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TARGET 2020

ENVIRONMENT & GEOGRAPHY II

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TARGET 2020
ENVIRONMENT & GEOGRAPHY - II
(JANUARY 2020 TO MARCH 2020)

ENVIRONMENT

1. POLLUTION

1.1 Smog towers

- First ever smog tower has been installed in New Delhi, Smog towers are structures designed to work as large-scale air purifiers.
- They are usually fitted with multiple layers of air filters, which clean the air of pollutants as it passes through them.
- The smog tower installed in Delhi is capable of treating 6,00,000 cubic meters of air per day and can collect more than 75 per cent of particulate matters (PM) 2.5 and 10.
- After the cleaning, the tower releases clean air, it will focus on reducing particulate matter load.
- The filters installed in the tower will use carbon nanofibers as a major component and will be fitted along its peripheries.
- The project is a collaboration between the Indian Institute of Technology (IIT) Bombay, IIT-Delhi and the University of Minnesota.
- The Central Pollution Control Board (CPCB) will also be involved with the project.
- Similar to this china, has two smog towers in its capital Beijing and in the northern city of Xi'an.

1.2 Scrubbers in Ships

- Scrubber systems are a diverse group of air pollution control devices that can be used to remove some particulates and/or gases from industrial exhaust streams.
- The International Maritime Organization's (IMO) adopted the International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI in 2008 that regulates the prevention of air pollution from ships and prohibits deliberate emissions of ozone-depleting substances such as Sulphur oxides and nitrous oxides.
- Following the adoption, exhaust scrubbers have become one of the most preferred ways of reducing Sulphur exhaust as they 'scrub' pollutants out of emissions.
- However, out of the two types those are being used widely, while closed-loop scrubbers retain the Sulphur emissions for safer disposal at port, open-loop scrubbers release pollutants back in the sea after turning the Sulphur dioxide into sulphuric acid.
- According to recent reports, there has been a huge increase in the use of open-loop scrubbers in Indian ships in just last one year.
- The IMO it approves the use of open-loop scrubbers, deeming them as an 'equivalent' – which is defined as 'any fitting, appliance or apparatus to be fitted in a ship or other procedures, alternative fuel oils, or compliance methods used as an alternative'.
- However, it has strict guidelines for discharge of wash water from exhaust gas cleaning systems.

1.3 Thermal Coal

- Thermal coal, also known as steam coal, is used for power and heat generation.
- In electricity generation, thermal coal is ground to a powder and fired into a boiler to produce heat, which in turn converts water into steam, the steam is used to move turbines to generate electricity.

- They usually have high ash content ranging from as low as 20% to as high as high as 50%.
- In Indian coal industry the Non-Coking coal grades have been categorized into 17 bands according to their Gross Calorific Value.
- As per ranks of the coal the Peat, Lignite and Sub-Bituminous ranges of coal are usually used as Thermal Coal.
- Metallurgical coal/Coking Coal on the other hand is used in metallurgical process such as in smelting of Iron to make steel.
- They are usually used both as fuel and reducing agent in the form of coke.
- Coke is a porous, hard black rock of concentrated carbon that is created by heating bituminous coal without air to extremely high temperatures.
- The coal is baked in a coke oven which forces out impurities to produce coke, which is almost pure carbon.
- These kinds of coal are usually low in ash, Sulfur and Phosphorous Content.
- Although ash content can be regulated by washing process, low contents of sulfur and phosphorous are necessary as they tend to migrate to metals.
- Union Coal and Mines Ministry announced it will stop importing thermal coal from Financial Year 2023-24.
- The move is taken after government's plan to achieve 1 billion tons (BT) coal production target by Coal India Limited (CIL) by Financial Year 2023-24.
- The Ministry of Coal will coordinate with Indian Railways and Shipping Ministry and enable CIL, Captive and Commercial Miners evacuate more coal by 2030.

1.4 Ban on CFL Lamps

- Kerala state announced it will impose a ban on the sale of compact fluorescent lamps (CFL) and incandescent (filament) bulbs starting November this year as part of sustainable energy policy.
- The state administration in its budget also added that streetlights and bulbs in government offices across the state will be converted to light-emitting diode (LED) bulbs.
- The announcement is in line with the government project of 'Filament-free Kerala' envisaged in 2018 as part of the state's Urja Kerala mission.
- LED bulbs are energy-efficient than filament or CFL bulbs and will, therefore, generate less waste.
- Also, filament bulbs contain the mercury element which, when broken, is polluting in nature.
- The filament-free Kerala project will be implemented by the Kerala State Electricity Board (KSEB) and the Energy Management Centre, Kerala.
- Consumers in the state can place orders for LED bulbs on the KSEB website in exchange for existing filament bulbs.

1.5 Draft on Reverse Osmosis (RO) Systems

- Reverse osmosis is a water purification process that uses a partially permeable membrane to remove ions, unwanted molecules and larger particles from drinking water.
- Environment ministry issued a draft notification to prohibit use of reverse osmosis (RO) purifiers where total dissolved solids (TDS) in water are below 500 milligrams per liter.
- The draft is based on NGT's to ban RO purifiers in areas, which get potable drinking water.
- It also said water from RO purification system for domestic use would be "used only for drinking purpose".
- Once the rules are finalized, RO machine manufacturers will have to tweak their designs to meet the new parameters so that the system does not discharge water beyond the prescribed limit during the purification process.
- BIS will develop a system to monitor, assess and certify in consultation with the Central Pollution Control Board (CPCB) within six months of final notification.
- Enforcement will largely be the responsibility of CPCB and State Pollution Control Boards (SPCBs).

- Final notification on banning RO purifiers and parameters on design of such machines will be issued after examining the views of all stakeholders, including manufacturers.

1.6 Arsenic Contamination

- Arsenic is a chemical element occurs in many minerals, usually in combination with sulfur and metals.
- About one third of the arsenic in the atmosphere comes from natural sources, such as volcanoes, and the rest comes from man-made sources.
- Arsenic compounds can be used to make special glass and preserve wood.
- According to the World Health Organization, long-term exposure to arsenic, mainly through drinking water and food, can lead to poisoning.
- Skin lesions and skin cancer are the most characteristic effects.
- Several studies have shown that arsenic from groundwater and the soil can enter the food chain through paddy.
- West Bengal is among the States with the highest concentration of arsenic in groundwater

1.7 World Air Quality Report 2019

- World Air Quality Report is released by the pollution tracker IQAir and Greenpeace.
- The ranking is based on a comparison of PM 2.5 levels.
- According to the recent report Bangladesh emerged as the most polluted country for PM 2.5.
- Pakistan, Mongolia, Afghanistan and India followed behind respectively.
- PM 2.5 includes pollutants such as sulfate, nitrates and black carbon. Exposure to such particles has been linked to lung and heart disorders and can impair cognitive and immune functions.

MOST POLLUTED CITIES IN 2019

Rank	City	PM2.5 (micrograms/cu. m)
1	Ghaziabad (India)	110.2
2	Hotan (China)	110.1
3	Gujranwala (Pak)	105.3
4	Faisalabad (Pak)	104.6
5	Delhi (India)	98.6
6	Noida (India)	97.7
7	Gurgaon (India)	93.1
8	Raiwind (Pak)	92.2
9	Greater Noida (India)	91.3
10	Bandhwari (India)	90.5

1.8 Legacy Waste

- Legacy wastes are the wastes that have been collected and kept for years at some barren land or a place dedicated for Landfill (an area to dump solid waste).
- Legacy wastes not only occupy large space, but also become a breeding ground for pathogens, flies, malodours and generation of leachate, which may lead to water contamination.
- They also contribute to generation of greenhouse gases and pose risk of uncontrollable fire.
- This waste can be roughly grouped into four categories:
  1. Contained and/or stored waste (contained or stored waste are wastes in tanks, canisters, and stainless steel bins).
  2. Buried waste.
  3. Contaminated soil and groundwater
  4. Contaminated building materials and structures.
- Bio-mining method has been proposed by the Central Pollution Control Board (CPCB) for the effective disposal of legacy wastes.
- Recently, the National Green Tribunal (NGT) has directed a committee to assess the amount of damage caused to the environment due to the dump sites (legacy waste) in Delhi.
- The committee comprises representatives from the Central Pollution Control Board, National Environmental Engineering Research Institute (NEERI) and IIT Delhi.

1.9 Biomining

- Biomining or bioremediation 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.
- It is usually used for old dumped waste that remains in a partly or fully decomposed state with no segregation in existence between wet and dry waste.
- In the cost effective method of bioremediation, treatment is done by dividing the garbage heap at the site into suitable blocks to let the air percolate in the heap.
- As a result, the leachate which is the water in the heap with suspended solid particles is drained off and microbes are sprayed in the heap to initiate biological decompositions.
- The waste is turned over several times in order to devoid the waste to leachate as much as possible.
- This biological decomposition of the waste decreases the volume of the waste by 40%.

1.10 Hazardous Contamination

- According to recent update of Central Pollution Control Board (CPCB), there are 128 sites in India contaminated by toxic and hazardous substances.
- West Bengal led the list with 27 sites followed by Odisha at 23.
- Including those, there are 324 sites that may be contaminated, with 196 still awaiting an investigation and confirmation.
- Twenty sites in 6 States have seen agencies prepare a detailed project reports, or a plan of action, to clean up sites.
- Such action follows orders by the National Green Tribunal (NGT).
- There are four such sites in
    1. Kerala (Eloor-Edayar),
    2. Odisha (Ganjam, Orichem)
    3. Tamil Nadu (Ranipet),
    4. Uttar Pradesh (Rania, IPL and Deva Road),
    5. West Bengal (Nibra village),
    6. Madhya Pradesh (Ratlam).
- Types of contamination are as follows
    1. Oil contamination - These incidents include oil contamination due to leakage of underground oil pipelines of Bharat Petroleum Corporation Limited in Tamil Nadu,
    2. Pesticide and heavy metal contamination in creeks at Eloor, Kerala.
    3. Chromium contamination at Rania, due to improperly disposed electronic waste lying on the banks of river Ramganga, Moradabad.
    4. Mercury contamination of the soil at Kodaikanal, Tamil Nadu, and Ganjam, Odisha.

1.11 Paraquat Poisoning

- The VIMSAR, a major public healthcare center for western Odisha and parts of Chhattisgarh and Jharkhand, has many deaths cases of farmers, since September 2017.
- The reason behind these deaths is the consumption of Paraquat — a herbicide used in agricultural fields.
- Paraquat is a toxic chemical that is widely used as an herbicide (plant killer), primarily for weed and grass control.
- “Paraquat consumption leads to pulmonary fibrosis and patients find difficulty in respiration, similarly kidney failures occur.

- Even if a person survives, he will not be fully fit as pulmonary fibrosis worsens with the passage of time and Paraquat does not have antidote.
- The vast majority of the population in western Odisha and its bordering districts in Chhattisgarh are dependent on agriculture.
- Crop failures and family disturbances often drive people to look for poison to commit suicide and Paraquat, which is easily available at homes as well as in neighbourhood shops, becomes an "obvious" choice.
- There have also been cases of people becoming accidental victims when they absorb Paraquat while sprinkling it in agricultural fields.

1.12 Yellow Rust Disease

- Indian Institute of Wheat and Barley Research (IIWBR) issued an advisory about Yellow Rust detected in wheat crops in parts of Punjab and Haryana.
- Yellow Rust disease appears as yellow stripes of powder or dust on leaves and leaf sheaths of the wheat crop.
- This yellow powder comes out on clothing or fingers when touched.
- The disease can spread rapidly under congenial conditions and affects crop development, and eventually the yield.
- This occurs when the rust colonies in the leaves drain the carbohydrates from the plant and reduce the green leaf area.
- According to the IIWBR advisory, fungicides will help to contain this disease.
- In India, it is a major disease in the Northern Hill Zone and the North-Western Plain Zone and spreads easily during the onset of cool weather and when wind conditions are favourable.
- Rain, dew and fog favour the disease's development.
- A new variety of wheat called HD-3226 or PusaYashasvi released by the Indian Agricultural Research Institute, has higher levels of resistance against major rust fungi such as the yellow/stripe, brown/leaf and black/stem.

1.13 NGT Order on Fly Ash

National Green Tribunal asked thermal power plants to take prompt steps for scientific disposal of fly ash.

- It also warned that the failure to do so would entail a penalty.
- The bench of NGT said difficulties pointed out by the plants are of no relevance.
- Those difficulties are to be resolved by the administration and not by the victims of pollution whose rights are being affected.
- The bench said there is no discretion available with this tribunal to dispense with the mandate of law and statutory provisions are binding on every thermal power plant without any exception.
- The order is in accordance with the statutory notification issued by the Ministry of Environment and Forest under the provisions of Environment Protection Act.
- The act requires 100% utilisation and disposal of fly ash.
- The bench said that the statutory provisions are binding on every thermal power plant without any exception.

1.14 'Reef Toxic' Sun Cream

Palau became the first country to ban 'reef toxic' sun cream.

- Toxic sunscreen chemicals have been found throughout Palau's critical habitats, and in the tissues of its most famous creatures.
- The ban prohibits sun cream containing any of 10 ingredients. The list includes oxybenzone and octinoxate, which absorb ultraviolet light.
- The island nation markets itself as a "pristine paradise" for divers.

- A lagoon in Palau's Rock Islands is a Unesco World Heritage site.
- The country has a population of around 20,000 dotted across hundreds of islands.
- Other places to announce bans include the US Virgin Islands and the Dutch Caribbean island of Bonaire.

2. RENEWABLE ENERGY

2.1 Reverse Bundling Scheme

The Ministry of New and Renewable Energy recently proposed 'reverse bundling' scheme for balancing between coal-fired power and renewables.

- In 2015, the government had come up with a plan to 'bundle' solar energy with the then cheaper coal generation.
- The idea was to push sales of renewable power through a market-driven approach.
- The 'bundling' mechanism soon became obsolete as renewable energy cost started falling dramatically.
- The cost of electricity using solar photovoltaic fell to $38 per megawatt hour which is 14% lower than cost of coal-fired power in 2019.
- A new proposal now seeks to flip the 'bundling' scheme by using cheap renewable energy to subsidise costlier coal-fired power.
- It aims to ensure uninterrupted round-the-clock electricity.
- Under 'reverse bundling', "high cost thermal power" is bundled with cheaper renewable energy to overcome the 'intermittent-ness' of green power.
- The draft policy stipulates supply of 51% renewable energy with or without energy storage bundled with 49% thermal power component.
- **Concerns -** The tariff for this bundled electricity could work out to be much higher instead of a simple average of cheap renewables and costlier coal supply.
- This is because renewable energy can only be supplied for 6-8 hours.
- On the other hand, battery storage plus thermal plants will cover power supply for the remaining 18-14 hours in a day.
- The cost of battery storage, although falling rapidly, could raise power tariff when supplying for several hours together.
- The high charge for a fixed amount of standby thermal power capacity needed for bundling will further add to the combined tariff.
- Coal power generators in the country are evading deadlines year after year to retrofit their plants with emission controlling systems.
- Given this, using renewable energy to lower tariff of polluting power counters the climate objectives.
- Also, if thermal power is bundled with renewable energy without storage, the coal-fired capacity will have to be ramped up and down throughout the day.
- Otherwise, it has to be shut for a part of the day depending on renewable generation.
- This may not benefit the coal-fired projects due to inefficient operation.
- The capacity utilisation factor (CUF) of a solar project is only 20%.
- If 80% power is supplied from thermal capacity, the mechanism is still workable because the coal-fired plants will be utilised to a larger extent.
- Instead, necessitating renewables to form a 51% share of supply will make bundled power tariff expensive.
- The inability of power distribution companies (discoms) to buy enough electricity due to their poor financial health is at the centre of the tussle between renewables and coal-fired power.
- Simultaneously, coal thermal capacity utilisation has constantly been falling throughout the year.

- Reverse bundled power will thus have to face the test of being attractive to discoms, which cannot be forced to buy it.

2.2 National Renewable Energy Database

- A national renewable energy database could be developed in order to help the policymakers and developers.
- For the former, it helps for them to make effective evidence-based interventions. For the latter, it can be a valuable tool to source capital at scale on favourable terms.
- **India's current status -** India has come a long way in its efforts to **decarbonise electricity generation.**
- Installed solar and wind capacity has now crossed 68 GW, compared to a modest 16 GW in 2010.
- From a utility-scale solar perspective, India already ranks the third largest market globally, after China and the US.
- Enabling policies and interventions is vital to any business generating returns over an extended time period, but requiring vast upfront capital investment.
- Renewable energy (RE) is no different from other infrastructure classes in the above respect.
- There are two complementary aspects which sets RE apart, they are,
    1. The **scale of the ambition** set by the government, and
    2. Its **unique operating profile** on the other.
- Taken together, these two aspects combine to form the perfect setting for the effective harvesting of data.
- **Each project SPV generates** electricity, and also another extremely valuable commodity, i.e. **information**.
- Appropriately harvesting and disseminating this information can profoundly **impact the pace of deployment** of RE capacities in India.
- It means that the information that investors require from any project SPV is surprisingly modest in scope.
- It comprises a specific **mix of techno-commercial data**, including but not limited to grid availability, which can be correlated against variables such as PPA tariffs and offtaker identity.
- This information is indirectly **embedded in the annual accounts** that individual project SPVs file with the ministry of corporate affairs.
- Such accounts are readily available in the public domain.
- **Challenges -** Even though the data is available in the public domain, the challenge is that the **relevant data points are not easily extractable**.
- Existing databases aggregate information at state, distribution company or developer-level on the basis of voluntary and selective contributions.
- This information **fails to match the granular detail** that project SPV-level data contributions would provide.
- Investors have backed the deployment of sizeable RE capacities in India despite a discernible gap between the **type of information** valued by them and what is readily available.
- Multiple refinements to RE policymaking are under development to facilitate future deployments.
- These will undoubtedly play a crucial role in mobilising the investment flow.
- However, they are **unlikely to achieve their potential** in an information vacuum.

