



IAS PARLIAMENT

Information is a Blessing

A Shankar IAS Academy Initiative

TARGET 2021

ENVIRONMENT & GEOGRAPHY I



SHANKAR IAS ACADEMY

Door No. 18, Old Plot No 109, New Plot No 259,
AL Block, 4th Avenue, Shanthi Colony,
Anna Nagar, Chennai 600040

www.shankariasacademy.com || www.iasparliament.com



INDEX

ENVIRONMENT.....	7	3.9	Ban on Import of Air Conditioner with Refrigerants .	22
1. Pollution.....	7	3.10	Dip in Delhi's Temperature - Causes	22
1.1 GRAP	7	3.11	Iceberg A68	23
1.2 Forest Fires in India	8	3.12	Shift in Seasonal Changes in Steppes	23
1.3 Aerosol Optical Depth (AOD).....	8	3.13	Brahmaputra Floods.....	23
1.4 Increase in Ozone Levels.....	9	4. Environmental organisations, Conventions & Treaties	24	
1.5 Burn Indices	9	4.1	United Nations Global Commission on Adaptation.....	24
1.6 E-Waste	9	4.2	Partnership for Action on Green Economy.....	24
1.7 Methane Budget	10	4.3	Blue Flag Certification	24
1.8 Report on Construction and Demolition Waste.....	10	4.4	Stockholm Convention on Persistent Organic Pollutants.....	25
1.9 NGT order on ground water extraction.....	11	4.5	Paris Agreement	26
1.10 Air Quality in Mega Cities	11	4.6	AIPA	27
1.11 Air Unique-quality Monitoring.....	11	4.7	UN Biodiversity Summit.....	27
1.12 Micro Plastics	12	4.8	Rainforest Action Network - Leuser Ecosystem	28
1.13 Arsenic Poisoning	12	5. Government Interventions	29	
1.14 Fluoride Toxicity.....	13	5.1	Draft EIA Notification, 2020	29
1.15 PUSA Decomposers	13	5.2	Environmental Appraisal.....	31
1.16 Plastic Pollution in the Atlantic Ocean	13	5.3	Genetically Modified Seeds	31
1.17 Factors influencing Delhi's Air Pollution	14	5.4	Guidelines on Exotic Animals.....	32
1.18 Arctic Fires	14	5.5	Decarbonizing Transport in India	32
1.19 Yellow Dust	15	5.6	All India Tiger Estimation	33
1.20 Human Emissions of Nitrous Oxide	15	5.7	Status of Tigers in India Report.....	33
1.21 Clean Air Day for Blue Skies	15	5.8	Conservation Assured Tiger Standards [CA/TS]	33
1.22 Agricultural Subsidies & Air Pollution	16	5.9	Source - Sink Dynamics & Tiger Population.....	34
1.23 Indo-Gangetic Plain as Ammonia Hotspot.....	16	5.10	Bhagirathi Eco-Sensitive Zone	34
1.24 Aerosols in Indo-Gangetic Plain.....	16	5.11	BIS' Draft Standard.....	35
1.25 Brown Carbon 'Tarballs'	17	5.12	Section 5 of Environment Protection Act.....	36
2. Renewable Energy.....	17	5.13	Aarey Forest land	37
2.1 World's Largest Solar Tree.....	17	5.14	Net Present Value (NPV).....	37
2.2 Standards for Safety Evaluation of Hydrogen Fuel Cell Vehicles	17	5.15	Forest Rights Act in J&K.....	37
2.3 First World Solar Technology Summit	18	5.16	National Bamboo Mission	38
2.4 Green hydrogen.....	18	5.17	BEAMS	38
3. Climate Change.....	19	5.18	Initiatives Launched on G20 EMM.....	39
3.1 Climatic Investment Fund	19	5.19	Buldhana Pattern.....	39
3.2 Assessment of Climate Change Report.....	19	5.20	Green Strategic Partnership.....	39
3.3 Reducing Emissions from Deforestation and forest Degradation (REDD+).....	19	5.21	Project Lion.....	39
3.4 Biochar.....	20	5.22	Vulture Action Plan 2020-25	40
3.5 Variability of Ozone	20	5.23	NMR Test for Honey	41
3.6 Climate Smart Cities Assessment Framework (CSCAF) 2.0	21	5.24	Ethanol Blended Petrol.....	41
3.7 Coal Gasification	21	5.25	Firefly Bird Diverters	42
3.8 Released norms on NOx Emissions	21	5.26	iCommit Initiative	42
		5.27	Healthy and Energy Efficient Buildings.....	42



5.28	Time Stamped Card System.....	42	10.2	Assam Gas Leak.....	60
5.29	Kaleshwaram project	43	10.3	IFLOWS-Mumbai - Integrated Flood Warning System 61	
5.30	Dam Rehabilitation and Improvement Programme... 43		10.4	Russian Oil Spill	62
5.31	Deemed Forests.....	44	10.5	Neyveli Boiler Blast - Safety Protocols.....	63
5.32	Forest Landscape Restoration.....	45	10.6	Idukki Landslides.....	63
5.33	Glyphosate	45	10.7	Zombie Fires.....	63
5.34	Mission Mode for Green Railways	46	10.8	IFFCO Ammonia Leak	64
6.	Protected Areas	46	10.9	Disaster Management Fund.....	64
6.1	Haldwani Bio-Diversity Park.....	46	10.10	State Disaster Response Fund (SDRF)	65
6.2	Maguri Motapung Beel	46	10.11	National Crisis Management Committee	65
6.3	Kole Wetlands	47			
6.4	Expansion of Kaziranga National Park.....	47	GEOGRAPHY	65	
6.5	New Ramsar Sites.....	47	GENERAL GEOGRAPHY	65	
6.6	Elephant Corridors	48	11.1	Umbra, Penumbra and Antumbra.....	65
6.7	Mansar Lake Development Plan	49	11.2	Role of Anti-cyclone in North-East Asia	66
6.8	Critical Tiger Habitats	49	11.3	Arctic Sea	66
6.9	Lichen Park.....	49	11.4	Decline in Arctic Sea Ice	66
7.	Bio-Diversity	50	11.5	Last Glacial Maximum	67
7.1	China & its Pangolin Protection.....	50	11.6	Study on Regional Climatic Features	67
7.2	Rise in Population of Asiatic Lion.....	50	11.7	Tuting-Tidding Suture Zone (TTSZ).....	68
7.3	Reintroduction of African Cheetahs	51	11.8	Fujiwhara Effect.....	68
7.4	Sandalwood Spike Disease (SSD)	51	11.9	Boreal Summer Intra-Seasonal Oscillation (BSISO).....	69
7.5	Beaching/Stranding Events	52	11.10	Madden Julian Oscillation (MJO)	69
7.6	Death of Elephants in Botswana	52	11.11	Sea Surface Temperature.....	69
8.	Man-animal Conflicts	52	11.12	Indus Suture Zone (ISZ).....	70
8.1	CrocBITE.....	52	11.13	Glacial Lake Outburst.....	70
8.2	Indian Crocodile Conservation Project	53	11.14	La Niña Influence.....	71
8.3	Kerala Elephant Killing	53	11.15	Medicanes.....	71
9.	Index & Reports	53	11.16	Chababar-Zahedan Railway Line.....	72
9.1	State of India's Environment 2020	53	11.17	Milne ice shelf.....	72
9.2	Global Forest Resources Assessment.....	54	11.18	Mount Sinabung.....	72
9.3	Environment Performance Index.....	54	11.19	Kilauea Volcano	73
9.4	IEP's Ecological Threat Register.....	54	11.20	Pripyat River.....	73
9.5	Living Planet Report 2020	55	11.21	E40 Project.....	73
9.6	World Risk Index.....	55	11.22	Barbados.....	73
9.7	Human Cost of Disasters Report.....	56	11.23	Oruç Reis Vessel.....	74
9.8	State of Global Air 2020.....	56	11.24	Tristan da Cunha	74
9.9	Confronting Carbon Inequality	57	11.25	Western Sahara Dispute.....	75
9.10	WWF Report on Water Scarcity	57	11.26	Height of Mt. Everest	75
9.11	Climate Change Performance Index	57	11.27	Mount Ili Lewotolok.....	75
9.12	State of the Global Climate Provisional Report	58	11.28	Droughts in Non-El Niño Years	75
9.13	Emissions Gap Report 2020.....	58			
9.14	Snakebite Mortality in India.....	59	INDIAN GEOGRAPHY.....	76	
10.	Disaster Management	59	12.1	Container Ship to Agartala.....	76
10.1	Delhi Earthquakes.....	59	12.2	Kakrapar Atomic Power Plant.....	76
			12.3	Kutch Mainland Fault (KMF).....	76
			12.4	India's Wind Power Project	77



12.5	<i>Rewa Solar Project</i>	77	12.23	<i>Durand line</i>	82
12.6	<i>Finding on Fish landings</i>	77	12.24	<i>Distress Migration in Bonda Tribes</i>	83
12.7	<i>Depsang Plains</i>	77	12.25	<i>Erra Matti Dibbalu</i>	83
12.8	<i>Lonar Lake</i>	78	12.26	<i>Luhri Stage-I Hydro Electric Project</i>	83
12.9	<i>Undersea Optical Fiber Cable</i>	78	12.27	<i>Hazira-Ghogha Ro-Pax Ferry Service</i>	84
12.10	<i>Agatti Island</i>	79	12.28	<i>Survey of River Ganga</i>	84
12.11	<i>Shinkun La Tunnel</i>	79	12.29	<i>Saffron Cultivation in North East</i>	84
12.12	<i>Daudkandi - Sonamura Inland Waterways</i>	79	12.30	<i>Ideal Conditions for Saffron Cultivation</i>	85
12.13	<i>Regional Rapid Transit System (RRTS)</i>	79	12.31	<i>Dobra-Chanthi Bridge</i>	85
12.14	<i>Nechiphu Tunnel</i>	80	12.32	<i>Maritime Cluster</i>	85
12.15	<i>Lost River of Thar Desert</i>	80	12.33	<i>Silver Line</i>	85
12.16	<i>Sitwe Port</i>	80	12.34	<i>National Monsoon Mission</i>	86
12.17	<i>Atal Tunnel</i>	81	12.35	<i>R Cluster</i>	86
12.18	<i>Nagorno-Karabakh Region</i>	81	12.36	<i>Lithium Refinery</i>	86
12.19	<i>Srisaïlam Hydroelectric Power Plant</i>	81	12.37	<i>Koilwar Bridge</i>	86
12.20	<i>First route of Seaplane project</i>	82	12.38	<i>Organic Lakshadweep</i>	87
12.21	<i>Pearl River</i>	82	12.39	<i>Hazardous Ideas for the Himalayas - Hydroelectric Projects of India and China</i>	87
12.22	<i>Dhulasidh Hydro Electric Project</i>	82			



TARGET 2021

ENVIRONMENT & GEOGRAPHY I

(JUNE 2021 TO DECEMBER 2021)

ENVIRONMENT

1. POLLUTION

1.1 GRAP

Starting October 15, some stricter measures to fight air pollution came into force in Delhi and its neighbouring National Capital Region (NCR) towns.

