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TARGET 2020

ENVIRONMENT & GEOGRAPHY I

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TARGET 2020
ENVIRONMENT & GEOGRAPHY – I
(JUNE 2019 TO DEC 2019)

ENVIRONMENT

1. POLLUTION

1.1 Corporate Average Fuel Efficiency Norms

- CAFE (Corporate Average Fuel Efficiency/Economy) norms aim at lowering fuel consumption (or improving fuel efficiency) of vehicles.
- It is achieved by lowering carbon dioxide (CO_2) emissions.
- Thus, it serves the twin purposes of reducing dependence on oil for fuel and controlling pollution.
- Corporate Average refers to sales-volume weighted average for every auto manufacturer.
- The norms are applicable for petrol, diesel, LPG and CNG passenger vehicles.
- The CAFE regulations are in place in many advanced as well as developing nations, including India.
- CAFE regulations in India came into force from April 1, 2017.
- Under this, average corporate CO_2 emission must be less than 130 gm per km till 2022 and below 113 gm per km thereafter.
- In other words, it requires cars to be 10% or more fuel efficient between 2017 and 2021, and 30% or more fuel efficient from 2022, in terms of CO_2 emission.
- **Significance -** Upgrading to stricter fuel standards is one way to tackle air pollution.
- Stricter CAFE targets can also lead to manufacturers moving to electric or strong hybrid vehicles over the medium to long-term to comply with the norms.
- This can complement other efforts at ensuring cleaner air through measures such as the -
    i. implementation of the BS VI emission norms from April 2020 onwards
    ii. the plan to shift to mass use of electric vehicles by 2030
    iii. incentives under the FAME (Faster Adoption and Manufacturing of Hybrid & Electric Vehicles) scheme
- **CAFE & BS VI** - While CAFE regulations focus on reducing CO_2 emissions, BS VI focusses on other harmful exhaust from vehicles.
- The **Draft National Auto Policy** in early 2018 calls for developing a roadmap for reduction in CO_2 emissions through CAFE regulations.
- It aspires to match Indian CO_2 reduction targets to those set by developed countries by 2025.
- The Auto Policy also contemplates economic penalties for manufacturers who do not meet the targets.
- It also envisages a system where credits (for achieving more than the mandated fuel efficiency) can be banked and traded.

1.2 Bharat Stage Emission Standards

Supreme Court ordered a complete ban on the sale and registration of Bharat Stage IV (BS-IV) vehicles in the country from April 1, 2020.

- The court ordered that only BS-VI vehicles will be allowed after the April 1, 2020, at the same time BS-VI grade petrol and diesel would also come into force across the country.
- BS standards are emission standards instituted by the Government of India in the year 2000, based on EU standards.
- It is to regulate the **output of air pollutants** from internal combustion engines and Spark-ignition engines equipment, including motor vehicles.
- It includes both emission standards for new vehicles as well as specifications for commercial petrol and diesel fuels.
- The standards and the timeline for implementation are set by the Central Pollution Control Board under the Ministry of Environment & Forests and climate change.
- All new vehicles manufactured after the implementation of BS norms must be compliant with the regulations.
- Major emissions governed under these norms are carbon monoxide emissions, hydrocarbon emission limits. Nitrogen Oxides and particulate matter are also significant metrics.
- BS-IV standard was brought into place in country-wide in April 2017.
- Implementation of the BS V standard that was earlier scheduled for 2019 has now been skipped.
- In 2016, the Indian government announced that the country would skip the BS-V norms altogether and adopt BS-VI norms by 2020.
- The government has also announced that BS-VI fuel will be available in Delhi by April 2018 and NCR by 2019.
- **BS – IV Vs BS – VI -** The main difference between BS-IV and BS-VI (which is comparable to Euro 6) is in **the amount of sulphur in the fuel.**
- BS-VI fuel is estimated to bring around an 80% reduction in sulphur content — from 50 parts per million (ppm) to 10 ppm.
- Another major difference is NOx. BS VI is expected to cut NOx emissions from diesel cars by nearly 70% and from cars with petrol engines by 25%.
- Also, BS VI will bring the cancer-causing **particulate matter** in diesel cars by a phenomenal 80%.
- **Implications** - This measure is expected to help mitigate the problem of air pollution in NCT of Delhi and surrounding areas.
- The move is also in line with India's commitment under the Paris Climate Change Agreement to reduce its vehicular emission as part of the effort to cut emission intensity of the gross domestic product.
- The government statement does not mention any plans on seeking automakers to sell only BS-VI vehicles in the city.
- **Recent development** - International Centre for Automotive Technology (ICAT) releases first Bharat Stage -VI engine certificate for a heavy-duty engine model.

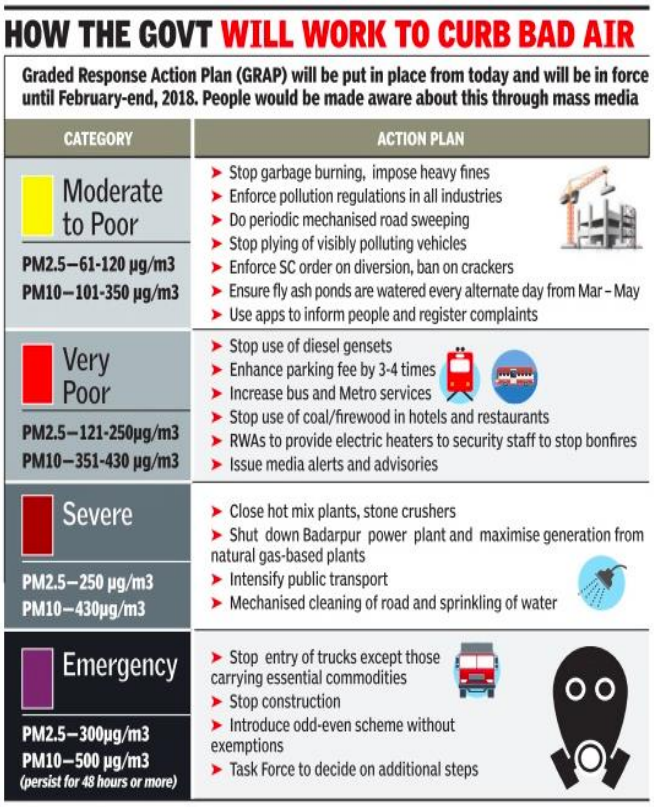
Standard	Reference	Year	Region
India 2000	Euro 1	2000	Nationwide
BS-II	Euro 2	2001	NCR, Mumbai, Kolkata, Chennai
		2003	NCR, 13 Cities
		2005	Nationwide
BS-III	Euro 3	2005	NCR, 13 Cities
		2010	Nationwide
BS-IV	Euro 4	2010	NCR, 13 Cities
		April, 2017	Nationwide
BS-V	Euro 5	(Skipped)	-
BS-VI	Euro 6	April, 2018	Delhi NCR (BS VI Fuel only)
		January, 2019	13 Cities (BS VI Fuel only)
		April, 2020	Nationwide (Both BS Fuel & Compliant vehicles)

- It is much ahead of the implementation date of 1st April 2020 for rolling out of Bharat Stage-VI norms in the country.

1.3 Graded Response Action Plan - Delhi

Some stricter measures to fight air pollution has come into force in Delhi's neighbourhood starting October 15 2019, as part of the Graded Response Action Plan (GRAP).

- The GRAP was formulated in 2016 and approved by the Supreme Court in the same year.
- It was notified in 2017 by the Centre, and draws its authority from this notification.
- It was planned after several meetings of EPCA (Environment Pollution (Prevention and Control) Authority) with state government officials and experts.
- GRAP institutionalized the measures to be taken when air quality deteriorates.
- It aims to roll out progressively tougher actions as pollution levels rise, without waiting for an emergency to impose strict measures.
- **Working of GRAP -** The plan is incremental in nature.
- So, it does not include action by various state governments to be taken throughout the year to tackle emissions.
- Rather, when the air quality shifts from poor to very poor, the measures listed have to be followed.
- If air quality reaches the severe stage, GRAP talks about shutting down schools and implementing the odd-even road-space rationing scheme.
- The plan requires action and coordination among 13 different agencies in Delhi, Uttar Pradesh, Haryana and Rajasthan (NCR areas).
- At the top is the *EPCA*, mandated by the Supreme Court.
- Before the imposition of any measure, EPCA holds a meeting with representatives from all NCR states.
- A call is taken on which actions have to be made applicable in which town.
- **Effectiveness -** It has been successful in doing two things that had not been done before -
    i. creating a step-by-step plan for the entire Delhi-NCR region
    ii. getting on board several agencies: all pollution control boards, industrial area authorities, municipal corporations, regional officials of IMD and others
- The biggest success of GRAP has been in fixing accountability and deadlines.
- For each action to be taken under a particular air quality category, executing agencies are clearly marked.
- In a territory like Delhi, where a multiplicity of authorities has been a long-standing impediment to effective governance, this step made a crucial difference.



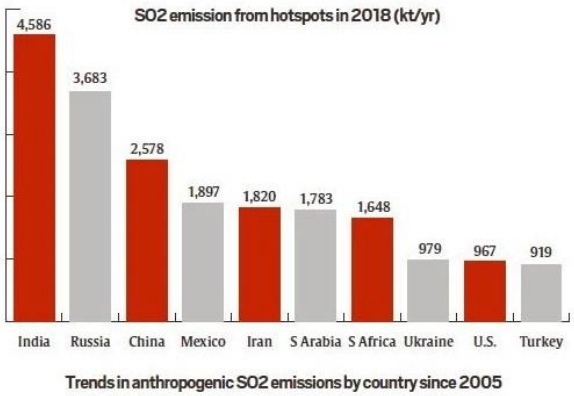
- Clear demarcation of responsibilities has made easier the coordination among as many as 13 agencies from 4 states.
- Three major policy decisions that can be credited to EPCA and GRAP are-
    1. The closure of the thermal power plant at Badarpur
    2. Bringing BS-VI fuel to Delhi before the deadline set initially
    3. The ban on Pet coke as a fuel in Delhi NCR

- **Shortfalls** - A major concern with the EPCA and the GRAP has been the focus on Delhi.
- Delhi has always been the first one to have stringent measures enforced.
- Other states have managed to delay several measures, citing lack of resources.
- For GRAP as well as EPCA, the next challenge is to extend the measures to other states effectively.

1.4 Sulphur Dioxide Emission

A new report by Greenpeace India shows, India is the largest emitter of sulphur dioxide in the world.

- The report also includes NASA's data on the largest point sources of sulphur dioxide.
- More than 15% of all the anthropogenic **SO2** hotspots are in India, as detected by the NASA OMI (Ozone Monitoring Instrument) satellite.
- Almost all of these emissions are because of coal-burning.
- The vast majority of coal-based power plants in India lack flue-gas desulphurisation technology to reduce air pollution.
- To combat pollution levels, the MoEFCC introduced,
    1. **SO2** emission limits for coal-fired power plants in 2015.
    2. But the deadline for the installation of flue-gas desulphurisation (FGD) in power plants has been extended from 2017 to 2022.



Trends in anthropogenic SO2 emissions by country since 2005

- Air pollutant emissions from power plants and other industries continue to increase in India, Saudi Arabia and Iran.
- China and the US have reduced emissions rapidly by switching to clean energy sources and enforcement for **SO2** control.

1.5 Need for Amending 1981 Air Act

As Delhi's Air Quality Index crosses 500, the national capital has officially entered the public health emergency category. This highlights the dire need for amending the 1981 Air Act.

- **Status of Air Pollution** - several internationally acclaimed studies have affirmed that life expectancy in India has declined anywhere between 2 to 3 years.
- India is in a worse situation compared to its global counterparts in this regard.
- According to Greenpeace, 22 of the world's 30 most polluted cities are in India.
- Delhi has yet again bagged the position of the world's most polluted capital.
- These are grim figures, especially when compared to India's neighbors: Five in China, two in Pakistan and one in Bangladesh.
- In 2018, India was placed in the bottom 5 countries on the Environmental Performance Index.
- It was ranked 177th out of 180 countries, along with Bangladesh, Burundi, Democratic Republic of Congo, and Nepal.
- **Provisions –** The act defines air pollutant as any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as tend to be injurious to human beings or other living creatures or plants or property or environment.
- It expanded the authority of the central and state boards established under the Water Act, to include air pollution control.
- Central Pollution Control Board advises the central government on any matter concerning the improvement of the quality of the air and prevention, control and abatement of air pollution.

- It provides technical assistance to and guidance to the State Pollution Control Board. It also lays down the down standards for the quality of air.
- Under the Air Act, all industries operating within designated air pollution control areas must obtain a "consent" from the State Boards.
- The states are required to prescribe emission standards for industry and automobiles after consulting the central board and noting its ambient air quality standards.
- The Act grants power to SPCB and to test equipment and to take the sample for the purpose of analysis from any chimney, fly ash or dust or any other.
- The 1988 amendment act empowered SPCB and CPCB to close a defaulting industrial plant.
- However, the Pollution Control Boards are presently unable to fulfill their mandate as watchdogs against polluting industries.
- In its present form, India's Air Act does not mention or prioritize the importance of reducing the health impact of rising pollution.
- It is therefore essential to make a rework on the 1981 Air Act that governs the country's pollution control system.
- **Format of New Law -** A new bill will plug many loopholes in the 1981 Act.
- It could align the functions and priorities of the Pollution Boards towards reducing the adverse impact of pollution on human health in India.
- Primarily, a new law should make 'protecting health needs' to become the central mission that the pollution boards work towards.
- When the air quality goes from normal to toxic and hazardous, the boards must be empowered to declare public health emergencies.
- They should have the power to temporarily shut down all polluting activities.
- Accountability and deterrence are essential in ensuring that industries comply with emission standards.
- While the boards cannot levy penalties, they should be empowered to encash environmental compensations from polluting industries.
- This would be a strong reinforcement for industries to adopt cleaner technologies and comply with standards.
- The industries and their respective state boards must be ranked in order of their efficiency and programme delivery.
- This would incentivise the industries to better themselves through environmental compensations.
- Finally, in a federal set-up, the Centre and states must work in synergy to ensure that targets set for the country and states are fulfilled.
- The new law must thus push Central and state boards to convene joint sittings with a multi-sectoral participation from concerned ministries.
- Multi-sectoral participation is crucial as air pollution is not, and has never been, a problem with a single solution.
- With this need in place, ensuring appropriate political leadership is essential in giving shape to public commitment.
- Therefore, the new law must give an additional mandate to a senior minister or else the prime minister's office needs to be involved directly.
- The pollution targets must be made public every year to have greater public transparency and control.

1.6 Winter-Grade Diesel

- Motorists in high-altitude sectors like Ladakh, Kargil, Kaza and Keylong face the problem of freezing of diesel in their vehicles when winter temperatures drop to as low as -300 Celsius.

- Indian Oil has come up with an innovative solution to this problem by introducing a special winter-grade diesel with a low pour-point of -33 degree Celsius, which does not lose its fluidity function even in extreme winter conditions.
- Winter diesel fuel is also known as winter diesel, alpine diesel, or winterized diesel (AE).
- It refers to diesel fuel enhanced to prevent it from gelling in cold weather conditions.
- In general, it is achieved by treatment with additives that change the low temperature characteristics of the fuel.
- Winter-Grade Diesel will smoothen the travel and transportation in high alpine region and will help in overall economic development.

1.7 Heavy Metal Contamination in Indian Rivers

Central Water Commission released a report which pointed out that 2/3rd of the water quality stations spanning India's major rivers showed contamination by one or more heavy metals.

- The study spanned 67 rivers in 20 river basins.
- The concentration of heavy metals exceeds safe limits set by the Bureau of Indian Standards.
- The presence of metals in drinking water in trace amounts is required for good health and when present above safe limits, it will bring range of disorders.
- **Iron** emerged as the most common contaminant in most of the sampled sites registering levels of the metal above safe limits.
- The other major contaminants found in the samples were lead, nickel, chromium, cadmium and copper.
- Lead, cadmium, nickel, chromium and copper contamination were more common in non-monsoon periods.

River	Chromium	Lead	Iron
Ganga	Exceeds		Exceeds
Yamuna			Exceeds
Brahmaputra			Exceeds
Ramganga		Exceeds	
Rapti	Exceeds		Exceeds
Narmada			Exceeds
Godavari			Exceeds

SOURCE: CENTRAL WATER COMMISSION STUDY

- While iron, lead, chromium and copper exceeded 'tolerance limits' in monsoon periods most of the time.
- None of the sites registered **arsenic and zinc** levels above the safe limit.
- Arsenic contamination is a major environmental issue that affects groundwater.
- The main sources of heavy metal pollution are mining, milling, plating and surface finishing industries that discharge a variety of toxic metals into the environment.

1.8 e-Waste Clinic

India's first e-waste clinic is going to be setup in Bhopal.

- The clinic would ensure scientific handling and disposal of electronic waste generate from both households and commercial establishments.
- The Bhopal Municipal Corporation (BMC) and the Central Pollution Control Board (CPCB) have signed an MoU to this effect.
- The project would be taken up as a pilot project in Bhopal for three months and will be subsequently replicated across India.
- It has been conceived as per the Solid Waste Management Policy, 2016.

1.9 Taj Trapezium Zone

- Taj Trapezium Zone was established in 1996 through an order of Supreme Court.
- It is so named since it is located around the Taj Mahal and is shaped like a trapezoid.
- It is a 10,400 sq km area to protect the Taj Mahal from pollution.

- It is spread across the districts of Agra, Firozabad, Mathura, Hathras and Etah in Uttar Pradesh and Bharatpur district of Rajasthan.
- It comprises over 40 protected monuments along with 3 world heritage sites such as the Taj Mahal, Agra Fort and Fatehpur Sikri.
- SC in its order declared it as an eco-sensitive area and banned the use of coal/coke in industries located in the zone with a mandate of switching over to natural gas.
- Recently, SC lifted its earlier interim order imposing a complete ban on construction, industrial activities and cutting of trees in the TTZ.

1.10 Continuous Ambient Air Monitoring System

CAAQMS was recently installed at three places in Patna to monitor air quality on real-time basis

- The air quality would be monitored on large screens installed at places through metrological sensors.
- Installation of the CAAQMS was initiated in 2014 in 17 categories of highly polluting industries and common pollution treatment facilities in India.
- It displays digitally, other viral statistics of weather, to include wind speed, direction, ambient temperature, relative humidity, solar radiation, barometric pressure and rain gauge.
- CAAQMS is comprised of sampling, conditioning and analytical components through software designed to provide direct real-time continuous monitoring of ambient of air quality.
- Patna is India's one of the ten most polluted cities.

1.11 Udaipur - Treating Waste

The process called bioremediation has been introduced in Udaipur city for treating legacy waste i.e garbage hill accumulated for years.

- It will be treated by natural processes where, the leachate which is the water in the heap with suspended solid particles is drained off.
- Then the microbes are sprayed in the heap to initiate biological decompositions in a cost-effective form.
- The waste is turned over several times in order to devoid the waste to leachate as much as possible.
- The process has previously been used to treat garbage heaps in cities like Mumbai and Gurugram.
- This biological decomposition of the waste decreases the volume of the waste by 40%.
- Once the bio remediation process is carried out in full, bio-mining will be carried out i.e is segregation of minerals and useful materials from mould of waste.

1.12 UPPCB Order on Kanpur Tanneries

The Uttar Pradesh Pollution Control Board (UPPCB) has ordered tanneries in Kanpur to shut down.