2.3 I-CUBE

- I-Cube is a multi-stakeholder collaborative platform to catalyze ideas on renewable energy, works under IRIX Portal.
- It represents an out-of-the-box process that triggers ideas, encourages innovation and enables incubation.

- I-Cube framework follows a multi-pronged approach from concept to reality implementation of an idea that contributes to the sustainable development of the renewable energy eco-system, helping reduce dependence on fossil fuels.
- This platform aims to bring together industry experts, relevant members of the Global RE community, relevant entrepreneurs and policymakers to drive exponential adoption of innovation in the renewable energy space

2.4 Mission 175

- Mission 175 is a global platform to explore strategies for development and deployment of renewables.
- It is hosted by the Ministry of New and Renewable Energy (MNRE), the event showcases India's renewable energy potential and the Government's efforts to scale up capacity to meet the national energy requirement in a socially, economically and ecologically sustainable manner.
- In the year 2015, the Government of India announced a target for 175 GW cumulative renewable power installed capacity by the year 2022.
- Ahead of COP 21, India submitted its Intended Nationally Determined Contribution (INDC) to the UNFCCC, outlining the country's post-2020 climate actions.
- India's INDC builds on its goal of installing 175 Gigawatts (GW) of renewable power capacity by 2022 by setting a new target to increase the country's share of non-fossil based installed electric capacity to 40 percent by 2030.

2.5 AkshayUrja Portal

- AkshayUrja Portal is launched by Ministry of New and Renewable Energy.
- The energy such as Solar Energy, Wind energy, hydroelectrical power are few example of AkshayUrja.
- The portal aims to develop ways to use akshayurja or renewable energy more efficiently.
- It promotes innovation to adopt renewable energy sources to produce power for the electricity grid and for several standalone applications and decentralized power production.

2.6 India Renewable Idea Exchange (IRIX) Portal

- India Renewable Idea Exchange IRiX is a real-time idea exchange platform for the Global RE community.
- It empowers to ideate, innovate and incubate in the renewable energy sector.
- It is launched by Ministry of New and Renewable Resources.

3. CLIMATE CHANGE

3.1 Phasing out HCFC-141 b

- Hydro chlorofluorocarbon (HCFC)-141 b, which is a chemical used by foam manufacturing enterprises and one of the most potent ozone depleting chemical after Chlorofluorocarbons (CFCs) .
- (HCFC)-141 b is used mainly as a blowing agent in the production of rigid polyurethane (PU) foams.
- India had proactively and successfully taken the challenge of complete phase out of Hydro chlorofluorocarbon (HCFC)-141 b, by 1.1.2020.
- In 2019 December, Ministry of Environment, Forest and Climate Change (MoEFCC) brought out a notification in the Gazette of India through which the issuance of import license for HCFC-141b is prohibited from 1st January, 2020 under Ozone Depleting Substances (Regulation and Control) Amendment Rules, 2019 issued under the Environment (Protection) Act, 1986.
- HCFC-141b is not produced in the country and all the domestic requirements are met through imports.
- With this notification, prohibiting the import of HCFC-141 b, the country has completely phased out the important ozone-depleting chemical.

- Nearly, 50 % of the consumption of ozone depleting chemicals in the country was attributable to HCFC-141 b in the foam sector.
- The phase out of HCFC-141b from the country has twin environmental benefits viz.
  (i) Assisting the healing of the stratospheric ozone layer, and
  (ii) Towards the climate change mitigation due to transitioning of foam manufacturing enterprises at this scale under HPMP to low global warming potential alternative technologies

3.2 1t.org

- World Economic Forum, Davos has launched a global initiative to grow, restore and conserve 1 trillion trees around the world - in a bid to restore biodiversity and help fight climate change.
- The initiative aims to unite and promote reforestation efforts worldwide through fund mobilization and political support.
- The 1t.org (https://www.1t.org/) project aims to unite governments, non-governmental organizations, businesses and individuals in a "mass-scale nature restoration".
- 1t.org offers innovative technologies, which will serve to connect tens of thousands of small and large groups around the world that are engaged in tree planting and forest restoration.

3.3 BEE's Star Rating Programme

- The Bureau of Energy Efficiency is a statutory body under Ministry of Power.
- It was created in 2002 under the provisions of the nation's 2001 Energy Conservation Act.
- The agency's function is to develop programs which will increase the conservation and efficient use of energy in India.
- The Star Labeling Programme has been formulated by Bureau of Energy Efficiency, as part of its mandate, under the Energy Conservation Act, 2001.
- Under this Programme, BEE has covered 24 appliances till date wherein 10 appliances are under mandatory regime.
- Recently BEE has expanded the coverage by including Energy Efficient "Deep Freezers" and "Light Commercial Air Conditioners (LCAC)".
- Through launch of these two new appliances under voluntary regime, 26 appliances would now be covered under this programme.
- The Star Labeling Programme for Deep Freezer and LCAC has been launched on a voluntary basis and the energy consumption standards will be effective up to 31st December 2021.
- Deep freezer and LCAC are major energy guzzlers in commercial space, therefore, it is imperative that these two appliances shall be included in the program to save energy and reduce CO_2 emission.
- With these two products only, a total savings of around 9 Billion units of electricity is expected to be saved for the country by FY 2030.

4. ENVIRONMENTAL ORGANISATIONS, CONVENTIONS & TREATIES

4.1 Convention on the Conservation of Migratory Species of Wild Animals

- The Convention on the Conservation of Migratory Species of Wild Animals, also known as the Convention on Migratory Species or the Bonn Convention.
- It is an international agreement that aims to conserve migratory species within their migratory ranges
- Conference of Parties (COP) of the Convention on the Conservation of Migratory Species of Wild Animals (CMS) was organized from February 17 to 22 in Gandhinagar, Gujarat.
- CMS is an environment treaty under the United Nations Environment Programme (UNEP).
- There are 130 parties to the convention and India has been a member since 1983.
- India hosted the 13th COP of CMS at Gandhinagar, Gujarat.
- Theme - "Migratory species connect the planet and we welcome them home"
- Mascot - "Gibi - The Great Indian Bustard"

Migratory Species

- Migratory species are those animals that move from one habitat to another during different times of the year, due to various factors such as food, sunlight, temperature, climate, etc.
- The movement between habitats, can sometimes exceed thousands of miles/kilometres for some migratory birds and mammals.
- A migratory route can involve nesting and also requires the availability of habitats before and after each migration.

Highlights

- It is the first of a series of international nature-related meetings in 2020 which adopted a new global biodiversity strategy for the next decade - Post-2020 Global Biodiversity Framework
- In COP 13, the first ever report on the Status of Migratory Species was presented.
- It adopted the Gandhinagar Declaration which calls for migratory species and the concept of 'ecological connectivity' to be integrated and prioritized in the new Framework.
- CMS Ambassadors Programme was relaunched for terrestrial, avian and aquatic species.
- Seven Migratory Species Champions - Germany, India, Italy, Monaco, Norway, the EuropeanCommission, and the Environment Agencywere acknowledged for their generous contributions to CMS initiatives.
- Ethiopia joined the CMS Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia (Raptors MOU).
- Ethiopia is a strategically important country for the conservation of migratory birds of prey given its location across the East African flyway.
- This was the first CMS COP to be inaugurated by a host-country Head of Government.
- India has been designated the President of the COP for the next three years (till 2023).
- India is home to several migratory species of wildlife, including the snow leopard, Amur falcons, bar- headed geese, black-necked cranes, marine turtles, dugongs and hump-backed whales.
- The government of India has been taking necessary actions to protect and conserve migratory marine species.
- Seven species that include Dugong, Whale Shark, Marine Turtle (two species), have been identified for preparation of Conservation and Recovery Action Plan.

4.2 India's Proposals at CMS

India has proposed inclusion of some species on Appendix-I of the UN Convention on the Conservation of Migratory Species of Wild Animals (CMS) during 13th COP held in Gandhinagar, Gujarat.

- **India's proposals -** Those species that India wants to include are the Great Indian bustard, Asian elephant and Bengal florican.

- It was accepted by a committee at the 13th Conference of the Parties to CMS (CMS COP13) held in India for the first time.
- [Appendix-I lists species threatened with extinction.
- Appendix-II lists those species in need of global cooperation for favourable conservation status.]
- If listed on Appendix-I, it would facilitate trans-boundary conservation efforts of these species.
- **Procedure** - Listing generally leads to concerted actions in different national jurisdictions in which a species ranges.
- Actions may include cooperation among range countries, harmonization in policies etc through regional agreements.
- CMS has **working groups** specializing in various fauna families.
- It also has a **Scientific Council** that advises research-based solutions for conservation.
- Many countries started shifting towards renewable energy by building infrastructure like wind turbines, solar parks; these pose risks to wildlife.
- CMS set up in 2014 an **Energy Task Force** that advises contracting parties on how to keep their energy projects wildlife-friendly.
- **Implications** - If the plenary eventually adopts these proposals and the listing goes through, a formal regional cooperation among range countries would become possible.
- Once the listing is done, contracting parties within the range of a species are obliged to cooperate in trans-border conservation efforts.
- Bangladesh welcomed the proposals on the elephant and the florican.
- However, Pakistan did not express any views on the proposal on the great Indian bustard.
- Conservation efforts would also gain from the international expertise of the CMS family.
- It could increase pressure on Pakistan for preventing alleged hunting of the great Indian bustard.
- **Other Proposals** - Besides the three species, proposals have been moved for including **seven other species** for listing on CMS Appendices.
- Jaguar, Little Bustard, Antipodean Albatross and the Oceanic White-tip Shark in Appendix I and The Urial, Smooth Hammerhead Shark and the Tope Shark in Appendix II.
- COP13 also discussed marine noise pollution, plastic pollution, light pollution, insect decline etc.
- India has also signed a non-legally binding MOU with CMS on the conservation and management of Siberian Cranes (1998), Marine Turtles (2007), Dugongs (2008) and Raptors (2016).

Asian Elephant

- The Government of India has declared Indian elephant as National Heritage Animal.
- The Indian elephant is also provided with the highest degree of legal protection by listing it in Schedule I of the Wildlife (Protection) Act, 1972.
- Mainland Asian elephants/Indian elephants migrate over long distances in search of food and shelter, across States and Countries.
- Some elephants are resident while others migrate regularly in annual migration cycles; proportion of resident and migratory populations depends upon, size of regional populations, as well as on extent, degradation and fragmentation of their habitats.
- Recently Indian elephant is placed under in Schedule I of the CMS Convention, which will fulfil natural urge of migration of Indian elephant across India's borders and back safely and thereby promote conservation of this endangered species for our future generations.

Great Indian Bustard

- The Great Indian Bustard, an iconic, critically endangered (under IUCN Red List) and conservation dependent species.

- The Great Indian Bustard is a Critically Endangered species with a small population of about 100–150 individuals that are largely restricted to the Thar Desert in Rajasthan, India.
- The species has disappeared from 90% of this range; their population has reduced by 90% within 50 years (six generations); and their threats are expected to increase in future.
- It exhibits transboundary movements, and its migration exposes it to threats such as hunting in boundary area of Pakistan-India and power-line collisions in India.
- Recently it has been included in Appendix I of CMS, which will aide in transboundary conservation efforts facilitated by International conservation bodies and existing international laws and agreement.

Bengal Florican

- The Bengal Florican an iconic, critically endangered species of topmost conservation priority.
- It exhibits transboundary movements, and its migration exposes it to threats such as land-use changes, collision with power transmission line at boundary area of India-Nepal and probable power-line collisions.
- Populations have declined as a result of habitat loss, hunting and the species no longer breeds outside Protected Areas in the Indian subcontinent, except in a few areas of Assam.
- The bird has been included in Appendix I of CMS, which will aid in transboundary conservation efforts facilitated by International conservation bodies and existing international laws and agreement.

4.3 Appendix 1 of CITES

- CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora, also known as the Washington Convention) is a multilateral treaty to protect endangered plants and animals.
- It was drafted as a result of a resolution adopted in 1963 at a meeting of members of the International Union for Conservation of Nature (IUCN).
- The convention was opened for signature in 1973 and CITES entered into force on 1 July 1975.
- Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species in the wild, and it accords varying degrees of protection to more than 35,000 species of animals and plants.
- Appendix I of CITES, has about 1200 species, are species that are threatened with extinction and are or may be affected by trade.
- Commercial trade in wild-caught specimens of these species is illegal (permitted only in exceptional licensed circumstances).
- India has planned to include the Asian Elephant and the Great Indian Bustard in the list of species that merit heightened conservation measures.
- The Union Environment Ministry reports India as having 29,964 elephants according to the Project Elephant Census in 2017.
- The pachyderm merits the highest level of protection, or Schedule 1, under the Wildlife Protection Act.

4.4 Tropical Forest Alliance

- TFA 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.
- This project is part of the World Economic Forum's Shaping the Future of Global Public Goods Platform
- The Alliance includes more than 150 partners representing the private sector, governments, civil society organizations, indigenous peoples groups and multilateral organizations.
- TFA is funded by the governments of Norway, the United Kingdom and the Netherlands, and hosted at the World Economic Forum.
- Avoiding further deforestation could reduce carbon dioxide emissions by three to four billion metric tons per year.

- Natural climate solutions represent more than 30% of cost effective emissions reductions.

4.5 Tyler Prize

Pavan Sukhdev has won the 2020 Tyler Prize

- He is a renowned Indian environmental economist and UN Environment Programme (UNEP) Goodwill Ambassador.
- He has been honored for his groundbreaking "green economy" work.
- Tyler Prize is regarded as the Nobel Prize for the Environment.
- He will receive the award alongside conservation biologist Gretchen Daily.
- The duo will receive a gold medallion and share a USD 200,000 cash prize.

5. GOVERNMENT INTERVENTIONS

5.1 Wetland Conservation Rules

- Union government has notified new rules that prohibit setting up or expansion of industries, and disposal of construction and demolition waste within the wetlands.
- The rules, provide for setting up an authority in each state and Union Territory.
- The authority will prepare a list of all wetlands of the state or UT within three months and make strategies for conservation and wise use of wetlands within their jurisdiction.
- It (authority) shall recommend mechanisms for maintenance of ecological character through promotional activities for land within the boundary of notified wetlands.
- The authority will include one expert each in the fields of wetland ecology, hydrology, fisheries, landscape planning and socio-economics.
- The wetlands are land areas covered by water, either temporarily/ seasonally or permanently.
- Marsh, fen and peatland come under this category, The wetlands play a key role in hydrological cycle and flood control, water supply and providing food, fibre and raw materials.
- The Centre had in September 2019, identified 130 wetlands for priority restoration in the next five years and asked states to submit their respective integrated management plan.
- The highest number of such identified wetlands are in Uttar Pradesh (16) followed by Madhya Pradesh (13), Jammu & Kashmir (12), Gujarat (8), Karnataka (7) and West Bengal (6).
- ISRO had in 2011 come out with a national wetlands atlas on the basis of satellite image, mapping over two lakh wetlands covering around 4.63% of the total geographic area of India.

Wetlands

- Wetlands are areas where water is the primary factor controlling the environment and the associated plant and animal life.
- They occur where the water table is at or near the surface of the land, or where the land is covered by water.
- Wetlands provide a wide range of important resources and ecosystem services such as food, water, fiber, groundwater recharge, water purification, flood moderation, erosion control and climate regulation.

India's prominent wetlands include

- Chilika lake - Odisha
- Wular lake - J&K ,
- Renuka - Himachal Pradesh ,
- Sambhar lake - Rajasthan,
- DeeporBeel - Assam,
- East Kolkata wetlands - West Bengal,
- Nal Sarovar - Gujarat,
- Harika - Punjab,
- Rudra Sagar – Tripura,
- Bhoj wetland - Madhya Pradesh

- They are, in fact, are a major source of water and our main supply of freshwater comes from an array of wetlands which help soak rainfall and recharge groundwater.
- Five major wetland types are generally recognized:
  1. Marine - Coastal wetlands including coastal lagoons, rocky shores, and coral reefs.
  2. Estuarine - Including deltas, tidal marshes, and mangrove swamps.
  3. Lacustrine - Wetlands associated with lakes.
  4. Riverine - Wetlands along rivers and streams.
  5. Palustrine - Meaning "marshy" - marshes, swamps and bogs.
  6. Human-made wetlands - such as fish and shrimp ponds, farm ponds, irrigated agricultural land, saltpans, reservoirs, gravel pits, sewage farms and canals.