- The plan was formulated by the Environment Pollution (Prevention and Control) Authority (EPCA) in consultation with state government representatives and experts.
- The plan was approved by the Supreme Court in 2016.
- GRAP was notified in 2017 by the Centre and draws its authority from this notification.
- The action plan has been in effect for three years in Delhi and NCR.
- Experts have credited the actions under the GRAP for the improvement in Delhi's air over the past few years.
- GRAP works only as an **emergency measure**.
- As such, the plan does not include action by various state governments to be taken throughout the year to tackle industrial, vehicular and combustion emissions.
- When the air quality moves from '**Poor**' to '**Very Poor**', the measures listed under both sections have to be followed.
- If air quality reaches the '**Severe+**' stage, the response includes extreme measures such as shutting down schools and implementing the odd-even road-space rationing scheme.
- **Stricter measures** - These measures are part of the Graded Response Action Plan (GRAP).
- **Diesel generator** sets can no longer be used in Delhi and the NCR towns of Noida, Ghaziabad, Greater Noida, Faridabad, and Gurgaon.
- The only exception is DG sets used for emergency and essential services.
- Pollution control authorities will begin **night patrolling** to check for dust and industrial emissions, as well as the burning of waste.
- **Mechanised sweeping** and frequent **sprinkling of water on roads** (to make the dust settle) have been directed.
- These steps will be incremental. When levels of pollution rise, more measures will come into force, depending on the air quality.
- **Achievements** – The biggest success of GRAP has been in fixing accountability and deadlines.
- GRAP has been successful in doing two things, they are
 1. Creating a step-by-step plan for the entire Delhi-NCR region, and
 2. Getting on board several agencies.
- These agencies include all pollution control boards, industrial area authorities, municipal corporations, regional officials of the India Meteorological Department, and others.
- The plan requires action and coordination among 13 different agencies in Delhi, Uttar Pradesh, Haryana and Rajasthan (NCR areas). At the head of the table is the EPCA, mandated by the Supreme Court.

- Before the imposition of any measures, EPCA holds a meeting with representatives from all NCR states. A call would be taken on which actions have to be made applicable in which town.
- Three major policy decisions that can be credited to EPCA and GRAP are
 1. Closure of the thermal power plant at Badarpur,
 2. Bringing BS-VI fuel to Delhi before the deadline set initially, and
 3. Ban on Pet coke as a fuel in Delhi-NCR.
- One criticism of the EPCA as well as GRAP has been the focus on Delhi.
- While other states have managed to delay several measures, citing **lack of resources**, Delhi has always been the first to have stringent measures enforced.
- For GRAP as well as EPCA, the next challenge is to extend the measures to other states effectively.

1.2 Forest Fires in India

- According to the report of the Forest Survey of India, between 2003–2017, a total of 5,20,861 active forest fire events were detected in India.
- About 54% of the forest cover in India is exposed to occasional fire.
- Most fire prone regions - Northeast India, Madhya Pradesh, Odisha, Chhattisgarh, Himachal Pradesh and Uttarakhand.
- Western Himalaya have shown a sharp increase of carbon monoxide, nitrogen oxides and ozone during high fire activity periods.
- The occurrence of high fire intensity at the low altitude Himalayan hilly regions may be due to the plant species (pine trees) in the area and proximity to villages.
- Villages make them more susceptible to anthropogenic activities like forest cover clearance, grazing and so on.
- The sharp increase in average and maximum air temperature, decline in precipitation, and change in land-use patterns have caused the increased episodes of forest fires in most of the Asian countries.

1.3 Aerosol Optical Depth (AOD)

- Recently, a study by the Aryabhata Research Institute of Observational Sciences (ARIES) has found that radiative forcing of aerosols i.e. effect of anthropogenic aerosols is much higher over the high altitudes of western trans-Himalayas.
 - The study analyzed the variability of aerosol optical, physical and radiative properties from January 2008 to December 2018 and the role of fine and coarse particles in Aerosol Radiative Forcing (ARF) assessment.
 - ARF is the effect of anthropogenic aerosols on the radiative fluxes at the top of the atmosphere and at the surface and on the absorption of radiation within the atmosphere.
 - The ARF values at top of the atmosphere were mostly low over Hanle and Merak.
 - Hanle and Merak, situated in Ladakh are the part of Indian Astronomical Observatory (IAO).
 - Highlights of the study are as follows
 1. Change in Temperature - The study shows that monthly-mean atmospheric radiative forcing of aerosols leads to heating rates of 0.04 to 0.13 degree Celsius per day.
 2. Aerosol Optical Depth (AOD) - The observations show that the AOD exhibited a distinct seasonal variation with higher values (0.07) in May and lower (0.03) in winter months.
 3. Composition of Air - Pure and polluted dust exhibited fractions between 16% and 23%, with a low frequency of less
- Aerosols are defined as a combination of liquid or solid particles suspended in a gaseous or liquid environment.
 - In the atmosphere, these particles are mainly situated in the low layers of the atmosphere (< 1.5 km) since aerosol sources are located on the terrestrial surface.
 - However, certain aerosols can still be found in the stratosphere, especially volcanic aerosols ejected into the high altitude layers.
 - AOD is a measure of how light is absorbed or reflected by airborne particles as it travels through the atmosphere



than 13% of absorbing aerosols, denoting weak influence of anthropogenic aerosols and Black Carbon over the trans-Himalayan sites.

1.4 Increase in Ozone Levels

- Recently, the Centre for Science and Environment (CSE) has observed an increase in ozone (a harmful pollutant) levels in the several cities of the country.
- The analysis is based on Central Pollution Control Board (CPCB) data from 22 cities in 15 States.
- The ozone is primarily a “sunny weather problem” in India as the presence of sunlight has a direct impact on formation of ground level ozone.
- Heat acts as a catalyst, facilitating photochemical reactions, hence higher concentrations of ozone are seen during the summer months.
- Additionally, the intense heat waves are one of the factors responsible for increased ozone levels in the country.
- Usually, the ozone levels tend to spike when winter conditions subside, and its presence is felt most during the day.
- At night, ozone levels tend to deplete, before spiking again during the afternoon, when sunlight is available.
- Thus, the characteristics of summer pollution include high winds, intermittent rains, thunderstorms, high temperature and heat waves.

1.5 Burn Indices

- The Normalized Burn Ratio is an effective burn index commonly used to identify burnt regions in large fire zones.
- In normal conditions, healthy vegetation exhibits a very high reflectance in the near-infrared spectral region and considerably low reflectance in the shortwave infrared spectral region.
- These conditions get dismantled and reversed if a fire occurs.
- **Remote Sensing Burn Indices** - The spectral differences between healthy vegetation and burnt forest areas can easily be identified and highlighted by remote sensing burn indices.
- Remote sensing based models to measure primary productivity over an area and also looked at burn indices, which help to demarcate the forest fire burn scars using satellite imagery.
- It can be a promising tool for land resource managers and fire officials.

1.6 E-Waste

- E-Waste is short for Electronic-Waste and the term used to describe old, end-of-life or discarded electronic appliances.
- It is categorized into 21 types under two broad categories:
 1. Information technology and communication equipment.
 2. Consumer electrical and electronics.
 3. E-waste includes their components, consumables, parts and spares.
- It consists of toxic elements such as Lead, Mercury, Cadmium, Chromium, Polybrominated biphenyls and Polybrominated diphenyl.
- E-waste consisting of gold, silver, copper, platinum and other high-value, recoverable materials was mostly dumped or burned rather than being collected for treatment and reuse.
- It can cause some of the major health effects including serious illnesses such as lung cancer, respiratory problems, bronchitis, brain damages, etc. due to inhalation of toxic fumes, exposure to heavy metals and alike.
- It is an environmental hazard causing groundwater pollution, acidification of soil and contamination of groundwater and air pollution due to the burning of plastic and other remnants.



- **Recent Developments** - According to a recent United Nations University (UNU) report, global e-waste will increase by 38% in the decade between 2020 and 2030.
- Asia generated the greatest volume (around 24.9 MT) followed by the Americas (13.1 MT) and Europe (12 MT). Africa and Oceania generated 2.9 MT and 0.7 MT respectively.
- UNU is a global think tank and postgraduate teaching organization headquartered in Japan.
- UNU's mission is to resolve the pressing global problems of human survival, development and welfare that are the concern of the United Nations, its peoples and the member states.

1.7 Methane Budget

Recently, international team of scientists has published an update on the global methane budget as part of the Global Carbon Project.

- Methane is emitted from a range of anthropogenic sources like landfills, agriculture, and fossil fuels, as well as natural systems like wetlands.
- It is the second most important greenhouse gas that humans are contributing to.
- Since pre-industrial times, increases in atmospheric methane have contributed to a quarter of the climate-warming effect from greenhouse gases.
- But unlike carbon dioxide, methane has a shorter lifetime in the atmosphere.
- **Report Highlights** - If big changes are brought in our emissions, methane can be removed relatively quickly.
- They estimated annual global methane emissions at nearly 570 million tons for the 2008 to 2017 decade.
- This is 5% higher than emissions recorded for the early 2000s and the equivalent of 189 million more cars on the world's roads.
- Anthropogenic sources like agriculture, waste, and fossil fuels contributed to 60% of these emissions, while wetlands made up for the largest natural source of methane.
- Global wetland methane emissions remained largely unchanged between the last decade and the early 2000s, these landscapes have continued to introduce some of the greatest uncertainties in estimating the global methane budget.
- Wetlands are estimated to make up 20% to 30% of the global methane budget, but emissions vary by latitude.
- The fluxes are larger in the tropics than in the high latitudes and temperate zones.