- In August 2019, UPPCB had permitted 126 tanneries to run at 50% capacity, provided they fulfilled the pollution norms.
- But, a report of the Ganga monitoring wing of the National Green Tribunal found the shortcomings in this.
- It said that effluents from tanneries, located in Kanpur's Jajmau industrial area, were being released into the river.
- As a result, tanneries have now been ordered to remain closed.
- **Concerns -** The estimated size of Kanpur's leather industry is Rs 12,000 crore, 50% of which is exported.
- It provides direct and indirect employment to about a million people.
- Notably, it is the state agency Jal Nigam, which is mandated to run the effluent treatment plant, not the tanneries.

- The Jal Nigam has not fulfilled its commitment and has asked for more time to set things right. But it is the tanneries that are left to suffer.
- The issue highlights the several economic and governance challenges in India's attempt to deal with rapidly increasing urbanization.
- However, the issue of externality is not new and, in the Kanpur tanneries case, pollution of the Ganga has wider consequences.
- Despite all the efforts made by the government, a large amount of sewage water is still being released into the Ganga in Uttar Pradesh.
- India needs to build the state capacity to deal with such issues.
- Notably, tanneries in Kanpur have been closed because a state agency could not handle the project properly.
- Engagement of local institutions is necessary, as the one-size-fits-all solutions may not work in a country like India.
- Dealing with pollution thus requires empowering the institutions of local governance.

2. RENEWABLE ENERGY

2.1 New Rules on Ethanol Production

The Central Government has declared that no separate environmental clearance is required to produce additional ethanol from B-heavy molasses as it does not contribute to the pollution load.

- ***Ethanol Production*** - Ethanol is a secondary biofuel which is produced through processing of biomass.
- In the National Policy on Biofuels 2018, Government has allowed B grade molasses, sugarcane juice and damaged food grains as feedstocks to increase availability of ethanol.
- ***"A" molasses*** is intermediate by-product resulting from initial processing of sugarcane juice at the sugar factory.
- ***"B" molasses/"second" molasses*** is an intermediate product, obtained from boiling together "seed-sugar" & A molasses to extract an additional 12% of raw sugar.
- ***"C" molasses/"final"*** is the end product of the sugar extraction process. It still contains considerable amounts of sucrose but there is no economically viable method to date to extract this.
- While in many nations, ethanol is directly produced from sugarcane juice, in India ethanol has been produced from C-heavy molasses.
- It is because of a general perception that diverting a food crop for producing fuel would lead to a shortage of sugar in the country.
- With various incentives provided by the Government of India, sugar mills are expected to undertake production of ethanol from B-heavy Molasses and other by-products/products.
- The recent environment clearance clause is to facilitate ethanol production from B-heavy molasses/Sugar cane juice/ Sugar syrup/ Sugar.
- Such projects will be considered under the provisions of 7 (ii) (a) of EIA Notification, 2006 by the concerned Expert Appraisal Committee for grant of environmental clearance.

2.2 Biofuels

- Biofuels are fuels produced directly or indirectly from organic material biomass, including plant materials and animal waste.
- Primary biofuels are organic materials used in an unprocessed form, primarily for heating, cooking or electricity production.
- Ethanol is a secondary biofuel which is produced through processing of biomass.

Generations of Biofuels

1. First Generation Biofuel

- They are produced directly from food crops.
- wheat and sugar cane are the most widely used feedstock

2. Second Generation Biofuel

- They are produced from marginal croplands unsuitable for food production. For example- Jatropha
- It overcomes over food vs fuel debate in first generation biofuel.

3.Third Generation Biofuel

- Uses specially engineered energy crops such as algae as its energy source.
- The algae are cultured to act as a low-cost, high-energy and entirely renewable feedstock.
- Algae will have the potential to produce more energy per acre than conventional crops.

4. Fourth Generation Biofuels

- Aimed at producing sustainable energy and also capturing and storing carbon dioxide.
- Carbon dioxide is captured which can be then geo-sequestered.
- This is carbon neutral technology.

2.3 Global Solar Park

The global solar park was inaugurated at UN headquarters by the Indian Prime Minister during the Gandhi@150 commemorative event.

- It has 193 solar panels, each representing a member of the multilateral body.
- It is a roof-top solar park which has the capacity of 50-kilowatt hour (kWh) for each panel and the total output is 86,244 KWh.
- This equals 61 metric tonnes of carbon dioxide, 30,242 kg of coal burned, and carbon sequestered from 1,008 tree seedlings grown for 10 years.
- It was built at the cost of US $1 million.
- India is the third largest emitter of greenhouse gases, after China and the US.
- Coal power, cattle and paddy are major sources of emission, though per capita emissions are roughly a seventh of the US and less than half the world average.
- India has pledged for a 33-35% reduction in emission intensity (emissions associated with each unit of economic output) by 2030, compared to 2005 levels in Paris agreement.
- India hosted the 2nd general assembly of the International Solar Alliance, in New Delhi on the sidelines of COP-21, the UN Climate Conference.

3. CLIMATE CHANGE

3.1 U.S. Pentagon emits more Greenhouse Gases

The findings showed that if The U.S. Department of Defense (Pentagon) was listed as a country, its emissions would make it the world's 55th largest contributor of greenhouse gases.

- Pentagon is the largest institutional consumer of fossil fuels in the world.
- It emits more greenhouse gases than Portugal or Sweden.
- It released about 59 million metric tons of carbon dioxide and other greenhouse gases in 2017.
- It consumed between 77% and 80% of all federal government energy consumption since 2001.
- Military weapons and equipment use so much fuel that that is gallons per mile.

- China is the world's largest emitter of carbon dioxide, followed by the United States.
- Global temperatures are on course for a 3C to 5C rise this century.
- Overshooting a global target of limiting the increase to 2C or less.
- 4C of warming would increase more than five times the influence of climate on conflict.
- Failing to reduce greenhouse gas emissions will make the nightmare scenarios, perhaps even "climate wars" more likely.
- A case for decarbonizing the military - Over the past decade the Defense Department has reduced its fossil fuel consumption through actions that include using renewable energy.
- Cutting Pentagon greenhouse gas emissions will help save lives in the United States and could diminish the risk of climate conflict.

3.2 Commemoration of a Glacier

In Iceland, people commemorated the loss of the glacier Okjokull.

- The glacier was officially declared dead in 2014 at the age of 700, when it was no longer thick enough to move.
- It has been reduced to a small patch of ice atop a volcano.
- The people walked up the volcano northeast of the capital Reykjavik to lay a plaque which carries a letter to the future.
- The plaque reads "Okjokull is the first Icelandic glacier to lose its status as glacier. In the next 200 years all our main glaciers are expected to follow the same path. This monument is to acknowledge that we know what is happening and what needs to be done. Only you know if we did it."
- Iceland loses about 11 billion tonnes of ice per year, and scientists fear that all of the island country's 400-plus glaciers will be gone by 2200.

3.3 Achieving COP21 - NDC Targets

- **India's NDC –** India promised to take steps to **reduce** the greenhouse gas (GHG) emissions and to **adapt** to living in a warmer world. NDCs include,
    1. By 2030, there will be about 1/3rd reductions in the emissions intensity of the GDP below 2005 levels.
    2. By 2030, there will be a total of 40% of the installed capacity for electricity from non-fossil fuel sources.
    3. By 2030, it promised an additional carbon sink (a means to absorb carbon dioxide from the atmosphere) through additional forest and tree cover.
- **Trees and other vegetation** fix carbon as part of photosynthesis. **Soil** too holds organic carbon from plants and animals.
- **Forest Survey of India (FSI) study** - Estimated the costs involved, and the opportunities and potential actions needed for additional forest and tree cover to meet the NDC target.
- Recently, there is a gradual increase in the forest and green cover.
- The additional increase in carbon sinks is to be achieved by restoring impaired and open forests; afforesting wastelands, Agro-forestry, etc.,
- 72.3%of the increase will be **by restoring forests and afforestation** on wastelands, with a modest rise in total green cover.
- The **green cover increase** will provide many other **benefits** like improving the water quality, storage of water in wetlands, etc.

Paris Agreement (COP21)

- Paris Agreementis an agreement under the United Nations Framework Convention on Climate Change (UNFCCC)to combat climate change.

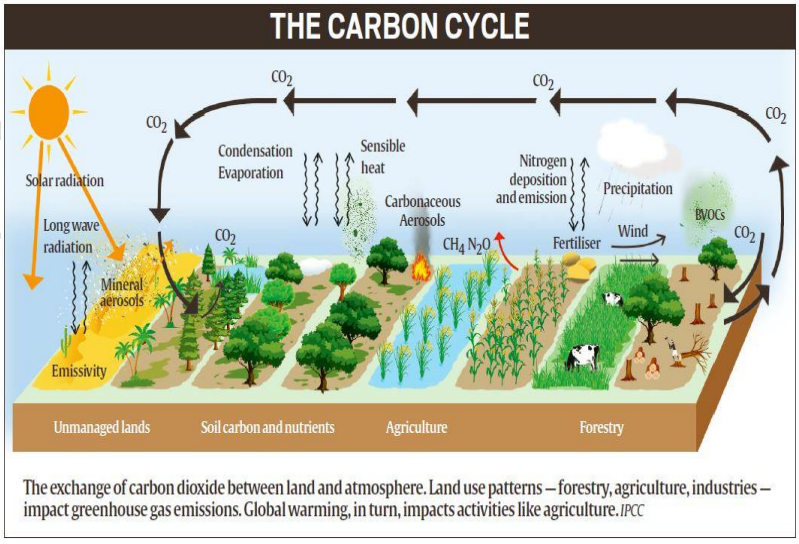
- Aims of Paris Agreement are,
    1. To keep the global temperatureriseof this century well below 2°C above the pre-industrial level
    2. To pursue efforts to limit the temperature increase further to 1.5°C
    3. To strengthen the ability of countries to deal with the impacts of climate change

3.4 IPCC report

A new report by the Intergovernmental Panel on Climate Change (IPCC) was released recently.

- It presents the most recent evidence on **how the different uses of land** like forests, agriculture, and urbanization **are affecting and getting affected by climate change**.
- The Geneva-based IPCC is the United Nations body for assessing the science related to climate change.
- It provides policymakers with regular scientific assessments on climate change, its implications and potential future risks, as well as to put forward adaptation and mitigation options.
- **Land-climate link -** Land use, and changes in land use, has always been an integral part of the **conversation on climate change**.
- That is because land acts as both the source as well as a sink of carbon.
- Activities like agriculture, cattle rearing, etc are a major source of methane and nitrous oxide, which are more dangerous than CO2.
- Soil, trees, plantations and forests absorb CO_2 for photosynthesis, thus reducing the overall CO2 content in the atmosphere.
- This is the reason why large-scale land use changes like deforestation, urbanisation or change in cropping pattern, have a direct impact on the overall emissions of greenhouse gases.

Report Highlights



The exchange of carbon dioxide between land and atmosphere. Land use patterns – forestry, agriculture, industries – impact greenhouse gas emissions. Global warming, in turn, impacts activities like agriculture. IPCC

- It talks about the **contribution of land-related activities to global warming**.
- It also talks about the manner in which even existential activities like food production contributes to global warming and is also affected by it.
- If **pre-production** and **post-production activities** are taken into account, food production could contribute as much as 37% of all greenhouse gas emissions (GHG) every year.
- It points out that nearly 25% of all food produced is either lost or wasted. And even the decomposition of the waste releases emissions.
- Land and ocean together absorb nearly 50% of GHGs emitted every year through natural processes in the carbon cycle.
- The importance of land or ocean, as a carbon sink cannot be overstated in the global fight against climate change.
- That is why afforestation and reduction in deforestation are vital approaches in a global strategy to combat climate change.
- India's action plan on climate change too, has a very important component on forests.
- India has promised that it would create an additional carbon sink of about 2.5 to 3 billion tonnes by the year 2032 by increasing its forest cover, and planting more trees.

3.5 Deforestation in Amazon Forests

Deforestation in the Amazon rainforest in Brazil is increasing rapidly since January, 2019.

Recent changes

- **Deforestation** - The new Brazilian President Mr. Bolsonaro has spoken in favour of "reasonable" exploitation of Amazon forestlands.
- Although the forest code has not been changed, his comments have emboldened illegal expansion into forests.
- Armed gold-hunting gangs have reached tribal areas and the leader of a tribe has been murdered in an incursion.
- Satellite images show that about 4,200 sq km of forests have been destroyed up to July 24, 2019 under the new government (since January).
- **Brazil's stance** - Brazil is the custodian of forests in about 5 million sq km of Amazon land.
- Given this, it has everything to gain by engaging with the international community on meeting the opportunity cost of leaving the Amazon undisturbed.
- But Mr. Bolsonaro refused to host the annual convention of the UN Framework Convention on Climate Change in 2019 (but did not exit the Paris Agreement).
- By doing so, he lost a valuable opportunity to seek higher funding for forest protection.

Amazon Fund

- The Amazon Fund was created in 2008 to receive donations for non-reimbursable investments.
- The objective was to prevent, monitor, and combat deforestation, as well as to promote the preservation and sustainable use in the Brazilian Amazon.
- It consists of money donated by Norway, the main donor, and Germany.
- The fund holds US$850 million, and is managed by the National Bank for Economic and Social Development (BNDES) of Brazil.

- Most nations tend to view their land and forests through the narrow prism of short-term economic gain. However, climate science data show that they play a larger environmental role.
- Globally, there is tremendous momentum to save the Amazon forests.
- So, Brazil must welcome initiatives such as the billion-dollar *Amazon Fund* backed by Norway and Germany, instead of trying to shut them down.
- Remedial funding, accounting for the value of environmental services, is the most productive approach.
- This is because forest removal has not helped agriculture everywhere due to soil and other factors.
- In all, Brazil's President must recognize that rainforests are universal treasures, and the rights of indigenous communities to their lands are inalienable.
- The international community must use diplomacy in convincing Mr. Bolsonaro at this front.

3.6 ILO Report: Global Warming

The report "Working on a warmer planet: The impact of heat stress on labour productivity and decent work" was released by International Labour Organisation (ILO).

- **Report Highlights** - In 2030, 2.2% of total working hours worldwide will be lost because of higher temperatures.
- The global productivity losses would be around 80 million full-time jobs (equivalent to economic loss of US$ 2,400 billion).
- The projection of 34 million jobs losses in India would make it the worst affected.
- A third of the southern Asian countries have already incurred losses greater than 4%.
- This is a conservative estimate, assuming that the global mean temperature does not rise more than 1.5°C .
- The report defines heat stress as heat in excess of what the body can tolerate without suffering physiological impairment.
- It generally occurs at temperatures above 35°C, in high humidity.

- Excess heat during work is an occupational health risk and restricts workers' physical functions and capabilities, work capacity and thus, productivity.
- Assumptions **and basis** for the projections are,
    1. Global temperature rise of 1.5°C by the end of the century,
    2. Labour force trends.

Projections for India

- India to lose the most working hours is southern Asia in 2030.
- It lost 4.3% of working hours in 1995 because of heat stress.
- It is projected to lose 5.8% of its working hours in 2030, which corresponds to 34 million jobs.
- The report projects losses in working hours as
    1. 9.04% in agriculture (in shade),
    2. 5.29% in manufacturing,
    3. 9.04% in construction, and
    4. 1.48% in services.
- Most of the impact will be felt in the agricultural sector.
- More working hours are expected to be lost in the construction sector (where heat stress affects both male and female workers).
- Most areas have drought like conditions so there will be more migration ofagricultural workers to urban areas – usually to work in the construction sector.
- There has been no direct job loss at present, with distressed workers switching from one vulnerable sector to another.

Global Picture

- Globally, the two sectors projected to be hit worst are agriculture and construction, with agriculture worse affected.
- In agriculture – 60%of working hours will be lost due to heat stress by 2030.
- In construction – 19% of global working hours to be lost.
- More inequality between low- and high-income countries to be seen.
- There will be worsening working conditions for the most vulnerable, as well as displacement of people.
- To adapt to this new reality appropriate measures by governments, employers and workers, focusing on protecting the most vulnerable, are urgently needed.

3.7 Global Climate Strike Movement

*Students in more than 2,000 cities across the world are holding demonstrations under the **#FridaysforFuture** movement.*

- The **#FridaysforFuture** movement, also known as the 'Youth Strike for Climate Movement', started in August 2018.
- It was started by Swedish student 'Greta Thunberg', who skipped school to protest outside parliament for more action against climate change.
- 'Thunberg' called for a strike every Friday until the Swedish parliament revised its policies towards climate change.
- Gradually, students and adults from across the world started mobilising and demonstrating in front of parliaments and local city halls in their respective countries.
- Thousands of events are planed from September 20th to 27th,
    - Millions of students to walk out of classrooms, workplaces and homes,

  - to join together in the streets and demand climate action and climate justice.
  - The strikes are registered to take place in over 2,350 cities.
- In India, strikes have been scheduled in New Delhi, Chennai, Pune, Mumbai, Phagwara (Punjab), Nagercoil (Tamil Nadu), Kishangarh (Rajasthan) and several other places.
- Students are demanding 'urgent', 'decisive' action to keep global average temperatures from rising above 1.5 degree Celsius.
- The global strikes will commence just as the "UN Climate Action Summit 2019" set to take place in New York on September 23, where Thunberg has been invited.
- These global school movements have been supported by scientists as well.
- The sentiments behind these school student movements are
  - The "broken promises" of older generations,
  - Members of which continue to extract and use fossil fuels,
  - leading to increased CO_2 emissions and
  - subsequently, increasing average global temperatures.
- Thunberg sailed through transatlantic, from Britain to the United States to take part in a United Nations climate summit.

3.8 Climate change and Bananas

A new study has found that climate change has benefited Bananas over the last several decades.

- It also predicted that the trend will reserve, with climate change eventually causing a negative impact.
- Bananas are recognised as the most important crop, providing food, nutrition and income for millions across the globe.
- It thrive in warmer climates and India is the world's largest producer and consumer of the fruit crop.
- The study found that 27 countries, accounting for 86% of the world's dessert banana production.
  1. These countries have, on an average seen increased crop yield since 1961 by 1.37 tonnes/hectare every year.
  2. It was due to the changing climate resulting in more favourable growing conditions.
- In India, data from the National Horticulture Board show broadly consistent yields in 6 years.
- The study says the gains in these 27 countries could be significantly reduced by 2050 to 1.19-0.59 tonnes/hectare.

- The study predicts that 10 countries, including India could see a significant decline in crop yields.
- On the other hand, that some countries including Ecuador (the largest exporter), Honduras and a number of African countries may see an overall benefit in crop yields.

3.9 Post-2020 Emission Market Scenario

With market mechanisms mandated under the Paris Agreement coming into operation, the CDM's future is uncertain.

- The Clean Development Mechanism (CDM) is a product of the Kyoto Protocol.
- It is one of the market instruments that can help industry as well as climate.
- Under the CDM, emission-reduction projects in developing countries can earn certified emission reduction credits.

- These saleable credits can be used by industrialized countries to meet a part of their emission reduction targets under the Kyoto Protocol.
- Along with China and Brazil, India is a leader in CDM since its inception in 2007.
- A number of small and medium projects in the field of energy efficiency and renewable energy were set up in India in the last two decades.
- Most of these owe their origin to the financing support available from CDM.
- The situation may change in 2021 when market mechanisms mandated under the Paris Agreement come into operation.
- Most developed countries are strongly opposed to permitting the carryover of CDM projects and their credits into the Paris Pact's mechanisms.
- The credits lying unsold with the CDM projects could lose their economic worth.
- Besides, the CDM projects will have to go through the process of validation and registration again with the new mechanism.
- This will involve additional financial and administrative costs.
- **Implication for India** - India has about 250 million Certified Emission Reduction (CER) units under CDM issued by the UNFCCC, the global administrator of Kyoto mechanisms.
- The number of CDM projects registered in India is 1,376 (out of total 7,979 globally) and 89% of these projects are still active.
- India would lose substantially if the doors on the existing CDM projects and credits are closed in 2020.