5.2 Ramsar Convention

- The Ramsar Convention signed on February 2, 1971, is one of the oldest inter-governmental accord signed by members countries to preserve the ecological character of their wetlands of international importance.
- The aim of the Ramsar list is to develop and maintain an international network of wetlands, which are important for the conservation of global biological diversity and for sustaining human life through the maintenance of their ecosystem components, processes and benefits.
- Wetlands declared as Ramsar sites are protected under strict guidelines of the convention.
- The convention dose not directly bind on the nation, but countries formulate policies based on it.
- The Ramsar Convention has adopted a Ramsar Classification of Wetland Type which includes 42 types, grouped into three categories:
  1. Marine and Coastal Wetlands,
  2. Inland Wetlands,
  3. Human-made Wetlands
- Recently 10 more wetlands from India gets the Ramsar site tag.
- Maharashtra gets its first, Punjab adds 3 and UP 6 to its list.
- The total number of Ramsar sites in India are now 37 & the surface area covered by these sites is 1,067,939 hectares.
- List of Ramsar Sites in India are as follows

S.No	State	Site Name
1	Andhra Pradesh	1. Kolleru Lake
2	Assam	2. DeeporBeel
3	Gujarat	3. Nalsarovar Sanctuary
3	Himachal	4. Pong Dam Lake 5. Renuka Wetland 6. Chandertal
4	J&K	7. Hokera Wetland 8. Surinsar-Mansar Lakes 9. Wular Lake

4	Kerala	10. VembanadKol Wetland 11. Sasthamkotta Lake 12. Asthamudi Wetland
5	Ladakh	13. Tsomoriri Lake
6	Madhya Pradesh	14. Bhoj Wetlands
7	Maharashtra	15. NandurMadhameshwar(added in 2020)
7	Manipur	16. Loktak Lake
8	Orissa	17. Chilka Lake 18. Bhitarkanika Mangroves
9	Punjab	19. Harike Lake 20. Kanjli Lake 21. Ropar Lake 22. Keshopur-Miani, 23. Beas Conservation Reserve, 24. Nangal
10	Rajasthan	25. Keoladeo National Park 26. Sambhar Lake
11	Tamilnadu	27. Point Calimere
12	Tripura	28. Rudrasagar Lake
13	U.P	29. Upper Ganga River (Brijghat to Narora Stretch) 30. Nawabganj, 31. Parvati Agra, 32. Saman, 33. Samaspur, 34. Sandi 35. SarsaiNawar
14	West Bengal	36. East Calcutta Wetlands 37. Sundarbans Wetland

5.3 'Green Credit Scheme'

- The Forest Advisory Committee, an apex body tasked with adjudicating requests by the industry to raze forest land for commercial ends, has approved a scheme that could allow "forests" to be traded as a commodity.

- If implemented, it allows the Forest Department to outsource one of its responsibilities of reforesting to non-government agencies.
- The proposed 'Green Credit Scheme', as it is called, allows agencies — they could be private companies, village forest communities — to identify land and begin growing plantations.
- After three years, they would be eligible to be considered as compensatory forest land if they met the Forest Department's criteria.
- An industry needing forestland could then approach the agency and pay it for parcels of such forested land, and this would then be transferred to the Forest Department and be recorded as forestland.
- "The participating agency will be free to trade its asset, that is plantation, in parcels, with project proponents who need forest land,"
- This is not the first time that such a scheme has been mooted.
- In 2015, a 'Green Credit Scheme' for degraded forest land with public-private participation was recommended, but it was not approved by the Union Environment Minister, the final authority.
- Such a scheme will encourage plantation by individuals outside the traditional forest area, will help in meeting international commitments such as sustainable development goals, and nationally determined contributions.
- In the current system, industry needs to make good the loss of forest by finding appropriate non-forest land equal to that which would be razed.
- It also must pay the State Forest Department the current economic equivalent called Net Present Value of the forestland.
- It's then the Forest Department's responsibility to grow appropriate vegetation that, over time, would grow into forests.
- Industries have often complained that they find it hard to acquire appropriate non-forest land, which has to be contiguous to existing forest.
- The Centre had collected nearly ₹ 50,000 crore over decades, but the funds were lying unspent because States were not spending the money on re growing forests.

5.4 Dolphin Census

- The dolphin census in Odisha coast was taken up by the Chilika Development Authority (CDA).
- According to last year's census, the Irrawaddy dolphin population in Chilika was 151, by which Chilika is considered as the highest single lagoon dolphin population in the world.
- According to recent census only 62 humpback dolphins were spotted at Gahirmatha down from 126 in 2019, their number was pegged at 307 in 2015.
- Officials conducted a dolphin census for the first time in Gahirmatha in 2015.
- The census in 2016 and 2017 had been cancelled due to bad weather.
- The 2020 census was the fourth such dolphin census undertaken in the marine sanctuary.
- The census was conducted using hydrophones.
- A hydrophone is a microphone designed to be used underwater for recording or listening to underwater sound.
- Most hydrophones are based on a piezoelectric transducer that generates an electric potential when subjected to a pressure change, such as a sound wave.
- A hydrophone can detect airborne sounds, but will be insensitive because it is designed to match the acoustic impedance of water, a denser fluid than air.

5.5 Importing African Cheetahs

The Supreme Court (SC) has recently given a green signal to introduction of African Cheetahs in a suitable from Namibia into the Indian habitat on an experimental basis to revive the Indian cheetah population in the PalpurKuno sanctuary in Madhya Pradesh.

- This signal has revived a decade-long debate over the controversial plan first floated in 2009 and shot down by the SC in 2013.
- Cheetahs are the only large carnivore to have gone extinct in India.
- In 2009, the then Environment Minister Jairam Ramesh cleared a proposal to import a few cheetahs back in the Indian wild.
- At a 2009 meeting, the Namibia-based Cheetah Conservation Fund offered to help bring in African cheetahs in stages over the next decade, possibly starting in early 2012.
- By 2010, India's cheetah plan was ready and the Centre approved Rs 50 crore for the programme in 2011.
- The International Union for Conservation of Nature (IUCN) has a protocol to introduce wild animals in the country.
- It has reintroduction specialist groups, it has template guidelines.
- India currently don't have such protocol for its own species.
- In India there is a need to create provisions under the Wildlife Act for a policy on introduction of wild animals.
- Otherwise, reintroduction of cheetahs may hinder the interests of other species.
- **Obstacles -** The matter of import came up before the SC during a hearing on shifting few lions from Gujarat to Kuno-Palpur wildlife sanctuary, Madhya Pradesh.
- It was also one of the sites identified for releasing Cheetahs.
- In 2012, the SC stayed the cheetah plan and in 2013, it ordered translocation of lions while quashing the plan to introduce African cheetahs to Kuno-Palpur.
- The cheetah plan was revived in 2017 when the government sought the SC permission to explore possibilities to reintroduce cheetahs from Africa to suitable sites other than Kuno-Palpur.
- In April 2013, the SC had set a 6-month deadline for trans-locating lions from Gujarat to Madhya Pradesh.
- Instead, the 3rd National Wildlife Action Plan (2017-2031) released in 2017 said that the identification of an alternative home for the Asiatic lion will be completed during 2018-2021.
- Then, **Kuno** resurfaced as a potential cheetah site in the court.
- But, much of its grasslands have naturally progressed to woodlands, they are not suitable for the African import.
- In the sanctuary, there is barely any presence of the four-horned antelope, chinkara or blackbuck - potential prey for the cheetah.

Cheetahs

- The cheetah (Acinonyx jubatus) is a large cat that occurs in North, Southern and East Africa, and a few localities in Iran.
- It inhabits a variety of mostly arid habitats like dry forests, scrub forests, and savannahs.
- The species is IUCN Red Listed as Vulnerable, as it suffered a substantial decline in its historic range in the 20th century due to habitat loss, poaching for the illegal pet trade, and conflict with humans.
- Several African countries have taken steps to improve cheetah conservation measures.
- Its yellowish tan or rufous to greyish white coat is uniformly covered with nearly 2,000 solid black spots.
- The cheetahs are the fastest land animal which makes them good antelope hunters.
- In India captive cheetahs were used to hunt other animals in the princely states

- **Nauradehi** in Madhya Pradesh will be the host to the first batch of imported animals, as other sites were not feasible.
- **Arguments against the host place -** Wolves are the keystone species in Nauradehi and would have to compete with cheetahs.

- The majestic GIB is a potential prey for the cheetah.
- Putting the cheetah in with the bustard cannot be contemplated, because of the threat to this most gravely endangered bird.
- The project excluded Jaisalmer's Desert National Park, a potential host.
- Yet, it recommended erstwhile GIB habitats for the cheetah, in effect denying the bird any chance of habitat recovery.
- There is a lopsided focus on flying in an exotic species as a replacement for what was long gone, at the cost of undermining the future of an indigenous species that is still around.
- This is one of the reasons why the SC scrapped this plan in 2013.

5.6 Exploratory Drilling License

- The Environment Ministry has exempted oil and gas firms, looking to conduct exploratory drilling, from seeking an environmental clearance.
- The clearance is for both on-shore and offshore drilling explorations and the process is an ecologically-intensive exercise that involves digging multiple wells and conducting seismic surveys offshore.
- Until today, even exploratory surveys have merited the highest level of environmental scrutiny — called category 'A' — that required project proponents to prepare an environment impact assessment (EIA) plan, have it scrutinized by a centrally constituted committee of experts and subject the proposal to a public hearing involving the local residents of the proposed project site.
- While public hearings, even for category A projects are frequently exempted if they are offshore, the new amendments demote exploratory projects to the category of 'B2'.
- This means it will be conducted by the States concerned and will not require an EIA.
- The move is part of a larger process of 'decentralization' by the Centre in that it seeks to farm more regulatory actions to State and local units.
- Developing an offshore or onshore drilling site as a hydrocarbon block will however continue to merit a "category A" treatment.

5.7 Bio-Rock

- 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.
- 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.
- 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.
- 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.
- Under the plan a biorock structure or mineral accretion technology was installed one nautical mile off the Mithapur coast in the Gulf of Kachchh, it will use solar panels that float on the surface as a power source.

5.8 Arth Ganga Project

- National Ganga Council planned to evolve the 'NamamiGange' project to 'Arth Ganga'.
- In simple terms, 'Arth Ganga' implies a sustainable development model with a focus on economic activities related to Ganga.

- As part of this process, farmers will be encouraged to engage in sustainable agriculture practices, including zero budget farming, planting of fruit trees and building plant nurseries on the banks of Ganga.
- Above practices, along with creation of infrastructure for water sports and development of campsites, cycling and walking tracks etc., would help to tap the 'hybrid' tourism potential of the river basin area- for purposes of religious as well as adventure tourism.
- Almost half of the Indian population lives around the Ganges River belt. Moreover, of India's total freight, about 1/5th originates and 1/3rd terminates in the states around Ganges Belt.
- Thus, inland waterway is one of the most important pillars of "ArthGanga"project.
- National Waterway-1 is an inland water transport route between Haldia in West Bengal and Prayagraj in Uttar Pradesh.
- Ministry of Shipping is also developing Varanasi (Uttar Pradesh) Freight Village and Sahibganj (Jharkhand) Industrial Cluster-cum-Logistics Park with an objective of creating synergy with Inland Waterways.
- The income generated from encouraging ecotourism and Ganga wildlife conservation and cruise tourism etc. would help to generate sustainable income streams for cleaning of Ganga.

5.9 Algal Bloom Information Service (ABIS)

- The increasing frequency of algal blooms is a major concern due to its ill effects on fishery, marine life and water quality. INCOIS has developed a service for "Detection and Monitoring of Bloom in the Indian Seas".
- The target users are fishermen, marine fishery resource managers, researchers, ecologists and environmentalists.
- The service also complements INCOIS' marine fishing advisories i.e. Potential Fishing Zone advisories.
- INCOIS-ABIS will provide near-real time information on spatio-temporal occurrence and spread of phytoplankton blooms over the North Indian Ocean.
- Accordingly, relevant data retrieved from satellites i.e. Sea Surface Temperature , chlorophyll-a, Algal Bloom Index - chlorophyll, rolling chlorophyll anomaly, rolling sea surface temperature anomaly, phytoplankton class/species, phytoplankton size class and a composite image delineating bloom and non-bloom regions will be disseminated daily through ABIS.
- In addition, four regions have been identified as bloom hotspots viz.
    1. North Eastern Arabian Sea
    2. coastal waters off Kerala
    3. Gulf of Mannar and
    4. Coastal waters of Gopalpur.

5.10 Indian Scientific Expedition to Southern Ocean 2020

- The 11th expedition of an Indian mission to the Southern Ocean, or Antarctic Ocean has been started recently.
- The first mission took place between January and March 2004.
- The crew will be collecting air and water samples from around 60 stations along the cruise track.
- These will give valuable information on the state of the ocean and atmosphere in this remote environment and will help to understand its impacts on the climate.
- The data's will be analyzed National Centre for Polar and Ocean Research (NCOPR) in Goa, which works under the Ministry of Earth Sciences.
- 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, the researchers said.

5.11 CRZ Regime

- Union Ministry of Environment, Forest and Climate Change has notified the 2019 Coastal Regulation Zone (CRZ) norms, replacing the CRZ norms of 2011.
- The CRZ was issued under of the Environment Protection Act, 1986, it aims to promote sustainable development based on scientific principles.
- Two separate categories for CRZ-III (Rural) areas:
    1. CRZ-III A - The A category of CRZ-III areas are densely populated rural areas with a population density of 2161 per square kilometre as per 2011 Census - Such areas have a No Development Zone (NDZ) of 50 meters from the High Tide Line (HTL) as against 200 meters from the High Tide Line stipulated in the CRZ Notification, 2011.
    2. CRZ-III B – The B category of CRZ-III rural areas have population density of below 2161 per square kilometer as per 2011 Census - Such areas have a No Development Zone of 200 meters from the HTL.
- **Floor Space Index Norms eased** - As per CRZ, 2011 Notification, the Floor Space Index (FSI) or the Floor Area Ratio (FAR) had been frozen.
- As per the latest notification, the government has decided to de-freeze the Floor Space Index and permit FSI for construction projects.
- **Tourism infrastructure permitted in coastal areas -** The new norms permit temporary tourism facilities such as shacks, toilet blocks, change rooms, drinking water facilities, etc. in Beaches.
- **Streamlining of CRZ Clearances -** The procedure for CRZ clearances has been streamlined.
- Now, the only such projects which are located in the CRZ-I (Ecologically Sensitive Areas) and CRZ IV (area covered between Low Tide Line and 12 Nautical Miles seaward) will be dealt with for CRZ clearance by the Ministry.
- The powers for clearances with respect to CRZ-II and III have been delegated at the State level.
- **No Development Zone of 20 meters for all Islands -** For islands close to the main land coast and for all Backwater Islands in the main land, No Development Zone of 20 meters has been stipulated in wake of space limitations and unique geography of such regions.
- **Pollution abatement -** To address pollution in Coastal areas, the treatment facilities have been made permissible in CRZ-I B area subject to necessary safeguards.
- **Critically Vulnerable Coastal Areas (CVCA) -**Sundarban region of West Bengal and other ecologically sensitive areas identified as under Environment (Protection) Act, 1986 such as Gulf of Khambat and Gulf of Kutchh in Gujarat, Achra-Ratnagiri in Maharashtra, Karwar and Coondapur in Karnataka, Vembanad in Kerala, Gulf of Mannar in Tamil Nadu, Bhaitarkanika in Odisha and Krishna in Andhra Pradesh are treated as Critical Vulnerable Coastal Areas.
- These Critical Vulnerable Coastal Areas will be managed with the involvement of coastal communities including fisher folk.

CRZ 2011 and Kerala

- CRZ 2011 notification, which made special provisions for Kerala considering the “unique coastal systems of backwaters and backwaters islands along with the space limitation in the coastal stretches of the State of Kerala,” that the islands were identified.
- Within the 50 metre CRZ area of these islands, only the repair and reconstruction of existing dwelling units of local communities will be permitted.
- Beyond the 50 metre limit, the local communities could construct new dwelling units with the permission of the local body, said the notification.
- However, the CRZ area of these islands has been reduced to 20 meters in the subsequent CRZ notification issued in 2019, allowing more land for construction towards the water body.

5.12 Biological Safety Level

- A biosafety level (BSL) is a set of biocontainment precautions required to isolate dangerous biological agents in an enclosed laboratory facility.

- The levels of containment range from the lowest biosafety level 1 (BSL-1) to the highest at level 4 (BSL-4).
- In the United States, the Centers for Disease Control and Prevention (CDC) have specified these levels.
- At the lowest level of biosafety, precautions may consist of regular hand-washing and minimal protective equipment.
- At higher biosafety levels, precautions may include airflow systems, multiple containment rooms, sealed containers, positive pressure personnel suits, established protocols for all procedures, extensive personnel training, and high levels of security to control access to the facility.
- In India high risk pathogens can be tested only in BSL4 lab with highest level of biological safety, a BSL4 lab consists of work with highly dangerous and exotic microbes.
- Infections caused by microbes, including Ebola, Nipha and Marburg viruses, are frequently fatal, and come without treatment or vaccines are tested in BSL4 lab.

5.13 Enforcement & Monitoring Guidelines for Sand Mining 2020

Ministry of Climate Environment has for the first time released guidelines to monitor and check illegal sand mining.

- The Enforcement and Monitoring Guidelines for Sand Mining 2020 include directions to states to carry out river audits, put detailed survey reports of all mining areas online and in the public domain.
- It also includes directions to conduct replenishment studies of river beds, constantly monitor mining with drones, aerial surveys, ground surveys and set up dedicated task forces at district levels.
- The guidelines also push for online sales and purchase of sand and other riverbed materials to make the process transparent.
- They also propose night surveillance of mining activity through night-vision drones.
- MoEF has already put in place the Sustainable Sand Management Guidelines 2016, which focus on the management of sand mining in India.
- However there is an urgent need to have guidelines for effective enforcement of regulatory provisions and their monitoring.
- The Mines and Minerals (Development and Regulation) Act, 1957 has empowered state governments to make rules to prevent illegal mining, transportation and storage of minerals.
- The 2020 guidelines are to be enforced simultaneously with the Sustainable Sand Management Guidelines, 2016.
- In instances where the two sets of guidelines may seem to be in conflict, the new set will hold legal precedence.
- The Sustainable Sand Mining Guidelines, 2016, require the preparation of District Survey Reports (DSR), which is an important initial step before grant of mining lease.
- However, the government has found that the DSRs carried out by state and district administrations are often not comprehensive enough, allowing space for illegal mining.
- The new guidelines, therefore, list a detailed procedure of how the DSRs are to be made, including the development of an inventory, for the first time, of river bed material and other sand sources in the district.
- The need for replenishment study for river bed sand is also required in order to nullify the adverse impacts arising due to excessive sand extraction.
- No riverbed mining will be allowed during the monsoon.
- In cases where rivers become district boundaries or state boundaries, the districts or states sharing the boundary shall constitute the combined task force.