Global Carbon Project

- The Global Carbon Project (GCP) is an organization seeks to quantify global greenhouse gas emissions and their causes.
- Established in 2001, its projects include global budgets for three dominant greenhouse gases
 1. Carbon dioxide,
 2. Methane,
 3. Nitrous oxide
- GCP's complementary efforts are in areas of urban, regional, cumulative, and negative emissions.
- The main object of the group has been to fully understand the carbon cycle.
- The project has brought together emissions experts, earth scientists, and economists to tackle the problem of rising concentrations of greenhouse gases.
- The Global Carbon Project is currently chaired by Rob Jackson of Stanford

1.8 Report on Construction and Demolition Waste

Centre for Science and Environment (CSE), a Delhi based think tank has released a report on construction and demolition (C&D) waste.

- Construction and demolition waste is generated whenever any construction/demolition activity takes place, such as, building roads, bridges, fly over, subway, remodeling etc.
- It consists mostly of inert and non-biodegradable material such as concrete, plaster, metal, wood, plastics etc.
- **Report Highlights** - India recycles just 1% of its construction and demolition (C&D) waste, i.e. meagre 6,500 tons per day.
- The country generates an estimated 150 million tons of C&D waste every year, according to the Building Material Promotion Council.



- Unofficial estimates of the total waste generated in the country put the figure at three-five times more than the official estimate.
- About 53 cities were expected to set up recycling facilities to recover material from C&D waste by 2017, but only 13 cities have done that by 2020.
- Heaps of concrete, bricks and metal waste from construction were choking waterbodies, green areas and public spaces in Indian cities.
- Toxic dust particles from the debris were polluting air at a time when cities had to reduce their particulate pollution by 20-30 per cent by 2024, under the ongoing National Clean Air Programme.

1.9 NGT order on ground water extraction

The National Green Tribunal (NGT) has called for commercial entities to follow new rules for getting permission to extract groundwater.

- Environmental Impact Assessments (EIA) will now form the basis of granting such permissions.
- The Union Ministry of Jal Shakti and the Central Ground Water Board (CGWB) were ordered by the NGT to ensure no general permission was given for withdrawing groundwater, particularly to any commercial entity.
- Under the order, plants involved in commercial extraction of ground water will undergo individual assessment through an expert committee.
- All overexploited, critical and semi-critical (OCS) assessment units must undergo water mapping.
- Water management plans need to be prepared for all OCS assessment units in the country based on the mapping data, starting with overexploited blocks.
- NGT had also mentioned permission to extract groundwater must be for specified times and quantity of water, not for perpetuity.
- It must be necessarily subject to digital flow meters, which cannot be accessed by proponents, with mandatory annual calibration by the authorized agency at proponents.

1.10 Air Quality in Mega Cities

Centre for Science and Environment (CSE), a Delhi based think tank has analyzed air quality in the Mega cities – Delhi, Mumbai, Kolkata, Hyderabad, Chennai and Bangalore.

- Local meteorological events have also influenced the air quality of different cities.
- Highlights of the Analysis -
 1. All cities other than Delhi had better air quality, in terms of PM_{2.5} levels.
 2. Throughout the COVID-19 lockdown, air pollution in Delhi was less compared to 2019, however the air quality of the city was still worst among six large cities in different parameters
 3. The daily average PM_{2.5} levels in Delhi had breached the safe value on 56 days between March 25 and May 31 in 2019 and it exceeded the safe limit on 14 days this year.
 4. The cleanest period is usually during monsoon and this essentially means that the PM_{2.5} levels of Chennai and Kolkata were better during the lockdown than last year's monsoon.
 5. In Bangalore and Delhi, the average air quality during 54 days of lockdown was only 20% worse than last year's monsoon.

1.11 Air Unique-quality Monitoring

- The AUM Photonic System is developed under the Clean Air Research Initiative of Department of Science and Technology.
- The system is based on principals of statistical mechanics, laser backscattering, optoelectronics, AI, machine learning and IoT.
- The system identifies, make classification and quantifies various pollutants present in the air atmosphere.



- It does these three steps simultaneously of the order of less than one part per billion and following the standards of meteorology with high precision and accuracy.
- Karnataka State Pollution Control Board will be operating this system by following the standards of the Central Pollution Control Board of India.

1.12 Micro Plastics

According to recent study, Maldives beaches have the most Micro plastics in the world.

- These are small pieces of plastic, less than 5 mm in length, that occur in the environment as a consequence of plastic pollution.
- The debris can be of any size and shape, but those which are less than 5 mm in length (or about the size of a sesame seed) are called micro plastics.
- Micro plastics come from a variety of sources, including from larger plastic debris that degrades into smaller and smaller pieces.
- In addition, microbeads, a type of Micro plastic, are very tiny pieces of manufactured polyethylene plastic that are added as exfoliants to health and beauty products.
- These tiny particles easily pass through water filtration systems and end up in the ocean or other water bodies and cause serious environmental and food safety concerns.
- The problem with micro plastics is that, like plastic items of any size, they do not readily break down into harmless molecules.
- Plastics can take hundreds or thousands of years to decompose and in the meantime, wreak havoc on the environment.
- On beaches, micro plastics are visible as tiny multicolored plastic bits in sand.
- In the oceans, micro plastic pollution is often consumed by marine animals.

1.13 Arsenic Poisoning

- Arsenic is naturally present at high levels in the earth crust and groundwater of a number of countries. It is highly toxic in its inorganic form.
- Contaminated water used for drinking, food preparation and irrigation of food crops poses the greatest threat to public health from arsenic.
- Long-term exposure to arsenic from drinking-water and food can cause cancer, skin disease, cardiovascular disease and diabetes.
- In early childhood exposure, it has been linked to negative impacts on cognitive development and increased deaths in young adults.
- According to the WHO's guidelines for drinking water quality (2011), the permissible limit of Arsenic in groundwater is 0.01 mg per liter.
- However, in India the permissible limit in drinking water has recently been revised from 0.05 mg per liter to 0.01 mg per liter.
- The most important action in affected communities is the prevention of further exposure to arsenic by provision of a safe water supply.
- According to data shared in the Parliament, the number of arsenic-affected habitations in India has increased by 145% in the last five years (2015-20).
- Most of the arsenic-affected habitations lie in the Ganga and Brahmaputra alluvial plains. i.e in Assam, Bihar, West Bengal, Punjab, and Uttar Pradesh (UP).
- Assam had the highest share of such habitations (1,853), followed by West Bengal (1,383).



1.14 Fluoride Toxicity

- Excessive fluoride intake usually occurs through the consumption of groundwater naturally rich in fluoride, particularly in warm climates where water consumption is greater, or where high-fluoride water is used in food preparation or irrigation of crops.
- Such exposure may lead to dental fluorosis (tooth decay) or crippling skeletal fluorosis, which is associated with bone deformities.
- The number of fluoride affected habitations has significantly come down from 12,727 in 2015 to 5,485 as of September 2020.
- Rajasthan had the highest number of such habitations (2,956), followed by Bihar (861).

1.15 PUSA Decomposers

- Recently, the scientists have developed a bio-decomposer technique called 'PUSA Decomposers' for converting crop stubble into compost.
- The decomposers are in the form of capsules made by extracting fungi strains that help the paddy straw to decompose at a much faster rate than usual.
- The fungi helps to produce the essential enzymes for the degradation process.
- It involves making a liquid formulation using decomposer capsules and fermenting it over 8-10 days and then spraying the mixture on fields with crop stubble to ensure speedy bio-decomposition of the stubble.
- The decomposer improves the fertility and productivity of the soil as the stubble works as manure and compost for the crops and lesser fertilizer consumption is required in the future.

1.16 Plastic Pollution in the Atlantic Ocean

A new study has estimated the amount of microplastic pollution in the Atlantic Ocean.

- Microplastics are plastic debris smaller than 5mm in length.
- They come from a variety of sources. One of the sources is when larger pieces of plastic degrade into smaller pieces, which are difficult to detect.
- **Plastics and Ocean** - There are multiple pathways, which includes,
 1. Riverine and atmospheric transport from coastal and inland areas,
 2. Illegal dumping activities and
 3. Direct-at-sea littering from shipping, fishing and aquaculture activities.
- According to the IUCN, at least 8 million tonnes of plastic end up in the oceans every year.
- This makes up about 80% of all marine debris from surface waters to deep-sea sediments.
- **India's position** - Currently, India is considered the twelfth-largest source of marine litter.
- It is projected to become the fifth-largest by 2025.
- The Ganga has been documented as one of the top-five rivers dumping plastics into oceans.
- India consumes 16.5 mt of plastic annually, 43% of which was towards the manufacture of single-use plastic material.
- **Study** - In the study, scientists studied pollution of the Atlantic Ocean caused by three types of plastics: polyethylene, polypropylene, and polystyrene.
- These plastics, most commonly used for packaging, were suspended in the top 200 metres of the ocean.
- **Smaller plastic particles** - They are a hazard as it is easier for them to sink to greater ocean depths.
- Some marine species such as zooplanktons show preferential ingestion of smaller particles.
- This makes them easier to enter the food chain and their conversion to fast-sinking faecal pellets.

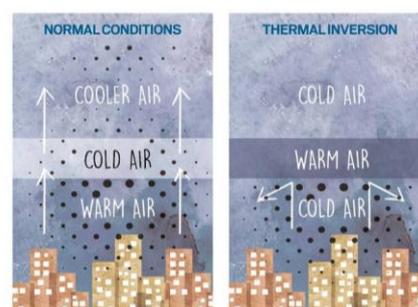
- **Underestimated** - Scientists say that pollution caused by microplastics has been “severely” underestimated in previous assessments.
- They said that a considerable amount of small microplastics are lost from the surface and are stored in ocean interiors.
- **Amount** - The study have estimated that the Atlantic waters could hold 17-47 million tonnes of plastic waste.
- This estimation is based on the trends of plastic waste generation from 1950-2015.
- This is also based on the fact that the Atlantic Ocean has received 0.3-0.8% of the global plastic waste for 65 years.
- **Problem** - Single-use plastics are a common part of the political discourse in India.
- But, the implementation of their phase-out has been marred by the **lack of a common definition** that could unite the states for this cause.
- The definition assumes greater significance as it would impact multiple stakeholders, thereby, impacting the use of specific types of plastics.