Advantages of CDM

- CDM has failed to demonstrate environmental benefits in addition to the "business as usual" scenario, or provide technological benefits.
- Its transition to new mechanisms will have adverse impacts on carbon prices and investor sentiments in future markets.
- Nevertheless, it is to be noted that credits for CDM projects are issued after their compliance with internationally approved criteria is ascertained.
- CDM project proponents should be free to choose available cost-effective technologies as long as the objective of emission reductions is achieved.
- Moreover, "additionality" in CDM projects should not be judged solely on the criterion of technology.
- They are also about investments and overcoming market barriers.
- All CDM projects have passed these tests.

3.10 Smallest Annual Ozone Hole

An "ozone hole", which builds up over the Antarctic region this time of the year, has been found to be the smallest since it was first discovered in the 1980s.

- **Ozone** is, chemically, a molecule of three oxygen atoms.
- It is found mainly in the upper atmosphere, an area called stratosphere, between 10 and 50 km from the earth's surface.
- Though it is talked of as a layer, ozone is present in the atmosphere in rather low concentrations.
- Even at places where this layer is thickest, there are not more than a few molecules of ozone for every million air molecules.
- Nevertheless, they perform a very important function.
- By absorbing the harmful ultraviolet radiations from the sun, the ozone molecules eliminate a big threat to life forms on earth.
- Notably, UV rays can cause skin cancer and other diseases and deformities, in plants and animals.

- **Ozone hole -** It is to be understood that the 'ozone hole' is not really a hole.
- It is a region in the stratosphere, directly above Antarctica, where the ozone concentration is measured to become extremely low in certain months.
- Notably, depletion has happened in other regions of the stratosphere as well but the problem is more acute in Antarctica.
- This is due to a set of special meteorological and chemical conditions that arise there in the months of September, October and November.
- Given its significance, the ozone layer's depletion was considered as grave a threat to the planet in the 1980s and 1990s as climate change is now.
- By mid-1980s, scientists narrowed down on a class of industrial chemicals like chloroflurocarbons, or CFCs, as the likely culprits. So, over the years, the threat has largely dissipated.
- This is largely because the world has banned the production and consumption of most of the "ozone-depleting substances".
- However, it will take another 15-45 years for the ozone layer to be fully restored.
- **Recent discovery -** NASA recently reported that the ozone hole, which usually grows to about 20 million sq km in September, was less than half that size in this year (2019).
- This is the smallest it has ever been during this time of the year, after being discovered.
- There was an extraordinarily high temperature in the stratosphere this year.
- The NASA said that the less depletion could have happened because of this rather than the ongoing human efforts to contain the ozone depletion.
- Temperatures in some areas of the stratosphere, which is usually over 100 degrees below zero, were 30° to 40°C higher than normal in September.
- At least two such extraordinary warming of the stratosphere has been observed in the past.
- On both such occasions, the ozone hole was also measured to be smaller than usual.
- However, the reason why this warming happens is uncertain.
- The warming has no observed connection with the warming in lower atmosphere that leads to climate change.
- Given all, it should be noted that this gain is temporary, and persistent human efforts are essential.
- **Global efforts -** The depletion in the ozone layer is consistently being contained with global efforts to ban the use of harmful chemicals that destroy ozone.
- CFCs and similar chemicals were being widely used in industrial applications like refrigeration, air-conditioning, foams, fire-extinguishers and solvents.
- The 1989 global agreement (Montreal Protocol) organised international consensus on phased elimination of these chemicals.
- In subsequent years, the agreement has ensured the phase-out of over 90% of these chemicals.
- Two years ago, an amendment to the Montreal Protocol cleared the way for a faster elimination of another set of similar compounds.
- These are hydroflurocarbons, or HFCs, which were being used as temporary replacements for CFCs.
- With these, the impact on the ozone layer has been encouraging.
- In September 2019, the UN Environment Programme said that the ozone layer was on track to be completely restored within "our lifetime" itself.
- It said that the ozone layer over some areas in the northern hemisphere could be completely restored to their pre-1980 levels by as early as the 2030s.
- It said that the Antarctica ozone hole could be completely healed by the 2060s.
- Parts of the ozone layer had recovered at the rate of 1 to 3% every 10 years since 2000.

3.11 New Zealand's Zero-Carbon Act

New Zealand's Parliament recently passed The Zero-Carbon Act, which will commit New Zealand to zero carbon emissions by 2050 or sooner.

- The Act comes as part of the country's attempts to meet its Paris climate accord commitments.
- The Act is not a separate legislation but is an amendment to the existing Climate Change Responses Act, 2002.
- The Act is titled Climate Change Response (Zero Carbon) Amendment Act.
- It provides a framework by which New Zealand will be able to develop and implement climate change policies in line with the Paris Agreement.
- The objective is to limit the temperature increase to 1.5 degree Celsius.
- According to the New Zealand government, this is the first legislation in the world to make a legally binding commitment to living within 1.5°C of global warming.
- **Key targets -** The Bill presents the country's plan on how to act over the next 30 years, to safeguard its future and that of its children.
- The key aims of the Act include:
    i. reducing all greenhouse gases (except methane) to net zero by 2050
    ii. reducing emissions of biogenic methane (produced from biological sources) up to 10% below 2017 levels by 2030 and to 24-47% below 2017 levels by 2050
    iii. establishing an independent Climate Change Commission
    iv. establishing a system of emissions budget
- The Act proposes separate targets for biogenic methane.
- [Biogenic methane is emitted by livestock, waste treatment and wetlands.]
- This is because methane is a short-lived climate pollutant with an atmospheric lifetime of around 12 years.
- While its lifetime in the atmosphere is much shorter than carbon dioxide (CO_2), it is much more efficient at trapping radiation.
- In other words, it is a more potent greenhouse gas than CO_2.

4. ENVIRONMENTAL ORGANISATIONS, CONVENTIONS & TREATIES

4.1 CoP 18 of the CITES

*Over 100 nations, acting within the framework of **CITES**, approved a proposal by India, Nepal and Bangladesh.*

- It is an international agreement aimed at ensuring that international trade in specimens of wild animals and plants does not threaten their survival.
- It was drafted after a resolution was adopted at a meeting of the members of the **IUCN** in 1963.
- Convention was agreed in Washington DC, therefore, sometimes referred to as the 'Washington Convention'.
- It entered into force on July 1, 1975, and now has 183 parties.
- States and regional economic integration organisations adhere voluntarily to CITES.
- The Convention is legally binding on the Parties in the sense that they are committed to implementing it.
- However, it does not take the place of national laws and it provides a framework for Parties to make domestic legislation.
- To ensure that the Convention is implemented effectively in their national jurisdictions.
- **Recent Developments -** It is to prohibit commercial international trade in a species of 'Otter' native to the subcontinent and some other parts of Asia.

- The Conference also accepted a separate proposal by India, moved together with the EU, the US and the Philippines.
    1. It is for inclusion of a species of 'Gecko lizard' for protection as a species not necessarily threatened with extinction.
    2. It is found widely in South Asia, the US, and Madagascar.
    3. To control the trade in order to avoid utilisation incompatible with their survival.
- Members voted to move the Smooth-coated otter (Lutrogale perspicillata) from CITES Appendix II to CITES Appendix I.
    1. It is considered to be facing a high risk of extinction
    2. It is detrimentally affected by international trade and habitat loss.
- The other proposal that was passed was to include the 'Tokay gecko' (Gekko gecko) in CITES Appendix II.
- India had proposed Appendix I status for the small-clawed otter, mako shark, the Indian star tortoise and the Tokay gecko.

4.2 Restoration of Degraded Land - UNCCD

The 14th Conference of Parties (COP14) of the UN Convention to Combat Desertification (UNCCD) was held in Greater Noida, Uttar Pradesh.

- India takes over COP Presidency of UNCCD from China for next two years.
- The key outcomes of COP 14 will facilitate in delivering convergence and synergies among the existing programmes in the field of agriculture, forestry, land, water management and poverty alleviation.
- It will cater the need to achieve the SDGs and focused vision of of Doubling the Farmer's Income by 2022.
- The Conference is being attended by delegates from 197 parties comprising of,
    1. Scientists and representatives of national and local governments.
    2. Global business leaders, NGOs, gender-based organisations, youth groups, journalists, and faith and community groups.
    3. They will share their expertise and give an overview to achieve their goals at the Conference.
- The objective of the COP 14, accompanied with 'Committee on Science and Technology' (CST 14) and Committee to Review the Implementation of the Convention (CRIC 18) is to,
    1. Discuss on various issues of land such as sustainable land management, reversing land degradation, mitigating drought.
    2. Addressing sand and dust storms, linkages with gender, tenure, etc. and
    3. To guide the Convention as global and national circumstances needs change.

Drought-forecasting toolbox

- 'Drought-forecasting toolbox' was unveiled at **UNCCD** COP14 event.
- It aims to track, assess and deliver relevant information concerning climatic, hydrologic and water supply trends.
- It is a kind of knowledge bank that may be used by vulnerable countries, including India,

United Nations Convention to Combat Desertification

- **UNCCD** was adopted in Paris on 17 June 1994 and ratified by 196 countries & European Union.
- India ratified the UNCCD Convention on December 1996.
- **UNCCD** called as "Mother convention" along with other 2 Conventions emerged at 1992 Rio Earth Summit. The other 2 are,
    1. United Nations Framework Convention on Climate Change (**UNFCCC**) and
    2. Convention on Biological Diversity (**CBD**).
- It is committed to a bottom-up approach, encouraging the participation of local people in combating desertification and land degradation.

1. To reduce drought risk, be better prepared and effectively respond to it.

- It is developed through the close partnership among,
  1. UNCCD,
  2. World Meteorological Organisation (WMO),
  3. Food and Agriculture Organisation (FAO) and global bodies.
- It also provides the stakeholders,
  1. Easy access to case studies and other resources to support action on drought preparedness
  2. It aims to boost the resilience of people and ecosystems to drought.
- It will help the countries in framing their respective national drought policies in due course based on monitoring, forecast, and early warning.

New Delhi Declaration

- The declaration was adopted by the participating countries at the 14th CoP to the **UNCCD.**
- It comes with an action plan to save the planet from losing more land and to achieve SDG target of land degradation neutrality by 2030.
- The parties expressed support for new initiatives to improve human health, well-being and to advance peace and security.
- The declaration also stated that,
  - World needs to consider land-based solutions for climate action and
  - Biodiversity conservation to achieve the long-term goals of the Paris Agreement.
- It also special emphasis on,
  - Community-driven transformative projects,
  - That are gender-sensitive at local, national and regional levels to drive implementation.

Bamboonomics

- Ministry of Tribal Affairs launched the biggest Tribal movement, to promote tribal enterprise through 'Bamboonomics'.
- It was launched for combating desertification and the climate change at COP 14 to the **UNCCD**.
- **TRIFED** introduced the 'The 4P1000 Initiative: The Tribal Perspective through Bamboonomics'.
- The international initiative "4 per 1000" was launched by France in 2015 at the COP 21.
- The aim of the initiative is to,
  - Demonstrate that agriculture, and in particular agricultural soils can play a crucial role where food security and climate change are concerned.
- The ambition of the initiative is to,
  - Encourage stakeholders to transition towards a productive, highly resilient agriculture,
  - based on the appropriate management of lands and soils,
  - creating jobs and incomes hence ensuring sustainable development.
- An annual growth rate of **0.4%** in the soil carbon stocks, or **4‰** per year, in the first 30-40 cm of soil,
  - would significantly reduce the CO2 concentration in the atmosphere related to human activities.
  - This is what the 4 per 1000 Initiative proposes, soils for food security and climate.
- The initiative is intended to complement those necessary efforts to reduce greenhouse gas emissions globally.
- It is voluntary, it is up to each member to define how they want to contribute to the goals.

4.3 Basel Ban Amendment

The 1995 Basel Ban Amendment has become an international law.

- It is a global waste dumping prohibition.
- It became law, after Croatia ratified it on September, 2019.
- Croatia became the 97th country to ratify the ban, which was adopted by the parties to the Basel Convention in 1995.
- The aim of the convention to protect human health and the environment against the adverse effects of hazardous wastes
- BAN is a Unites States-based charity organisation and is one among the organisations and countries, which created the Basel Ban Amendment.
- The Ban Amendment prohibits all export of hazardous wastes, including electronic wastes and obsolete ships from 29 wealthiest countries of the OECD to non-OECD countries.
- The Ban Amendment had been stalled for all these years due to uncertainty over how to interpret the Convention.
- Now, it will become a new Article in the Convention and will enter into force in the 97 countries.
- However, countries like the US**, Canada, Japan, Australia, New Zealand, South Korea, Russia, India, Brazil, and Mexico** are yet to ratify the ban.
- The US produces the most waste per-capita but has failed to ratify the Basel Convention and has actively opposed the Ban Amendment.
- Non-adherence to rules has allowed US to export many hundreds of containers of hazardous electronic waste each week to developing countries.

4.4 Climate Action Summit 2019

The Climate Action Summit took place at New York recently.

- The UN Secretary-General, Antonio Guterres, hosted the 2019 Climate Action Summit.
- The Summit was held to boost ambition and accelerate actions to implement the 2015 Paris Agreement on Climate Change.
- It took place amidst one of the largest environmental protests ever and a heart-wrenching speech from Greta Thunberg.
- The summit seems to be based on the age-old assumption that adaptation to climate change has its limits, and mitigation deserves more emphasis.
- But, large parts of the underdeveloped and the developing world might not have the wherewithal for mitigation.
- Worryingly, there is scant acknowledgement of this fact by the UN. So given the reality, the true need is more focus on adaptation than mitigation.

Green Climate Fund

- GCF was set up in 2010 under the UNFCCC's financial mechanism to channel funding from developed countries to developing countries to allow them to mitigate and adapt to climate change.
- It will support projects, programmes, policies and other activities in developing country Parties using thematic funding windows.
- It is intended to be the centrepiece of efforts to raise Climate Finance of $100 billion a year by 2020.
- The Fund is governed and supervised by a Board that will have full responsibility for funding decisions and that receives the guidance of the Conference of Parties (COP).
- The Fund is accountable to, and functions under the guidance of, the COP.
- Historically, mitigation projects have always been preferred for funding over adaptation projects.

- But, the Green Climate Fund (GCF) remained a rare exception.
- It offered funding for both mitigation and adaptation, while being guided by the UNFCCC principles and provisions.
- At present, the share of funds allocated by GCF to adaptation projects is 24% and mitigation 42%.
- The balance 34% is classified as "cross-cutting", but with a larger mitigation component.
- The low level of funding to adaptation can be attributed to two factors:
    i. adaptation is a new endeavour without much "expertise" available
    ii. adaptation primarily provides local benefits
- It is felt that the GCF has failed to channel funding to the most vulnerable communities in the most vulnerable countries.
- [These include the communities in the least developed countries (LDCs) and small island developing states (SIDS)]
- This is largely due to GCF's mandate to act as a "bank", seeking returns on its investments.
- The GCF focusses on fund management capacities of both recipient country governments and implementing entities.
- This has made the access to large-scale funding difficult.
- In absence of revenue streams, adaptation projects have mostly remained micro and small, and thus incremental rather than transformative.
- The GCF also insists on genuine adaptation projects, not development proposals dressed up as adaptation.
- Due to this approach, adaptation projects from Bangladesh and Ethiopia have been rejected lately.
- **Possible Solution -** A solution for this may be found in the **Generic Adaptation Decision Framework.**
- The GADF was proposed in an article in the Journal of Indian Ocean Region.
- The GADF has been proposed to help rationalise between choices of -
    1. in-situ adaptation (adaptation in the vulnerable region)
    2. managed retreat (movement to safer regions)
- The GADF suggests that managed retreat should be thought of if three conditions are satisfied:
    1. the socio-economic well-being under the business-as-usual (or status quo) is diminishing
    2. the cost of in-situ adaptation is higher than the business-as-usual scenario
    3. net current value of ex-situ adaptation (or strategic and managed retreat) is highest of all the adaptation scenarios
- On managed retreat being the best option, development of the host location could be designed to generate a revenue stream for private investors as well as the GCF.
- Even the source location could generate revenue through forest regeneration and tourism concession.

4.5 Clean Air Cities Declaration

- The declaration was signed in at the C40 World Mayors Summit in Copenhagen.
- It commits cities to set ambitious pollution reduction targets and implement substantive clean air policies by 2025.
- Totally 35 cities signed this declaration in which Delhi is also a part.
- Through the declaration, mayors commit to using their power and influence to reduce air pollution and work towards meeting the WHO guidelines.
- C40 cities is a network of the world's megacities committed to addressing climate change.

- It connects 94 of the world's greatest cities to take bold climate action, leading the way towards a healthier and more sustainable future.

4.6 International Seed Treaty

- International Treaty of Plant Genetic Resources for Food and Agriculture (ITPGRFA), is popularly known as the International Seed Treaty.
- It is a comprehensive international agreement, which aims at guaranteeing food security through the conservation, exchange and sustainable use of the world's plant genetic resources for food and agriculture (PGRFA).
- It also recognizes farmers' rights, subject to national laws to:
    1. The protection of traditional knowledge relevant to plant genetic resources for food and agriculture;
    2. The right to equitably participate in sharing benefits arising from the utilization of plant genetic resources for food and agriculture.
    3. The right to participate in making decisions, at the national level, on matters related to the conservation and sustainable use of plant genetic resources for food and agriculture.
- The Treaty establishes the Multilateral System of Access and Benefit-sharing to facilitate plant germplasm exchanges and benefit sharing through Standard Material Transfer Agreement (SMTA).
- The treaty was negotiated by the Food and Agriculture Organization of the United Nations (FAO) Commission on Genetic Resources for Food and Agriculture (CGRFA) and since 2006 has its own Governing Body under the aegis of the FAO.
- The Governing Body is the highest organ of the Treaty and holds biennial meetings.

PPV & FR Act

- Protection of Plant Varieties and Farmers' Rights (PPV&FR) Act is an unique Indian legislation to protect Farmers' Rights and breeder's rights.
- Under this act, a farmer is entitled to save, use, sow, resow, exchange, share or sell his farm produce including seed of a variety protected under the PPV&FR Act, 2001 except brand name.
- PPV&FR Act is fully compliant to the International Seed Treaty.
- Under the provisions of PPV&FR Act, 138 farmers/farming communities have been awarded with Plant Genome Saviour Awards.

4.7 UN Global Climate Action Awards

- The UN Global Climate Action Awards are led by UN Climate Change's Momentum for Change initiative.
- The initiative is implemented with the support of The Rockefeller Foundation, and operates in partnership with the World Economic Forum.
- It is given under 4 focus areas such as
    i. Planetary Health,
    ii. Climate Neutral Now,
    iii. Women for Results, and
    iv. Financing for Climate Friendly Investment
- 15 projects across these focus areas will be awarded this year.
- Indian NGO Mahila Housing Sewa Trust will be one of the 15 recipients for empowering women to fight climate change.
- It organized a project that empowered women in low-income households to increase their resilience to impacts of climate change across seven cities in India, and neighbouring countries of Bangladesh and Nepal.

- For example, women were trained to be energy auditors under the project, who encourage households to switch to more energy-efficient products, thus forming a women-led network of green energy and building products.
- Infosys in India will also receive an award for its journey to carbon neutrality.
- It is one of the first companies of its type to commit to carbon neutrality, while investing in local carbon offsetting projects.
- The award will be given at the UN Climate Change Conference (COP25), hosted by the Chilean government in Madrid in Spain.