6. PROTECTED AREAS

6.1 MalaiMahadeshwara Tiger Reserve

- MM Hills wildlife sanctuary is spread over 906.18 sq km is contiguous to Bandipur and Biligiri Ranganatha Temple (BRT) Tiger Reserve on one side, Satyamangalam Tiger Reserve in Tamil Nadu on the other, Cauvery Wildlife Sanctuary also borders it.
- The sanctuary will be renamed as MalaiMahadeshwara Hill Tiger Reserve (MMH TR) with a core area of 670.95 sq km spread across MalaiMahadeshwara Reserve Forest, Hanur Reserve Forest and Yediyarahalli Reserve Forest.
- The forests has an abundance of prey species like gaur, sambar, chital, four-horned antelope, wild boar, etc., according to authorities who say that studies have proved that the prey density was 5.05 animals per sq km.
- Being part of Mysore Elephant Reserve, these forests also support nearly 300 elephants.
- This is a unique geographical zone that acts as a bridge between the Western and Eastern Ghats.
- Decks have been cleared to notify the MalaiMahadeshwara Wildlife Sanctuary as a tiger reserve.
- The approval from the National Tiger Conservation Authority (NTCA) is expected any time now.
- Once notified, Chamarajanagar district will have the rare distinction in the country of harbouring three tiger reserves.
- Also, with this, Karnataka will have six tiger reserves, the others being Nagarahole, Bhadra, and Anshi-Dandeli, apart from Bandipur and BRT Tiger Reserves.

6.2 Namdapha National Park

- Namdapha National Park is a large protected area in Arunachal Pradesh of Northeast India.
- It is India's easternmost tiger reserve and a biodiversity hotspot in the Eastern Himalayas.
- Itharbors the northernmost lowland evergreen rainforests in the world at 27°N latitude.
- It also harbors extensive dipterocarp forests, comprising the northwestern parts of the Mizoram-Manipur-Kachin rain forests ecoregion.
- It is the fourth largest national park in India.

6.3 Pakke Reserve

- Pakke Tiger Reserve, also known as Pakhui Tiger Reserve, is a Project Tiger reserve in the East Kameng district of Arunachal Pradesh in northeastern India.
- The 862 sq.Km reserve is protected by the Department of Environment and Forest of Arunachal Pradesh.
- This Tiger Reserve has won India Biodiversity Award 2016 in the category of 'Conservation of threatened species' for its Hornbill Nest Adoption Programme.
- The main perennial streams in the area are the Nameri, Khari and Upper Dikorai. West of Kameng River are Sessa Orchid Sanctuary and Eaglenest Wildlife Sanctuary.
- Arunachal government has cleared plans to build a 692.7 km highway through the 862 sq km Pakke Tiger Reserve (PTR) in East Kameng district.
- Named the ***East-West Industrial Corridor***, the highway aims to connect Bhairabhunda in West Kameng district and Manmao in Changlang district along Arunachal Pradesh's border with Assam

6.4 TadobaAndhari Tiger Reserve

- TadobaAndhari tiger reserve (TATR) is located in Chandrapur district of Maharashtra state in India.
- It is Maharashtra's oldest and largest national park.
- Created in 1995, the Reserve includes the Tadoba National Park and the Andhari Wildlife Sanctuary.

- It is Maharashtra's largest reserve for the wild cat/Tiger .
- The reserve also hosts other wild animals, such as leopard, wild dog, sloth bear, gaur, sambhar, cheetal, besides the rarely spotted ratel, flying squirrel, pangolin and rusty spotted cat.
- A dam proposed on the river Human (pronounced Hooman) at TadobaAndhari Tiger Reserve (TATR) in Chandrapur district threatens to submerge more than 90 per cent of a 7-km forest area.
- The project not only falls in TATR buffer zone, but also the eco-sensitive zone of Ghodazari Wildlife Sanctuary closeby.
- It will break the only linking corridor for tiger movement between TATR, Ghodazari and Umred-Karhandla wildlife sanctuaries in the state.
- Indravati Tiger Reserve in Chhattisgarh is in east of TATR and Kawal Tiger Reserve in Telangana is in south west.

6.5 Kanha National Park and Tiger Reserve (KNPTR)

- KNPTR is on the Maikal range of the Satpura hills.
- It is spread over an area of 940 square kilometres between Mandla and Balaghat districts of Madhya Pradesh.
- The swamp deer is endemic to KNPTR.

6.6 Gahirmatha Marine Sanctuary

- Gahirmatha Marine Sanctuary is a marine wildlife sanctuary located within Bhitarkanika National Park in Odisha's Kendrapara district.
- It is the world's largest nesting beach for Olive Ridley Turtles.
- It extends from Dhamra River mouth in the north to Brahmani river mouth in the south.

6.7 Valmiki Tiger Reserve (VTR)

- Valmiki Tiger Reserve (VTR) was set up in the early 1990s.
- It is spread over 899 square kilometers in Bihar's West Champaran district, bordering Nepal's Chitwan National Park to its north and Uttar Pradesh to its west.
- Gaur, which are native to south and Southeast Asia, had shifted to Chitwan a few years back due to grassland destruction in VTR.

6.8 Singchung Bugun Village Community Reserve

- SBVCR has bagged the first prize from the National Bio-diversity Authority (NBA)
- Singchung Bugun Village Community Reserve is an NGO from West Kameng district of Arunachal Pradesh.
- It is honoured for its efforts in conserving rare wildlife resources in the area.
- NBA, established by the Centre in 2003, honoured SBVCR with a citation, a memento and a cash prize of Rs one lakh.
- The SBVCR has been partnering with the state forest department since 2016 in protecting and conserving the 17 sq km area adjacent to the Eaglenest Wildlife Sanctuary in the district.
- Rich in both flora and fauna, with 545 species of birds and various species of plants and animals, the sanctuary is spread over about 217 sq km.
- The sanctuary is also known for the existence of Bugun Liocichla, a bird species presently found only in the park, it said.
- NGO organises ecotourism camps for visitors and researchers every year, and employs local community members.

7. BIO-DIVERSITY

7.1 Locust Attack

- Locusts are a collection of certain species of short-horned grasshoppers that have a swarming phase.
- These insects are usually solitary, but under certain circumstances, they become more abundant and change their behavior and habits, becoming gregarious.
- Adult locust swarms can fly up to 150 km a day with the wind and adult insects can consume roughly their own weight in fresh food per day.
- These hoppers in small numbers or groups do not cause any economic damage to crops unless they appear in swarms.
- A very small swarm eats as much in one day as about 35,000 people, posing a devastating threat to crops and food security.
- Locusts do not attack people or animals; there is no evidence that suggests that locusts carry diseases that could harm humans.
- India has not witnessed any full-blown locust cycles after 1962, however, during 1978 and 1993, large-scale upsurges were observed.
- Recently few villages of Punjab and Haryana bordering Rajasthan has reported presence of locusts.
- Experts believe that appearance of locusts in winter months is a new phenomenon and may be linked to climate change.

7.2 Irrawaddy dolphins

- Irrawaddy dolphins can grow to a length of 2.3 m and attain a weight of 130 kg.
- This species is closely related to the killer whale, a much larger, oceanic dolphin that can grow to 8m and weigh in excess of 6 tones.
- Although the species gets its common name from the Irrawaddy River in Myanmar, where it also lives, it was first described in 1866 from a specimen found in the Vishakapatnam harbour in present day Andhra Pradesh on India's east coast.
- Its range extends from the Bay of Bengal to New Guinea and the Philippines.
- Besides the Irrawaddy River, it is also found in India's Ganges, and Southeast Asia's Mekong River.
- However, it is not a true river dolphin and prefers to live in estuaries and brackish water near coasts.
- Following the opening of the sea mouth in Chilika in 2002, and the consequent increase in water depth, dolphins have reportedly been recorded in more areas of the lake than before, perhaps indicating an expansion of suitable habitat.
- Irrawaddy dolphins are classified as 'Vulnerable' in the IUCN Red List of Threatened Species.
- In Chilika they can be seen singly, in pairs or as small groups of 4-6 individuals, they are slow swimmers.

Humpback Dolphin Vs Irrawady Dolphin

- Humpback dolphin is a coastal dolphin found in Gahirmatha Wildlife Sanctuary.
- It is found along the coasts of Indian Ocean and coasts of West Africa.
- It is listed under appendix I and II of the convention on the conservation of migratory species of wild animals.
- Reduction in the humpback dolphin count in Gahirmatha could be due to their migration from Gahiramatha to Chilika Lake and towards the deep sea.
- Climate change and bad weather could have also pushed them towards deep sea.
- Sometimes, dolphins are trapped in fish nets or hit by propellers of fishing trawlers.
- Irrawaddy dolphins reside in estuaries of Chilika Lake, Humpback dolphins live in sea water near the coast at Gahirmatha.
- Irrawaddy dolphin is an example of euryhaline species, this means that it is able to tolerate a wide range of salinities.

7.3 Northern White Rhinoceros

- The northern white rhinoceros or northern square-lipped rhinoceros is one of two subspecies of the white rhinoceros (the other being the southern white rhinoceros).
- Formerly found in several countries in East and Central Africa south of the Sahara, this subspecies is a grazer in grasslands and savanna woodlands.
- Since March 19, 2018, there are only two known rhinos of this subspecies left, both of which are female.
- Neither of the two living northern white females can carry a pregnancy.
- Barring the existence of unknown or misclassified male northern white rhinos elsewhere in Africa, this makes the subspecies functionally extinct.
- The two female rhinos belong to a Zoo in the Czech Republic but live in a Conservancy in Kenya.
- According to International Union for Conservation of Nature (IUCN) the subspecies is considered "Critically Endangered (Possibly Extinct in the Wild)
- Recently scientists used IVF (In vitro fertilization) for Rhinos, they created a test-tube embryo by fertilizing the egg of a southern white female with the frozen sperm of a northern white male.
- The embryos have been preserved in liquid nitrogen, and will be transferred to a southern white surrogate.
- Since the gestation period for a rhino could be 18 months, the first northern white calf is expected to arrive in the world in 2022.
- The Indian rhinoceros is different from its African cousins, most prominently in that it has only one horn.
- There is also a Javan rhino, which too, has one horn, and a Sumatran rhino, which, like the African rhinos, has two horns.

7.4 Giant Tusked Elephant

- Recent study has found that about 800,000 years ago, a giant straight-tusked elephant migrated out of Africa and spread across Europe and Asia.
- The elephant is marked by a huge head, which is 4.5 feet from the top of the skull roof to the base of the tusk sheaths.
- The elephant divided into many species, such as
  1. Palaeoloxodonantiquus (in Europe),
  2. Palaeoloxodonnamadicus (India),
  3. Palaeoloxodonnaumanni (Japan).
- All these species are now extinct.
- For a long time, it was thought that the European species had a rather slenderly built skull roof crest, whereas Indian species was characterized by an extremely robust skull crest that extended near to the base of the trunk from the top of the skull.
- However, some skulls, found in Italy and Germany, with almost the same exaggerated skull crest as the Indian form, raised confusion whether these were the same as the Indian species.
- The new study has concluded that there was a single European species.
- Measurements showed that even in European skulls with pronounced crests, the skull roof never becomes as thickened as in the Indian specimens.
- On the other hand, fossils found in Asia and East Africa represent distinct species that evolved.

7.5 Archaea

- 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, and have a potential relationship with human health.
- They are known for producing antimicrobial molecules, and for anti-oxidant activity with applications in eco-friendly waste-water treatment.
- Archaea are extremely difficult to culture due to challenges in providing natural conditions in a laboratory setting.
- As archaea are relatively poorly studied, very little is known about how archaea behave in the human body.
- Scientists have reported a new archaeon (a kind of microorganism), which they discovered in Sambhar Salt Lake in Rajasthan.
- It has been named Natrialbaswarupiae, after Dr Renu Swarup, secretary, Department of Biotechnology.

7.6 Xenobots

- Scientists in the United States have created the world's first "living machines".
- These are tiny robots built from the cells of the African clawed frog, that can move around on their own.
- They have named the millimetre-wide robots "xenobots" — after the species of aquatic frog found across sub-Saharan Africa from Nigeria and Sudan to South Africa, Xenopus laevis.
- The xenobots can move toward a target, perhaps pick up a payload (like a medicine that needs to be carried to a specific place inside a patient) and heal themselves after being cut.

7.7 Extraocular Vision

- Recently researchers have shown that a species of brittle stars, which are relatives of starfish, can see even though it does not have eyes.
- The red brittle star (Ophiocomawendtii), which lives in the coral reefs of the Caribbean Sea, becomes only the second creature, after a sea urchin species, known to have this ability.
- The ability to see without eyes is known as extraocular vision.
- Previous researchers have defined it as the ability to resolve scenes without discrete eyes.
- In sea urchins and brittle stars, extraocular vision is facilitated by the photoreceptor cells found on their bodies.
- The researchers suggest that a brittle star sees with the help of light-sensing cells that cover its entire body.
- These light-sensing cells give the brittle star visual stimuli, allowing it to recognize coarse structures such as rocks, the research suggests.

7.8 Chinese paddlefish

- Psephurus gladius, a Chinese paddlefish living in the Yangtze River (Asia's longest river), was declared extinct.
- Psephurus gladius was about 2 to 3 meters long, and could grow longer than 7 meters.
- The fish had existed for 15 million years.
- The Chinese paddlefish had also been on the critically endangered list since 1996.
- It was the largest freshwater fish in China might have gone extinct between 2005 and 2010.
- Experts from the International Union for Conservation of Nature estimated that this unique and first-class protected fish had been extinct already.
- Two other notable Yangtze species reeves shad, a type of fish and the baiji, or Yangtze River dolphin were declared 'functionally extinct' in 2015 and 2006 respectively.
- From Jan 1, 2020, China began a 10-year fishing ban on key areas of the Yangtze River to protect biodiversity in the country's longest river.

7.9 Red Snow

- "Red snow" or "watermelon" is a phenomenon that has been known since ancient times, now it raises concerns about climate change.
- Chlamydomonas Chlamydomonasnivalis, exists in snow in the polar and glacial regions, and carries a red pigment to keep itself warm.
- It is the algae that give the snow its red tinge, it causes the surrounding ice to melt faster.
- The more the algae packed together, the redder the snow and the darker the tinge, the more the heat absorbed by the snow. Subsequently, the ice melts faster.
- While the melt is good for the microbes that need the liquid water to survive and thrive, it's bad for glaciers that are already melting from a myriad of other causes, the study said.
- These algae change the snow's albedo which refers to the amount of light or radiation the snow surface is able to reflect back, Changes in albedo lead to more melting.
- In the melting of snow in the Arctic, the key drivers have been snow and ice albedo, according to a 2016 study in the journal Nature.
- Aristotle is believed to be one of the first to give a written account of red snow, over 2,000 years ago.

7.10 Henneguyasalminicola

- Researchers have discovered a non-oxygen breathing animal, which significantly changes one of science's assumptions about the animal world that all animals use aerobic respiration and therefore, oxygen.
- It also challenges what may be generally thought of as evolution in organisms that they become more complex as they evolve.
- In the case of this non-oxygen breathing organism, evolution turned it into a simpler organism that shed "unnecessary genes" responsible for aerobic respiration.
- The organism Henneguyasalminicola, a fewer-than-10-celled microscopic parasite that lives in salmon muscle.
- According to the researchers, as the organism evolved, it gave up breathing and stopped the consumption of oxygen for the production of energy which means it relies on anaerobic respiration (through which cells extract energy without using oxygen).
- Other organisms such as fungi and amoebas that are found in anaerobic environments lost the ability to breathe over time.
- The new study shows that the same can happen in the case of animals, too.
- Henneguyasalminicola did not have a mitochondrial genome.
- Mitochondria is the "powerhouse" of the cell, which captures oxygen to make energy its absence in the H. salminicola genome indicates that the parasite does not breathe oxygen.

7.11 Olive Ridley Turtles

- Rushikulya rookery on the Odisha coast is prepared to welcome and protect olive ridley turtles during mass nesting.
- Olive Ridley Turtles are 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 the Kemps ridley turtle, are best known for their unique mass nesting called Arribada (mass-nesting event when thousands of turtles come ashore at the same time to lay eggs on the same).
- The coast of Odisha in India is the largest mass nesting site for the Olive-ridley, followed by the coasts of Mexico and Costa Rica.
- Olive Ridley Turtles are Vulnerable according to the International Union for Conservation of Nature and Natural Resources (IUCN).
- They are Listed in Appendix I of CITES and Under Schedule I of the Wildlife Protection Act, 1972.

- The Odisha government has made it mandatory for trawls to use Turtle Excluder Devices (TEDs), a net specially designed with an exit cover which allows the turtles to escape while retaining the catch.

7.12 Operation Turtshield

Thousand endangered turtles were seized from a West Bengal

- Operation Turtshield is a Central programme.
- Under this, Wildlife Crime Control Bureau of the Union ministry of environment, forest and climate change and West Bengal forest department personnel, seized Indian flapshell turtles and Indian peacock softshell turtles.
- Indian peacock softshell turtles figures in the Red List of the IUCN as 'threatened species'.
- The flapshell turtle, which is smaller in size, is killed for its meat which is considered a delicacy in both Bengal and Bangladesh.