1.17 Factors influencing Delhi’s Air Pollution

- Air quality in the national capital turned ‘poor’ for the first time this season October 7, 2020, according to Central Pollution Control Board (CPCB).
- The reasons for deteriorating air quality are as follows
 1. Dip in temperature,
 2. Calm surface winds,
 3. Steady increase in farm fires in Punjab and Haryana.
- Air pollution in Delhi and the whole of the Indo Gangetic plains is a complex phenomenon that is dependent on a variety of factors.
- The first and foremost is the input of pollutants, followed by weather and local conditions.
- The other factors of air pollution in NCR are as follows
 - 1) **Thermal Inversion**
 - 2) **Wind speed** - High wind speeds are highly effective at dispersing pollutants but winters bring dip in wind speeds as compared to summers.
 - 3) **Stubble burning** 12-26% of all particulate matter in Delhi is of bio-mass burning.

Characteristics of AQI

- Classification of an AQI between 0-500 are as follows
 1. 0-50 is considered ‘good’
 2. 51-100 ‘satisfactory’
 3. 101-200 ‘moderate’.
 4. 201-300 ‘poor’.
 5. 301-400 ‘very poor’.
 6. 401-500 ‘severe’.
- An AQI above 500 falls in ‘severe-plus or emergency’ category.



Dip in temperature
 When the temperature dips, it lowers the inversion height, which is the layer beyond which pollutants cannot disperse into the upper layer of the atmosphere. The concentration of pollutants in the air increases when this happens

1.18 Arctic Fires

- The Arctic region has a cold body of water and permafrost, it naturally acts as a carbon sink.
- On average it absorbs 58 megatons of CO₂ a year in its cold water.
- Soils in areas of permafrost contain twice as much carbon as there is currently in the atmosphere.
- As the climate and permafrost soils have warmed, microbes have started to break down this organic carbon, which has been frozen and fixed in the permafrost.
- That has led to a rise in land emissions of CO₂ and methane.
- Also there will be less absorption of carbon by water with rising temperature.
- It will be a feedback loop, as peatlands release more carbon, global warming increases, which thaws more peat and causes more wildfires.



- Arctic fires will affect the global climate over the long term depending on what they burnt.
- That's because peatlands, unlike boreal forest, do not regrow quickly after a fire, so the carbon released is permanently lost to the atmosphere.

1.19 Yellow Dust

Recently North Korean authorities have urged citizens to remain indoors to avoid contact with a mysterious cloud of 'yellow dust' blowing in from China.

- Yellow dust is actually sand from deserts in China and Mongolia that high speed surface winds carry into both North and South Korea during specific periods every year.
- The sand particles tend to mix with other toxic substances such as industrial pollutants, as a result of which the 'yellow dust' is known to cause a number of respiratory ailments.
- Usually, when the dust reaches unhealthy levels in the atmosphere, authorities urge people to remain indoors and limit physical activity, particularly heavy exercise and sport.
- Sometimes, when the concentration of yellow dust in the atmosphere crosses around 800 micrograms/cubic meter, schools are shut and outdoor events cancelled in the affected areas.

1.20 Human Emissions of Nitrous Oxide

- According to recent findings Human emissions of nitrous oxide (N₂O) increased by 30 per cent between 1980 and 2016.
- Its global concentration levels increased from 270 parts per billion (ppb) in 1750 to 331 ppb in 2018, a jump of 20 per cent.
- The growth has been the quickest in the past five decades because of human emissions.
- It has also found that a major proportion of the N₂O emissions in the last four decades came from the agricultural sector, mainly because of the use nitrogen-based fertilisers.
- Most N₂O emissions have come from emerging countries like India, China and Brazil.
- The increase in its emissions means that the climatic burden on the atmosphere is increasing from non-carbon sources as well, while the major focus of global climate change negotiations is currently centred on carbon its emissions and mitigation.

Nitrous Oxide (N₂O)

- Nitrous oxide is a dangerous gas for the sustainable existence of humans on Earth.
- It has the third-highest concentration (CO₂ and Methane are other two gases) in our atmosphere among greenhouse gases responsible for global warming.
- N₂O can live in the atmosphere for up to 125 years.
- N₂O is also the only remaining threat to the ozone layer, for it accumulates in the atmosphere over a long period of time, just like CO₂.

1.21 Clean Air Day for Blue Skies

- The United Nations General Assembly On December 19, 2019, during its 74th session adopted the resolution to hold an International Day of Clean Air for blue skies every year.
- It invited the United Nations Environment Programme (UNEP) to facilitate the observance of the International Day, in collaboration with other relevant organizations
- The very first International Day of Clean Air for blue skies will be held on September 7th, 2020.
- The day aims for the following
 1. Raise public awareness at all levels individual, community, corporate and government—that clean air is important for health, productivity, the economy and the environment.
 2. Demonstrate the close link of air quality to other environmental/developmental challenges such as most and foremost climate change and the global Sustainable Development Goals.
 3. Promote and facilitate solutions that improve air quality by sharing actionable knowledge best practices, innovations, and success stories.

1.22 Agricultural Subsidies & Air Pollution

- **Agriculture's** contribution to air pollution runs even deeper than what happens between crop seasons.
- Atmospheric ammonia comes from fertiliser use, animal husbandry, and other agricultural practices.
- This combined with emissions from power plants, transportation, and other fossil fuel burning form fine particles.
- Agriculture is a victim of pollution as well as a perpetrator.
- **Particulate matter** and **ground-level ozone** (from industrial, power plant, and transportation emissions among others) cause losses in crop yields.
- Ozone damages plant cells, handicapping photosynthesis, while particulate matter dims the sunlight that reaches crops.

Subsidies & Air Pollution

- The irony of agricultural pollution is that taxpayers are essentially paying for it through a system of subsidies.
- These subsidies motivate the very behaviors that drive the agricultural emissions that the taxpayers breathe.
- **Free power** - Hence "free" water, pumped from the ground - is a big part of what makes growing rice in these areas attractive.
- **Open-ended procurement** of paddy, in spite of bulging stocks of grains with the Food Corporation of India, adds to the incentives.
- Subsidies account for almost 15% of the value of rice being produced in Punjab-Haryana belt.
- **Fertiliser**, particularly urea in granular form, is highly subsidised.
- Urea is one of the cheapest forms of nitrogen-based fertiliser, but it is also one of the first to release ammonia into the air.
- This loss of nitrogen leads to a cycle of more and more fertiliser being applied to get the intended benefits for crops.

1.23 Indo-Gangetic Plain as Ammonia Hotspot

- A study by the Indian Institute of Technology (IIT) Kharagpur found that Indo-Gangetic Plain (IGP) is a global hot-spot of atmospheric ammonia.
- Atmospheric ammonia is typically generated due to agricultural activities including the use of nitrogenous fertilizers, manure management, soil and water management practices and animal husbandry.
- Satellite data used in the study on agricultural emissions show a positive correlation between atmospheric ammonia and fertilizer consumption.
- The general trend in atmospheric ammonia over India is negative in most seasons.
- Atmospheric ammonia plays a key role in the deterioration of air quality in India by actively contributing to the formation of secondary aerosols.
- The study has also recommended wider adoption of precision farming along with seasonal restrictions on the use of fertilizers.

1.24 Aerosols in Indo-Gangetic Plain

- Indo-Gangetic Plain (IGP) is located south and upwind of the Himalayan foothills.
- A team under the Dept. of Science & Technology Climate Change program has found that high aerosol loading in IGP has increased the high rainfall events in the foothills of the Himalayan Region.
- They have found that the particulate emissions can alter the physical and dynamical properties of cloud systems.
- These alterations, in turn, amplify rainfall events over orographic regions downwind of highly polluted urban areas.

- The team found clear associations between high precipitation events, high aerosol loading, and high moist static energy (MSE) values.
- (MSE of an air mass includes the potential energy due to its height above the ground and the latent heat due to its moisture content).

1.25 Brown Carbon ‘Tarballs’

- Tarballs are small light-absorbing, carbonaceous particles formed due to burning of biomass or fossil fuels that deposit on snow and ice.
- They are formed from brown carbon, emitted during the burning of fossil fuels.
- The median sizes of externally mixed tarballs and internally mixed tarballs were 213 and 348 nanometre respectively.
- Primary brown carbon (BrC) co-emitted with black carbon (BC) from biomass burning is an important light-absorbing carbonaceous aerosol.
- The black carbon from the Indo-Gangetic Plain can reach the Himalaya region and influence glacial melting and climatic change.
- A study has highlighted that brown carbon ‘tarballs’ that fasten the glacial melting has been found in the Himalayan atmosphere.
- Until now, black carbon was found to be transported long distances by the wind to the Himalayan atmosphere.
- The researchers concluded that tarballs from long-range transport can be an important factor in the climatic effect and would correspond to a substantial influence on glacial melting in the Himalaya region.

2. RENEWABLE ENERGY

2.1 World’s Largest Solar Tree

CSIR- Central Mechanical Engineering Research Institute (CMERI) has developed the World’s Largest Solar Tree and installed it at Durgapur, West Bengal.

- The installed capacity of the Solar Tree is above 11.5 kWp.
- There are a total of 35 Solar PV Panels in each tree with a capacity of 330 wp each.
- It has the annual capacity to generate 12,000-14,000 units of Clean and Green Power, West Bengal.
- The inclination of the arms holding the Solar PV Panels are flexible and can be adjusted as per requirement, this feature is not available in Roof-Mounted Solar facilities.
- MSMEs who are interested in the solar tree can align their Business Model with PM KUSUM Scheme for farmers, for developing a Renewable Energy based Energy Grid.



2.2 Standards for Safety Evaluation of Hydrogen Fuel Cell Vehicles

The Ministry of Road Transport and Highways has notified the Standards for Safety Evaluation of vehicles being propelled by Hydrogen Fuel Cells.

- A fuel cell is an electrochemical cell that converts the chemical energy of a fuel (often hydrogen) and an oxidizing agent (often oxygen) into electricity through a pair of redox reactions.
- Fuel cells are different from most batteries in requiring a continuous source of fuel and oxygen (usually from air) to sustain the chemical reaction, whereas in a battery the chemical energy usually comes from metals and their ions or oxides that are commonly already present in the battery, except in flow batteries.
- Fuel cells can produce electricity continuously for as long as fuel and oxygen are supplied.
- Hydrogen + Oxygen = Electricity + Water Vapor
- The products of the reaction in the cell are water, electricity, and heat.