4.8 IPCC report on the Ocean and Cryosphere

- IPCC released a report - 'Special Report on the Ocean and Cryosphere in a Changing Climate'.
- It highlights the changes taking place in oceans, glaciers and ice-deposits on land and sea.
- It was prepared following an IPCC Panel decision in 2016 to prepare three Special Reports.
- The above report follows the Special Reports on Global Warming of 1.5°C (SR1.5), and on Climate Change and Land (SRCCL).
- The 1.5°C report was a key input used in negotiations at Katowice, Poland in 2018.
- Countries relied on it to commit themselves to capping global temperature rise to 1.5°C by the end of the century.
- The recent report updates scientific literature available since 2015.
- 2015 was when the IPCC released its comprehensive 5th Assessment Report.
- The report summarises the disastrous impacts of global warming based on current projections of global greenhouse gas emissions.

Intergovernmental Panel on Climate Change

- IPCC was established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988.
- It is the leading international body for the assessment of climate change.
- It is the apex referee for scientific evidence on the impact of global warming.
- It provides a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts.

4.9 Platform for Science-Based Ocean Solutions

The annual conference of United Nations Framework Convention on Climate Change (UNFCCC) took place in Madrid, Spain.

- It was launched in 25th Conference of Parties (COP) to the UNFCCC.
- The platform is an alliance between all stakeholders of civil society and the research community to include the Ocean in solutions relating to climate change.
- It seeks to promote the necessity of addressing ocean and climate issues synergistically in climate commitments and strategies.
- It will engage many actors in ocean-climate action, including the public and private sectors, civil society and academia.
- Chile, as its capacity as a president of COP25, has named COP 25 the **'Blue COP'** because for the first time the study, protection and sustainable management of oceans was centred in a major climate action conference.
- The COP will also feature several additional discussions on the importance of protecting the ocean.
- The Nairobi work programme on impacts, vulnerability and adaptation to climate change (NWP) has facilitated experts to identify gaps and action on climate change and ocean linkages.
- **'Because the Ocean'** Declaration was signed in 2015 UNFCCC COP held in Paris that focuses on objectives to advance action on climate change, oceans and sustainable development.

4.10 UPOV

- The International Union for the Protection of New Varieties of Plants (UPOV) is an intergovernmental organization established by the International Convention for the Protection of New Varieties of Plants.
- The convention was adopted in Paris in 1961 and it was revised in 1972, 1978 and 1991.
- It is headquartered in Geneva (Switzerland).
- It aims to provide and promote an effective system of plant variety protection, with the aim of encouraging the development of new varieties of plants, for the benefit of society.
- By this convention, member countries had to introduce restrictions on the free use and exchange of seeds by farmers unless the "breeders" were remunerated.
- In 2002, India joined this organisation.
- It led to the introduction of some form of Intellectual Property Rights over plant varieties.

UPOV Vs other Conventions

- UPOV is in contradiction with the Convention on Biological Diversity (CBD), in which India is also a member.
- CBD provided for "prior informed consent" of farmers before the use of genetic resources and "fair and equitable sharing of benefits" arising out of their use.
- International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) recognised farmers' rights as the rights to save, use, exchange and sell farm-saved seeds.
- National governments had the responsibility to protect such farmers' rights.
- Trade-Related Aspects of Intellectual Property Rights (TRIPS) provides for IPRs as an incentive for technological innovation.
- India is a signatory to CBD, ITPGRFA, TRIPS and UPOV.
- TRIPS, UPOV gives priority to breeders' rights while CBD and ITPGRFA emphasises on farmers' rights.
- Thus, there needs to be a delicate balance in Indian laws among these conventions.

5. GOVERNMENT INTERVENTIONS

5.1 Radio-collaring Asiatic lions

- Asiatic lions are slightly smaller than African lions.
- They used to range from Turkey, across Asia, to eastern India.
- At present Gir National Park and Wildlife Sanctuary is the only abode of the Asiatic lion.
- They are estimated to be 523 in the wild.
- Five protected areas currently exist to protect the Asian lion:
    1. Gir Sanctuary,
    2. Gir National Park
    3. Pania Sanctuary together forms the "Gir Conservation Area" (GCA)
    4. The other two are, Mitiyala and
    5. Girnar protected areas within dispersal distance of the Gir Conservation Area.
- The lions face the usual threats of poaching and habitat fragmentation.
- However, recent death of around two dozen lions is attributed to the deadly Canine Distemper Virus (CDV) in Dalkhaniya range of Gir forest division.
- So the Gujarat Forest Department has begun Radio-collaring Asiatic lions in a bid to study their movement patterns, territories and habitat preferences.

- Radio-collars are fitted with small radio transmitter that will beam signals to the satellites at a preset frequency and the satellites, in turn, will relay the signals to a control-room in Sasan.
- The government has set up a high-tech monitoring unit at Sasan which will serve as control-room for the collars.
- This will help the forest department in monitoring of the group's movement, research, knowing the territory of the animal and other details.
- During floods and other calamities and spread of diseases, the radio collars would be a big help for forest teams.
- Conservation Status-
    1. Listed in Schedule I of Wildlife (Protection) Act 1972
    2. Appendix I of CITES
    3. Endangered on IUCN Red List
    4. Asiatic Lion Conservation Project by the MoEFCC

5.2 Emission Trading Scheme

- Gujarat has launched India's first Emission Trading Scheme to combat particulate air pollution.
- The programme is a market-based system where the government sets a cap on emissions and allows industries to buy and sell permits to stay below the cap.
- Under the cap and trade system, the regulator first defines the total mass of pollution that can be put into the air over a defined period by all factories put together.
- Then, a set of permits is created, each of which allows a certain amount of pollution, and the total is equal to the cap.
- These permits are the quantity that is bought and sold, each factory is allocated a share of these permits (this could be equal or based on size or some other rule).
- After this, plants can trade permits with each other, just like any other commodity on the National Commodity and Derivatives Exchange Limited (NCDEX).
- The reason for trading is that in a cap and trade market, the regulator will measure pollution over a period of time and industries must own enough permits to cover their total emissions.
- Factories who find it very expensive to reduce pollution, will seek to buy more permits.
- Those who can easily reduce pollution are encouraged to do so because then they have excess permits to sell.
- Globally, cap-and-trade systems have been used to reduce other forms of pollution, such as programmes that have successfully reduced Sulphur dioxide (SO_2) and nitrogen oxides (NOx) in the United States.
- But the Gujarat programme is the first in the world to regulate particulate air pollution.

5.3 Seashore as 'Land' - Maharashtra

The Maharashtra government has decided to treat a part of the Arabian Sea shoreline at Mumbai's Nepeansea Road as "revenue land".

- It is the part of the seashore lying between the low tide mark and the high tide mark in a particular part of South Mumbai.
- The part of the shoreline in question was marked as "sea" at the time of Mumbai's last land survey.
- Since then, about 100 shanties (huts) have come up illegally on a portion of this land.
- Mumbai's latest approved Coastal Zone Management Plan (CZMP) categorises it as an inter-tidal zone or foreshore.
- Under The Maharashtra Land Revenue Code, 1966, ownership of foreshore areas vests in the state government.
- Revenue land, in other words, means land that is utilisable and disposable, and which can generate revenues.

- It has been placed in the ecologically sensitive CRZ-1B category.
- The CZMP shows it as lying to the seaward side of the high tide line.
- **Recent Decision -** Maharashtra CM gave in-principle approval to a proposal for a survey, and to give a cadastral survey (CS) number to the identified portion of the shoreline.
- [A cadastral survey is done to determine the land boundaries of a city, ward, or plot.]
- The foreshore area was under water when the last survey was carried out, and exists beyond the current boundaries.
- So a survey is necessary to determine its boundaries. The survey will also effectively increase the ward boundaries.
- The Superintendent of Land Records carries out the survey and marks the new boundaries.
- After this, the Mumbai Collector's office would be expected to decide the ownership of the newly formed land, and assign it a CS number.
- An independent property card will then be generated containing all the details.
- The CS number and the property card are essential documents for the assessment and development of any land.
- Official documents show that the Revenue Department had processed the proposal for surveying the foreshore area.
- The CM has said that the "developability" of the newly surveyed "land" would be assessed in accordance with -
    i. Coastal Regulation Zone (CRZ) norms
    ii. rules governing construction activity in Mumbai
- Meanwhile, a developer has submitted an in situ slum redevelopment project for the land.
- This has been admitted by the state-run Slum Rehabilitation Authority (SRA).
- As per the **CRZ notifications** (2011 and 2019), no development or construction is permissible on this portion even if it is categorised as revenue land.
- Maharashtra's environment department has clarified this.
- The 2019 notification allows only foreshore facilities such as jetties, harbours, and ports in such places.
- However, slum-dwellers on this illegally reclaimed portion of the shore have come together to form a "housing society".
- They have authorised the developer to carry out in situ re-development.
- It is said that the decision to carry out the survey would amount to recognising illegal reclamation of the seashore.
- This, and other such claims, would expose the coastal areas to a fresh wave of construction.

5.4 Coastal Regulation Zone

- Coastal Regulation Zone **(CRZ)** are the notification for regulation of activities in the coastal area.
- It was issued under the **Environment Protection Act, 1986** by **Ministry of Environment and Forests (MoEF).**
- As per the notification, the coastal land up to 500m from the High Tide Line (HTL) and a stage of 100m along banks of creeks, estuaries, backwater and rivers subject to tidal fluctuations, is called the Coastal Regulation Zone(CRZ).
- CRZ along the country has been placed in four categories.
- **CRZ I -** Ecologically Sensitive Areas
    1. They lie between low and high tide line.
    2. These areas are essential in maintaining the ecosystem of the coast.

3. These include national parks/marine parks, sanctuaries, reserve forests, mangroves and coral reefs.
4. Exploration of natural gas and extraction of salt are permitted

- **CRZ II** - Shore Line Areas
  1. The areas that have been developed up to or close to the shoreline which fall within the Municipal limits.
  2. Unauthorized structures are not allowed to construct in this zone.
- **CRZ III** - Undisturbed Area, has been divided into CRZ- IIIA and CRZ- III B in the **CRZ Notification 2018,**
  1. Rural and Urban localities which fall outside I and II.
  2. **CRZ - III A -** it Includes those areas where population density is more than 2161 per sq km as per the 2011 census.
  3. Such areas shall have a No Development Zone of 50 meters from the HTL as against 200 meters stipulated in the CRZ Notification, 2011
  4. **CRZ - III B -** it includes all the other areas of CRZ- III where population density is below 2161 per sq km as per the 2011 census.
  5. Such areas shall continue to have an NDZ of 200 meters from the HTL.
  6. Only certain activities related to agriculture and some public facilities are allowed in this zone.
- **CRZ IV -** Territorial Area
  1. An area covered between Low Tide Line and 12 Nautical Miles seaward.
  2. Fishing and allied activities are permitted in this zone.
  3. Solid waste should be let off in this zone.
- **Shailesh Nayak committee** on CRZ recommended relaxation on the terms set up by the CRZ 2011 notification.
- The major objective behind the recommendations was to boost tourism, port construction and real estate.
- Theprojects which falls under the CRZ- I and CRZ- IV areas only require the approval of the Environment Ministry.
- States and the Union territories shall consider all other projects.

5.5 Coastal Zone Management

The Environment Ministry has unveiled the draft Environmental and Social Management Framework (ESMF).

- It is part of a World Bank-funded project.
- The document was prepared by the Society for Integrated Coastal Management, a Ministry-affiliated body.
- The draft plan that will dictate how prospective infrastructure projects situated along the coast ought to be assessed.
- It lays out guidelines out for coastal States to adopt when they approve and regulate projects in coastal zones.
- It seeks to enhance coastal resource efficiency and resilience, by building collective capacity for adopting and implementing integrated coastal management approaches.
- Integrated coastal zone management (ICZM) has to be a continuous process rather than a "one-off" investment.
- Such plans would be prepared for the selected coastal stretches in other States/UT, the project notes.

5.6 Forest landscape restoration and Bonn Challenge

Minister for Environment recently launched a flagship project to build capacity on forest landscape restoration (FLR) and Bonn Challenge in partnership with IUCN.

- The pilot phase of the project will be implemented in the States of Haryana, Madhya Pradesh, Maharashtra, Nagaland and Karnataka.
- According to India's Nationally Determined Contribution (NDC), submitted under UNFCCC, India aims to create an additional carbon sink of 2.5 to 3 billion tonnes of CO_2 equivalent through additional forest and tree cover by 2030.
- India also joined the voluntary Bonn Challenge pledge, to bring into restoration 13 million hectares of degraded and deforested land by the year 2020, and an additional 8 million hectares by 2030.
- India's pledge is one of the largest from Asia.
- The project launched in partnership with the National Afforestation and Eco-Development Board (NAEB), MoEFCC will eventually be scaled up across the country in subsequent phases.

Bonn Challenge

- It is a global effort to bring 150 million hectares of the world's deforested and degraded land into restoration by 2020, and additional 350 million hectares by 2030.
- It was launched in 2011 by the Government of Germany and IUCN.
- It was endorsed and extended by the New York Declaration on Forests at the 2014 UN Climate Summit.
- Underlying the Bonn Challenge is the forest landscape restoration (FLR) approach, which aims to restore ecological integrity at the same time as improving human well-being through multifunctional landscapes.
- The restoration will create approximately USD 84 billion per year in net benefits that could bring direct.

5.7 Sustainable Livelihoods and Adaptation to Climate Change

NIRDPR launches training programme of Sustainable Livelihoods and Adaptation to Climate Change.

- National Institute of Rural Development and Panchayati Raj (NIRDPR) is a Hyderabad-based autonomous organisation under the Union Ministry of Rural Development.
- It has launched a training programme of SLACC to help Rural Poor Farm Holds adapt to Climate Change and sustain their livelihoods.
- The first batch Community Resource Persons and National Resource Persons from Madhya Pradesh and Bihar states have begun receiving training classes in Hyderabad.
- The impact of Climate Change on farmers, especially small and marginal ones is high in any part of the country.
- The programme will help the community at the grassroots level to combat the impact of climate change.

5.8 Forest-PLUS 2.0

Union Environment Ministry and US Agency for International Development has launched Forest-PLUS 2.0.

- It is a 5-year programme that focuses on developing tools & techniques to bolster ecosystem management and harness ecosystem services in forest landscape management.
- It is a set of pilot projects meant to enhance sustainable forest landscape management.
- Previously, Forest-PLUS was completed in 2017. Forest-PLUS 2.0 was initiated in December 2018.
- Achievements of Forest-PLUS –
  i. Promotion of bio-briquettes in Sikkim,
  ii. Introduction of solar heating systems in Rampur and
  iii. Development of an agro-forestry model in Hoshangabad
- Forest-PLUS 2.0 - It comprises pilot project in 3 landscapes - Gaya in Bihar, Thiruvananthapuram in Kerala and Medak in Telangana.
- These sites were chosen for the contrast in their landscapes – Bihar (Forest deficit area), Telangana (Relatively drier area) and Kerala (Rich in Biodiversity).
- 3 Focal points of action under the programme are,
  i. Developing tools for multiple services in forests management

ii. Instruments for leveraging finance & mobilising investment from the private sector

iii. Economic opportunities for forest-dependent people.

5.9 Ganges River Dolphin Census

- The annual Ganges River Dolphin census is being undertaken by World Wide Fund for Nature-India in collaboration with the Uttar Pradesh Forest Department.
- The census started in 2015, is taken along about 250-km-long riverine stretch of Upper Ganga between Hastinapur Wildlife Sanctuary and Narora Ramsar site.
- Unlike previous years, when direct counting method was used, this year the tandem boat survey method is being used.
- The survey method uses inflated boats which move in tandem with dolphins and provides a more accurate count of the endangered species.
- The animal is known to make strange sounds when it breathes, earning it the sobriquet 'Susu'.
- Being a mammal, it has to come to the surface to breathe.
- It is also called a blind dolphin because it doesn't have a crystalline eye lens and uses echolocation to navigate and hunt.
- Like bats, they produce high-frequency sounds which helps them 'see' objects when the sound waves bounce off them.

5.10 Snow Leopard Population Assessment

- Union Environment Ministry launched the First National Protocol on Snow Leopard Population Assessment in India.
- It was launched in the Global Snow Leopard & Ecosystem Protection (GSLEP) Program on International Snow Leopard Day.
- It is the first of its kind, developed in association with the Snow Leopard States/UTs - Ladakh, Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh.
- Snow Leopard is found in 12 countries - India, Nepal, Bhutan, China, Mongolia, Russia, Pakistan, Afghanistan, Kyrgyzstan, Kazakhstan, Tajikistan and Uzbekistan.
- It is listed as a 'vulnerable' category in the Red List of IUCN.

GSLEP

- It is the world's first initiative that aims to conserve high mountain ecosystems by protecting snow leopard in the region.
- It unites all 12 range country governments, nongovernmental and inter-governmental organisations, local communities, private sector.
- Arunachal Pradesh is one of the 22 priority landscapes of the GSLEP.
- In 2004, WWF-India introduced the concept of Community Conserved Area (CCA) in the State to empower local communities to become active decision-makers and implement conservation initiatives.
- This year, GSLEP Program is being organised by Union Environment Ministry at New Delhi.
- The Steering Committee meeting of GSLEP chaired by Nepal and Co-Chaired by Kyrgyzstan.

5.11 Definition of land as forest

- The conundrum of defining forest has been around since the 1980s.
- In 1996, the Supreme Court in its Godavarman Judgement expanded the definition of Forest that includes lands,
    1. That was already notified by the Centre as forests,
    2. That appears in government records as forests

3. That fell in the "dictionary definition" of forest.

- Under the third category, it is the prerogative of the States to define their own criteria and define tracts of land as a forest which is known as 'deemed forests'.
- This is because, a tract of grassland in one State might qualify in one region as forest, but not in another.
- However, not all States have submitted such criteria and once a State applied criteria, it couldn't be reversed.
- Forests defined under these criteria constituted about 1% of the country's forests.
- The discussion on this deemed forests came up because the Uttarakhand government had put forth a set of criteria defining forest land and asked the Environment ministry for it's opinion.
- The Forest Advisory Committee (FAC) have clarified that the States need not take the Centre's approval to define what constitutes unclassified land as forest.

5.12 Electric Vehicles Guidelines

Ministry of Power has recently approved amendments in Electric Vehicles charging guidelines and specifications.

- Under it, Bureau of Energy Efficiency (BEE) nominated as the Central Nodal Agency to facilitate installation of charging infrastructure.
- It envisages at least 1 charging station should be available in a grid of 3 Km X 3 Km in the cities and 1 charging station at every 25 Km on both sides of highways/roads.
- Fast Charging Station for long range and/or heavy duty EVs like buses/trucks etc., shall be installed at every 100 Kms.
- **Phases of Development** – It covers cities in two phases for distributed and demonstrated effect.
- Phase I (1-3 years) - All Mega Cities with population of 4 million plus as per census 2011, all existing expressways and highways connecting it.
- Phase II (3-5 years) - State Capitals, UT headquarters
- Further, setting up of Public Charging Stations shall be a de-licensed activity and any individual/entity is free to set up public charging stations.
- The tariff to be charged has also been mentioned in the guidelines.