7.13 Bent Toed Gecko

- The new species of lizard, zoologically named Cyrtodactylusurbanus, is discovered in Guwahati.
- It is markedly different in molecular structure, blotch and color from the Cyrtodactylusguwahatiensis, or the Guwahati bent-toed gecko, that was discovered two years ago.
- The bent-toed gecko, named Cyrtodactylusurbanus, was earlier thought to be same as the Khasi Hills lizard.
- All bent-toed geckos in Northeast India were thought to be a single species, the Cyrtodactyluskhasiensis found primarily in the Khasi Hills of Meghalaya.
- The study on the urban bent-toed gecko provided additional information on the Guwahati bent-toed gecko, the first of the two Cyrtodactylus endemic to the areas covered by the city and the fourth from Assam.
- It was also the 12th recorded gecko from the Northeast.

7.14 Cave Fish

- Scientists have discovered a new cave fish in Meghalaya which is similar in anatomy to an endangered masher species.
- It is by far the largest known subterranean fish in the world.
- The biggest specimen they found was longer than 40 cm.
- All previous discoveries of cave fish from India have been of small fish, and this is the largest of the cave fish discovered in the country, and probably from anywhere in the world.
- Widely consumed in India, mahseer live mostly in "fast-flowing streams and rivers and also large reservoirs.
- The new species is similar to the golden mahseer, its unusual underground home in Meghalaya's Jaintia Hills.

7.15 Muktoshri Rice

- Researchers from West Bengal's have developed a rice variety called Muktoshri (IET 21845), that is resistant to arsenic.
- The variety yields 5.5 metric tons per hectare in the Boro (Winter) season and 4.5 to 5 metric tons per hectare in the Kharif season, respectively.
- The rice was long and thin, and aromatic.
- Notification for the commercial use of Muktoshri was made by West Bengal last year.

7.16 Genome Mapping of Basmati Rice

- Gene mapping describes the methods used to identify the locus of a gene and the distances between genes.

- Genome mapping is used to identify and record the location of genes and the distances between genes on a chromosome.
- The essence of all genome mapping is to place a collection of molecular markers onto their respective positions on the genome.
- Molecular markers come in all forms.
- Recently Scientists have mapped the complete genome of two basmati rice varieties, including one that is drought-tolerant and resistant to bacterial disease.
- Basmati 334 from Pakistan, known to be drought tolerant and resistant to rice-killing bacterial blight, and Dom Sufid from Iran, an aromatic long-grain rice that is one of the most expensive on the market are two basmati rice varieties used by scientists.

7.17 Hard ground swamp deer

- Hard ground swamp deer is also known as Barasingha or Rucervusduvaucelii, the state animal of Madhya Pradesh.
- It is seeing a revival in the Kanha National Park and Tiger Reserve (KNPTR) after having been perilously close to extinction for a long time.
- The species now numbers 800, after five decades of persistent conservation work.
- In 1967, the numbers of swamp deer decreased to 66 due to rampant hunting, habitat loss and diseases.
- The number was estimated at around 551 in 1953.
- The deer was brought back from the verge of extinction with the help of a successful breeding programme and conservation practices at the KNPTR.
- Swam deer are already extinct in Pakistan and Bangladesh.
- It is now found only in south- western Nepal and central and northeastern India.
- There are three subspecies of swamp deer found in the Indian Subcontinent.
    1. The western swamp deer (Rucervusduvaucelii) found in Nepal,
    2. Southern swamp deer (Rucervusduvauceliibranderi) found in central and
    3. North India and eastern swamp deer (Rucervusduvauceliiranjitsinhi) found in the Kaziranga and Dudhwa National Parks.

7.18 Swamp Wallaby

- Swamp wallaby, is a marsupial related to the kangaroo.
- It is likely the only mammal pregnant and lactating all lifelong.
- It typically conceives a new embryo days before delivering the newborn from its previous pregnancy.
- Female wallabies and kangaroos have two uteri and two separate ovaries.
- At the end of a pregnancy in one uterus, a new embryo develops in the other uterus.
- Kangaroos and wallabies regularly have an embryo in the uterus, a young joey in the pouch, and a third semi-dependent young at foot, still drinking its mother's milk.
- In kangaroos, the new embryo is conceived a day or two after the previous birth.
- In the swamp wallaby (Wallabiabicolor), the new conception happens one or two days before the previous joey is delivered.
- As soon as the mature fetus is born and settles in the pouch, the swamp wallaby arrests the development of the new embryo.
- This is called embryonic diapause, which happens in many animals to pause reproduction until the conditions are right — season, climate, food availability.

7.19 Red Panda

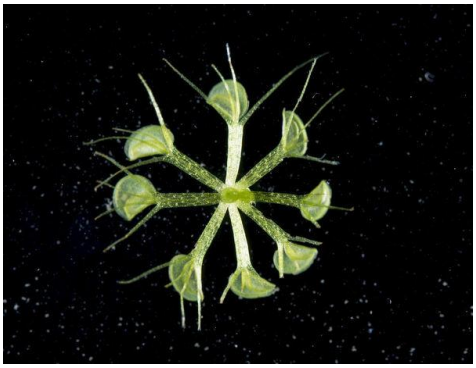
- The red panda is a small arboreal mammal found in the forests of India, Nepal, Bhutan and the northern mountains of Myanmar and southern China.
- In India, it is found in Sikkim, western Arunachal Pradesh, Darjeeling district of West Bengal and parts of Meghalaya.
- It is also the state animal of Sikkim.
- Red pandas have been reported from 11 districts of Arunachal Pradesh, which is presumed to hold the largest red panda population in the country.
- It is survival is crucial for the eastern and north-eastern Himalayan subalpine conifer forests and the eastern Himalayan broadleaf forests.
- The only living member of the genus Ailurus, the Red Panda is listed as 'endangered' on the IUCN Red List of threatened species.
- The animal has been hunted for meat and fur, besides illegal capture for the pet trade.
- An estimated 14,500 animals are left in the wild across Nepal, Bhutan, India, China and Myanmar.
- In recent times Red Panda has fewer hunters because the younger generations of people across its Himalayan habitat are losing interest in animal products.

7.20 Gaur

- The gaur (Bos gaurus) is also called the Indian bison, is the largest extant bovine.
- They are heavily built, with body weight varying between 400 and 1,200 kilogram.
- It is native to South and Southeast Asia and has been listed as Vulnerable on the IUCN Red List since 1986.
- It is extinct in Sri Lanka and probably also in Bangladesh.
- Due to an increase in grassland cover, Gaur (Bos Gaurus), has returned to Bihar's Valmiki Tiger Reserve (VTR)

7.21 Waterwheel plant

- Aldrovanda vesiculosa or the waterwheel plant is a carnivore with well-equipped traps for capturing unsuspecting prey.
- The traps are arranged in whorls around a central, free-floating stem, giving rise to the common name.
- This is one of the few plant species capable of rapid movement.
- Instead of bladders, the waterwheel produces snap traps that closely resemble those of the Venus fly trap (Dionaea muscipula).
- These traps function in a similar way, when zooplankton or even a small fish trigger the bristles along the rim, the trap snaps shut and begins the digestion process.
- At one point in time, the waterwheel was found growing in wetland habitats throughout Africa, Europe, Asia, and even Australia.
- Now it is considered at risk of extinction (IUCN has deficient data about the plant).
- Most often this plant reproduces vegetative, reducing genetic diversity, sexual reproduction in the waterwheel is a rare event.
- Its numbers have been severely reduced due to wetland degradation and destruction.
- Agricultural and industrial runoff are exacting a significant toll on its long term survival.



7.22 Sahyadri Megha

- The University of Agricultural and Horticultural Sciences (UAHS), Shivamogga (Karnataka), has developed a new variety of paddy, 'Sahyadri Megha'.
- The new variety has been developed to prevent decline in the area under paddy cultivation.
- Sahyadri Megha is a red variety of paddy that is resistant to blast disease and rich in nutrients.
- The red variety gets its rich colour from an antioxidant called anthocyanins, which are also found in deep purple or reddish fruits and vegetables.
- The compound is believed to have properties that can reduce inflammation, allergy, prevent risks of cancer and help in weight management.
- The protein content in it is 12.48%, higher than the other red rice varieties grown.
- The yield per hectare from 'Sahyadri Megha' is around 65 quintals, substantially higher than other red paddy varieties.
- It is a medium-term paddy that can be grown when there is a delay in the onset of monsoon. It can be harvested after 120 days of sowing.
- The new variety will be notified under the Indian Seed Act 1966 shortly after which it will become part of the seed chain.

7.23 Methanotrophic Bacteria

- Recently Agharkar Research Institute (ARI), Pune has enriched, isolated and cultivated 45 different strains of methanotrophs (methane-utilising bacteria).
- They created the first indigenous methanotroph culture.
- ARI is an autonomous institute under the Department of Science & Technology.
- Methanotrophs can effectively reduce the emission of methane, which is the second most important greenhouse gas (GHG) and 26 times more potent as compared to carbon-di-oxide.
- Native methanotrophs isolated from rice fields can be excellent models to understand the effect of various factors on methane mitigation.
- Besides methane mitigation studies, methanotrophs can also be used in methane value addition (valorization) studies.
- Bio-methane generated from waste can be used by the methanotrophs and can be converted to value-added products such as single-cell proteins, biodiesel, and so on.

7.24 Microbial Inoculants

- In microbiology, inoculation is defined as introducing microorganisms into a culture where they can grow and reproduce. More generally, it can also be defined as introducing a certain substance into another substance.
- Bio-inoculants are living organisms containing strains of specific bacteria, fungi, or algae. These are also known as microbial inoculants.

7.25 Biofuel from Microorganisms

Researchers developed a method to improve the growth rate and sugar content of a marine microorganism called Synechococcus sp. PCC 7002.

- Most biotechnological processes, including biofuel production, are dependent on the availability of low-cost and sustainable supply of sugars and a nitrogen source.
- The sugars typically come from plants.
- Plants utilize light energy through the process of photosynthesis to convert carbon dioxide in the atmosphere into biological components such as sugars, proteins and lipids.
- However, some bacteria like the cyanobacteria blue-green algae), too can perform photosynthesis.

- The yield of sugars from cyanobacteria could potentially be much higher than that of land-based crops.
- Further, unlike plant-based sugars, cyanobacterial biomass provides a nitrogen source in the form of proteins.
- Cyanobacteria are found in both fresh and marine waters.
- Using marine cyanobacteria could be better as freshwater is increasingly getting scarce.
- However, there is a need to significantly improve their growth rates and sugar content in order to improve the economic feasibility of marine cyanobacteria-based sugar production.
- A team from the International Centre for Genetic Engineering and Biotechnology has achieved this feat.
- They have successfully engineered a marine cyanobacterium called Synechococcus sp. PCC 7002, which showed a higher growth rate and sugar (glycogen) content.

7.26 Blast Disease in rice

- The disease in rice is caused by fungus Pyriculariagrisea (P. oryzae), was first recorded in India during 1918.
- It is also known as rotten neck or rice fever.
- Expected grain loss: 70 to 80%.

7.27 Carissa Kopilii

- Carissa kopilii is a multi-utility wild berry, greenish and sour when raw and blackish and sweet when ripe.
- The fruits were difficult to find amid a profusion of thorns.
- The “sun-loving” plant was distributed sparsely, rooted in rocky crevices along the Kopili riverbed (in Central Assam) at altitudes ranging from 85-600 meters above sea level.
- The plant is threatened due to hydroelectric project on the river and water turned acidic because of coal mining in Meghalaya upstream.
- The Carissa carandas (distant cousin of Carissa Kopilli) , was also among several thorny plants the British had grown 140 years ago for a 1,100-mile barrier apparently to enforce taxes and stop the smuggling of salt.
- Carissa Carandas has been used as a traditional herbal medicine for a number of ailments such as diarrhoea, anaemia, constipation, indigestion, skin infections and urinary disorders.
- The leaves have been used as fodder for silkworms while a paste of its pounded roots serves as a fly repellent.
- Carissa kopilii, yielding white flowers from August-October and fruits from November-January, should have all the medicinal and utilitarian properties of Carissa Carandas.

7.28 Long-Tailed Macaques

- In recent times, there has been a lot of interest among primatologists in studying object handling and tool-use in non-human primates such as apes and chimpanzees.
- MacacafascicularisUmbrosus which are vulnerable under IUCN Red list, are the only Old World monkeys who use stone tools in their daily foraging.
- Stone tools in the prehistoric records are a key source of evidence for understanding early hominin technological and cultural variation.
- Primate archaeology is well placed to improve our scientific knowledge by using the tool behaviors of living primates as models to test hypotheses related to the adoption of tools by early stone-age hominins.
- Scientists do not know for certain how or why certain groups have developed this behavior.
- This behavior is mainly observed in populations that live along the ocean shores of southern Thailand and Myanmar where long-tailed macaques use tools primarily to prey on shellfish, including oysters, crabs and mussels.
- The Nicobar long tailed macaque.Macacafascicularisumbrosus, is one such species found in the three southernmost islands (viz. Great Nicobar, Little Nicobar and Katchal) of the Andaman and Nicobar archipelago, India.

- The interesting part is that the same foraging behavior creates distinct tool evidence in the environment.

7.29 MACS 4028

- Recently, scientists from Agharkar Research Institute (ARI), Pune, have developed a bio fortified durum wheat variety MACS 4028.
- Bio fortification is a process to increase the bioavailability and the concentration of nutrients in crops through both conventional plant breeding and genetic engineering.
- Durum is a kind of hard wheat grown in arid regions that is typically ground into semolina and used to make pasta.
- Durum wheat, or Triticum turgidum, is the second most cultivated species of wheat after bread wheat, which is also called common wheat or Triticum aestivum.
- Biofortified durum MACS 4028 wheat variety shows high protein content of about 14.7%, better nutritional quality having zinc 40.3 ppm, and iron content of 40.3 ppm and 46.1 ppm respectively, good milling quality and overall acceptability.
- MACS 4028, is a semi-dwarf variety, which matures in 102 days and has shown the superior and stable yielding ability of 19.3 quintals per hectare.
- It is resistant to stem rust, leaf rust, foliar aphids, root aphids, and brown wheat mite.
- The MACS 4028 variety is also included by the Krishi Vigyan Kendra (KVK) programme for United Nations Children's Fund (UNICEF) to alleviate malnutrition in a sustainable way and can boost the Vision 2022 “KuposhanMukt Bharat”, the National Nutrition Strategy.
- The Indian Council of Agricultural Research (ICAR) has also tagged this variety under the Biofortified category during the year 2019.
- MACS 4028 has been notified by the Central Sub-Committee on Crop Standards, Notification and Release of Varieties for Agricultural Crops (CVRC) for timely sown, rainfed condition of Peninsular Zone, comprising Maharashtra and Karnataka.
- In the peninsular zone of India (Maharashtra and Karnataka states), wheat cultivation is majorly done under rainfed and limited irrigation conditions. Under such conditions, the crop experiences moisture stress.

Wheat

- This is the second most important cereal crop in India after rice.
- It is the main food crop, in north and north-western part of the country.
- Wheat is a Rabi crop that requires a cool growing season and a bright sunshine at the time of ripening.
- It requires 50 to 75 cm of annual rainfall evenly-distributed over the growing season.
- There are two important wheat-growing zones in the country
    1. The Ganga-Sutlej plains in the north-west.
    2. Black soil region of the Deccan.
- The Major wheat-producing states are Punjab, Haryana, and Uttar Pradesh etc.

7.30 Siberian Ibex

- Siberian Ibex is a species of wild goat and is distributed in diverse habitats, ranging from cold deserts, rocky outcrops, steep terrain, high-land flats and mountain ridges to low mountains and foothills.
- It is in Least Concern category under IUCN.
- From Mongolia, its distribution extends towards Altai, Hangai, Gobi-Altai, the Hurukh mountain ranges as well as Sayan Mountains near Russia and scattered populations in the small mountains of Trans-Altai Gobi.

- In Asia, Ibex is distributed in the montane habitats, ranging in elevations from 500 m to 6,700 m in countries like India, Kazakhstan, Tajikistan, Mongolia, Pakistan, Southern Siberia and China.
- In India, the Ibex is distributed mainly in the trans-Himalayan ranges of the Union Territories of Ladakh and Jammu and Kashmir and Himachal Pradesh up to the river Sutlej.

7.31 Himalayan Ibex

- Himalayan Ibex, distributed in the trans-Himalayan ranges of Jammu and Kashmir, Ladakh and Himachal Pradesh,
- According to a recent genetic study by Zoological Survey of India (ZSI), Himalayan Ibex is found to be a distinct species from the Siberian Ibex.
- The 'montane systems', formed by a series of climatic oscillations and temporal topographic metamorphosis, have broken up the contiguous distribution of widespread species and accelerated allopatric speciation (speciation because of geographic and reproductive isolation).
- Identification of Indian Ibex (Himalayan Ibex) as a distinct species will prioritize the conservation of the species at global level.

7.32 Radio-Tags in Pangolins

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.
- This is the first case of successful rehabilitation of the species where the released individuals are monitored in the wild using telemetry.
- In anti-poaching operations where pangolin scales are recovered, those animals are already dead.
- Where live animals are involved, globally there is about 50% death rate among released pangolins.
- This new initiative is to ensure better survival rates and thus have a positive impact on the population of this endangered species.
- Very little is known about the ecology of pangolins.
- So the project will also provide first-hand data about their ecology.
- Pangolins are the most trafficked wildlife species in the world.
- Commonly known as scaly anteaters, the toothless animal evolved an armour of scales.
- The projected population declines range from 50% to 80% across the genus.
- World Pangolin Day, celebrated on 15th February, is an international attempt to raise awareness about pangolins.
- 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.