- This is a big improvement over internal combustion engines, coal burning power plants, and nuclear power plants, all of which produce harmful by-products.
- **Recent Developments** - The Standards were notified through an amendment to Central Motor Vehicles Rules 1989.
- This would facilitate the promotion of Hydrogen Fuel Cell based vehicles in the country which are energy efficient and environment friendly.
- These standards are also at par with the available international standards.
- The motor vehicles of Category M and Category N, running on compressed gaseous hydrogen fuel cell, shall be in accordance with AIS 157:2020, as amended from time to time, till the corresponding Bureau of Indian Standard Act, 2016, specification is notified.
- Also, the hydrogen fuel specification for fuel cell vehicles will be in accordance with ISO 14687.

2.3 First World Solar Technology Summit

The first World Solar Technology Summit (WSTS) is being organized by the International Solar Alliance (ISA) on 8th September, 2020.

- The Federation of Indian Chambers of Commerce and Industry (FICCI), as the convener of ISA Global Leadership Task Force on Innovation, is working with ISA in organizing the summit.
- The summit will witness the announcement of agreements between ISA and following institutions
 1. International Institute of Refrigeration,
 2. Global Green Growth Institute
 3. National Thermal Power Corporation.
- A tripartite agreement between India's Ministry of New and Renewable Energy, the World Bank and the International Solar Alliance is also set to be inked.
- ISA's technology journal, Solar Compass 360 will also be launched during the summit.

2.4 Green hydrogen

- Green hydrogen is a next generation fuel, with gas produced through electrolysis from water by using electricity generated through non-greenhouse gas (GHG) producing energy sources such as wind, solar or hydro.
- Hydrogen is also produced from others sources such as coal, oil and gas.
- Being emission free and having three times higher energy content per unit mass than gasoline, green hydrogen is being looked at as a preferred fuel source for both transportation and storage applications.
- State-run Solar Energy Corporation of India (SECI) has planned to call bids for setting up green hydrogen plants.
- The plan is to set up hydrogen production units by leveraging wind and solar power as hydrogen production is a very energy intensive process.

Hydrogen

- Hydrogen is the lightest and first element on the periodic table. Since the weight of hydrogen is less than air, it rises in the atmosphere and is therefore rarely found in its pure form, H₂.
- At standard temperature and pressure, hydrogen is a nontoxic, non-metallic, odourless, tasteless, colourless, and highly combustible diatomic gas.
- Hydrogen fuel is a zero-emission fuel burned with oxygen, it can be used in fuel cells or internal combustion engines.
- It is also used as a fuel for spacecraft propulsion.
- Type of Hydrogen



1. **Grey Hydrogen** - Constitutes India's bulk Production. Extracted from hydrocarbons (fossil fuels, natural gas), its by product is CO₂
2. **Blue Hydrogen** - It is sourced from fossil fuels with by-product of CO, CO₂
3. **Green Hydrogen** - Generated from renewable energy (like Solar, Wind) where Electricity splits water into hydrogen and oxygen with by Products Water and Water Vapor.

3. CLIMATE CHANGE

3.1 Climatic Investment Fund

- The Climate Investment Funds (CIFs) are implemented by the Multilateral Development Banks (MDBs) to bridge the financing and learning gap between international climate change agreements.
- They were designed by developed and developing countries.
- The World Bank is the Trustee of the CIFs.
- It include a "sunset clause" to ensure that the Fund's activities do not prejudice the outcome on the UNFCCC negotiations.
- CIFs are two distinct funds
 1. Clean Technology Fund
 2. Strategic Climate Fund.
- The CTF promotes scaled-up financing for demonstration, deployment and transfer of low carbon technologies with a significant potential for long-term greenhouse gas emissions savings.

3.2 Assessment of Climate Change Report

- The first 'Assessment of Climate Change over Indian Region' was recently released by the Union Ministry of Earth Sciences.
- Key projections of the report are as follows
 1. The coming decades are projected to witness a considerable rise in the mean, extreme and inter-annual variability of rainfall associated with monsoon.
 2. Flood risks are higher over the east coast, West Bengal, eastern Uttar Pradesh, Gujarat, Konkan and cities like Mumbai, Chennai and Kolkata.
 3. The Himalayan flood basins are projected to greater floods, due to the faster glacial and snow melting.
 4. Storms in the Arabian Sea are gaining more strength and the trend is projected to continue.
 5. In coming decades, the average duration of heatwaves during April-June is projected to double, and their frequency to rise by 3 to 4 times compared to 1976-2005.
 6. Eastern India could face two more droughts per decade compared to what was experienced during 1976-2005, while the Southern Peninsula is projected to experience one or two droughts fewer.

3.3 Reducing Emissions from Deforestation and forest Degradation (REDD+)

Recently, Uganda has become the first African country to submit results for REDD+ to UNFCCC.

- REDD+ is a mechanism developed by Parties to the United Nations Framework Convention on Climate Change (UNFCCC) in 2005.
- Most of the key REDD+ decisions were completed by 2013, with the final pieces of the rulebook finished in 2015.
- The "Plus" in REDD+, lays out the various ways in which countries have defined the three activities:
 1. Conservation,
 2. Sustainable management of forests,



3. Enhancement of forest carbon stock.

- It aims to achieve climate change mitigation by incentivizing forest conservation.
- It has three phases
 1. **Readiness** - Readiness phase involves the development of national strategies or action plans, REDD+ mitigation actions, and capacity building.
 2. **Implementation**- It is about enacting REDD+ actions and national strategies that could involve further capacity building, technology development and transfer.
 3. **Result-based actions** - It comprise the final REDD+ phase.
- It provides financial incentives to developing countries that prove they stopped deforestation during a certain period of time.
- This is done through rigorous UN-backed technical evaluations
- The Green Climate Fund (GCF) established at Conference of Parties (COP)-17 to function as the financial mechanism for the UNFCCC, is currently financing REDD+ programs.
- Brazil was the first country to receive \$96.5 million under the results-based payments.

3.4 Biochar

- Biochar is charcoal used as a soil amendment for both carbon sequestration and soil health benefits.
- Biochar technically defined as the solid material obtained from the thermochemical conversion of biomass in an oxygen-limited environment.
- Like most charcoal, biochar is made from biomass via pyrolysis (decomposition brought about by high temperatures).
- Biochar may increase the following
 1. Soil fertility of acidic soils (low pH soils),
 2. Agricultural productivity,
 3. Protection against some foliar and soil-borne diseases.
 4. Soil's water-holding capacity,
 5. Nutrient supply and retention.
- A recent research in Ghana, an African nation proved biochar application could help promote cowpea growth and crop yield in the country as well as fight climate change impact on soil.

3.5 Variability of Ozone

Aryabhata Research Institute of Observational Sciences (ARIES) has evaluated the variability of Ozone (O₃) in the Brahmaputra River Valley (BRV).

- They assessed seasonal characteristics of ozone to identify the emission source of ozone and its precursors, especially methane (CH₄) and non-methane hydrocarbons (NMHCs).
- NMHCs such as ethane, ethene, propane, propene, etc. play an important role in controlling ozone concentrations.
- Scientists have found relatively low concentration of ozone over BRV (Guwahati - Assam) compared to the other urban locations in India.
- The pattern of O₃ concentrations in the BRV indicated that it was strongly influenced by local oxides of nitrogen (NO_x) sources with an adjacent national highway being the likely major source.
- The mean ventilation coefficient was greater than 6000 m²s during the day in the pre-monsoon season indicating pollutant dispersion.
- High O₃ winter concentrations were observed, likely driven by local biomass burning providing reactive volatile organic compounds (VOCs) that contributed to ozone formation.



- In the pre-monsoon season, an impact of solar radiation (SR) on the photochemical formation of O₃ was observed.
- Tropospheric, or ground-level ozone, is created by chemical reactions between NO_x and Volatile Organic Compounds (VOC).

3.6 Climate Smart Cities Assessment Framework (CSCAF) 2.0

Union Minister for Housing and Urban Affairs has launched the Climate Smart Cities Assessment Framework (CSCAF) 2.0, along with the 'Streets for People Challenge'.

- The objective of CSCAF is to provide a clear roadmap for cities towards combating Climate Change while planning and implementing their actions, including investments.
- CSCAF initiative intends to inculcate a climate-sensitive approach to urban planning and development in India.
- The framework has 28 indicators across five categories namely Energy and Green Buildings, Urban Planning, Green Cover & Biodiversity, Mobility and Air Quality and Water Management and Waste Management.
- The Climate Centre for Cities under National Institute of Urban Affairs (NIUA) is supporting MoHUA in implementation of CSCAF.

3.7 Coal Gasification

- Coal gasification is the process of producing syngas from coal and water, air and/or oxygen, a mixture consisting primarily of
 1. Carbon monoxide (CO),
 2. Hydrogen (H₂),
 3. Carbon dioxide (CO₂),
 4. Natural gas (CH₄),
 5. Water vapor (H₂O)
- Historically, coal was gasified to produce coal gas, also known as "town gas".
- Coal gas is combustible and was used for heating and municipal lighting, before the advent of large-scale production of natural gas from oil wells.
- In current practice, large-scale coal gasification installations are primarily for electricity generation, or for production of chemical feedstock.
- The hydrogen obtained from coal gasification can be used for various purposes such as making ammonia, powering a hydrogen economy, or upgrading fossil fuels.
- Natural gas from coal gasification can be cooled until it liquefies for use as a fuel in the transport sector.
- Government plans for 100 million tons (MT) coal gasification by 2030.

3.8 Released norms on NO_x Emissions

Recently Union Ministry of Environment, Forest and Climate Change (MoEF&CC) has relaxed NO_x emission norms.

- NO_x or Oxides of nitrogen are a criteria pollutant emitted on burning coal.
- NO_x is harmful, it also triggers the formation of ground level ozone and leads to secondary particulate matter worsening health risks and needs to be controlled.
- Coal-based power plants, besides the transport sector, are a major source of this pollutant.
- There were no limits placed to control emissions of NO_x from power plants before 2015.
- The MoEF&CC introduced limits of 300 mg / Nm³.
- It has been relaxed to 450 mg / Nm³, from 300 mg / Nm³, for power stations commissioned between 2003 and 2015.