5.13 MOSAiC expedition

- The MOSAiC mission, stands for Multidisciplinary drifting Observatory for the Study of Arctic Climate is spearheaded by the Alfred Wegener Institute in Germany.
- It is the largest ever Arctic expedition in history.
- It will be the first to conduct a study of this scale at the North Pole for an entire year.
- **Objectives** - To parameterise the atmospheric, geophysical, oceanographic and all other possible variables in the Arctic, and use it to more accurately forecast the changes in our weather systems.
- It will help the researchers better understand the impact of climate change and aid in improved weather projections.
- Hundreds of researchers from 19 countries take part in this exceptional endeavour.
- The 32-year-old polar researcher from Kerala will be the only Indian aboard the mission.
- **First mission** – In 1893-1896, Norwegian explorer Fridtj first managed to seal his wooden expedition ship, Fram, into the North Pole.

5.14 Microbial Fuel Cells

- Microbial fuel cells are devices that use bacteria as the catalysts to oxidise organic and inorganic matter and generate current.

- The electrons produced by the bacteria are transferred to the negative terminal and flow to the positive terminal.
- Plants naturally deposit biomatter as they grow, which in turn feeds the natural bacteria present in the soil, creating energy that can be harnessed by fuel cells.
- It is used to power a wide range of vital conservation tools remotely, including sensors, monitoring platforms and camera traps.
- Among conventional power sources, batteries must be replaced while solar panels rely on a source of sunlight.
- On the other hand, plants can survive in the shade, naturally moving into position to maximise the potential of absorbing sunlight.
- Zoological Survey of London has deployed microbial fuel cells in fern to power camera traps and sensors in the wild.

5.15 Bamboo Technology Park

- Ministry of Development of North Eastern Region and the North Eastern Council (NEC) have announced setting up of Bamboo Technology Park in Jammu & Kashmir and Ladakh.
- The parks will be in Jammu, Srinagar and Leh and it is consonance with the National Bamboo Mission (NBM).
- The Cane and Bamboo Technology Centre (CBTC) under NEC will implement the project.
- The model for bamboo cultivation, harvesting and utilisation currently existing in the North Eastern Region shall be replicated in the 2 UTs.
- A Bamboo Industrial Park has already been approved to be set up in the Dima Hasao district of Assam.

5.16 Wasteland Atlas

- The 5th edition wasteland atlas of India is released by the Department of Land Resources, Ministry of Rural Development.
- The previous 4 editions were released in 2000, 2005, 2010 & 2011.
- National Remote Sensing Centre (NRSC), Department of Space collaborate with the ministry.
- The new wastelands mapping exercise is carried out by NRSC using the Indian Remote Sensing Satellite data.
- The changes in wastelands between 2008-09 and 2015-16 have been presented in the Atlas.
- It provides district and state wise distribution of different categories of wastelands area including mapping of about 12.08 Mha hitherto unmapped area of Jammu & Kashmir.
- ***Data highlights*** – The spatial extent of wasteland is 55.76Mha (16.96 % of geographical area of the Country) for the year 2015-16 as compared to 56.60 Mha in the year 2008-09.
- During this period 1.45 Mha of wastelands are converted into non wastelands categories.
- A reduction in wasteland area was observed in the categories of land with dense scrub, waterlogged and marshy land, sandy areas, degraded pastures / grazing land and gullied and / or ravinous land.
- Positive changes were observed in the following States - Rajasthan, Bihar, Uttar Pradesh, Andhra Pradesh, Mizoram, Madhya Pradesh, Jammu & Kashmir and West Bengal.
- Majority of wastelands have been changed into categories of croplands.

5.17 Green Urban Mobility

- India and Germany have launched Indo-German Partnership for Green Urban Mobility to reform bus sector in Tamil Nadu.
- Under this partnership, both the countries will earmark 200 million Euros for the purpose.
- The funding will be for the period of 5 years.

- It will be used to finance several environment friendly projects such as the introduction of electric buses to replace the ones running on diesel for public transport in urban centres.

5.18 Swachh - Nirmal Tat Abhiyaan

- Ministry of Environment, Forest and Climate Change (MoEF&CC) is undertaking a mass cleanliness-cum-awareness drive in 50 identified beaches under the "Swachh – Nirmal Tat Abhiyaan.
- The identified beaches are in 10 coastal States/Union Territories (UTs) namely Gujarat, Daman & Diu, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Puducherry, Andhra Pradesh, and Odisha.
- The cleaning drives in all beaches are being undertaken, involving school/college students of Eco-clubs, district administration, institutions, volunteers, local communities and other stakeholders.
- Collected waste will be processed as per extant Waste Management Rules, 2016.
- Environment Education Division of the Ministry and Society of Integrated Coastal Management (SICOM) under the aegis of MoEF&CCwill be responsible for the overall coordination for the drive in 50 beaches.

5.19 Ecoclub Programme

- Environment Education Awareness and Training (EEAT) is an established central sector scheme of the Environment Ministry since 1983-84.
- It aims to promote environmental awareness and mobilize student's participation for environment conservation.
- Under the scheme, National Green Corps (NGC) 'Ecoclub' programme was initiated in 2001-2002 with the objective to impart knowledge to school children about their immediate environment, interactions within it and the problems therein.
- It aims to inculcate proper attitude towards environment and sensitize children on issues related to environment and development.
- In a first, Annual Meet of the State Nodal Agencies implementing the Ecocluborganized by the EnvironmentMinistry was held in Kevadia, Gujarat.

5.20 HT Bt cotton – GM Cotton

- **Herbicide-tolerant Bt** (HT Bt)**Cotton** is genetically modified cotton crop.
- It is also known as **BG-III cotton**, an advanced version of **Bt Cotton,** as it takes care of weeds problem.
- Herbicide is like a poison which is used to destroy unwanted vegetation.
- They are designed to tolerate specific broad-spectrum herbicides, which kill the surrounding weeds, but leave the cultivated crop intact.
- The herbicide-tolerant trait was developed and commercialised by US-based multinational seed giant Monsanto.
- Currently, **Bt-Cotton** is the only GM crop allowed to be grown in India.
- **Herbicide-Tolerant Bt-cotton** has unapproved genes which is not permissible in India.
- The herbicide-resistant gene in HT cotton can spread through pollen into biodiversity system leading to transformation of weeds into super weeds.
- It will threaten growth and yields of all crops in future and leads to health hazards.
- But farmers in Gujarat, Andhra Pradesh, Telangana and Maharashtra cultivates the unapproved HTBT cotton, as they want improved seeds and technology for better crops.
- In the absence of government approval, production of **HT Bt cotton** is illegal.

6. PROTECTED AREAS

6.1 Vembanad Lake

- A group of fishermen have been conducting plastic collection drive every year to get the lake rid of plastic waste in Vembanad Lake.
- The Lake is also known as 'Vembanad Kayal', 'Vembanad Kol', 'Punnamada Lake' and 'Kochi Lake'.
- It is the largest in Kerala and the longest in India.
- The longest railway line in India, Vembanad Rail Bride is also named after the lake.
- 'Nehru Trophy Boat Race' is held every year in Vembanad Lake.
- It is the 'Wetland of international importance', as defined by the **Ramsar Convention.**
- The '**Kumarakom Bird Sanctuary'** is located on the east coast of the lake.
- It is included in the 'National Lake Conservation Programme' (NLCP) for conservation and management of the lake.
- Plastic pollution is the major threat to the lake ecosystem and to the entire biodiversity,
- So, houseboats and resorts in the district have started replacing single-use plastic water bottles with glass jars and glass bottles.
- Other Ramsar sites in Kerala - Ashtamudi Wetland, Sasthamkotta Lake

6.2 Pobitora Sanctuary

- It is in Assam and often called 'Mini Kaziranga' due to similar landscape and vegetation.
- It has the highest concentration of one-horned rhinos in the world.
- Rhinos is also vulnerable to the anthrax attacks whose population in the sanctuary is estimated to be 102.
- Two Asiatic water buffaloes in central Assam's Pobitora Wildlife Sanctuary was died due to Anthrax.
- Anthrax is caused by the bacterium Bacillus anthracis.
- It is primarily a disease of herbivorous mammals, although other mammals and some birds have been known to contract it.
- It can be fatal for humans who come in contact with infected animals.
- It is characterised by blisters around swellings on the skin, chest pain, vomiting, diarrhoea and fever.
- The disease is generally regarded as being non-contagious. Records of person-to-person spread exist but are rare.

6.3 Bihar's First Community Reserve

Gogabeel is declared as the Bihar's first community reserve.

- Gogabeel is located in the state's Katihar district.
- It is an ox-bow lake in Bihar's Katihar district, has been declared as the state's first 'Community Reserve'.
- It is formed from the flow of the rivers Mahananda and Kankhar in the north and the Ganga in the south and east.
- It is the fifteenth Protected Area (PA) in Bihar.
- Conservation reserves and community are protected areas which typically act as buffer zones to or connectors and migration corridors between established national parks, wildlife sanctuaries and reserved forests.

- Such areas are designated as conservation areas if they are uninhabited and completely owned by the Government.
- They are used for subsistence by communities and community areas if parts of the lands are privately owned.
- These protected area categories were first introduced in the Wildlife (Protection) Amendment Act of 2002.
- It was initially notified as a 'Closed Area' by the state government in the year 1990 for five years.
- In 2004, Gogabeel, including the neighbouring Baghar Beel and Baldia Chaur, were given the status of an Important Bird Area of India by the IBCN.

6.4 Nandankanan Zoo

- Recently, India's only orangutan which was brought from Singapore was died in Nanda Kannan Zoo, Odisha.
- Orangutans are one of the world's three extant species of great apes and are native to Indonesia and Malaysia.
- They are currently found only in the rain forests of Borneo and Sumatra.
- Classified in the genus Pongo, they were originally considered to be one species.
- Thy are among the most intelligent primates and use a variety of sophisticated tools and construct elaborate sleeping nests each night from branches and foliage.

7. BIO-DIVERSITY

7.1 Hoolock Gibbon

- The hoolock gibbons are native to eastern Bangladesh, Northeast India and Southwest China.
- White rings around their eyes and mouths give their faces a mask-like appearance.
- Hoolock Gibbon are categorized vulnerable, as per the International Union for Conservation of Nature (IUCN).
- Estimates of the eastern hoolock gibbon population in India are at 170 most found in Assam and Arunachal Pradesh.
- They are mainly concentrated in the Mishmi Hills, and are now commonly known as Mishmi hills gibbons.
- The animal is protected in Mehao Wildlife Sanctuary located in Lower Dibang Valley district.

7.2 Olive Ridley

- The Olive Ridley sea turtle are the second smallest and most abundant of all sea turtles found in the world.
- This species of sea turtle is found in warm and tropical waters, primarily in the Pacific and Indian Oceans.
- They can also be found in the warm waters of the Atlantic Ocean.
- These turtles, are best known for their unique mass nesting called arribada, where thousands of females come together on the same beach to lay eggs.
- The Gahirmatha marine sanctuary is the largest rookery of the Olive Ridley turtles in India.

Olive Ridley Research Centre

- A proposal has been made to establish a permanent research center near the Rushikulya rookery on the Odisha coast.
- The center will study the mass nesting of Olive Ridley and the environmental factors related to it.

- The center would also carry out a detailed study of the habits and the habitat of the turtles and the coastal flora and fauna.
- Rushikulya River is one of the major rivers in the state of Odisha , which originates 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, It has no delta as such at its mouth.

7.3 Black Softshell Turtle

- The black softshell turtle or Bostami turtle is a species of freshwater turtle found in India and Bangladesh.
- It is the close relative of Indian peacock softshell turtle, but it is a distinct species.
- As of 2002, the IUCN classified the species as Extinct in the Wild.
- The turtle is originally native to the lower Brahmaputra River.

7.4 Asiatic Golden Cat

- The Asian golden catis a wild cat native to the northeastern Indian subcontinent and Southeast Asia.
- It has been listed as Near Threatened on the IUCN Red List since 2008, and is threatened by hunting pressure and habitat loss.
- Since Southeast Asian forests are undergoing the world's fastest regional deforestation.
- It is found across eastern Nepal through north-eastern India to Indonesia.
- Recently scientists has found that Golden is no longer the only color that the elusive Asiatic golden cat can be associated with, its coat comes in five other shades.
- The wide variation displayed in the cat's coats provides them with several ecological benefits such as occupying different habitats at different elevations from wet tropical lowland forests to alpine scrubs and providing camouflage while preying.

7.5 Cryodrakon Boreas

- Paleontologists have identified a new species, named it 'Cryodrakonboreas' - a giant flying reptile.
- With a wingspan of over 10 metres, it is believed to have flown over the heads of dinosaurs.
- It could be one of the largest flying animals lived over 77 million years ago in today's western Canada.
- Its remains were, discovered 30 years ago from the Dinosaur Park Formation located in Alberta.
- A new study has concluded that the remains belong to a new species, which is the first pterosaur to be discovered in Canada.
- In terms of habitat and lifestyle, it would have lived in a tropical environment, feasting on small dinosaurs and lizards.

7.6 Asia's Oldest Bamboo

- A new fossil record has shown that India is the birthplace of Asian bamboo.
- The fossils were formed about 25 million years ago in the north-eastern part of the country.
- Bamboo fossils are not very common in India as they are known only from the Siwalik sediments.
- The new fossils were found in Makum coalfield in Assam, belonged to the late Oligocene period of about 25 million years ago.

- Yunnan Province in China now has the highest diversity of bamboo, but the oldest fossil in that region is less than 20 million years old.
- It clearly indicates that Asian bamboo was born in India and then migrated there.
- This finding further strengthens the theory that bamboo came to Asia from India and not from Europe.
- The collision of Indian Plate with the Eurasian Plate was not completed until 23 million years, restricting migration of plants and animals.
- Bamboo braved the climatic and geographical changes making it the fittest in the survival race.

7.7 Greater Adjutant Storks

- It is the world's most endangered of the stork species.
- Earlier it was distributed throughout northern and eastern India and many countries of south and south-east Asia, it is currently only in Assam and Bihar and a few other locations in Cambodia.
- It is listed as "Endangered" in IUCN Red list of threatened species.
- It is locally called 'Hargila' in the Brahmaputra Valley in Assam, which harbours more than 80% of the global population of the species.
- It is considered family by women of Dadara and Pacharia villages in Assam's Kamrup district.
- Families observed a unique ceremony of baby shower for the greater adjutant nesting in their neighbourhood.
- They build colonies on tall trees during their breeding season in winter.
- A campaign was launched in Assam to save the birds by Aaranyak, a wildlife conservation organisation in 2009.
- Assam's renowned environmentalist Purnima Devi Barman has won the prestigious Whitley Awards, also known as the Green Oscars, for her efforts in conserving greater adjutant storks in association with Aaranyak.

7.8 New Frog Species

- Brown Blotched Bengal Tree Frog under the genus *Polypedates*was recently discovered in the State of West Bengal.
- It is unique since it is not discovered from deep jungles but from residential areas.
- The name is derived from a series of six to nine dark brown blotches that extend laterally from behind the frog's eye to the vent.
- Its body colour is yellowish-brown to greenish-brown.

7.9 Cane Turtle

- While turtles are more or less dependent on water, tortoises are completely terrestrial.
- Cane Turtle is an anomaly. It scuttles through the forest and adopts a land-based lifestyle among leaves.
- Although the shape of its legs and webbed feet are reminiscent of its aquatic relatives, it doesn't like water and stays clear of streams.
- When scared, it dives under dry leaves as if it were plunging into a pond or brook.
- They are endemic to the evergreen and semi-evergreen forests of the Western Ghats of Karnataka, Kerala and Tamil Nadu.
- They are omnivorous and feed on fruits, leaves, arthropods, and molluscs.
- Males have a darker pink or scarlet colouring compared to females, besides also being smaller in size.
- The 10-cm-long turtle blended in colour and shape with the dry leaves that clothed the forest floor.
- Rainforests don't undergo a distinct winter season, but the turtle puts its life on hold for six months after the Northeast monsoon recedes.

- Its IUCN Status is Endangered.

7.10 Sumatran Rhino

- The Sumatran rhino has become extinct in Malaysia after the last remaining individual died on November 23, 2019, due to natural causes.
- It is the smallest of all rhino species and one of the most endangered land mammals on the planet.
- It is the only Asian Rhino with two horns.
- Its IUCN status is Critically Endangered.
- Earlier, it has occurred in the parts of Bangladesh, Bhutan, Brunei Darussalam, Cambodia, India, Lao PDR, Myanmar, Thailand and Viet Nam.
- Now, it exists only in four isolated regions of rainforests on the Indonesian islands of Sumatra and Borneo.

7.11 Malabar Tree Toad

- It is a very rare species of amphibian endemic to the Western Ghats.
- It is an endangered species that spends most of its life on trees, coming to the ground only during the first monsoon showers to mate.
- Its population is shrinking mainly due to habitat loss, climate change and *Batrachochytrium dendrobatidis*, a deadly fungus that has been decimating entire amphibian populations worldwide.
- The Metastring Foundation, a citizen-based conservation non-profit based in Bengaluru, was awarded a grant of Rs 15 lakh for one year for its project on the Malabar Tree Toad.
- It is working to train and equip citizens for mapping the range of an extremely rare species of toad as only sporadic records are available.

7.12 New Snake Species

- Researchers have discovered a new species of non-venomous burrowing snake named 'Trachischiumapteii' in Arunachal Pradesh.
- It was found under fallen logs inside a thickly forested area of the Tally Valley Wildlife Sanctuary near the town of Ziro in Arunachal Pradesh.
- *Trachischium* species are commonly called slender snakes.
- They are seldom seen due to the burrowing habits and hence remain poorly studied.
- They are currently known by seven species that are distributed across the Himalayas, and the Indo-Burma and Indo-China regions.
- Trachischiumapteii' was named so to honour the contribution of Deepak Apte, well-known marine biologist and Director of the Bombay Natural History Society.

7.13 Peregrine Falcon

- It is one of the world's most common predatory birds, has the fastest vision in the animal kingdom,
- It can register nearly 130 frames per second, where humans see up to a maximum of 50 to 60 blinks per second.
- This new discovery was published in Journal of Experimental Biology, it is the first time scientists have studied the speed of vision among birds of prey.
- The speed at which different birds of prey process visual impressions is related to their hunting needs.
- For the peregrine falcon, which hunts fast-flying birds, the ability to spot ultra-speed movements helps them detect prey sufficiently early in order to have time to react.

7.14 Himalayan Gold

- In the Himalayas, the reliance of local communities on the trade and collection of Himalayan Gold, caterpillar fungus has become extremely popular in recent decades.
- Caterpillar fungus (Ophiocordyceps Sinensis) is a fungal parasite of larvae (caterpillars) that belongs to the ghost moth.
- It has been used in traditional Tibetan and Chinese medicine as a tonic, as a therapeutic medicine for lung, liver and kidney problems.
- In the recent times, it has widely traded as an aphrodisiac (stimulating sexual desire) and a powerful tonic, often called the 'Himalayan Viagra'.
- It is endemic to the Tibetan Plateau, including the adjoining high Himalaya (3,200-4,500 metres above sea level).
- It is locally known as Kira Jari (in India), Yartsagunbu (in Tibet) and Yarsagumba (in Nepal).
- It has been found in alphine meadows of Nanda Devi Biosphere Reserve, Askot Wildlife Sanctuary, Kanchendzonga Biosphere Reserve and Dehan-Debang Biosphere Reserve.
- The harvesting of fungus starts at the beginning of May and lasts till the end of June.
- It depends on factors such as weather, snow cover on the pasture and elevation of collection sites.
- TRAFFIC, the wildlife trade monitoring network reported that the illegal trading of it is also a significant issue.