8. INDEX & REPORTS

8.1 India State of Forest Report

The Union Minister for Environment, Forest and Climate Change recently released the biennial "India State of Forest Report (ISFR)" for 2019.

- The report is published by the Forest Survey of India (FSI).
- FSI has been mandated to assess the forest and tree resources of the country including wall-to-wall forest cover mapping in a biennial cycle.
- Starting 1987, 16 assessment have been completed so far. ISFR 2019 is the 16th report in the series.

Key findings

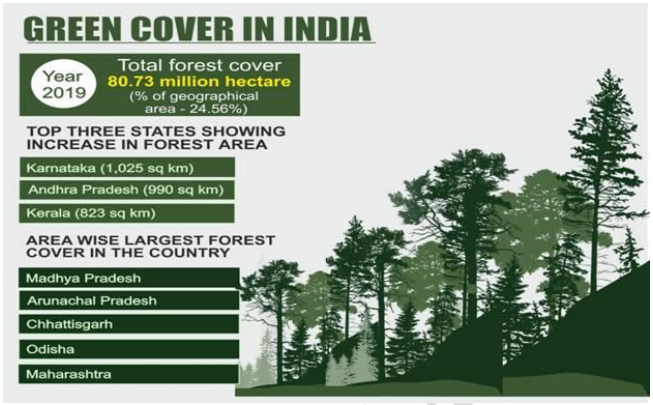
- The total tree and forest cover in the country increased by 5,188 Sqkm with sharpest declines in the northeastern states.
- There is an increase of 46 million tonnes in the carbon stock of the country.
- The total forest cover (TFC) in 2019 is 21.67% of the total geographical area (TGA) of the country as against 21.54% in 2017.
- Tree cover is estimated as 2.89% of the total geographical area (TGA).
- Tree and forest cover together made up 24.56% of the geographical area.
- India's forest cover has increased by 3,976 sq km or 0.56% since 2017.
- For the second successive time since 2007, the SFR recorded a gain (an impressive 1,275 sq km) in dense forest.
- This includes Very Dense Forest with a canopy density of over 70%, and Moderately Dense Forest with a canopy density of 40-70%.
- Around 2,140 sq km of dense forests became non-forests since 2017.
- [A dense forest can deteriorate into an open forest (10-40% canopy density) but conversion to non-forest signifies total destruction.]
- In terms of canopy density classes, area covered by Very Dense Forests (VDF) is 3.02%, Moderately Dense Forest is 9.39% and Open Forest is 9.26%.
- The category of VDF has increased by a mere 1.14% between 2017 and 2019.
- Area-wise 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%).
- The top 5 States showing an increase in forest cover are Karnataka, Andhra Pradesh, Kerala, Jammu & Kashmir and Himachal Pradesh.
- The top 3 States showing maximum loss in forest cover are Manipur, Arunachal Pradesh and Mizoram.
- The forest cover within the Recorded Forest Area or officially classified as 'forest' by States/Centre showed a decrease, but 'forest' outside such recorded area increased by 4,306 sqkm.
- Maharashtra had the largest extent of such tree outside forest.
- The biggest loss is under the tropical semi-evergreen head in SFR 2019 - close to 23,500 sq km.
- [In India, tropical semi-evergreen forests are found along the western coast, lower slopes of the eastern Himalayas, Odisha and Andamans.]
- **Mangroves -** The total mangrove cover in the country is 4,975 sq km.
- An increase of 54 sq Km in mangrove cover has been observed as compared to the previous assessment of 2017.

GAINS & LOSSES (in sq km)

	2003-15	2015-19	Total (2003-19)
FORESTLAND LOST			
VDF to NF	545	575	1,120
MDF to NF	8,968	7,977	16,945
Total lost	9,513	8,552	18,065
FORESTLAND GAINED			
NF to VDF	200	233	433
NF to MDF	4,569	5,225	9,794
Total gained	4,769	5,458	10,227

VDF: very dense forest; MDF: mid-dense forest; NF: non-forest *Source: Forest Survey of India*

- Top three states showing mangrove cover increase are Gujarat (37 sq km) followed by Maharashtra (16 sq km) and Odisha (8 sq km).
- **Carbon Stock -** The extent of bamboo bearing area of the country has been estimated 16 million hectare.
- There is an increase of 0.32 million hectare in bamboo bearing area as compared to ISFR 2017.



- Under the current assessment, the total carbon stock in the country's forest is estimated at around 7,100 million tonnes.
- There is an increase of 42.6 million tonnes in the carbon stock of the country as compared to 2017.
- The annual increase in the carbon stock is 21.3 million tonnes, which is 78.2 million tonnes CO_2 equivalent.
- **Wetlands** – FSI started a new exercise of overlaying spatial layer of wetlands in the forest areas.
- It covers 3.83% of the area withing Recorded Forest Area (RFA) and 8.13% of total wetlands are located with the RFA.
- **Forest Fire** – 21.40% of the forest cover is prone to extremely high forest fire.
- Most of it are located in the northeastern and central region of the country.
- **Biodiversity** – In an first attempt, FSI has carried out a rapid assessment of biodiversity in the States and UTs.
- Maximum Tree diversity is in tropical wet evergreen and semi-evergreen forests of Western Ghats (Tamil Nadu, Kerala and Karnataka) followed by northeastern states.
- **Species Richness** – Karnataka has the highest species richness
- Dependence of fuelwood on forests is highest in the State of Maharashtra, whereas, for fodder,small timber and bamboo, dependence is highestin Madhya Pradesh.
- Redefining and updating the forest cover as per the latest baseline completed in 2019.

Forest Survey of India

- Forest Survey of India (FSI) is an organisation under the Ministry of Environment & Forests.
- Its principal mandate is to conduct survey and assessment of forest resources in the country.
- The Forest Survey of India organize the training programmes to state sponsored forest personnel.
- FSI releases State of Forest Report biennially based on satellite imageries.
- According to the State of Forest Report, the definition of forest cover includes all lands more than 1 hectare in area with a tree canopy of more than 10 per cent, irrespective of land use, ownership, and legal status

Tree cover and Forest Cover

- The Ministry of Environment, Forest & Climate Change defines 'forest cover' in India as "all lands, more than one hectare in area with a tree canopy density of more than 10%"
- Similarly 'tree cover' is defined as "tree patches outside recorded forest areas exclusive of forest cover and less than the minimum mappable area of 1 hectare".
- There is a third measure known as Tree outside forest (TOF).
- The 'India State of Forest Report 2017' defines TOF as "trees existing outside the recorded forest area in the form of block, linear & scattered size of patches".
- Since tree cover measures only non-forest patches that are less than 1 hectare, it is only a part of TOF.

8.2 The State of India's Birds 2020 (SoIB)

The State of India's Birds 2020 (SoIB), a new scientific report on bird species was released recently.

- It is the **first such assessment** of long-term trend, current trend, distribution range size and overall conservation status of 867 birds.
    a. Adequate data on how birds fared over a period of over 25 years (long-term trend) are available only for 261 species.

b. Current annual trends are calculated over a five-year period.

- This report jointly released by **10 organisations** is based on the observations contributed by the birdwatchers on eBird platform.

Key Findings

- This assessment raises the alarm that several birds face a growing threat from loss of habitat due to human activity, widespread presence of toxins, hunting and trapping for the pet trade.
- It warned that diminishing population sizes of many birds because of one factor brings them closer to extinction because of the accelerated effects of others.
- For every bird species that was found to be increasing in numbers over the long term, 11 have suffered losses, some catastrophically.
- Of 101 species categorised as being of **High Conservation Concern**, endemics such as the Rufous-fronted Prinia, Nilgiri Pipit and Indian vulture were confirmed as suffering current decline.
- All these species except 13 had a restricted or highly restricted range, indicating greater vulnerability to man-made threats.
- The health of avifauna is looked at based on scientific groupings such as raptors (birds of prey), habitat, diet, migratory status and endemicity (exclusively found in an area).
- The analysis concludes that **raptors overall are in decline**, with some 'open country' species such as the eagle suffering the most.
- Migratory shorebirds, along with gulls and terns, seem to have declined the most among water birds.
- Within India, the losses suffered by resident water birds, particularly in the past five years, calls for detailed investigation, it adds.
- From a **dietary viewpoint**,
    1. Meat-eater birds' populations have fallen by half,
    2. Birds depend on insects exclusively have also suffered over the long term.
    3. There has been some stabilisation for omnivores, seed and fruit eaters in recent years.
- **Habitat impacts** have decimated 'specialist' birds, which need specific environmental conditions to survive, particularly those dependent on forests.
- This is followed by declines in numbers of grassland, scrubland and wetland species calling for urgent investigation into the causes.
- **Suggestions** - Forward-looking actions suggested by the report include an **update to the IUCN Red List** of endangered species using the SoIB.
- There should be a **collaborative research** by scientists and citizens aided by policy with special emphasis on removing gaps in data.
- An urgent **emphasis on habitats** of species of high concern, notably grasslands, scrublands, wetlands and the Western Ghats.
- Resolute steps to protect forests and other habitats will confer multiple benefits, protecting other myriad species too.
- It is essential to revive the Great Indian Bustard, now pushed to precariously low numbers.
- Coursers and floricans need help with their delicate habitat.
- Bird diversity in India must be protected to improve the health of forests, wetlands, open country habitat and high mountain.

8.3 State of Climate of India in 2019

The State of Climate of India Report was released by the India Meteorological Department (IMD) recently.

- The Statement on Climate of India in 2019 confirms that the **extreme weather events** have become par for the course in the country.

- This is what climate scientists have been claiming for more than half a decade.
- It notes that excessive heat, cold and rainfall killed 1,562 people in 2019.
- In 2019, the mean **temperature was 0.36 above normal** while the country also recorded **excess rainfall** during both the southwest and northeast monsoons.
- Intense dry spells were interspersed with floods in several parts of the country.
- This is a phenomenon that policymakers will increasingly be called to factor while drawing up projects in areas as diverse as agriculture, urban planning, water resources and disaster management.
- The IMD report should be seen in conjunction with **long-term meteorological trends**.
- The World Meteorological Organisation, for example, reckons that the decade starting 2011 remains on track to be the warmest on record.
- At the same time, data from the European Centre for Medium Range Forecast shows that the relative humidity in the mid-troposphere in the Subcontinent has increased by about 2% in the past four decades.
- Such warming has increased the capacity of oceans to form intense cyclonic disturbances.
- **Observations -** In 2019, as the IMD report notes, the Indian Ocean witnessed **eight cyclones**.
- By that very fact, cyclones don't kill but buildings can turn hazardous during such extreme weather events.
- The Ministry of Housing and Urban Affairs does have guidelines for climate-friendly construction.
- But planners in coastal cities and towns rarely pay heed to its provisions.
- Kerala, southern Karnataka and Gujarat were **heavily deficient** till July 2019.
- But in the last week of July, these states recorded **surplus rainfall**.
- For farmers, such vagaries mean **disruptions in the entire cropping cycle**.
- **Suggestions -** Increasing their resilience calls for efficient **rainwater storage and use**.
- The changing dynamics of weather also demand cooperation between states that share a river basin.
- This year, Maharashtra and Karnataka debated over opening the gates of the Almatti dam on the Krishna.
- By the time the two states agreed over the amount of water to be discharged from the dam, the damage was already done.
- It's clear that dealing with exceptional weather will require **interventions at the national, state and local-levels**.
- The Statement on Climate of India 2019 drives home the urgency of such interventions.

8.4 State Energy Efficiency Index 2019

- It tracks the progress of Energy Efficiency (EE) initiatives in 36 states and union territories based on 97 significant indicators.
- The index is developed by Bureau of Energy Efficiency (BEE) in association with Alliance for an Energy Efficient Economy (AEEE).
- It will help states contribute towards national goals on energy security and climate action by helping drive EE policies and program implementation at the state and local level, tracking progress in managing the states' and India's energy footprint and institutionalising the data capture and monitoring of EE activities by states.
- The State Energy Efficiency Index 2019 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.
- New indicators for this year include adoption of Energy Conservation Building Code (ECBC) 2017, energy efficiency in MSME clusters, etc.
- For rational comparison, States/UTs are grouped into four groups based on aggregated Total Primary Energy Supply (TPES) required to meet the state's actual energy demand (electricity, coal, oil, gas, etc.) across sectors.

- TPES grouping shall help states compare performance and share best practices within their peer group.
- Under four categories based on TPES, Haryana, Kerala, Karnataka, Maharashta, Himachal Pradesh, Uttarakhand, Puducherry and Chandigarh have been evaluated as progressive states/UTs in the State Energy Efficiency Index 2019.

9. DISASTER MANAGEMENT

9.1 COVID-19 as a Notified Disaster

The Ministry of Home Affairs (MHA) will treat COVID-19 as a notified disaster for providing assistance under the State Disaster Response Fund (SDRF).

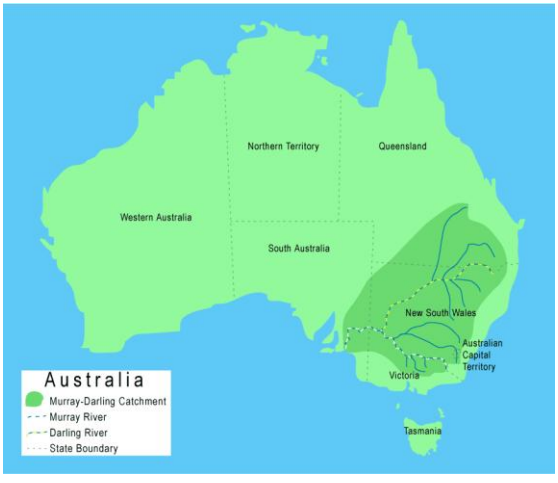
- The Disaster Management Act, 2005 (DM Act, 2005) has given a definition for disaster.
- Disaster is a catastrophe, calamity or grave occurrence in any area, arising from natural or man-made causes.
- It may result in substantial loss of life or human suffering or damage to, and destruction of, property or environment.
- Disaster would be of nature or magnitude as to be beyond the coping capacity of the community of the affected area.
- The High Power Committee on Disaster Management of 1999 had identified 31 disaster categories.
- This committee organised these categories into 5 major sub-groups,
    1. Water and climate related disasters
    2. Geological related disasters
    3. Chemical, industrial and nuclear related disasters
    4. Accident Related Disasters
    5. Biological related disasters, which includes epidemics.
- **SDRF** - It was constituted under the DM Act, 2005.
- It is the primary fund available with the State governments for responses to notified disasters.
- This fund will help the State governments meet expenditure for providing immediate relief to the victims.
- The disasters covered under the SDRF include cyclones, droughts, tsunamis, hailstorms, landslides and pest attacks among others.
- **Share -** The Centre contributes 75% of the SDRF allocation for general category States and Union Territories.
- It contributes 90% of the SDRF allocation for special category States (northeast, Uttarakhand, Himachal Pradesh, Jammu and Kashmir).
- For SDRF, the Centre releases funds in two equal instalments as per the recommendation of the Finance Commission.
- The National Disaster Response Fund (NDRF), also constituted under the DM Act, 2005, will supplement the SDRF of a state.
- The NDRF will support the SDRF in case of a disaster of severe nature, if adequate funds are not available in the SDRF.
- **Past Instances -** In 2001, the National Committee on Disaster Management under then Prime Minister was mandated to look into the parameters that should define a national calamity.
- However, the committee did not suggest any fixed criterion.
- As of now, there is no executive or legal provision to declare a national calamity.
- In 2018, in view of the devastation caused by the Kerala floods, Kerala politicians demanded that the floods be declared a “national calamity”.
- There have been demands from states to declare certain events as natural disasters, such as the Uttarakhand flood (2013).

9.2 Bushfire

Australia is witnessing an unprecedented catastrophic fire season that began in August 2019, with large-scale destruction, mainly in New South Wales (NSW) and Queensland.

- Fire is no stranger to the dry continent's woodlands. (Click here to know more on bushfires in Australia)
- But, the fires this time has devastated over 10 million hectares of land, killing at least 25 people and tens of millions of animals.
- Besides this, it has forced the evacuation of entire communities.
- Kangaroos were burnt in their tracks as they tried to flee, and koalas desperately escaped the fire.
- The government of Prime Minister Scott Morrison is struggling to pacify the angry citizens.
- Citizens are calling for a reconsideration of the country's relationship with fossil fuels.
- The government has, however, sought to downplay the impact of changing climate.
- **Significance -** Bushfires are routine in Australia, but authorities are calling this season the worst on record.
- Australia is hot, dry, prone to droughts, and, in some parts of the country, to bushfires.
- Such fires happen when grass, branches, and trees start to burn in an uncontrolled manner.

- In New South Wales and Queensland, the risk of bushfires peaks during the spring and early summer.
- This year, the fires started in August 2019, much before the Southern Hemisphere summer (December to February).
- These have been aggravated by an impending drought and record high temperatures.
- This summer, Australia has witnessed its worst drought in more than 5 decades, and temperatures went above 41°C.
- Scientists have said that the conditions demonstrate the effects of climate change.
- **Factors -** The coal industry has a sway over politics in Australia that is disproportionate to its share of economic production.
- One-third of global coal exports come from Australia, accounting for 7% of global carbon emissions.
- The country is the largest exporter of coal and liquefied natural gas in the world.
- The energy sector is an important employer there.
- Prime Minister Morrison's conservative government has defended the country's coal industry despite criticisms.
- Australia has also invited scorn for counting carbon credits under the Kyoto Protocol instead of making new reductions to meet its emissions targets.
- The mining industry has caused worries about greenhouse gas emissions increasing in Australia, and in countries to which it exports the fuel.
- The official Climate Commission too was shut down by the government 6 years ago.
- Credentialed specialists at the country's Climate Council have thus had to crowd-source funds to continue their work.