- The relaxations were brought about as the power sector strongly lobbied watering down the norms, alleging it was not possible to meet the 300 mg / Nm³ standard at all loads.
- Boiler companies assured government that a NO_x emission level of 450 mg / Nm³ can be achieved by combustion modification.
- To meet emissions below it would mean installation of slightly expensive pollution control equipment like selective non-catalytic reactors (SNCR) will be required.

3.9 Ban on Import of Air Conditioner with Refrigerants

Recently Union government has banned imports of air conditioners with refrigerants.

- This decision is taken in view to promote domestic manufacturing and cut imports of non-essential items.
- Non-essential electronic goods have been under the purview of the Ministry of Commerce and Industry since the government decided to push for self-reliance in various sectors this year.
- Air conditioners, have been singled out as an example of a segment where self-reliance was required.
- Air conditioners consume large amounts of electricity, and the fluorocarbons they use as refrigerants deplete the ozone layer and contribute to global warming.
- Under the Kigali Amendment to the Montreal Protocol, countries will phase down hydrofluorocarbon refrigerants by over 80 per cent over the next 30 years.
- The Cool Coalition, a global network connecting over 80 partners also works to expand access to cooling while reducing the climate impact

3.10 Dip in Delhi's Temperature - Causes

The minimum or night time temperature in New Delhi dropped to 4.1 degrees Celsius on 15 December 2020, the lowest during the season this year.

- A rapid decline in minimum temperature in Delhi was noted from 14.4 degrees Celsius on December 12 to 4.1 degrees on the 15th.
- According to IMD, the dip was five degrees below the normal temperature for this time of the year.
- **Causes** - There has been a significant amount of snowfall over the past few days in states falling in the western Himalayan range under the influence of a **Western Disturbance**.
 - These include Jammu & Kashmir, Himachal Pradesh and Uttarakhand.
- In winters, whenever an active Western Disturbance passes through the western Himalayan region, it leads to a dip in temperatures across northwest India.
 - A Western Disturbance is as an extra-tropical storm originating in the Mediterranean.
 - It is an area of low pressure that brings sudden showers, snow and fog in northwest India.
- Snowfall in the western Himalayan range means cold, north-westerly winds blowing over Delhi from the direction of this high altitude area.
- It also leads to clearing of cloud cover with the passing of Western Disturbance, and leads to a fall in temperatures.
- The lack of cloud cover also leads to higher radiation from the Earth's surface into the atmosphere at night time, which also cools the ground.
- Moreover, under the influence of an **active La Niña climate pattern**, temperatures across the globe have been dipping.
- The maximum or day time temperature has also dipped in Delhi from 29 degrees Celsius on December 10 to 19.4 on the 14th.
- **IMD forecast** - The IMD has forecast cold day and cold wave conditions in some parts of the city for the next three days.
 - A **cold day** is when the maximum temperature dips 4.5 degrees Celsius below normal temperature.

- The 'normal' has been set based on climatological data of 30 years between 1981 and 2010.
- **Cold wave** is when the minimum temperature dips to 10 degrees Celsius or less and the departure from normal temperature is 4.5 degrees Celsius or lower.
- Until December 19, the maximum temperature is forecast to be between 18 and 19 degrees Celsius.
- The minimum temperature is forecast to be between 4 and 5 degrees Celsius.

3.11 Iceberg A68

- This giant iceberg is the biggest block of free-floating ice that split off from Antarctica's Larsen C ice shelf in 2017.
- US National Ice Center (USNIC) said that two icebergs that calved from A68a were large enough to be named and tracked - A68E and A68F.
- [USNIC is responsible for naming icebergs, which are named according to the Antarctic quadrant in which they are spotted.]
- Icebergs travel with ocean currents and either get caught up in shallow waters or ground themselves.
- The fear is that if the iceberg grounds itself near an island, it could cause disruption to the local wildlife that forages in the ocean.
- On the other hand, there are some positives of an iceberg being stuck in the open ocean, since icebergs carry dust which fertilises ocean plankton, which draws up carbon dioxide from the atmosphere.

3.12 Shift in Seasonal Changes in Steppes

- Significant seasonal changes have been observed in southwestern Russia's Kulunda steppe by NASA.
- The forested valleys of the region appear dark green compared to the lighter green and brown farmland that surrounds them.
- The most interesting phenomenon witnessed, however, is the change in colour of the region's lakes.
- The colour of *Lake Kuchukskoye* shifts from green to pink, a phenomenon seen in other lakes in Russia's Altai Krai district as well.
- The aquatic population in the lakes including brine shrimp and salt-loving Halobacteria increases during the seasonal changes, which results in these lakes changing colour.
- The lakes turn into flamingo shades of pink at this time, because of these factors.

3.13 Brahmaputra Floods

- Tree rings grow wider in years when soil moisture is high.
- Indirectly, wider rings reflect more rainfall and higher river runoff.
- A study has analysed the tree rings at sites close enough to be affected by the same weather systems as Brahmaputra watershed.
- With this, the scientists built a 696-year chronology (1309 to 2004).
- These rings showed that the post-1950s period was actually one of the driest since the 1300s. There have been much wetter periods in the past.
- Projecting from all those periods, the researchers concluded that destructive floods probably will come more frequently than thought.
- If one projects from modern discharge records, one would be underestimating the danger by 24% to 38%.
- Higher temperatures drive more evaporation of ocean waters, and in this region that water ends up as monsoon rainfall.
- That is why warming climate will intensify the monsoon rains in coming decades, and in turn increase seasonal flooding.

4. ENVIRONMENTAL ORGANISATIONS, CONVENTIONS & TREATIES

4.1 United Nations Global Commission on Adaptation

- The Global Commission on Adaptation was launched in Hague in 2018 by then UN Secretary General Ban Ki-moon.
- Its mandate is to encourage the development of measures to manage the effects of climate change through technology, planning and investment.
- Secretary General Ban Ki-moon leads the group with co-chair of the Bill & Melinda Gates Foundation, and World Bank CEO.
- It was launched with the support of 17 convening countries including China, Canada and the UK and low-lying countries vulnerable to climate change including Bangladesh and the Marshall Islands.
- The Netherlands initiated the Global Commission on Adaptation to share its knowledge on how it has managed to adopt innovative water management solutions as sea levels rise.
- UNGCA Publishes Global Call for Leadership on Climate Resilience.
- It will be released in Climate Adaptation Summit in the Netherlands in 2021.

4.2 Partnership for Action on Green Economy

- The Partnership for Action on Green Economy (PAGE) was launched in 2013 as a response to the call at Rio+20.
- It aims to support those countries wishing to embark on greener and more inclusive growth trajectories.
- PAGE seeks to put sustainability at the heart of economic policies and practices to advance the 2030 Agenda for Sustainable Development.
- PAGE brings together five UN agencies
 1. UN Environment,
 2. International Labour Organization,
 3. UN Development Programme,
 4. UN Industrial Development Organization,
 5. UN Institute for Training and Research
- PAGE represents a mechanism to coordinate UN action on green economy.
- PAGE aims to assist countries in achieving and monitoring the emerging Sustainable Development Goals, especially SDG 8: “Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

4.3 Blue Flag Certification

Eight beaches in India have been awarded the ‘Blue Flag’ certification by an eminent international jury.

- The **Blue Flag programme** for beaches and marinas was started in France in 1985 and in areas out of Europe in 2001.
- It is run by the international, non-governmental, non-profit organisation FEE (the Foundation for Environmental Education), based in Denmark.
- Blue Flag beaches are considered the cleanest beaches of the world.
- In order to qualify for the Blue Flag, a series of stringent environmental, educational, safety, and accessibility criteria must be met and maintained.
- The programme promotes **sustainable development** in freshwater and marine areas through four main criteria.
- The **four criteria** include water quality, environmental management, environmental education and safety.



- Forty-seven countries currently participate in the program.
- 4,573 beaches, marinas, and boats have this certification.
- The '**Blue Flag**' certification can be obtained by a beach, marina, or sustainable boating tourism operator, and serves as an eco-label.
- It sets stringent environmental, educational, safety-related and access-related criteria that applicants must meet and maintain.
- It is awarded annually to beaches and marinas in FEE member countries.
- In its July 2019 notification, the Environment Ministry identified the 12 beaches in India for Blue Flag certification.
- **Jury members**- It comprises members of the
 1. United Nations Environment Programme (UNEP),
 2. United Nations World Tourism Organization (UNWTO),
 3. Foundation for Environmental Education (FEE) and
 4. International Union for Conservation of Nature (IUCN).
- **Selected Beaches** - 8 beaches of India have been awarded the "BLUE FLAG".
 - Shivrajpur in Gujarat,
 - Ghoghla in Daman & Diu,
 - Kasarkod and Padubidri beach in Karnataka,
 - Kappad in Kerala,
 - Rushikonda in Andhra Pradesh,
 - Golden beach of Odisha and
 - Radhanagar beach in Andaman and Nicobar.
- India is also the first country in "Asia-Pacific" region which has achieved this feat in just about 2 years' time.
- Japan, South Korea and UAE are the only other Asian nations who have been conferred with a couple of Blue Flag beaches, however, in a time frame of about 5 to 6 years.
- India is now in the league of 50 "BLUE FLAG" countries.
- It is an outstanding feat considering that no 'Blue Flag' nation has ever been awarded for 8 beaches in a single attempt.
- This is also a global recognition of India's conservation and sustainable development efforts.
- In January 2020, the Centre issued a Gazette Notification declaring a list of activities and facilities that would be permissible in the Coastal Regulation Zone (CRZ) areas of certain beaches.
- These beaches are those that are identified for obtaining the 'Blue Flag' certification.
- **Permitted Activities** - The activities and facilities like portable toilet blocks, grey water treatment plant, solar power plant, etc., would be permitted in the CRZ of the beaches, including islands.
- This would be subject to maintaining a minimum distance of 10 meters from the High Tide Line (HTL).
- These activities and facilities would be exempt from prior clearance under the provisions of CRZ Notification, Island Protection Zone Notification and Island Coastal Regulation Zone Notifications.

4.4 Stockholm Convention on Persistent Organic Pollutants

Union Cabinet has recently approved the ratification of seven chemicals listed under Stockholm Convention on Persistent Organic Pollutants (POPs).

- The Stockholm Convention is a global treaty to protect human health and the environment from POPs.
- The convention calls to ban 9 of the dirty dozen chemicals (key POPs), limit the use of DDT to malaria control, and curtail inadvertent production of dioxins and furans.