8. INDEX & REPORTS

8.1 Indian State of Forest Report

- Forest Survey of India (FSI) has been assessing the forest and tree resources of our country on a biennial basis since 1987.
- The results of the assessment are published in its biennial report titled "India State of Forest Report (ISFR)".
- According to the recent report in 2019, compared to the last assessment of 2017,
    1. The total tree and forest cover in the country increased by 5,188 Sqkm with sharpest declines in the northeastern states
    2. There is an increase of 42.6 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 and forest cover together made up 24.39% of the geographical area.
- 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 is defined as a canopy cover over 70 per cent has increased by a mere 1.14% between 2017 and 2019.
- 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 top three States showing an increase in forest cover are Karnataka, Andhra Pradesh and Kerala.
- 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 mangrove cover increased by 54 sqkm, or about 1%, from the last assessment, with Gujarat and Maharashtra registering the largest improvements.

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 Climate Change Performance Index

- It is an annual publication by Environment think tank German Watch, the New Climate Institute and the Climate Action Network since 2005.
- The index tracks countries' efforts to combat climate change.
- It is an independent monitoring tool aims to enhance transparency in international climate politics.
- It evaluates and compares the climate protection performance of 57 countries and the EU, which are together responsible for more than 90% of global greenhouse gas (GHG) emissions.
- 80% of the evaluation is based on objective indicators of emissions trend and emissions level.
- 20% of the index results are built upon national and international climate policy assessments by more than 200 experts from the respective countries.
- Country's ranking is defined by 14 indicators within 4 categories – GHG Emissions, Renewable Energy, Energy Use and Climate Policy.
- The CCPI ranking is qualified in relative terms (better–worse) rather than in absolute terms.
- In CCPI 2020, no country performs well enough in all index categories to achieve an overall very high rating in the index, thus the first 3 ranks remain empty.
- Sweden leads the ranking on rank 4, followed by Denmark and Morocco.
- The bottom 3 countries are Taiwan, Saudi Arabia and United States.
- **India**, for the first time, ranks at 9 among the top 10 in the index.

8.3 Global Climate Risk Index

- The index is released by Environment think tank, Germanwatch for the for 2018 and from 1999 to 2018.
- According to the index, Japan is the most affected followed by the Philippines as well as Germany in 2018.
- Madagascar was the 4th most affected followed by India as 5th most vulnerable country to climate change.
- India's rank has worsened from the 14th spot in 2017 to 5th in 2018 in the global vulnerability ladder.
- For the period from 1999 to 2018 Puerto Rico, Myanmar and Haiti rank highest.

- **Reason for ranking** – In 2018, a severe summer heatwave in Japan killed 138 people and caused more than 70,000 people to be hospitalised with heat stroke and exhaustion.
- Philippines was battered by top-strength Typhoon Mangkhut.
- In Germany, the period from April-July 2018 was the hottest ever recorded in the country, leading to the deaths of over 1,200 people.
- In Madagascar, two cyclones killed about 70 people and forced 70,000 to seek refuge.
- India suffered water shortages, crop failures and worst flooding.

8.4 Composite Water Management Index 2.0

- NITI Aayog is set to release the second Round CWMI 2.0.
- 'Jal Shakti Ministry' launched the 'Jal Shakti Abhiyaan' a campaign for water conservation and water security.
- To supplement the efforts of Jal Shakti Ministry, NITI Aayog has prepared the Second Round of CWMI 2.0.
- The CWMI is an important tool to assess and improve the performance of States and Union Territories in efficient management of water resources.
- This has been done through a first of its kind water data collection exercise in partnership with,
  1. Ministry of Jal Shakti,
  2. Ministry of Rural Development and
  3. all the States/ Union Territories.
- The index would provide useful information for the States and to Central Ministries to formulate and implement suitable strategies for better management of water resources.
- CWMI 2.0 ranks various states for the reference year 2017-18 as against the base year 2016-17.
- The Index and this associated report are expected to,
  1. Establish a clear baseline and benchmark for state-level performance on key water indicators.
  2. To uncover and explain how states have progressed on water issues over time.
  3. To identify areas for deeper engagement and investment on the part of the states.
- The Index comprises 9 themes with 28 different indicators covering,
  1. Groundwater and surface water restoration,
  2. major and medium irrigation,
  3. watershed development,
  4. Participatory irrigation management,
  5. On-farm water use,
  6. Rural and urban water supply, and
  7. Policy and governance.
- The earlier report was widely acknowledged and provided actionable guidance to States on where they were doing well and what they needed to focus on to secure their water future.

8.5 Status of Tigers in India, 2018 Report

The 4-year tiger census report, Status of Tigers in India of 2018, released recently shows numbers of the big cat have increased across all landscapes.

- The total number of tigers has risen by 33% since 2014.
- This is by far the biggest increase in terms of both numbers and percentage since the census using camera traps and the capture-mark-recapture method began in 2006.

- The 2018 figure has a great degree of credibility because 83% of the total tigers have been photographed by trap cameras.
- The biggest increase has been in Madhya Pradesh, 71% as compared to the numbers in 2014.
- In Maharashtra, Karnataka and Uttarkhand, the number has gone up by 64%, 29% and 30% respectively.
- However, since tigers keep moving between states, conservationists prefer to talk about tiger numbers in terms of landscapes.
- **India's five tiger landscapes:** Shivalik Hills and Gangetic Plains, Central Indian Landscape and Eastern Ghats, Western Ghats, North-East Hills and Brahmaputra Plains, and the Sundarbans.
- Only one of the 20 tiger-bearing states has seen a fall in numbers — Chhattisgarh, where the number reduced to 19 from 46 of 2014.
- The report has cited law and order as the reason, as large parts of the state are hit by the Maoist insurgency.
- No tiger has been found in the Buxa, Palamau and Dampa reserves.
- The success owes a lot to **increased vigilance and conservation efforts** by the Forest Department.
- The number of tiger reserves went up in 2018, extending protection to larger numbers of tigers over the years.
- The fact that organized poaching rackets have been crushed. The increased protection has encouraged the tiger to breed.
- The rehabilitation of villages outside core areas in many parts of the country has led to the availability of more inviolate space for tigers.
- Since state boundaries do not apply to the movement of tigers, conservationists prefer to talk about tiger numbers in terms of landscapes rather than of states.

8.6 UN's Emissions Gap Report 2019

The Emissions Gap Report 2019 was recently released by the United Nations Environment Programme.

- The Emissions Gap could also be called the "Commitment Gap".
- It measures the gap between what countries need to do and what they are actually doing to tackle climate change.
- In other words, it is the difference between current actions to reduce greenhouse gases (GHGs) and what is needed to meet the target.
- The Emissions Gap Report 2019 measures and projects three key trendlines:
    1. amount of GHG emissions every year up to 2030
    2. commitments countries are making to reduce their emissions and the impact these commitments are likely to have on overall emission reduction
    3. pace at which emissions must be reduced to reach an emission low that would limit temperature increase to 1.5°C, affordably
- The report also identifies key opportunities for each country to increase the pace of emission reduction necessary to close the gap.
- **Report Highlights -** The 2019 report presents the latest data on the expected gap in 2030 for the 1.5°C and 2°C temperature targets of the Paris Agreement.
- Even taking into account the current Paris pledges, the world is on track for a 3.2°C temperature rise.
- It estimates that there would have to be a 2.7% average annual cut in emissions from 2020 to 2030 for temperature rise to be contained at 2°C.
- The more ambitious 1.5° C target would require a 7.6% reduction.
- But, countries with large emissions, such as the U.S., China, the EU nations and India, will face more challenging demands.

- To bridge the gap, the report looks at the potential of the energy transition particularly in the power, transport and buildings sectors.
- It also looks at efficiency in the use of materials such as iron, steel and cement.

9. DISASTER MANAGEMENT

9.1 European Heat Wave

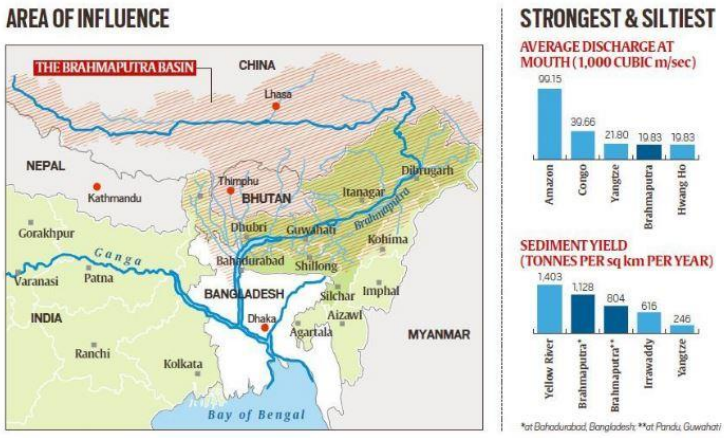
Europe went through a heat wave that lasted for six days and it has smashed temperature records, left many people dead and caused huge fires to break out.

- World Meteorological Organisation said that the heat wave in Europe is a result of warm air masses from Africa.
- It follows extreme heat episodes in India, Pakistan, parts of the Middle East and Australia.
- **Heat wave** is a weather phenomenon which is a period of prolonged abnormally high surface temperatures relative to those normally expected.
- No standardized definition of a heat wave exists.
- WMO definition: If five or more consecutive days during which the daily maximum temperature surpasses the average maximum temperature by 5 °C or more, it is called heat wave.
- It may be characterized by low humidity (which may exacerbate drought) or high humidity.
- **Classifying a heat** wave varies from country to country.
- That is because what is seen as extremely hot in one place may seem within normal range in another.
- In 2016 – The WMO listed several factors to be considered while analysing an extreme weather event such as a heat wave.
- This includes defining a specific threshold for variables such as temperature to be considered extreme as well as a human perspective of extremes.
- **India -** The India Meteorological Department (IMD) classifies heat waves.
- It does not consider a heat wave unless the maximum temperature crosses 40°C and 30°C in the plains and hills respectively.
- Where the normal maximum is 40°C or less,
    1. Heat wave departure from normal – 5°C to 6°C
    2. Severe heat wave departure – 7°C or more.
- Where the normal maximum is **more than 40°C**,
    1. Heat wave departure from normal – 4°C to 5°C
    2. Severe heat wave departure – 6°C or more.
- In places where the maximum temperature reaches **45°C or more**, the IMD declares a heat wave irrespective of the normal.
- **Health Hazards -** It poses a risk to people's health, agriculture and the environment.
- Babies and older people are particularly vulnerable as their bodies are not as well able to regulate their own temperatures.
- It can cause exhaustion and heat stroke.
- It can cause organfailure and breathingproblems.
- The people living in urban areas are trapped in heat islands as steel, concrete, and asphalt structures absorb heat.
- In regions like Europe where people are not used to extremely high temperatures, many buildings don't have air-conditioning.

9.2 Understanding Assam Floods

Assam is in the grip of floods frequently, with lakhs of people displaced and some killed, besides hundreds of animals.

- Apart from heavy and constant rainfall during the monsoon, there are many contributory factors, both natural and man-made that make floods so destructive in Assam.
- **Brahmaputra** - The very nature of the river Brahmaputra is dynamic and unstable.
- Its 580,000 sq km basin spreads over four countries (China, India, Bangladesh and Bhutan) with diverse environments.
- The Brahmaputra features among the world's top five rivers in terms of discharge as well as the sediment it brings.
- The vast amount of sediment comes from Tibet, where the river originates.
- Tibet is a cold and arid region, and lacks plantation. Glaciers melt, soil erodes and all of it results in a highly sedimented river.
- On the other hand, Assam primarily comprises floodplains surrounded by hills on all sides.
- So, by the time the Brahmaputra enters Assam, i.e. from a high slope to a flat plain, its velocity decreases suddenly.
- This results in the river unloading the sediment.
- Also, following the devastating earthquake of 1950, the level of the Brahmaputra rose by two metres in Dibrugarh area in eastern Assam.
- Because of the earthquake-prone nature of the region, the river has not been able to acquire a stable character.
- So the river's channels prove inadequate amid the siltation, in turn, leading to erosion and floods.
- **Man-made factors** - Besides the natural factors are the man-made ones which lead to higher sedimentation.
- These include habitation, deforestation, population growth in catchment areas (including in China), etc.
- For instance, the sediment deposition itself creates temporary sandbars or river islands.
- It is common for people to settle in such places, which further restricts the river flowing space.
- When rainfall is heavy, it combines with all these factors and leads to destructive floods.



Flood control measures

- **Dams** - In its master plan on the river in 1982, the Brahmaputra Board had suggested that dams and reservoirs be built to mitigate floods.
- However, the idea of dams has traditionally been a double-edged sword.
- One of objectives of dams is to regulate the release of flood waters.
- But, the release, when it comes, can sometimes be beyond the capacity of the channels downstream, further leading to floods there.
- In the Brahmaputra basin, there were protests against dam-building plans on grounds of displacement and destruction of ecology.
- All these prevent the plans from moving forward.
- **Embankments** - Given the above, the government has been using only one approach towards floods, which is building embankments on the river.

- Embankments were proposed only as an interim and ad hoc measure for short-term mitigation and thus, they lack durability.
- Since they were temporary measures, the government did not spend on high-specification embankments, and so, are weak and are regularly breached.
- **Dredging** - The government also considered dredging (digging up the riverbed and making the river deeper).
- However, this is not a wise idea given the fact that Brahmaputra sediment yield is among the highest in the world.
- Even if the silt is taken out this year, more silt will be deposited the following year, making the very expensive effort futile.
- Overall, most of the government's measures have been piecemeal and short-term, and the problem is not addressed at the source.

9.3 Kerala Landslides - Gadgil Panel Recommendations

The repeat of landslides and consequent tragedies in Kerala this year too, after the rainfall, has caused much concern.

- The 2018 floods and landslides in Kerala caused huge financial losses and manifold human tragedies.
- It was believed by many that the 2018 tragedy in Kerala marked a once-in-a-century calamity.
- Hence, a repeat of intense floods, landslides, financial losses and manifold human tragedies in 2019 too was something people were unprepared for.
- One set of possibilities is provided by the recommendations of the Western Ghats Ecology Expert Panel (WGEEP) chaired by Madhav Gadgil.
- The policy prescriptions in the report were well within the framework of the constitutional mandates, and only suggested following the existing laws.
- This relates to environmental protection and devolution of powers, right down to the gram sabha and ward sabha level.
- The WGEEP's mandate asked the state to demarcate areas within the Western Ghats Region that need to be notified as ecologically sensitive.
- It was also asked to recommend for notification of such areas as ecologically sensitive zones under the Environment (Protection) Act, 1986.
- In line with the National Forest Policy, the panel decided to assign 60% of the total area of Western Ghats in Kerala as a zone of highest ecological sensitivity, 'ESZ1'.
- These included the region housing wildlife sanctuaries and national parks.
- The panel proposed 'elevation' and 'slope' as two key indicators of sensitivity.
- In Kerala, rainfall increases rapidly with elevation, and high rainfall and steep slopes render localities vulnerable to landslides.
- Hence, areas prone to landslides would come under ESZ1.
- The extent and quality of natural vegetation was the third indicator for classifying an area as ESZ1.
- Landslides are under control in areas with intact natural vegetation because the roots bind the soil.
- Any disturbance to such vegetation would render any locality that has steep slopes and experiences high rainfall susceptible to landslides.
- Such disturbances may include -
    i. quarrying or mining
    ii. replacement of natural vegetation by new plantations
    iii. leveling of the land using heavy machinery
    iv. construction of houses and roads
- Therefore, it was recommended that such activities be avoided in ESZ1 areas.

9.4 Bushfires in Australia

Australia witnessed widespread bushfires, and the country has declared a state of emergency for the state of New South Wales (NSW) along with a catastrophic fire warning.

- Bushfires are a routine occurrence in the country.
- The Australian climate is hot, dry and prone to droughts.
- So, at any time of the year, some parts of Australia are prone to bushfires. Such fires happen when grass, branches, trees start burning in an uncontrolled manner.
- For New South Wales and Queensland, the peak risks for bushfires is during spring and early summer, which is around November-December.
- The above pattern now seems to be breaking down, and bushfires are happening outside the regular places and times.
- This bushfire season is believed to be the worst and has started even before the beginning of the Southern Hemisphere summer.
- Furthermore, these bushfires are also affecting the quality of air in the areas surrounding them.
- The readings for PM 2.5 (223) and PM 10 (399) fell in the "hazardous" category (readings above 200) as per the Australian scale.
- **Bushfires**, while are generally slow moving, have a higher heat output and can smoulder for days.
- Bushfires are thus considered to be an intrinsic part of Australia's environment.
- Its natural ecosystem has been shaped by and has evolved with historic and recent fires.
- It is difficult to tame and control naturally occurring bushfires; but their consequences can be minimised if certain measures are taken.
- There are other factors that create a favourable environment for bushfires.
- These include factors such as fuel load (leaf litter, barks, small branches), fuel moisture, wind speeds, high temperature, oxygen, low humidity and ignition source.
- They can be caused by both human activity and lightning, which is responsible for about half of ignitions in Australia.
- The remaining fires have human origins that are classified as deliberate or accidental.
- In fact, police in Australia are investigating if the fire in Sydney's upper north shore was deliberately lit by suspected arsonists (who commit the criminal act of deliberately setting fire to property.).
- **Climate Change** - There are speculations about the links between climate change and bushfires.
- While the bushfires are not directly triggered by climate change, climate change is increasing the risk of more frequent and intense bushfires.
- This time, fires are burning in places and at intensities never experienced before.
- E.g. rainforests in northern NSW, tropical Queensland, and the formerly wet old-growth forests in Tasmania
- The drought being faced is more intense than the Millennium Drought, with higher levels of evaporation due to higher temperatures.
- This has dried out the bush and made it easier for fires to start, easier for them to spread quickly

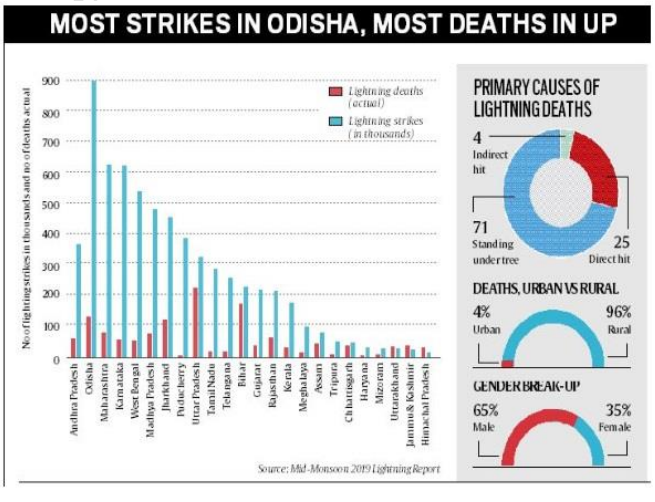
9.5 Coalition for Disaster Resilient Infrastructure

- Indian Prime Minister Narendra Modi first proposed CDRI during the 2016 Asian Ministerial Conference on Disaster Risk Reduction.
- The CDRI was later conceptualized in the International Workshop on Disaster Resilient Infrastructure (IWDRI) in 2018-19.
- The coalition envisages 3 tiered structures viz Governing Council (GC), Executive Committee (EC) and a Secretariat of the Society. The objectives of CDRI are as follows:

- The CDRI aims to serve as a platform where knowledge is generated and exchanged on different aspects of disaster and climate resilience of infrastructure.
- The work of CDRI is to focus on relevant thematic areas including the four major themes of
    a) Risk Assessment for key infrastructure sectors at multiple scales.
    b) Standards, regulation and mechanisms for enforcement.
    c) Role of finance in promoting disaster resilience.
    d) Predictable mechanisms for supporting disaster recovery in key infrastructure sectors.
- The charter of CDRI has been shared with 38 countries including G 20 and non-G 20 nations.
- So far nine countries viz. Afghanistan, Australia, Bhutan, Fiji, Italy, Mauritius, Mongolia, Sri Lanka and United Kingdom have conveyed their willingness to join the CDRI in writing.

