAR will work together for sustainable harnessing of ocean resources.
  - One of the main aims of the mission is to explore and extract polymetallic nodules.
- Its focus will be on **technologies** for deep-sea mining such as under water vehicles, under water robotics and ocean climate change advisory services, among others.
- Two key projects planned under DOM include a **desalination plant, powered by tidal energy** and a **submersible vehicle (Samudrayaan Project)** that can explore depths of at least 6,000 meters.

- 75000 sq km of area in the Central Indian Ocean has been allotted to India for deep sea mining by **International Seabed Authority (ISA).**

Samudrayaan Project by National Institute of Ocean Technology (an autonomous society under the Ministry of Earth Sciences)

- It proposes to send a submersible vehicle with three persons to a depth of about 6000 metres to carry out deep underwater studies.
- The indigenously developed vehicle is capable of crawling on the sea bed for 72 hours (Submarines go only about 200 metres).
- It is expected to be undertaken by 2021-22.

International Seabed Authority (ISA)

- It is an international organization established in 1994 under the **United Nations Convention on the Law of the Sea** to regulate mining and related activities in the international seabed beyond national jurisdiction.
- The ISA is headquartered in Kingston, Jamaica,
- **India is a member.**

Poly-Metallic Nodules (PMN)

- Polymetallic nodules, also called **manganese nodules,** are rock concretions formed of concentric layers of iron and manganese hydroxides around a core.
- They contain – nickel, copper, cobalt, manganese.
- Besides PMN contains iron, lead, molybdenum, cadmium, vanadium, titanium etc.
- India is the **first country** to have received the status of a **pioneer investor** in 1987 and was allocated an exclusive area in Central Indian Ocean Basin by United Nations (UN) for exploration and utilization of nodules.
- The program on PMN was initiated at CSIR-NIO with the collection of first nodule sample from Arabian Sea on board the first Research Vessel Gaveshani on 26 January 1981.

6.7. INCOIS LAUNCHES SERVICES FOR MARINE-BASED USERS

Why in news?

Indian National Centre for Ocean Information Services has launched three products to better cater to its users.

Three products include

- **Small Vessel Advisory and Forecast Services System (SVAS):**
  - It is to improve operations of the numerous small marine vessels, particularly fishing vessel by **warning about potential zones where vessel overturning can take place, ten days in advance.**
  - The warning system is based on **'Boat Safety Index' (BSI)** derived from forecast outputs such as wave height, wave steepness, directional spread and the rapid development of wind at sea.
- **The Swell Surge Forecast System:**
  - Designed for the **prediction of Kallakkadal or Swell Surge** that occurs along the Indian coast, particularly the west coast.
  - Kallakkadal (term used by Kerala fishermen) are **flash-flood events** that take place without any noticeable advance change in local winds or any other apparent signature in the coastal environment.
- **Algal Bloom Information Service (ABIS):**
  - It **provides near-real time information on spatio-temporal occurrence and spread of phytoplankton blooms** over the North Indian Ocean, which are detrimental to coastal fisheries and induce respiratory problems within the coastal population.
  - For this, **four regions have been identified as bloom hotspots**
    - ✓ North Eastern Arabian Sea
    - ✓ Coastal waters off Kerala
    - ✓ Gulf of Mannar
    - ✓ Coastal waters of Gopalpur (Odisha)

Indian National Centre for Ocean Information Services (INCOIS)

- INCOIS is an **autonomous organization under the Ministry of Earth Sciences** (MoES), established in 1999 at Hyderabad.
- It is a unit of **Earth System Science Organization (ESSO),** New Delhi. ESSO operates as an executive arm of the MoES for its policies and programmes.
- INCOIS is mandated to **provide ocean information and advisory services** to society, industry, government agencies and the scientific community.

6.8. INDIAN SCIENTIFIC EXPEDITION TO THE SOUTHERN OCEAN 2020

Why in News?

Recently, the 11th expedition of an Indian mission to the Southern Ocean, or Antarctic Ocean has been commenced.

About the Expedition

- It is a part of the **Indian Southern Ocean Research Program** which was initiated in 2004 when the pilot expedition took place onboard **ORV Sagar Kanya**. This is the **11th** such Expedition.
- This program was initiated by the **Ministry of Earth Sciences (MoES)** and is operated under **National Centre for Polar and Ocean Research (NCPOR).**

- A key objective of the mission is to quantify changes that are occurring and the impact of these changes on **large-scale weather phenomenon**, like the Indian monsoon, through tele-connection.

About NCPOR

- It was established as an autonomous Research and Development Institution of **the Ministry of Earth Sciences** in 1998.
- It is India's premier R&D institution responsible for the country's research activities in the Polar and Southern Ocean realms.
- The Centre is designated as the **nodal organization** for the co-ordination and implementation of the Indian Antarctic Programme.
- Year-round maintenance of the two Indian stations **(Maitri & Bharati)** in Antarctica is the primary responsibility of the Centre.

India's Permanent stations in Antarctica

- **Dakshin Ganga**
  - It was established in 1983 over the Ice shelf in Central Dronning Maud Land region.
  - The station was abandoned in 1990 as it got buried under snow.
- **Maitri -** It was established in 1988 on an ice free, rocky area on the Schirmacher Oasis.
- **Bharati**
  - It was commissioned in 2012 is located between Thala Fjord & Quilty bay, east of Stornes Peninsula in Antarctica.
  - It facilitates year-round scientific research activity by the Indian Antarctic program.