- The convention listed twelve distinct chemicals in three categories:
 1. **Eight pesticides** - Aldrin, Chlordane, DDT, Dieldrin, Endrin, Heptachlor, Mirex and Toxaphene.
 2. **Two industrial chemicals** - Poly chlorinated biphenyls and Hexachlorobenzene.
 3. **Two unintended by-products of many industrial processes** - Poly chlorinated dibenzo-p-dioxins and dibenzofurans. (Commonly referred to as dioxins and furans).
- The regulation inter alia prohibits the manufacture, trade, use, import and export of seven chemicals, namely
 1. Chlordecone,
 2. Hexabromobiphenyl,
 3. Hexabromodiphenyl ether and Hepta Bromodiphenyl Ether (Commercial octa-BDE),
 4. Tetrabromodiphenyl ether and Pentabromodiphenyl ether (Commercial penta-BDE),
 5. Pentachlorobenzene,
 6. Hexabromocyclododecane, and
 7. Hexachlorobutadiene.
- The Cabinet further delegated its powers to ratify chemicals under the Stockholm Convention to Union Ministries of External Affairs (MEA) and Environment, Forest and Climate Change (MEFCC) in respect of POPs for streamlining the procedure.
- The ratification process would enable India to access the Global Environment Facility (GEF) financial resources.

4.5 Paris Agreement

Though Paris Agreement is seen as a solution to all environmental problems, it has its own shortcomings.

- **Evolution of Climate Change Agreements** - The global cooperation in protecting of the planet was at peak between the time of the Stockholm Conference (1972) and the time of the Rio Conference (1992).
- At Stockholm conference, Former PM Indira Gandhi declared poverty as the biggest polluter.
- At Rio Conference, historic consensus arrived leading to the adoption of UNFCCC which balanced the right to development of the developing countries and the obligations of the developed countries.
- The developed countries had mandatory targets to cut down the emissions, the developed countries were allowed to increase & financial package was given to environment-friendly technologies in developing countries.
- At Berlin COP held in 1995, the developed countries backed off from their commitments & wanted to impose mandatory cuts on developing countries.
- In the Kyoto Protocol, developed countries were given targets but it was never ratified by the U.S.
- The Copenhagen Accord (2009) abandoned the spirit of the Rio principles & wanted voluntary GHG reduction targets.
- However, developing countries revolted & finally Paris Agreement was born out of Copenhagen and adopted in 2015.
- **Provisions in Paris Agreement** - For the first time it brought all nations into a common front to undertake ambitious efforts to combat climate change.
 - It requires all parties to put forward their nationally determined contributions (NDCs) which is voluntary in nature.
 - These targets has to be increased in the following years.
 - All the parties are required to report regularly on their emissions and their efforts to implement the reduction targets.
- **Issues with the Paris Agreement** - It repudiated the principles of 'common but differentiated responsibilities' and 'the polluter must pay'.

- There are no mandatory obligations for the developed countries to reduce GHGs.
- There is no penalty for not adhering to the targets.
- It only protected the lifestyles of industrialised nations by denying the developing countries their right to development.
- It did not add up to the limit of rise in global temperature 2°C -temperature required to live sustainably.
- Many scientists and environmentalists expressed disappointment when it was adopted, as the national and international actions envisaged under it were far below the optimum levels.
- According to IPCC report, at 1.5°C 70%-90% of coral reefs across the world would die & at 2°C, none would be left.
- Hence, a swift and complete transformative action is required not just from global economy but also from society too.
- It is possible if the world rejects nationalism and parochialism and adopts collaborative responses to the crisis.
- US is taking the first step which is evident from the fact that US President-elect laid out a clean energy and infrastructure plan, a commitment to return to the Paris Agreement, and a goal of net-zero emissions by 2050.
- **Nationally Determined Contributions** - NDCs are the accounts of the voluntary efforts to be made by countries as a part of Paris Agreement, to reduce greenhouse gas emissions and mitigate the impacts of anthropogenic climate change.
- The three quantitative goals in the Indian NDCs are:
 1. A 33-35% reduction in the gross domestic product emissions intensity by 2030 from 2005 levels
 2. A 40% share of non-fossil fuel based electricity by 2030
 3. Creating a carbon sink of 2.5-3 billion tonnes of carbon dioxide through afforestation programmes
- Apart from these, there are 5 non-quantitative goals in the Indian NDCs.
- The NDCs are to be implemented in the post-2020 period. India had submitted its NDCs in 2015.
- Now, the AIPA, with its 17 members, has the responsibility of formulating policies and programmes for implementing them.

4.6 AIPA

India has constituted the Apex Committee for the Implementation of the Paris Agreement (AIPA).

- The AIPA will have the secretary, Union Ministry of Environment, Forest and Climate Change as the chairperson.
- AIPA has been constituted with the purpose of ensuring a coordinated response on climate change matters that protects the country's interests.
- It will also ensure that India is on track towards meeting its climate change obligations under the Paris Agreement.
- It has the responsibility of regularly communicating and reporting the Nationally Determined Contributions (NDCs) to the UN Framework Convention on Climate Change (UNFCCC).
- It will define the responsibilities of the ministries that would be crucial in achieving the country's climate change mitigation and adaptation goals.
- The AIPA will also act as a national authority for the regulation of carbon markets in India under the Paris Agreement.

4.7 UN Biodiversity Summit

The first-ever UN Summit on Biodiversity was convened in New York.

- The theme of the Summit is "Urgent action on biodiversity for sustainable development."
- The Secretariat of the Convention on Biological Diversity and the United Nations Environment Programme (UNEP) assisted the President of the General Assembly in the preparation of the Summit.

- It takes place on the margins of the opening of the 75th session of the UN General Assembly.
- It was participated by Head of States/Minister level representing the countries which are party to Convention on Biological Diversity (CBD).
- It is expected to give momentum to the development and eventual adoption of an effective post 2020 global biodiversity framework at the Conference of the Parties to the Convention (COP 15) of CBD.
- The member-nations of the Convention on Biological Diversity (CBD) took note of the link between biodiversity loss and the spread of animal pathogens.
- They called for an end to destructive industrial and commercial practices.
- There is consensus that conservation targets set a decade ago in Aichi, Japan, to be achieved by 2020, have spectacularly failed.
- **India's Message** - At the summit, India's message was one of pride in an ancient conservation tradition, as one of the few mega diverse countries.
- India's message recognised the value of nature as much as the destructive impact of unregulated resources exploitation.

4.8 Rainforest Action Network - Leuser Ecosystem

Recently, an investigation by the global watchdog Rainforest Action Network (RAN) has shown that various food, cosmetics and finance companies have links with companies implicated in the destruction of the Leuser Ecosystem, a forest area on the island of Sumatra, Indonesia.

- Rainforest Action Network (RAN) is an environmental organization based in United States.
- Rainforest Action Network preserves forests, protects the climate and upholds human rights by challenging corporate power through frontline partnerships and strategic campaigns.
- RAN works toward a world where the rights and dignity of all communities are respected and where healthy forests, a stable climate and wild biodiversity are protected and celebrated.
- Leuser Ecosystem is among the most ancient and life-rich ecosystems ever documented by science and is a world-class hotspot of biodiversity and is widely acknowledged to be among the most important areas of intact rainforest left in all of Southeast Asia.
- The ecosystem has been designated a UNESCO World Heritage Site.
- The ecosystem stretches across the province of Aceh and North Sumatra, Indonesia.
- It spans 2.6 million hectares, almost three times the size of Yellowstone National Park, USA.
- Its diverse landscape includes lowland and montane rainforests and over 185,000 hectares of carbon-rich peatlands.
- Montane rainforests, also called cloud forests, are vegetation of tropical mountainous regions in which the rainfall is often heavy and persistent condensation occurs because of cooling of moisture-laden air currents deflected upward by the mountains.
- **Report** - 75% of the world's remaining population of the Sumatran orangutan is found in the ecosystem.
- These ecosystems plays an outside role regulating the global climate by storing massive amounts of carbon in its peatlands and standing forests.
- **Peatlands** are wet, carbon-rich areas that have formed through thousands of years of undecomposed leaf litter and organic material accumulation.
- When these areas are drained and the peat is exposed to air, it begins to oxidize and releases large amounts of carbon dioxide emissions into the atmosphere.

5. GOVERNMENT INTERVENTIONS

5.1 Draft EIA Notification, 2020

The government has put up for public consideration and comment the Draft Environmental Impact Assessment (EIA) Notification, 2020, which is seen as an attempt to weaken environmental regulation and silence the affected communities.

- **History** - The EIA regulation was first introduced in 1994 through a notification under the Environmental Protection Act, 1986.
- It was significantly amended in 2006, superseding the 1994 notification.
- The draft EIA 2020 notification is an attempt to remake many provisions of the 2006 notification.
- **EIA Process** – It scrutinises the potential environmental impact of a project
- It looks into the negative externalities of a proposed project i.e. before commencement.
- It then determines whether it can be carried out in the form proposed, or whether it is to be abandoned or modified.
- The assessment is carried out by an Expert Appraisal Committee (EAC).
- The EAC consists of scientists and project management experts.
- The EAC frames the scope of the EIA study and a preliminary report is prepared.
- The report is published, and a public consultation process takes place.
- During consultation, objections can be heard including from project-affected people.
- The EAC can then make a final appraisal of the project.
- It is then forwarded to the regulatory authority, which is the Ministry of Environment and Forests (MoEF).
- The regulatory authority is ordinarily obliged to accept the decision of the EAC.
- The basis in global environmental law for the EIA is the “precautionary principle”.
- Environmental harm is often irreparable.
- It is thus cheaper to avoid damage to the environment than to remedy it.
- Various international environmental treaties and obligations as well as Supreme Court judgments are based on this principle.
- Environmental regulation must balance damage to the environment with sustainable development and possible benefits of a project.
- In this line, any project that involves environmental factors needs an unbiased assessment made on a precautionary basis.
- It is with this idea that the Environmental Impact Assessment is carried out.
- However, industries and business interests have long regarded EIA as a constraint to them.
- **Concerns with recent notification** - The stated reason is to streamline the EIA process and bring it in line with recent judgments.
- If put into force, the EIA Notification, 2020 will replace the EIA Notification, 2006 for all future projects.
- But the Draft EIA Notification dilutes the effectiveness of the process, and shrinks its scope.