9.6 Lightning Report

- The 'Mid-Monsoon 2019 Lightning Report' released by 'Climate Resilient Observing Systems Promotion Council' (**CROPC**).
- **CROPC**, a non-profit organisation works closely with India Meteorological Department (**IMD**).
- It also convened, 'Lightning Resilient Campaign'.
- The report is prepared using IMD's lightning forecasts including Nowcast, IITM-Pune's lightning network data, NRSC, ISRO inputs and ground-based impacts reports.
- For the first time, a report has mapped lightning strikes across the country, and the lives they have claimed.
- This is part of effort to prepare a lightning risk map of India and identify lightning hotspots.
- Lightning strikes have caused at least 1,311 deaths between April to July this year.
    - UP accounted for 224 of these deaths, followed by Bihar (170), Odisha (129) and Jharkhand (118).
- It counted 65.55 lakh lightning strikes in India during April to July period, of which Odisha recorded over 9 lakh incidents.
- IMD-installed sensors across India, have been giving alerts.
- It is possible to predict, 30-40 minutes in advance, when a lightning strike heads towards Earth.
- Location-based SMS services is available, State governments should take the data and start an emergency response system.
    - But this is not done in many states, resulting in high casualties.



- Timely dissemination of this information can save several lives.
- After receiving alerts from IMD, they send pre-fixed messages to the grassroots utilising their network.
- Vulnerable people have been trained how to respond after hearing the warning siren.
- Recent observations confirm that the Chhotanagpur plateau,
    - which is the confluence of Jharkhand, Odisha, part of Chhattisgarh and West Bengal inhabited by tribals.
    - It is the most lightning-prone area.
- The area is electrostatically and thermodynamically charged, resulting in lightning.
- The report also founds that areas prone to heatwaves were also prone to lightning.
- Pollution increases aerosols in the atmosphere, which in turn increases lightning.
- There have been at least 2 to 3 instances of lightning strikes without rainfall, killing persons in Jharkhand.

GEOGRAPHY

GENERAL GEOGRAPHY

10.1 Atlantic Meridional Overturning Current

Atlantic Meridional Overturning Current (AMOC) is thought to be slowing down for the last 15 years, which could have drastic consequences on global climate

- Atlantic Meridional Overturning Current is the large system of ocean currents operating in the Atlantic Ocean.
- It circulates the waters between the north and the south.
- It ensures the oceans are continually mixed, and heat and energy are distributed around Earth.
- Warming as a result of climate change, the Indian Ocean is causing a series of cascading effects that is providing AMOC a "jump start".
- As warm water flows northwards in the Atlantic, it cools, while the evaporation increases its salt content.
- Low temperature and high salt content raise the density of the water, causing it to sink deep into the ocean.
- The cold, dense water deep below slowly spreads southward.
- Eventually, it gets pulled back to the surface and warms again and, the circulation is complete.
- This continual mixing of the oceans, and distribution of heat and energy around the planet, contribute to global climate.
- Another oceanic system, which is more frequent, is the El Niño-Southern Oscillation (ENSO).
- This involves temperature changes of 1°-3°C in the central and eastern tropical Pacific Ocean, over periods between 3 and 7 years.
- **El Niño** refers to warming of the ocean surface and **La Niña** to cooling, while "Neutral" is between these extremes.
- This alternating pattern affects rainfall distribution in the tropics and can have a strong influence on weather in other parts of the world.
- AMOC has been stable for thousands of years.
- Data since 2004 and projections are cause for concern.
- It is not clear whether the signs of slowing in AMOC are a result of global warming or only a short-term anomaly.
- Yale University research - AMOC had weakened substantially 17,000 to 15,000 years ago.
- The new study, by Fedorov and Shineng Hu of Scripps Institution of Oceanography, appears in Nature Climate Change.
- A new study suggests that AMOC is getting help from the Indian Ocean
- **Indian Ocean's role -** Fedorov and Hu's work involves climate mechanisms that may be shifting due to global warming.
- Using observed data and computer modelling, they have plotted out what effect such shifts might have over time.
- In this study, they looked at warming in the Indian Ocean.
- **Their findings** - As the Indian Ocean warms faster and faster, it generates additional precipitation.
- This draws more air from other parts of the world to the Indian Ocean, including the Atlantic.
- With so much precipitation in the Indian Ocean, there will be less precipitation in the Atlantic Ocean.
- Less precipitation will lead to higher salinity in the waters of the tropical portion of the Atlantic.

- This saltier water in the Atlantic, as it comes north via AMOC, will get cold much quicker than usual and sink faster.
- This would act as a jump start for AMOC, intensifying the circulation.
- **Concern -** It is not know how long this enhanced Indian Ocean warming will continue.
- If other tropical oceans' warming, especially the Pacific, catches up with the Indian Ocean, the advantage for AMOC will stop.

10.2 Continental Axis hypothesis

- It states that regions of the earth spread across,
    a. Latitudinal area (east-west) - more likely to witness greater development
    b. Longitudinal area (North-South) - comparatively lower development.
- This is because temparatures are largely similar across latitudes, which helps technology and ideas to spread among larger population.
- It also results in more cultural homogeneity.
- It is also known as "Continental orientation hypothesis."

10.3 Sudden Stratospheric Warming

Record warm temperatures occurred above Antarctica in a phenomenon called "sudden stratospheric warming".

- It will bring above-average spring temperatures and below-average rainfall across large parts of New South Wales and southern Queensland.
- In sudden stratospheric warming, the stratosphere high above the South Pole began rapidly heating.
- Every winter, westerly winds, often up to 200 km/hour, develop in the stratosphere high above the South Pole and circle the polar region.
- The winds develop as a result of the difference in temperature over the pole (where there is no sunlight) and the Southern Ocean (where the sun still shines).
- As the sun shifts southward during spring, the polar region starts to warm.
- This warming causes the stratospheric vortex and associated westerly winds to gradually weaken over the period of a few months.
- However, in some years this breakdown can happen faster than usual.
- Waves of air from the lower atmosphere (from large weather systems or flow over mountains) warm the stratosphere above the South Pole.
- This weakens or "mix" the high-speed westerly winds.
- Very rarely, if the waves are strong enough they can rapidly break down the polar vortex, actually reversing the direction of the winds so they become easterly.
- This is the technical definition of "sudden stratospheric warming."
- Apart from warming the Antarctic region, the most notable effect of the phenomenon will be a shift of the Southern Ocean westerly winds towards the Equator.
- Tasmania, New Zealand's South Island, and Patagonia directly in the path of the strongest westerlies results in more storminess and rainfall, and colder temperatures.
- Subtropical Australia, which largely sits north of the main belt of westerlies, receives reduced rainfall, clearer skies, and warmer temperatures.

10.4 El Nino

- A weak **El Nino** prevailing in the Pacific Ocean since the start of this year is beginning to dissipate as reported recently.
- It is a naturally occurring phenomenon that occurs every 2-7 years, and can last anywhere between nine months and two years.

- **El Nino** (The Little Boy) is a climate pattern with unusual warming of surface waters in equatorial Pacific Ocean.
- It is the **"Warm phase"**, off the coast of Peru.
- The opposite of El Nino is **La Nina** (The Little Girl), is when sea surface temperatures in the Pacific drop to lower-than-normal levels.
- It is the **"Cool phase"**.
- These warm and cool phases are part of a recurring climate pattern that occurs across this section of the Pacific, known as the El Nino-Southern Oscillation (**ENSO**).
- The air circulation as a result of difference in surface pressure and temperature over the western and eastern tropical Pacific Ocean is known as **Walker circulation**.
- The two conditions influence weather events worldwide, including the Indian monsoon.
- It affects precipitation in few areas, drought can be widespread affecting southern Africa, India, Southeast Asia, Australia.
- El Nino is known to suppress rainfall during the monsoon months in India.
- During an El Niño, the trade winds weaken in the central and western Pacific.
- The clouds and rainstorms associated with warm ocean waters also shift toward the east.
- So, the beginning of dissipation of El Nino is a good news for India which is hoping to get good rainfall in the remaining part of the monsoon season.
- Other effects around the world include,
    i. Flooding in South America
    ii. Drought in Indonesia and Australia
    iii. Warmer, drier winters in the eastern and midwestern US
    iv. Wetter winters in California and the Southwest
    v. Declining fisheries
    vi. More hurricanes in the Pacific, fewer in the Atlantic
    vii. Higher global temperatures

10.5 Diurnal Cycle

- A diurnal cycle is any pattern that recurs every 24 hours as a result of one full rotation of the Earth, around its own axis.
- In climatology, the diurnal cycle is one of the most basic forms of climate patterns.
- The most familiar such pattern is the diurnal temperature variation. Such a cycle may be approximately sinusoidal, due to the Sun's rising and setting and thermal relaxation at night.
- Diurnal cycles of environmental conditions (light or temperature) can result in similar cycles in dependent biological processes, such as photosynthesis in plants, or clinical depression in humans.
- Plant responses to environmental cycles may even induce indirect cycles in rhizosphere microbial activities, including nitrogen fixation.
- A semi-diurnal cycle refers to a pattern that occurs about every twelve hours or about twice a day.
- Often these can be related to lunar tides, in which case the interval is closer to 12 hours and 25 minutes.

10.6 Madden-Julian Oscillation

- The Madden–Julian Oscillation (MJO), is a moving band of rain clouds that travels around the globe spanning 12,000–20,000 km across the tropical oceans.
- Global warming has been expanding the size of the warm pool which affects its normal interaction period.
- In its journey, it interacts with surface waters of the Indo-Pacific Ocean, the largest pool of warm water in the globe and the lifecycle of the MJO gets affected.

- The MJO clouds on average are spending only 15 days, instead of 19, over the Indian Ocean and increased by 5 days over the west Pacific.
- It is this change in the residence time of MJO clouds that has altered the weather patterns across the globe.
- When the MJO appears in the Indian Ocean during the monsoon months of June-September, it can increase rains over India.
- This year, India was poised to receive below normal monsoon rainfall in April but ended up with excessive rain partly due to the MJO.
- The change in the MJO could drift warmer surface water towards the Bay of Bengal and increase cyclones.
- The changes in MJO behaviour have increased the rainfall over northern Australia, west Pacific, Amazon basin, southwest Africa and southeast Asia (Indonesia, Philippines and Papua New Guinea).
- At the same time these changes have brought a decline in rainfall over central Pacific, along the west and east coast of U.S. (e.g., California), north India, east Africa and the Yangtze basin in China.
- Scientists have asserted that the frequent California fires, droughts in Africa and East Asian floods and cyclones in the Bay of Bengal may be linked to these changes in global weather.
- This MJO phenomenon haven't been as extensively studied as say the El Nino.

10.7 Goldschmidtite

- It is a new mineral from the Earth's mantle, found inside a diamond in Koffiefontein, South Africa.
- It has been named after Victor Moritz Goldschmidt, the Norwegian scientist acknowledged as the founder of modern geochemistry.
- It has high concentrations of niobium, potassium and the rare earth elements lanthanum and cerium.
- It is an unusual chemical signature for a mineral from Earth's mantle, which is usually dominated by elements such as magnesium and iron.
- Though the mantle makes up about 80% of the Earth's volume but very little is known about it.
- Diamonds hold clues as they are found up to 160 km beneath the surface, in the upper mantle.
- Diamonds that are unearthed were brought up closer to the surface, probably as a result of violent volcanic eruptions when the Earth was hotter.

10.8 Rare Earth Metals

- Rare Earth Elements or Rare Earth Metals are a set of 17 chemical elements in the periodic table that have similar chemical properties.
- It includes 15 lanthanides plus scandium and yttrium.
- One of the Rare Earths, promethium, is radioactive.
- Some of the applications of Rare Earth Metals are,
    i. Cerium is used in Space shuttle components, jet engine turbines and drones
    ii. Scandium is used in Televisions and fluorescent lamps
    iii. Yttrium is used in drugs to treat rheumatoid arthritis and cancer
    iv. Other applications - Technologies of consumer electronics, computers and networks, communications, clean energy, advanced transportation, healthcare, environmental mitigation, and national defence.
- China dominates the production of these elements.
- **Recent Development -** The United States Army has planned to fund the construction of a Rare Earths processing facility,
- This is to secure the domestic supply of minerals that are used to make military weapons and electronics.
- The decision comes after China threatened to stop exporting Rare Earth materials to the US amid the ongoing trade war between the countries.

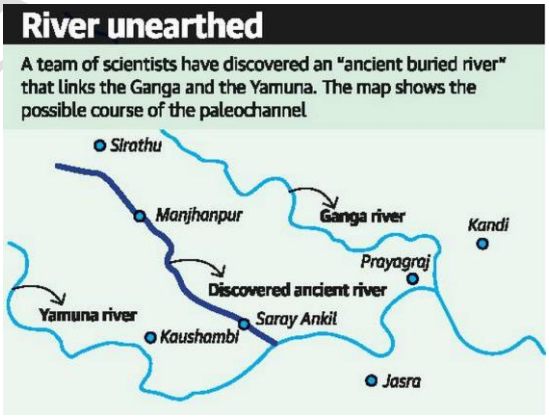
- This will be the first financial investment by the US military into commercial-scale Rare Earths production since the Manhattan Project to build the first atomic bomb during World War II.

10.9 Diamond Formation

- Diamonds are crystals of carbon formed beneath the Earth's crust.
- They are brought to the surface in volcanic eruptions of a special kind of magma called kimberlite.
- Recent study has found that seawater in sediment from the bottom of the ocean reacts to produce the same composition of salts found in diamonds.
- Most diamonds found at the Earth's surface formed in this way according to the researchers, by this it has been found that Diamonds are naturally recycled minerals on the ocean floor.
- Diamonds that are carved into gemstones are mostly pure-carbon in their composition.
- But there is another kind 'fibrous' diamonds. They are cloudy, less appealing and not used in jewelry.
- Instead, they are used for industrial purposes, eg drill bits.
- Fibrous diamonds come with traces of sodium, potassium or other minerals that reveal information about the environment where they formed.
- This salty fluid found in these diamonds provided the base of study for researchers.

10.10 Paleochannel

- A Paleochannel is an old or ancient channel, which are filled with younger sediments.
- It can store and transmit groundwater and therefore developed as a source of water.
- A paleochannel in Prayagraj (formerly Allahabad) that linked the Ganga and Yamuna rivers was recently excavated.
- The aim is to develop it as a potential groundwater recharge source.
- It is around 4km wide, 45km long and consisted of a 15-metre-thick layer buried under soil.
- These paleochannels reveal the course of rivers that have ceased to exist.
- It will play a very crucial role in planning of Ganga cleaning and protecting safe groundwater resource.



- The discovery was made by a team of scientists from the CSIR-NGRI (National Geophysical Research Institute) and the Central Groundwater Board.
- The genesis of the palaeochannel's discovery followed a 2016 report of a committee headed by K.S. Valdiya commissioned by the Water Resources Ministry.
- This report concluded that evidence from palaeochannels suggested that the mythological Saraswati river did indeed exist.

10.11 Korean Demilitarized Zone (DMZ)

- The DMZ has come into the spotlight with Donald Trump becoming the first serving American President to visit the area.
- Itis a strip of land running across the Korean Peninsula.
- It is established by the provisions of the **Korean Armistice Agreement** to serve as a buffer zone between North Korea and South Korea.
- It roughly follows latitude **38° N** (the 38th parallel), the original demarcation line between North Korea and South Korea at the end of World War II.

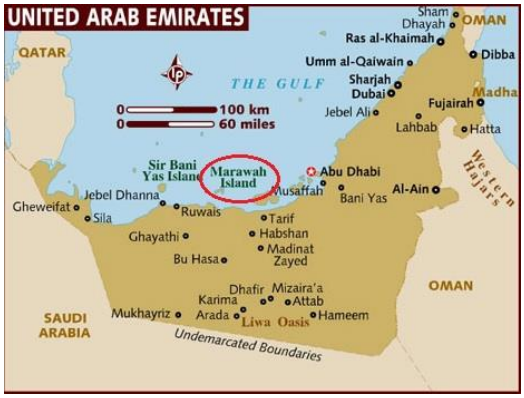
- The site where the Armistice was signed is called the **Joint Security Area (JSA).**

- It continues to be the venue where successive peace discussions concerning the region are conducted, including the recent Trump – Kim meet.
- Both North and South Korea maintain '**Peace villages'** in sight of each other's side of the DMZ.
- In September 2018, an agreement was signed with plans to convert the DMZ into a '**Peace park'**.
- Other major international borders of –
    1) **Durand Line -** Pakistan and Afghanistan**.**
    2) **Radcliffe Line -** India and Pakistan, India and Bangladesh
    3) **MacMohan Line** - India and China
    4) **49th Parallel, Medicine Line –** U.S and Canada
    5) **Maginot line, Siegfried Line** – France and Germany
    6) **Hindenburg Line** - Germany and Poland.
    7) **17th Parallel** - North Vietnam and South Vietnam**.**

10.12 Typhoon Hagibis

- A **hurricane** is a storm that occurs in the Atlantic Ocean and north eastern Pacific Ocean, a **typhoon** occurs in the north western Pacific Ocean, a **cyclone** occurs in the south Pacific or Indian Ocean, a **willy-willy** in south-west Australia.
- Hagibis, which means "speed" in the Philippine language, is a super typhoon swirling around Japan.
- It made landfall in Izu Peninsula, south-west of Tokyo and moved up the east coast.
- It led to **Chikuma river** breaching their banks inundating residential neighbourhoods and the torrential rain triggered landslides.
- After it made its landfall, a magnitude 5.7 earthquake shook Tokyo shortly after.

10.13 Marawah Island



- The World's oldest known natural pearl discovered at a Neolithic site on Marawah Island, off the coast of Abu Dhabi.
- It is dubbed the 'Abu Dhabi Pearl' that have been radio dated to 5,800-5,600 BCE.
- The discovery proves that pearls and oysters were being used in the UAE nearly 8,000 years ago.
- Prior to this discovery, the earliest pearl was found in another Neolithic site off the coast of Abu Dhabi.

10.14 Danakil Depression

- The Danakil Depression in Ethiopia is at the northern end of the Great Rift Valley and separated by live volcanoes from the Red Sea.
- It is one of the world's hottest places, as well as one of its lowest, at 100 metres below sea level.
- It was formed by the evaporation of an inland water body and no stream flow out from its extreme environment.
- It is covered with more than 10 lakh tonnes of salt.
- Microbes are known to survive almost anywhere. Scientists now believe that this pla ce is an exception.
- A new study says that active and naturally occurring life cannot be sustained and even it is daunting for extremophile microbes which can adapt to environmental conditions that are too extreme for everything else.

- It identifies two barriers that makes adaptation highly difficult such as
  i. Magnesium-dominated brines that cause cells to break down and
  ii. Environment having simultaneously very low pH and high salt.

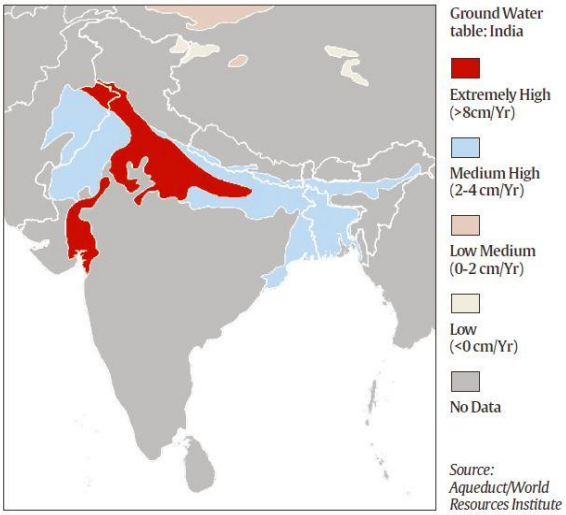
10.15 White Island Volcano

- The White Island Volcano, also called Whakaari, in New Zealand has recently erupted.
- It is the country's most active volcano situated in the east coast in the Bay of Plenty.
- It has been built up by continuous volcanic activity over the past 1,50,000 years.
- It is a privately owned island and tourist destination. The large eruption resulted in atleast 5 fatalities.