- Today, they are raising the alarm over the lowest ever rainfall recorded in parts of NSW and Queensland.

- These and high peak temperatures are producing challenging situations across the large Murray-Darling Basin.

9.3 Swell Surge Forecast System

- Swell surge forecast system is an innovative system designed for the prediction of Kallakkadal/Swell Surge that occurs along the Indian coast, particularly the west coast.
- Kallakadal/Swell surge are flash-flood events that take place without any noticeable advance change in local winds or any other apparent signature in the coastal environment.
- Hence the local population remains totally unaware of these flooding events until they actually occur.
- Such events are intermittent throughout the year. Kallakkadal is a colloquial term used by Kerala fishermen to refer to the freaky flooding episodes and in 2012 UNESCO formally accepted this term for scientific use.
- During Kallakkadal events, the sea surges into the land and inundates vast areas.
- These events have attracted attention especially after the 2004 Tsunami in the Indian Ocean, since most people mistake Kallakkadal to be Tsunamis.
- Tsunami and Kallakkadal/Swell surge are two different types of waves with entirely separate causes or mechanisms.
- Kallakkadal are caused by meteorological conditions in the Southern Ocean, south of 30°S.
- A study by INCOIS scientists has revealed that specific meteorological conditions in the Southern Indian Ocean support the generation of long period swells.
- These swells once generated, travel northward and reach the Indian coasts in 3-5 days time, creating havoc in the coastal areas.
- The system will now predict Kallakkadal and warnings will be given to concerned authorities at least 2-3 days in advance, which will help the local authorities for contingency plans and to reduce damage.

9.4 Conference on Coastal Disaster Risk Reduction and Resilience (CDRR&R)

- The first 'National Conference on Coastal Disaster Risk Reduction and Resilience (CDRR&R) – 2020' was held in New Delhi.
- It was organized by the National Institute of Disaster Management (NIDM).
- Implementation of the Prime Minister's 10-point agenda and Sendai Framework for Disaster Risk Reduction are the key takeaways of the conference.

9.5 The Prime Minister's 10-point Agenda

- The Prime Minister had listed the agenda during his inaugural speech at the Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR) 2016, held in New Delhi.
- It includes the following elements namely.
- All development sectors must imbibe the principles of disaster risk management.
- Work towards risk coverage for all-starting from poor households to SMEs to multinational corporations to nation-states.
- Encourage greater involvement and leadership of women in disaster risk management.
- Invest in risk mapping globally. For mapping risks related to hazards like earthquakes, we have accepted standards and parameters.
- Leverage technology to enhance the efficiency of our disaster risk management efforts.
- Develop a network of universities to work on disaster issues.
- Utilise the opportunities provided by social media and mobile technologies.
- Build on local capacity and initiative.
- Opportunity to learn from a disaster must not be wasted. After every disaster there are papers on lessons that are rarely applied.
- Bring about greater cohesion in the international response to disasters.

9.6 Sendai Framework for Disaster Reduction 2015-30

- It was adopted at the Third United Nations World Conference on Disaster Risk Reduction, held from March 14 to 18, 2015 in Sendai, Miyagi, Japan.
- It aims to guide the multi-hazard management of disaster risk in development at all levels as well as within and across all sectors.
- It is the successor instrument to the Hyogo Framework for Action (HFA) 2005-2015: Building the Resilience of Nations and Communities to Disasters.

GEOGRAPHY

GENERAL GEOGRAPHY

10.1 Yarrabubba Crater

- The Yarrabubba crater is an asteroid impact structure, the eroded remnant of a former impact crater, situated in the Mid West Western Australia.
- It as an precise age of 2.229 billion years, it is the oldest known impact structure on Earth.
- According to recent study, Australia's Yarrabubba asteroid impact crater is oldest on earth and it may have been responsible for ending an ice age.
- Other older asteroid crater are the Vredefort Dome in South Africa (2.023 billion years old) and Canada's Sudbury Basin (1.850 billion years old).
- These are the only other precisely dated Precambrian impact structures that are currently known.
- Originally stretching roughly 70 km wide, the Yarrabubba resisted reliable estimates of its age because of erosion and plate tectonics.
- It is now an elliptical structure with a diameter of approximately 20 km.
- NASA scientists sought to assign the crater an exact age by studying concentrations of uranium, thorium, and lead in rocks collected from the crater.
- The team submerged the rocks in water, exposed them to electricity, and searched the grains for zircon and monazite.
- That newly determined age coincides with "a dynamic time in the evolution of Earth following the transition from the Archaean to the Proterozoic eon.

10.2 India's Antarctic Expedition

The South African vessel SA Agulhas set off on a two-month Indian Scientific Expedition to the Antarctic Ocean 2020.

- This is the 11th expedition of an Indian mission to the Southern Ocean, or Antarctic Ocean.
- On board the vessel is 34 scientific staff from India, which is an 18-institution team led by Dr Anoop Mahajan.
- The first mission took place between January and March 2004.
- **Objective**- The mission mainly aims to understand the influence of the Southern Ocean across eco-system and atmospheric changes; and how it affects the tropical climate and weather conditions.
- **The cycle** - The carbon dioxide emitted into the atmosphere goes to the Antarctic and polar regions, through atmospheric circulation.
- Since the temperature is very low there, these gases are absorbed and converted into dissolved inorganic or organic carbon.
- Through water masses and circulation, it is coming back to tropical regions. Since it is warmer in these areas, it re-enters the atmosphere.

- It is this cycle, which the mission will help understand better.
- **Sampling** - For this, the team is collecting air and water samples from around 60 stations along the cruise track.

Projects

- **Study hydrodynamics and biogeochemistry** of the Indian Ocean sector of the Southern Ocean; involves sampling seawater at different depths.
- This will help understand the formation of Antarctic bottom water.
- **Observations of trace gases** in the atmosphere, such as halogens and dimethyl sulphur from the ocean to the atmosphere.
- This will help improve the parameterizations that are used in global models.
- **Study of organisms** called coccolithophores that have existed in the oceans for several million years.
- Their concentrations in sediments will give a picture of past climate.
- **Investigate atmospheric aerosols** and their optical and radiative properties.
- Continuous measurements will quantify impact on Earth's climate.
- **Study the Southern Ocean's impact on Indian monsoons**.
- The sediment core taken from the bottom of the ocean will be looked for signs.
- **Dynamics of the food web** in the Southern Ocean.
- This is important for safeguarding catch and planning sustainable fishing.
- **Progress so far -** The mission has extracted one of the largest sediment cores from the Southern Ocean measuring 3.4 metres.
- The changes that have occurred in the climate and the ocean over the years can be observed from the sediments collected.
- It is estimated that the sediments may date back to at least 30,000 years.
- When the samples collected are on shore, the first thing will be done is establishing the chronology using radio carbon dating.

10.3 Geological time scale

- The geologic time scale (GTS) is a system of chronological dating that relates geological strata (stratigraphy) to time.
- It is used by geologists, paleontologists, and other Earth scientists to describe the timing and relationships of events that have occurred during Earth's history.
- The International Commission on Stratigraphy (ICS) sets the nomenclature of geologic time spans.
- Few classification of geological time scale are as follows
    1. Age - is millions of years long
    2. Epoch - contains more than one age
    3. Period - contains more than one epoch
    4. Era - contains more than one period
    5. Eon - contains more than one era and is the longest division.
- The current eon is (Phanerozoic) for 542 million years.
- The previous eon (Proterozoic) lasted about two billion years; an eon does not correspond to a particular duration.

10.4 Hydrothermal vents

- The Earth has about 65,000 km of underwater mountain ranges called the mid-ocean ridges.

- Like mountains on land, these ridges represent 'weak' spots, where it is easy for the semi-solid material from the mantle of the Earth to escape to the surface.
- This 'escape' is sometimes in the form of volcanoes.
- The mid-ocean ridges are also known for their volcanic activity — several islands in the Pacific ocean were formed by the molten rock spewed by them.
- But often, stuff from under the Earth's crust also escapes through 'vents' in the mountains.
- The discovery of such hydrothermal vent systems in the deep oceanic ridges has generated a lot of interest, mainly because of the material spewed can contain valuable metals such as copper, zinc, gold, silver, platinum and palladium.
- Apart from their economic potential, sea-floor hydrothermal vents are characterised by dense biological communities," More than 700 species have been reported.

10.5 Indian Ocean Dipole

- The Indian Ocean Dipole (IOD), also known as the Indian Niño, is an irregular oscillation of sea-surface temperatures in which the western Indian Ocean becomes alternately warmer (positive phase) and then colder (negative phase) than the eastern part of the ocean.
- The IOD involves an aperiodic oscillation of sea-surface temperatures (SST), between "positive", "neutral" and "negative" phases.
- A positive phase sees greater-than-average sea-surface temperatures and greater precipitation in the western Indian Ocean region with a corresponding cooling of waters in the eastern Indian Ocean—which tends to cause droughts in adjacent land areas of Indonesia and Australia.
- The negative phase of the IOD brings about the opposite conditions, with warmer water and greater precipitation in the eastern Indian Ocean, and cooler and drier conditions in the west.
- The IOD also affects the strength of monsoons over the Indian subcontinent.
- The IOD is one aspect of the general cycle of global climate, interacting with similar phenomena like the El Niño-Southern Oscillation (ENSO) in the Pacific Ocean.

10.6 Madden Julian Oscillation

- The Madden-Julian Oscillation (MJO) is the major fluctuation in tropical weather on weekly to monthly timescales.
- The MJO can be characterized as an eastward moving 'pulse' of cloud and rainfall near the equator that typically recurs every 30 to 60 days.
- Because of this pattern, the Madden–Julian oscillation is also known as the 30- to 60-day oscillation, 30- to 60-day wave, or intra-seasonal oscillation.
- The Madden–Julian oscillation is characterized by an eastward progression of large regions of both enhanced and suppressed tropical rainfall, observed mainly over the Indian and Pacific Ocean.
- The anomalous rainfall is usually first evident over the western Indian Ocean, and remains evident as it propagates over the very warm ocean waters of the western and central tropical Pacific.
- This pattern of tropical rainfall generally becomes nondescript as it moves over the primarily cooler ocean waters of the eastern Pacific, but reappears when passing over the warmer waters over the Pacific Coast of Central America.
- The pattern may also occasionally reappear at low amplitude over the tropical Atlantic and higher amplitude over the Indian Ocean.
- The wet phase of enhanced convection and precipitation is followed by a dry phase where thunderstorm activity is suppressed.

10.7 Midnight Zone

- A team of scientists is preparing to dive deep into the depths of the Indian Ocean into a "Midnight Zone" where light barely reaches but life still thrives.
- The five-week expedition is targeting seamounts — vast underwater mountains that rise thousands of meters from the sea floor.

- To explore such inhospitable depths scientists will board one of the world's most advanced submersibles, called "Limiting Factor".
- Last August, the "Limiting Factor" completed the Five Deeps Expedition, diving to the deepest point in each of the world's five oceans.
- The deepest was almost 11,000 meters (36,000 feet) down, deeper than Mount Everest is tall.

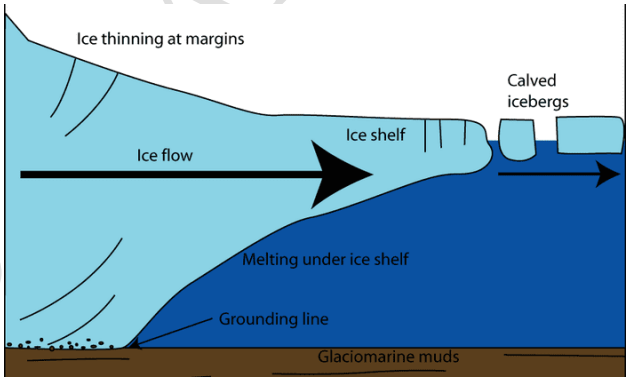
10.8 Ciara Strom

- It is a major storm hit northern Europe, disrupting travel and public events in the region.
- The storm, named 'Ciara' in the UK, is expected to hit Ireland, France, Belgium, the Netherlands, Switzerland, and Germany.
- In Germany, it is being referred to as 'Sabine'.
- The storm has two names because there isn't yet a pan-European system in place for labeling weather systems.

10.9 NYU Study on Antarctic Glacier

The New York University (NYU) study has pinned the cause of the melting of the Thwaites Glacier of Antarctica.

- Thwaites or Doomsday Glacier is 120 km wide glacier at its broadest, fast-moving and melting fast over the years.
- Because of its size (1.9 lakh sq.km.), it contains enough water to raise the world sea level by more than half a metre.
- The amount of ice flowing out of this glacier has nearly doubled over the past three decades.
- Its melting contributes 4% to global sea level rise each year, which has been a cause of alarm for scientists.
- It is estimated that it would collapse into the sea in 200-900 years.
- Thwaites is important for Antarctica as it slows the ice behind it from freely flowing into the ocean.



- A 2019 study had discovered a fast-growing cavity in the glacier.
- **New Study -** In 2020, researchers from NYU conducted a study that detected warm water at a vital point below the glacier.
- Warm waters in this part of the world, as remote as they may seem, should serve as a warning about the potential dire changes to the planet brought about by climate change.
- The study reported water at just two degrees above freezing point at Thwaites's "grounding zone" or "grounding line".
- This NYU study was funded by the International Thwaites Glacier Collaboration which has been studying the glacier since 2018.
- Scientists dug a 600 m access hole and deployed an ocean-sensing device called Icefin to measure the waters moving below the glacier's surface.
- Such warm water along a section of Thwaites grounding zone where the glacier is melting suggests that it may be undergoing an unstoppable retreat that has huge implications for global sea-level rise.
- **Grounding line** is the place below a glacier at which the ice transitions between resting fully on bedrock and floating on ocean as an ice shelf.
- The location of the line is a pointer to the rate of retreat of a glacier.
- When glaciers melt and lose weight, they float off the land where they used to be situated.
- When this happens, the grounding line retreats.
- That exposes more of a glacier's underside to seawater, increasing the likelihood it will melt faster.

- This results in the glacier speeding up, stretching out, and thinning, causing the grounding line to retreat ever further.

10.10 Northern European Enclosure Dam (NEED)

- A research paper accepted by American Meteorological Society has proposed an extraordinary measure to protect 25 million people and important economic regions of 15 Northern European countries from rising seas as a result of climate change.
- It proposes for a mammoth construction of Northern European Enclosure Dam (NEED) enclosing all of the North Sea.
- The concept of constructing NEED showcases the extent of protection efforts that are required if mitigation efforts fail to limit sea level rise.
- The proposed structure comprises of two dams of a combined length of 637 km, the first between northern Scotland and western Norway, measuring 476 km and with an average depth of 121 m and maximum depth of 321 m.
- The second between France and southwestern England, of length 161 km, and average depth of 85 m and maximum depth of 102 m.
- They have also identified other regions in the world where such mega-enclosures could potentially be considered, including the Persian Gulf, the Mediterranean Sea, the Baltic Sea, the Irish Sea, and the Red Sea.

10.11 Jebel Ali Gas Field

- United Arab Emirates (UAE) had discovered a new natural gas field with 80 trillion standard cubic feet (tscf) of shallow gas resources.
- The reservoir, named 'Jebel Ali', is located between the emirates of Dubai and Abu Dhabi, which along with five other emirates form the UAE.
- The gas field discovery, reportedly the largest in the world since 2005, holds the potential of helping UAE's gas self-sufficiency, reducing its reliance on neighboring Qatar for the fuel.
- At 80 tscf, the new reservoir would now be ranked the fourth largest by size in the Middle East, behind the North Field in Qatar, South Pars in Iran, and the Bab field in Abu Dhabi.
- According to officials, it spans around 5,000 square kilometres.

10.12 Vanilla Islands

- Vanilla Islands is an affiliation of the island nations Seychelles, Madagascar, Réunion, Mauritius, Comoros, Mayotte in the Indian Ocean to form a new travel destination brand.
- Aim of the co-operation that has been founded in 2010 at La Réunion is to pool forces and jointly market the region compared to the solely individual marketing of each island in the past.
- Indian Navy has launched 'Operation Vanilla' by sending INS Airavat, in support of flood-hit Madagascar in January 2020, which was in line with India's vision of Security and Growth for all in the Region (SAGAR).

10.13 Great Barrier Reef

- The Great Barrier Reef Marine Park, is located off the east coast of the Queensland mainland, Australia.
- It spreads across a length of over 2,300 km and is roughly the size of Italy.
- It is home to about 3,000 coral reefs, 600 continental islands, 1,625 type of fish, 133 varieties of shark and rays and 600 types of soft and hard corals.
- It was entered into UNESCO World heritage List in 1981.
- Recently scientists have warned that the Great Barrier Reef will face a critical period of heat stress over the coming weeks, following the most widespread coral bleaching the natural world has ever endured.
- Warming ocean temperatures, a sign of climate change, is associated with the deteriorating health of the Reef.