Related News – Thwaites Glacier

- It is a **glacier in Antarctic** which contains enough water to raise world sea level by more than half a metre.
- Thwaites is important for Antarctica as it slows ice behind it from freely flowing into ocean.
- Recently, Researchers have detected warm water at Thwaites's grounding zone.

6.9. MOSAIC EXPEDITION

Why in news?

- India's Vishnu Nandan was among 300 researchers to join the **Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC)** expedition.

Details

- MOSAiC expedition is a one-year-long expedition into the Central Arctic, planned to take place from 2019 to 2020.
- Led by the **Alfred Wegener Institute in Germany**, with scientists from 19 countries, this is **the largest ever Arctic expedition** in history**.**
- The **objective** of the expedition is to measure 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.

India at Arctic

- India has set up an underground observatory, called **IndARC**, at the Kongsfjorden fjord, half way between Norway and the North Pole.
- Indian Arctic station **'Himadri'** is located at NyAlesund, Spitsbergen Island, Norway and serves as a hub of Indian scientific investigations.

6.10. MISCELLANEOUS

6.10.1. MOUNT ETNA & MOUNT SINABUNG ERUPTIONS

- **Mount Etna:** is an **active composite volcano** on the east coast of Sicily, Italy.
- **Mount Sinabung:** It is a **composite volcano** in the Karo plateau of Karo Regency, North Sumatra, Indonesia.
- Indonesia has nearly 130 active volcanoes, more than any other country.

Other Recent Major Volcanic eruptions	
Volcanic Eruption	**Region**
Mayotte Island	France, Western Indian Ocean
Mount Agung	Indonesia
Mount Soputan	Indonesia
Anak Krakatau island	Indonesia

6.10.2. SARGASSO SEA

- Recently it was found that **Sargasso seaweed algae belt is increasingly growing**.
- It is named for a genus of **free-floating seaweed** called **Sargassum**.
- While there are many different types of algae found floating in the ocean all around world, the Sargasso Sea is unique in that it harbors **species of sargassum that are 'holopelagi'** - this means that the algae not only freely floats around the ocean, but it reproduces vegetatively on the high seas.
- The Sargasso Sea lies **within the Northern Atlantic Subtropical Gyre.** While all other seas in the world are defined at least in part by land boundaries, the Sargasso Sea is **defined only by ocean currents.**
  - The **Gulf Stream** establishes the Sargasso Sea's western boundary, while the Sea is further defined to the north by the **North Atlantic Current**, to the east by the **Canary Current**, and to the south by the **North Atlantic Equatorial Current.**

6.10.3. NORTHERN EUROPEAN ENCLOSURE DAM (NEED)

- Recently, a Dutch government's proposal to **build two mega dams to separate the North Sea from the Atlantic Sea**, is being hailed as a future solution to **defend northern Europe from rising sea levels**.
- **Northern European Enclosure Dam (NEED)** is a set of two proposed dams in the English Channel between:
  - Scotland and Norway: **NEED-North** France and England: **NEED-South**
- It would cut off the **North and Baltic Seas from the Atlantic Ocean**.
- When completed, it would be the longest dam in the world.
  - NEED would lock Europe's four busiest ports—Rotterdam, Antwerp, Bremerhaven, Hamburg—behind a huge dam. New harbours would need to be built on the exterior of the dams to accommodate the volume of traffic to the interior ports.

6.10.4. ANTHROPOGENIC MINERAL

- They are mineral that have been made on Earth, of substances formed as a **result of human activities** such **as mining and mineral processing.**
- There are about **208 human-made minerals** which have been approved as minerals by the International Mineralogical Association.
- Example of Anthropogenic mineral:
  - **Hydrotalcite** are produced when asbestos tailings passively **absorb atmospheric carbon dioxide.**
- Other type is **True mineral** which is **naturally occurring** and **formed by geological processes either on Earth or in outer-space.** True minerals comprise the majority of the approximately 5,200 known minerals.
  - **Edscottite,** recently in news, was discovered after an examination of the Wedderburn Meteorite, a metallic-looking rock found in Central Victoria back in 1951. It is made **of iron and carbon,** and was likely formed within the core of another planet.

6.11. OTHER PLACES IN NEWS

Kaleshwaram Lift Irrigation Project (KLIP)	• It is a multi-purpose irrigation project **on the Godavari River** in Kaleshwaram, Telangana. • It is **world's largest multi-stage lift irrigation project;** its farthest upstream influence is at the confluence of the Pranhita and Godavari rivers. • **Telangana has requested the Centre to treat KLIP as a National Project** and make adequate provision for it in the Union Budget for 2020-21.
Jayakwadi Dam	• It is located near **Aurangabad, Maharashtra.** • It is built across the **Godavari River with a purpose to solve the irrigation problem in the region.**
Ujh Multipurpose (National) Project, Jammu & Kashmir	• Project is planned to be constructed in Kathua District of J&K on the **River Ujh which is a major tributary of River Ravi.** • It will enhance utilization of waters of Eastern Rivers allotted to India as per the **Indus Water Treaty** by utilizing the flow that presently goes across border unutilized.
Burhi Dihing river	• River Burhi Dihing is one of the important **south-bank tributaries of the Brahmaputra.** It flows through the major coal belt and some oil fields of north-east India and its drainage basin lies in the states of Assam and Arunachal Pradesh. • Recently an oil spillage has occurred over the river which caught fire.