INDIAN GEOGRAPHY

10.16 Water Stress

- A new data about 'water stress' was released by the **World Resources Institute (WRI).**
- One-quarter of the world's population faces "extremely high" levels of baseline water stress.
- India is 13th among 17 countries which faces huge water stress.
- India has more than three times the population of the other 16 extremely highly stressed countries.
- It implies that more than three-quarters of these populations facing extremely high water stress live in India.
- The report noted that last year, NITI Aayog declared that the country is "suffering from the worst water crisis in its history.
- India's groundwater resources are severely overdrawn, largely to provide water for irrigation.
- Groundwater tables in some northern aquifers declined at a rate of more than 8 cm per year between 1990 and 2014.



- Steps taken by India to mitigate water stress including,
  - Setting up the Jal Shakti Ministry.
  - Other solutions which the WRI suggested, includes more efficient irrigation,
  - conserving and restoring lakes, floodplains,
  - groundwater recharge areas; and
  - collecting and storing rainwater.
- Globally, water withdrawals have more than doubled since the 1960s due to growing demand.
- 17 countries faces withdrawals of 80% or more from available supply, 12 of them are in the Middle East and North Africa.
- Another 44 countries (home to one-third of the world) face "high" levels of stress, where on average more than 40% of available supply is withdrawn every year.
- The World Bank found that this region has the greatest expected economic losses from climate-related water scarcity.

World Resources Institute (WRI)

- It is a global research non-profit organization whcih focuses on 7 areas: food, forests, water, energy, cities, climate and ocean.
- Its mission is to move human society to live in ways that protect Earth's environment.
- It partners with local and national governments, private companies, publicly held corporations, and other non-profits organistations.

- The economic losses is estimated at 6%-14% of GDP by 2050.
- Even in countries with low overall water stress, communities may still be experiencing extremely stressed conditions.
- For example, South Africa and the United States, which rank 48 and 71 on the list, respectively, yet the Western Cape (SA) and New Mexico (US) experience extremely high stress levels.

10.17 Monsoon Model

- IMD deploys various dynamical model to predict monsoon rains in the country.
- Traditionally, IMD has relied on its statistical database of over 100 years to estimate the chances of a good monsoon or a drought.
- It is based on correlations between certain weather parameters such as temperatures in the Indian ocean, or the warm water volume in the Pacific.
- Over the years, IMD came with a new dynamical model which relies on capturing interactions between the land, ocean and atmosphere and tracking how the changes in each affect the other.
- The conditions are mathematically simulated on supercomputers and extrapolated into the monsoon months.
- The dynamical model is also called the Climate Forecast Model (CFS), implemented on the Prithvi High Performance Computers (HPC) at Indian Institute of Tropical Meteorology (IITM), Pune.
- It was developed as part of " National Monsoon Mission" by the Ministry of Earth Sciences, to develop both short and long-term forecasting.
- It failed to forecast August-September surge in monsoon rainfall.
- This year, India have recorded its highest monsoon rain in 25 years.
- India ended up with 10% more monsoon rain (or 110% of the long period average LPA of 887 mm) than usual.
- However, none of the agency's models tuned to capture long term forecast trends warned of this.
- The statistical models said that All India Monsoon Rainfall (June-September) would be 96% of the LPA.
- The CFS model said the monsoon would be 94% of the normal and updated to 99% in August.

10.18 Geochemical Baseline Atlas of India

- Geochemical Baseline Atlas of India is developed by CSIR-National Geophysical Research Institute (NGRI).
- The atlas consists of 45 maps of metals, oxides and elements present in top and bottom soils across India.
- These maps help in finding out future contamination caused by industries or other bodies, which cause pollution on the earth surface.
- For instance, tanneries release chromium, by going through the map of chromium, policymakers will get to know regions with a high concentration of it.
- Earlier, there was no way to prove if polluters denied causing damage to the environment.

10.19 Cold Waves in India

In 23 of the last 38 years, the death toll in India due to cold waves was higher than that due to heat waves.

- In 1992, 41 times more lives were lost due to cold waves.
- Between 2010 and 2018, the trend was somewhat different.
- In this period, around 4,506 people died due to cold waves while 5,572 died due to heat waves.
- The notable exception was 2011.
- That year, human deaths due to cold waves were nearly 60 times more than those due to heat waves.
- However, in 2018, the trend reversed again.
- About 136 people died due to cold waves in comparison to 16 deaths due to heat waves.
- There has also been a 506% increase in the number of cold waves in India in this decade

- A cold day is defined on the basis of maximum day temperature while a cold wave is defined by looking at minimum temperatures recorded on two consecutive nights.
- We have guidelines for Action Plan on Prevention and Management of Heat Wave prepared by the National Disaster Management Authority (NDMA)
- But the states do not have plans to deal with cold waves.

10.20 Mekedatu Reservoir

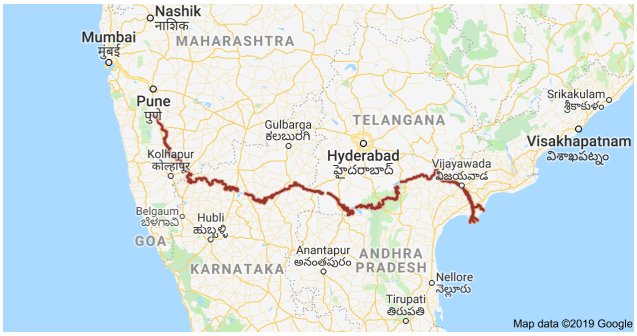
- The Mekedatu Reservoir project envisages building a balancing reservoir in Cauvery River with storage of 67 thousand million cubic feet (tmc ft).
- It would also supply drinking water to Bengaluru and Ramanagaram districts, besides generating power.
- The proposal received the Karnataka Cabinet's approval in February 2017 and the feasibility report was submitted to the Central Water Commission (CWC).
- CWC has allowed Karnataka to go ahead with the project with the prerequisite that it should get No-Objection Certificate (NOC) from the Cauvery Water Management Authority (CWMA).
- After obtaining NOC from CWMA, the proposal will be considered by Advisory Committee of the Ministry of Jal Shakti, whose concurrence is mandatory for a project on any inter-State river.
- Karnataka has been contending for the project to help store excess water in Monsoon surplus year.
- Tamil Nadu has been opposing the project that it would effectively prevent the flow in the Cauvery, the lifeline for agriculture in delta districts, besides being a major drinking water source for several districts.

10.21 Floods in Krishna River

- Krishna river, the lifeline of south-western Maharashtra, has wreaked havoc in the districts it flows through.
- Large tracts of land in Satara, Sangli, Kolhapur and Pune continue to remain under water.
- Dams dot the course of Krishna and her tributaries across Maharashtra, Karnataka, Andhra Pradesh and Telangana.
- These dams are the lifeline of western Maharashtra, and are a major supporting factor for the area's sugarcane-based economy.
- Almatti, a major dam on Krishna, located in Karnataka, close to the Maharashtra border, controls the flow of water into the neighbouring state.
- The position of Almatti dam is unique, as this is the first dam on Krishna river after it leaves Maharashtra.
- The amount released from the dam is important to prevent any flooding upstream of Krishna, which is Maharashtra.
- Poor dam management, where the dam gates were opened suddenly, and the catchment areas were flooded.
- Dam management is an inter-departmental job.
- It involves close coordination between the departments of revenue, water resources and agriculture and the weather forecaster.
- The release of water is managed by taking into account the projected water usage for human consumption, agriculture and industries.
- In case of a weak monsoon, less water is released to tide over the non-monsoon months.

10.22 Krishna Water dispute

- Recently, Maharashtra and Karnataka Chief Ministers jointly oppose Andhra Pradesh's application.
- A.P seeks to relook at the Krishna Water Disputes Tribunal's 2010 order on water distribution between the riparian states.
- This took a new turn in the Krishnawater dispute.



- The Krishna is an east-flowing river that originates at Mahabaleshwar in Maharashtra.
- It is flowing through Maharashtra, Karnataka, Telangana and Andhra Pradesh before entering into the Bay of Bengal.
- A dispute over the sharing of Krishna waters has been ongoing for many decades.
- In 1969, the 'Krishna Water Disputes Tribunal' (**KWDT**) was set up under the Inter-State River Water Dispute Act, 1956.
- It presented itsreport in 1973, which was published in 1976.
    1. It divided the 2060 TMC of Krishna water at 75% dependability into 3 parts.
    2. 560 TMC for Maharashtra, 700 TMC for Karnataka and 800 TMC for Andhra Pradesh.
    3. It also stipulated that KWDT order may be reviewed or revised by a competent authority or tribunal any time after May 31, 2000.
- The second KWDT was instituted in 2004. It delivered its report in 2010.
    1. It made allocations of the Krishna water at 65% dependability and for surplus flows.
    2. 81 TMC for Maharashtra, 177 TMC for Karnataka, and 190 TMC for Andhra Pradesh.
- Soon after the 2010 report, Andhra Pradesh challenged it through a Special Leave Petition before the Supreme Court.
- In an order, the apex court stopped the Centre from publishing it in the official Gazette.
- In 2013, the KWDT issued a 'further report', which was again challenged by Andhra Pradesh in the Supreme Court.
- After the creation of Telangana in 2014, the Water Resources Ministry has been extending the duration of the **KWDT**.
- Andhra Pradesh has since asked that Telangana be included as a separate party at the KWDT.
- The allocation of Krishna waters be reworked among four states, instead of three.
- Maharashtra and Karnataka are now resisting this move.
- According to these 2 states, Telangana was created following bifurcation of Andhra Pradesh.
- Therefore, allocation of water should be from Andhra Pradesh's share which was approved by the tribunal.

10.23 Bhakra Dam

- The Bhakra Beas Management Board (**BBMB**), constituted in 1966, manages the Bhakra Dam on Sutlej in Nangal, Punjab.
- The members of the board are appointed by,
    1. the government of India and
    2. the states of Punjab, Haryana, Rajasthan, Himachal Pradesh, Delhi, and Chandigarh.
- It works for the regulation and operation of Bhakra dam, Dehar hydroelectricity project, Pong dam, Ganguwal and Kotla power station.
- Its mission is to set high standards in Operation, Maintenance, Renovation & Modernization of Hydel Projects.
    1. Transmission, Canal Systems and to exploit New Hydro Power Potential to optimally utilize the existing infrastructure & resources.
- It has been working hard to manage Sutlej's flow, and reduce the losses downstream in the recent heavy rainfall.
- Very heavy rain have resulted in the Sutlej river overflowing and wreaking havoc in around a dozen districts of Punjab.
- The reservoir height is 1,690 feet but the upper limit for water was fixed at 1,680 feet by the BBMB.
- The dam is built on Sutlej River and it is the 2nd tallest dam in Asia after Tehri dam.

- The Gobind Lake, an artificial lake formed on river Sutlej can have enough amount of water to flood the whole of Chandigarh, parts of Haryana, Punjab and Delhi.
- It provides for irrigation and electricity to Haryana, Rajasthan, Gujarat, and Himachal Pradesh.

10.24 Kartarpur Corridor

- It is a road link for Sikh pilgrims to visit the famous Kartarpur Sahib Gurdwara in Pakistan.
- It would link two important holy sites related to the founder of Sikhism located in Pakistan and in India.
- The 16th century Gurdwara Darbar Sahib Kartarpur is on the banks of the river Ravi.
- The gurudwara was established by the first Sikh Guru in 1522.
- It was here that Guru Nanak assembled a Sikh community and lived for 18 years until his death in 1539.
- Recently it had been agreed between two countries for a visa-free Kartarpur corridor to operate daily with a limit of 5,000 pilgrims per day.
- This would also be open to pilgrims of Indian origin who are citizens of other countries.

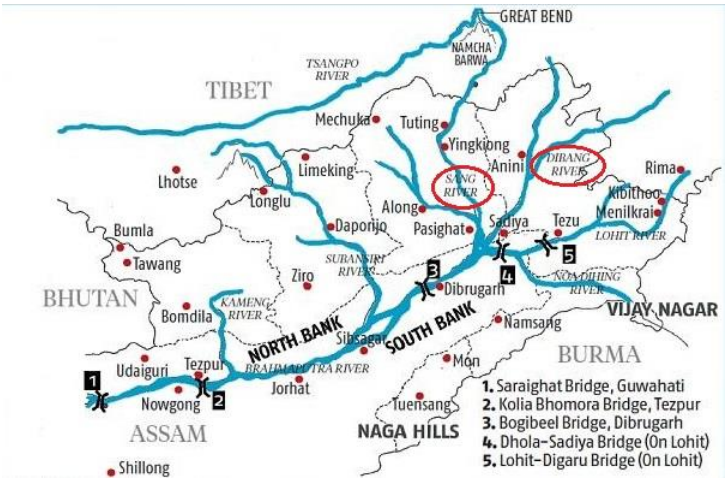
- A four-lane Highway will connect Dera Baba Nanak from Gurdaspur-Amritsar Highway to International border.
- The length of the corridor is about 4 km, 2 km on either side of the International Border.
- It comes at the time of 550th birth anniversary year of Guru Nanak.

10.25 Ujh and Basantar Bridge

- The Ujh and Basantar are two strategically important bridges inaugurated near International Border in J&K.
- The bridges have been built under Project Sampark, by Border Roads Organisation (BRO).
- The 1 Km long 'Ujh bridge in Kathua, over Ujh river is the longest bridge constructed by BRO.
- The 617 m Basantar bridge in Samba has been constructed over Basantar river.
- These bridges will provide smooth connectivity and are vital for the army for deployment on border areas.
- The BRO develops and maintains road networks in India's border areas and friendly neighboring countries.
- It functions under 'Ministry of Defense'.

10.26 Feni River

- River Feni is a transboundary river, originated in the State of Tripura and passes through sabroom town and finally enters South Eastern border of Bangladesh.
- Muhuri is the tributary of Feni, which originates from Tripura and combines with Feni near to the region of Bay of Bengal in Bangladesh.
- Muhuri is also called as Little Feni.
- Union Cabinet has recently given ex-post facto approval for the MoU between India and Bangladesh regarding Feni River.
- It allows for withdrawal of 1.82 cusec of water from Feni River by India for drinking water supply scheme for Sabroom town Tripura.



10.27 Sisseri River bridge

- The bridge was recently inaugurated at Lower Dibang Valley in Arunachal Pradesh.
- It will provide connectivity between Dibang Valley and Siang.

- It also provides connectivity to Tinsukia via Dhola-Sadia bridge.
- It was constructed by Project Brahmank of Border Roads Organisation (BRO).
- It will be a part of Trans Arunachal Highway.
- Other Projects of BRO - Vartak, Arunank and Udayak for the development of road connectivity in the State.

10.28 Pushkaram Festival

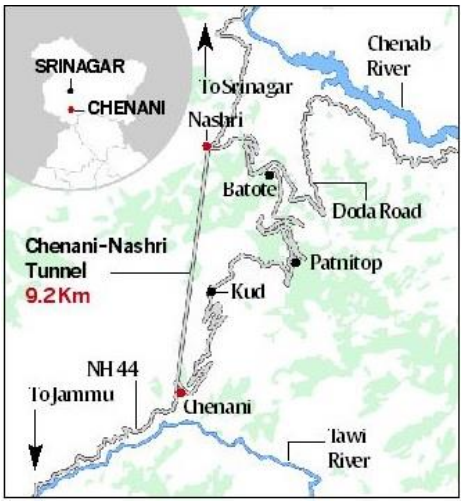
- Pushkaram festival is a festival of rivers that pertains to the 12 important rivers in India, it occurs once in 12 years for each river.
- In 2018, the Pushkaram festival was celebrated on the banks of the Tamiraparani in Tirunelveli district, Tamil Nadu.
- The Assam government is celebrating Brahmaputra Pushkaram- a 12-day mega river festival.
- Earlier, the Brahmaputra Pushkaram festival was held in 2007.
- It will be the second biggest river festival ever to be celebrated in the state of Assam after Namami Brahmaputra (State festival that celebrates the beauty of the Brahmaputra river)

10.29 Kolleru Lake

- Kolleru Lake is one of the largest freshwater lakes in India located in state of Andhra Pradesh and forms the largest shallow freshwater lake in Asia.
- Kolleru is located between Krishna and Godavari deltas, the lake spans into two districts Krishna and West Godavari.
- The lake is fed directly by water from the seasonal Budameru and Tammileru streams, and is connected to the Krishna and Godavari irrigation systems by over 67 major and minor irrigation canals.
- The lake was an important habitat for an estimated 20 million resident and migratory birds, including the grey or spot-billed pelican (Pelecanusphilippensis).
- The significant birds migrate here during winter are Siberian crane, ibis, pelicans and painted storks.
- The lake was declared as a wildlife sanctuary in November 1999 under India's Wildlife Protection Act of 1972, and designated a wetland of international importance under the international Ramsar Convention.

10.30 Chenani Nashri tunnel

- Union Ministry of Road Transport & Highways has recently approved renaming of ChenaniNashri Tunnel on NH 44 in Jammu & Kashmir as Dr Syama Prasad Mookerjee Tunnel.
- It is a 9 km tunnel and the longest such state of art tunnel in the country, connecting Udhampur to Ramban in Jammu.
- The tunnel incorporates India's first fully integrated mechanism to externally control everything from the movement of vehicles to the inflow and outflow of air, and even the evacuation of passengers or vehicles in distress.
- It is located at an altitude of 1,200 metres (nearly 4,000 feet) in difficult Himalayan terrain.
- It will reduce the travel time on NH 44 between Jammu and Srinagar by about 2 hours by shortening the distance between the cities by 30 km.



10.31 Abujh Marias Tribes

- Abujh Marias are Particularly Vulnerable Tribal Group (PVTG) community living in Abujhmarh forest, Bastar region of Chhattisgarh.
- Abujh Marias have their own governance structure.
- Since AbujhMarias is a PVTG community, they are entitled to the habitat rights under the Forest Rights Act (FRA).

- Recently Chhattisgarh government has initiated the processing of habitat rights for Abujh Marias, a (PVTG).

PVTG

- Particularly Vulnerable Tribal Group (PVTG) are more vulnerable among the tribal groups.
- In India, there are 75 PVTGs out of 705 Scheduled Tribes, spread over 18 states and one Union Territory (A&N Islands).
- Among the 75 listed PVTG's the highest number are found in Odisha (13), followed by Andhra Pradesh (12).
- The Ministry of Tribal Affairs implements the Scheme of "Development of Particularly Vulnerable Tribal Groups (PVTGs)" exclusively for them.
- The criteria followed for determination of PVTGs are as under:
    1. A pre-agriculture level of technology.
    2. A stagnant or declining population.
    3. Extremely low literacy.
    4. A subsistence level of economy.
- The Forest Rights Act ensures, that the District Level Committee should play a pro-active role in ensuring that all PTGs receive habitat rights in consultation with the concerned PTGs' traditional institutions of these groups, after filing claims before the gram sabha.
- Habitat is defined under the act as, "the area comprising the customary habitat and such other habitats in reserved forests and protected forests of primitive tribal groups and pre-agricultural communities and other forest dwelling Scheduled Tribes."

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