10.14 Coral Bleaching

- According to the National Oceanic and Atmospheric Administration (NOAA), when corals are stressed by changes in conditions such as temperature, light or nutrients, they expel the algae living in their tissue, causing them to turn white, hence bleached.
- Coral bleaching does not mean the corals are dead, but make them vulnerable, hence increasing their mortality.
- Warm ocean temperatures are one condition that could lead to coral bleaching.
- For instance, in 2005, the US lost half of its coral reefs in the Caribbean in one year due to a massive bleaching event.
- Even so, NOAA says that not all bleaching events are due to warmer temperatures.
- In January 2010, cold water temperatures in the Florida Keys caused a coral bleaching event that resulted in some coral deaths.

10.15 Changes in Snow Cover

- According to NASA and JAXA findings Winter snow cover is now expected to last for 110 days, down from the 126 days between 1982 and 2014.
- The patterns of change were visible in maps showing changes in the duration of winter snow cover between 2071 and 2100. This was compared to data from 1982-2014.
- The largest decline in snow cover was expected between 40 and 50 degrees latitude across North America and Asia.
- This means species will have to try to survive an extra month without such protection.
- Another problem species will face is longer periods of frozen ground, which will expose them to colder temperatures and leave them more vulnerable to predators.
- Animals like rodents will be more exposed to predators and find it tough to find food in frozen ground.
- Changes in duration of bare, frozen ground for 2071-2100 compared to 1982-2014
- Plants will face problems with freeze-thaw cycles, the diversity of microbes will also be impacted by colder soil temperatures.
- Only those species which can tolerate and adapt to these new conditions will survive.

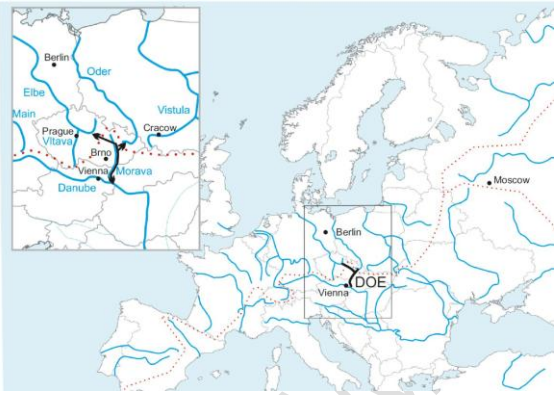
10.16 Study on Earth's Orbit

- Recently, a study on Earth's spin was published in the American Geophysical Union's journal Paleoceanography and Paleoclimatology.
- The study came after scientists studied a 70 million years old mollusc fossil from Oman.
- The study states that Earth spun 372 times a year 70 million years ago, compared to the current 365 times. This means the day was 23½ hours long, compared to 24 hours today.
- It is important to note that the period of Earth's orbit has remained the same. In other words, one year 70 million years ago was as long as one year today.
- Today, Earth's orbit is not exactly 365 days, but 365 days and a fraction, which is why our calendars have leap years, as a correction.
- It has long been known that Earth's spin has slowed over time.
- The study states friction from ocean tides, caused by the Moon's gravity, slows Earth's rotation and leads to longer days.
- And as Earth's spin slows, the Moon moves farther away.
- The study states that the Moon's rate of retreat has changed over time.

10.17 Project to Link Rivers in Europe

- The Danube-Oder-Elbe Canal intends to connect the Danube, Oder and Elbe rivers and thus provide another navigable link from the Black Sea to the North and Baltic Seas.
- The project is planned under Trans-European Transport Network.

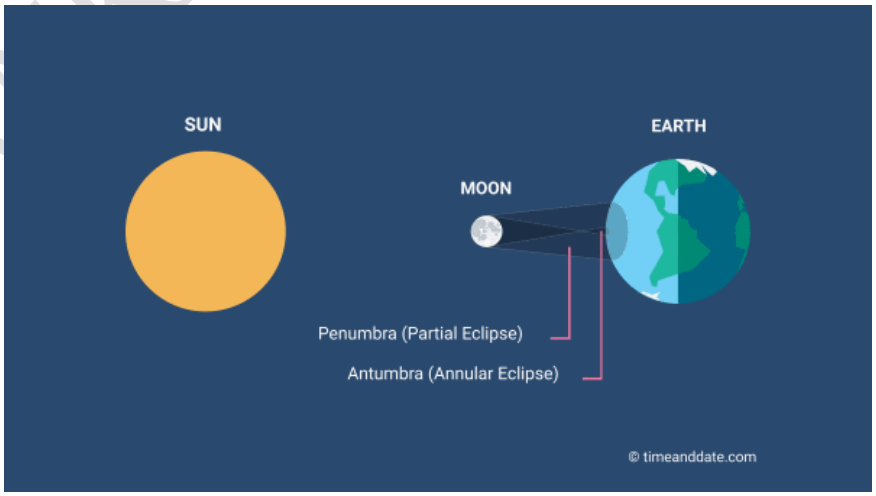
- Under the project several hundred kilometers of artificial waterways would have to be built for the canal.
- In order to hoist freight ships over a low mountain range and overcome 250 meters in altitude, 70 locks would need to be constructed, even tunnels are being considered.
- Environmental organizations from across central and Eastern Europe have criticized a major project intending to link three rivers and provide seamless navigation between three of Europe's peripheral seas.
- If constructed, would destroy the region's river landscapes, in violation of EU environmental laws.
- This major project, costing at least 23 billion euros, fundamentally violates EU environmental and nature conservation directives and must not be allowed to become a reality.



- The acceleration of flood waves resulting from the construction of numerous locks, and canalized and deepened riverbeds is expected to diminish flood protection and increase flood risks further.
- The canal would also result in a great loss of biodiversity, as the areas where the canal is be built, offer a safe haven to Europe's most valuable and threatened species and habitats, for birds as well as other animal and plant species.
- Moreover, the three rivers that are earmarked for the project, are not navigable in many section for much of the year.
- Due to the extremely low water level of the Elbe, its construction would not benefit freight shipping, but rare river habitats such as sandy banks and softwood floodplains would be destroyed.

10.18 Umbra, Penumbra and Antumbra

- Like any other opaque objects illuminated by a light source, the Moon and the Earth cast shadows into space as they block the sunlight that hits them. Each shadow has 3 different areas: the umbra, the penumbra, and the antumbra.
- **Penumbra -** It is the lighter outer part of a shadow, the Moon's penumbra causes partial solar eclipses, and the Earth's penumbra is involved in penumbral lunar eclipses.
- The penumbra is a half-shadow that occurs when a light source is only partly covered by an object – for example, when the Moon obscures part of the Sun's disk.
- **Umbra -** The shadow's dark center portion.
- **Antumbra -** The lighter part of the shadow that begins where the umbra ends.



INDIAN GEOGRAPHY

10.19 Belum Caves

- The Belum Caves are located near Belum Village in Kurnool District in the state of Andhra Pradesh.
- Belum is part of a larger complex of caves carved out of the limestone deposits in the Erramalai region.
- The Belum Caves is the largest and longest cave system open to the public on the Indian subcontinent, known for its speleothems, such as stalactite and stalagmite formations.
- This cave system was formed over the course of tens of thousands of years by the constant flow of underground water from the now-disappeared river Chitravathi.
- It is the second largest caves on the Indian Subcontinent after the KremLiatPrah caves in Meghalaya.
- It is one of the centrally protected Monuments of National Importance.
- Belum Caves are geologically and historically important caves, There are indications that Jains and Buddhists monks occupied these caves centuries ago.
- Many Buddhists relics were found inside the caves, These relics are now housed in Museum at Ananthapur.
- Archaeological survey of India (ASI) also found remnants of vessels of the pre-Buddhism era and dated the remnants of these objects to 4500 years BCE.
- The Belum Caves festival is also known as KandanavoluSambaralu, It is being organized to popularize the Belum caves.

10.20 Sambhar Salt Lake

- The Sambhar Salt Lake, India's largest inland salt lake is located southwest of Jaipur, Rajasthan.
- Sambhar Salt is the source of most of Rajasthan's salt production; It produces 196,000 tons of clean salt every year.
- Sambhar has been designated as a Ramsar site (recognized wetland of international importance).
- The specialized algae and bacteria growing in the lake provide striking watercolors and support the lake ecology that, in turn, sustains the migrating waterfowl.

10.21 Chilika Lake

- Chilika Lake is the largest brackish water (mixture of saline and fresh water) lagoon of India, spread over the Puri, Khurda and Ganjam districts of Odisha State on the east coast of India.
- It is the largest coastal lagoon in India, located at the mouth of the Daya River, which is flowing into the Bay of Bengal, covering an area of over 1,100 km.
- It is designated as 'wetland of international importance under the Ramsar convention.
- Before Cyclone Fani hit the Odisha coast, Chilika lake had only two active mouths - the point where it meets the sea.
- But after Fani Cyclone four new mouths have opened due to wave energy with high tidal prism.
- With the opening of new mouths, a lot of sea water is entering Chilika Lake and, thereby increasing salinity of Chilika lagoon, Increasing salinity may alter Chilika's ecosystem.
- Generally, if sea water ingression goes up, fish migration will increase and the biodiversity will get richer.
- However, its long term impact needs a proper vigil.

10.22 India's Deep Sea Exploration Project

- Indian scientists are preparing to set sail to a region of the Indian Ocean, off the East coast of Madagascar, where they believe are plenty of valuable minerals to pick up.
- At a point in the Indian Ocean off the coast of Madagascar, around 26° South, three mid-ocean ridges intersect, This is estimated to be a highly productive area.
- The massive deposits "can range from several thousands to 100 million tonnes.

- The sea-bed sampling that NCPOR is planning for next year will pinpoint the best areas for further exploration and mining.
- This region has been proven to contain rich deposits of polymetallic nodules that hold copper and cobalt.
- India has an exclusive exploration right over a 75,000 sq km area.
- It's been two years since India leased a 10,000 sq km area (for 15 years) from the International Seabed Authority.
- National Centre for Polar and Ocean Research (NCPOR), Goa and Chennai-based National Institute of Ocean Technology (NIOT), will jointly purchase an autonomous underwater vehicle — an unmanned, pre-programmed vehicle that can dive into the ocean and collect pictures and samples.
- Both NCPOR and NIOT are research institutions under the Ministry of Earth Sciences.
- NCPOR has "identified a dozen locations", potential candidates for detailed exploration for tapping into minerals spewed by 'hydrothermal vents'.

Samudrayaan

- The machine, currently stationed at NIOT, will move on tracks, but in order they don't get mired into the seabed, the vehicle has buoys on it to keep pulling it upwards.
- This machine is a precursor to another equipment, informally christened 'Samudrayaan', which will contain a module to hold human beings.

10.23 Buddah Nullah

- Buddah Nullah is a seasonal tributary of Sutlej in Ludhiana, which originates at village Koom Kalan of Ludhiana.
- It runs for 47 kms till Walipur Kalan where it merges with River Sutlej, this stream carrying freshwater was earlier known as 'Buddha Dariya'.
- Over the years, the name got changed to Buddha Nullah (drain) owing to the sewage, industrial and domestic waste that is dumped into it in the 14-km stretch within Ludhiana city municipal corporation limits.
- The pollution in the Buddah Nullah is a major threat to public health and environment and the main sources of pollution in the nullah are direct flow of pollutants by industries and dairies.
- Recently Punjab Cabinet approved ₹ 650 crore in the first phase for rejuvenation of Buddah Nullah.

10.24 India's Polar Stations

- India presently has two research stations at Antarctica namely 'Maitri' and 'Bharati'.
- At both the stations, research and investigations are undertaken to understand the Polar processes and phenomenon.
- Observations and studies are carried out in atmospheric, biological, geological, ecological sciences etc.
- Maitri station has been in operation since 1989.
- Indian Arctic station 'Himadri' is located at Ny Alesund, Spitsbergen Island, Norway and serves as a hub of Indian scientific investigations since 2008.
- In Antarctica scientific studies and investigations are undertaken on the continental part and contiguous shelf ice area.
- India's Polar research vessel is still under construction, National Centre for Polar & Ocean Research; Goa has taken up the task of building the vessel.

10.25 Wainganga

- Wainganga River is one of the key tributaries of the river Godavari.
- It rises in the Mahadeo Hills in the Seoni District of Madhya Pradesh and drains Madhya Pradesh and Maharashtra.
- The Wainganga after joining the Wardha River at Chaprala in Gadchiroli district (Maharashtra) is known as the Pranahita River.

- Wardha river originates in Satpura Range in Betul District, Madhya Pradesh.
- Penganga river is a major tributary of the Wardha river and rises in the Ajanta range.
- Pranahita river empties into the Godavari River at Kaleshwaram, Telangana.
- Pranahita river is the largest tributary of the Godavari river covering about 34% of its drainage basin.
- Gosekhurdh irrigation project is being constructed on the Wainganga River.

10.26 Godavari River

- It is India's second longest river after the Ganga. Its source is in Trimbakeshwar, Maharashtra.
- It flows east for 1,465 kilometres, draining the states of Maharashtra, Telangana, Andhra Pradesh, Chhattisgarh, Odisha, and Karnataka.
- Major Tributaries: Indravati, Pravara, Wardha, Wainganga, Kanhan, Purna, Pranhita, Sabari, Manjira, Bindusara River etc.
- The Kaleshwaram lift irrigation project is an under-construction multi-purpose irrigation project on the Godavari River in Kaleshwaram, Bhoopalpally, Telangana.
- The project starts at the confluence point of Pranahita River and Godavari River.

10.27 Port at Vadhavan

- Union Cabinet has given its 'in-principle' approval for setting up a Major Port at Vadhavan, Maharashtra.
- Vadhavan port will be developed on "land lord model".
- A Special Purpose Vehicle (SPV) will be formed with Jawaharlal Nehru Port Trust (JNPT) as the lead partner with equity participation equal to or more than 50% to implement the project.
- The SPV will develop the port infrastructure including reclamation, construction of breakwater, besides establishing connectivity to the hinterland.
- All the business activities would be undertaken under PPP mode by private developers.
- With the development of Vadhavan port, India will break into the countries with top 10 container ports in the world.

10.28 Sonbhadra Gold Mines

- Geographical Survey of India (GSI) provided estimates for the amount of gold that can be extracted from a site in Sonbhadra district of Uttar Pradesh.
- The gold resource is located near a village called Mahuli, around 70 km from Sonbhadra district, the land is mainly forest area and inhabited mostly by tribal and members of backward classes.
- The probable resource is 52,806.25 tonnes of ore, with an average grade of 3.03 grams per tonne, which means the total gold that can be extracted is 160 kg.
- The site is part of the Mahakoshal region that includes parts of UP, Madhya Pradesh and Jharkhand.
- It is known to be potentially mineral-rich
- Two basic processes are involved to determine the quantity of gold that can be extracted are as follows
- **Study of rocks -** Laboratory analysis of the rocks indicates the possibility of these containing a particular mineral, in this case gold.
- For high possibility of containing such metals and minerals, the rocks need to be at least 700 million years old.
- The rocks in Sonbhadra are in the Mahakoshal region and from the Proterozoic era, which started 2,500 million years ago.
- The age of the rocks is determined by radiometric dating processes.
- **Drilling of the ground -** This eventually provides a three-dimensional image of the area, which is necessary for determining the quality of the resource and the amount available.
- The GSI classifies ore into categories based on the viability of extraction, which is determined from density.

- The gold ore found in Sonbhadra is in the "economic" category, which means that extraction will cost less than the cost of the gold that is extracted.
- The cost of extraction also depends on the grade of gold; the higher the gold concentration, the easier its extraction.

10.29 Saranda and Chaibasa Iron Ore Reserves

- Saranda and Chaibasa — in Jharkhand's West Singhbhum district had large iron ore reserves.
- Management Plan for Sustainable Mining (MPSM), which regulates mining in Chaibasa and the Saranda Sal forest area.
- The Saranda forest the biggest Sal forest in Asia was once a hotbed of leftwing extremism.

10.30 Teesta River

- Teesta River (or Tista River) is a 315 km long river that rises in the eastern Himalayas, flows through the Indian states of Sikkim and West Bengal through Bangladesh and enters the Bay of Bengal.
- The Teesta River originates from the Pahunri (or Teesta Kangse) glacier above 7,068 metres and flows southward through gorges and rapids in the Sikkim Himalaya.
- It drains an area of 12,540 Sq.Km, It forms the border between Sikkim and West Bengal.
- Recently Border Roads Organisation (BRO) opened for traffic 360 feet long bailey suspension bridge over Teesta River in Munshithang near Chungthang town.
- The bridge will give impetus to tourism and facilitate the movement of logistics for the Armed Forces deployed in forward areas.

10.31 Rushikulya River

- The Rushikulya River is one of the major rivers in the state of Odisha and covers entire catchment area in the districts of Kandhamal and Ganjam of Odisha.
- The Rushikulya originates at an elevation of about 1000 metres from Daringbadi hills of the Eastern Ghats range.
- The place from where the river originates, Daringbadi is called the ' Kashmir of Odisha '.
- The river meets the Bay of Bengal at Puruna Bandha in Ganjam.
- Its tributaries are the Baghua, the Dhanei, the Badanadi etc.
- It has no delta as such at its mouth.
- Gahirmatha marine sanctuary and Rushikulya rookery coast in Ganjam district are main Olive Ridley Nesting sites in Odisha.
- After 7 years, recently over one lakh turtles have laid eggs along Rushikulya coast.

10.32 Reunion Island

- Reunion Island is a remote Indian Ocean island located between Madagascar and Mauritius.
- It is an overseas region of France.
- The island's capital is Saint-Denis which is home to one-fifth of the population.
- The Island is home to one of the world's most active volcanoes, the Piton de la Fournaise which is also a World Heritage site.
- India and France have conducted joint patrols from the Reunion Island for the first time. (This is different from annual Indo-French Military Joint Exercise Shakti).