- The draft has laid out a process that violators should follow in order to continue their operations legally.
- The Appraisal Committee would assess whether the project can be run sustainably under compliance of environmental norms with adequate environmental safeguards.
- If the answer is no, it can recommend closure of the project.
- If the answer is yes, it will require the project proponent to assess the ecological damage and prepare a remediation plan.
- It will want the project proponent to prepare a ‘natural and community resource augmentation plan’, along with an EIA report.
- The project proponent is needed to submit a bank guarantee, equivalent to the cost of the remediation plan, prior to receiving an environmental clearance.
- In addition, there are monetary penalties specified for each day the violation occurs.
- **Clause 22** of the draft sets out a process for **post-hoc legalisation** of projects that start construction and/or operation prior to receiving an environmental clearance.
- Under this, the project proponent can enter an assessment procedure, with some minor fines for the violations.
- In other words, it offers a route when an EIA clearance is not sought or granted, and the construction of the project had taken place.
- Where such ex-post-facto clearances were being granted previously, the courts cracked down on them as illegal.
- Therefore, what could not be ratified will now find itself notified.
- The legality of sidestepping the courts is questionable and will have to be tested.
- According to Clause 22, only the violators themselves or a regulatory or governmental authority can bring the violation to notice.
- It is not clear from the notification if any other stakeholders, like interested individuals, have a legal basis to report violations.
- In essence, the EIA would become a business decision as to whether the law needs to be followed or the violation can be “managed”.
- The argument that this route will be an “exception” is difficult, given the long history of expanding the exception into the rule.
- The draft notification also shortens the time for the public to furnish responses on the project.
- The project-affected people are frequently forest dwellers.
- For these and others who do not have access to information and technology, this will make it harder to put forth representations.
- Monitoring requirements have also been relaxed.
- The draft EIA notification halves the frequency of reporting requirements from every 6 months to once a year.
- It also extends the validity period for approvals in critical sectors such as mining.
- The scope of the EIA regime is also set to shrink.
- Industries that previously fell under the categories that required a full assessment have been downgraded.
- The construction industry will be one such beneficiary, where only the largest projects will be scrutinised fully.
- Defence and national security installations were always understandably exempt.
- But, a vague new category of projects “involving other strategic considerations” will also now be free from public consultation requirements.



5.2 Environmental Appraisal

- Recently Ministry of Environment and Forests (MoEF) issued fresh guidelines to accelerate environment appraisal of industrial projects.
- Environmental appraisals, as per norms, are conducted by independent panels of experts that have representatives from the government as well as from outside, trained in matters of ecology, wildlife and habitat preservation.
- The Expert Appraisal Committees opine on whether a proposed project beyond a certain size ought to be commissioned and recommend ways to mitigate the potential environmental impact.
- Their advice is critical to the MoEF's eventual decision to either clear or red flag a project.
- There are separate EAC committees for industrial projects, coal mining, non-coal mining, river and hydroelectric projects, each with its own independent chairperson and committee members.
- However, several members have full-time jobs independent of their commitments to EAC meetings.

5.3 Genetically Modified Seeds

The farmers' union Shetkari Sanghatana (Maharashtra) announced fresh plans in its agitation for use of genetically modified seeds.

- Conventional plant breeding involves crossing species of the same genus to provide the offspring with the desired traits of both parents.
- Genetic engineering aims to transcend the genus barrier by introducing an alien gene in the seeds to get the desired effects.
- The alien gene could be from a plant, an animal or even a soil bacterium.
- **Bt cotton** - It is the only GM crop that is allowed in India.
- It has two alien genes from the soil bacterium *Bacillus thuringiensis* (Bt) that allows the crop to develop a protein toxic to the pest pink bollworm.
- **Ht Btcotton** - It is derived with the insertion of an additional gene, from another soil bacterium.
- This allows the plant to resist the common herbicide glyphosate.
- **Bt Brinjal** - In this, a gene allows the plant to resist attacks of fruit and shoot borer.
- **DMH-11 mustard** - It was developed in University of Delhi.
- In this, genetic modification allows cross-pollination in a crop that self-pollinates in nature.
- Globally, GM variants of maize, canola and soya bean are available.
- **Legal position** - In India, the Genetic Engineering Appraisal Committee (GEAC) is the apex body that allows for commercial release of GM crops.
- In 2002, the GEAC had allowed the commercial release of Bt cotton.
- More than 95% of the country's cotton area has since then come under Bt cotton.
- Use of the unapproved GM variant can attract a jail term of 5 years and fine of Rs 1 lakh under the Environmental Protection Act, 1989. **Cotton** - In the case of cotton, farmers cite the high cost of weeding.
- This cost goes down considerably if they grow Ht Bt cotton and use glyphosate against weeds.
- **Brinjal** - Brinjal growers in Haryana have rooted for Bt brinjal.
- This is because it reduces the cost of production by cutting down on the use of pesticides.
- Problem - **Unauthorised crops** are widely used.
- Of the 4-4.5 crore packets (each weighing 400 g) of cotton sold in the country, 50 lakh are of the unapproved Ht Bt cotton.
- Haryana has reported farmers growing Bt brinjal in pockets which had caused a major agitation there.

- Environmentalists argue that the **long-lasting effect of GM crops** is yet to be studied and thus they should not be released commercially.
- Genetic modification brings about changes that can be harmful to humans in the long run.

5.4 Guidelines on Exotic Animals

The Environment Ministry's wildlife division has introduced new rules to regulate the import and export of 'exotic wildlife species'.

- The term exotic does not have a set definition but it usually refers to a wild animal or one that is more unusual and rare than normal domesticated pets like cats or dogs.
- These are those species which are not usually native to an area and are introduced to an area by humans.
- Many exotic species of birds, reptiles and amphibians are imported into India for commercial purposes.
- Recently, the Ministry of Environment, Forest and Climate Change has issued an advisory to streamline and formalize the process of importing live exotic animals.
- Currently, it is the Directorate-General of Foreign Trade, Ministry of Commerce that oversees such trade.
- The major reason for issuing the advisory is to regulate trade because the issue of zoonotic diseases is linked to wildlife.
- With this advisory, it will be known how many such exotic animals are there in the country.
- **New rules** – 'Exotic live species' will mean animals named under Appendices I, II and III of the Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora.
- It will not include species from the Schedules of the Wild Life (Protection) Act, 1972.
- Owners and possessors of such animals and birds must also register their stock with the Chief Wildlife Warden of their States.
- Officials of the Wildlife Department will also prepare an inventory of such species and have the right to inspect the facilities of such traders to check if these plants and animals are being housed in salubrious conditions.
- A person trying to import a live exotic animal will have to submit an application for grant of a license to the Director-General of Foreign Trade (DGFT), under the Ministry of Commerce and Industry.
- Earlier, these imports were happening through the DGFT but they were beyond the purview of the forest departments and the chief wildlife wardens were not aware of them.
- The importer will also have to attach a No Objection Certificate (NOC) of the chief wildlife warden of the state concerned along with the application.
- For those people who have already imported exotic animals, a declaration will have to be made within six months.
- However, if the declaration is made after six months, documents related to the provenance of the animal will have to be submitted.
- Being an advisory, it does not have the force of law and can potentially incentivize illegal trade by offering a long amnesty period.

5.5 Decarbonizing Transport in India

NITI Aayog and International Transport Forum (ITF) will collaborate to launch a new online project called 'Decarbonizing Transport in India'.

- It is to chart out a path for a low-carbon transport system in the country.
- It will offer an opportunity to provide inputs for transport challenges and their relation to CO₂ reduction in the country.
- The project will include designing a transport emissions assessment framework for India, providing the government with a detailed understanding of transport activities and CO₂ emissions as a basis for decision-making.

- It is a part of the ITF's DTEE (Decarbonizing Transport in Emerging Economies) series of projects.
- DTEEs aimed at lowering carbon emissions across different regions in the world.
- The current participants in the initiative are India, Argentina, Azerbaijan, and Morocco.

5.6 All India Tiger Estimation

- All India Tiger Estimation 2018 has entered the Guinness World Record for being the world's largest camera trap wildlife survey.
- The fourth iteration of the survey, conducted in 2018-19 was the most comprehensive to date, in terms of both resource and data amassed.
- According to the report of 2018, India now has an estimated 2967 tigers out of which 2461 individual tigers have been photo captured, about 83 % of the tiger population.
- With this number, India is home to nearly 75% of the global tiger population.
- India has already fulfilled its resolve of doubling tiger numbers, made at St. Petersburg in 2010, much before the target year of 2022.
- The All India Tiger Estimation done every four year once, It is
 1. Steered by the National Tiger Conservation Authority
 2. Technically supported by Wildlife Institute of India
 3. Implemented by State Forest Departments and partners.

5.7 Status of Tigers in India Report

- Ministry of Environment, Forest and Climate Change has released a detailed 'Status of Tigers, Co-predators and Prey in India (2018) Report' on the eve of the Global Tiger Day (29th July).
- The report compares information obtained from the earlier three tiger surveys (2006, 2010, and 2014) with data obtained from the 2018-19 survey to estimate tiger population trends at country level.
- India's Project Tiger was launched in 1973 with 9 tiger reserves.
- India has 70% of the world's tiger population, it is tirelessly working with all 13 tiger range countries towards nurturing the tiger.

Highlights of the Report

- The national tiger status assessment of 2018-19 estimated the overall tiger population in India at 2,967 - 33% increase from 2014 (2,226).
- Tigers were observed to be increasing at a rate of 6% per annum in India from 2006 to 2018.
- Uttarakhand's Corbett Tiger Reserve (CTR) has reported the highest tiger density among India's 50 reserves with 14 tigers per 100 sq km, followed by Kaziranga, Nagarhole and Orang tiger reserves.
- Madhya Pradesh has the highest number of tigers at 526, closely followed by Karnataka (524) and Uttarakhand (442).
- The Northeast has suffered losses in population.
- Further, the tiger status in Chhattisgarh, Jharkhand and Odisha has steadily declined, which is a matter of concern.
- With 2,967 tigers, India is four years in advance, has achieved the target set in the 2010 St Petersburg Declaration of doubling tiger population by 2022.

5.8 Conservation Assured | Tiger Standards [CA|TS]

- CA|TS is a conservation tool developed in 2013, in collaboration with field managers, tiger experts and government agencies engaged in tiger conservation.



- It sets best practice and standards to manage target species, and encourages assessments to benchmark progress.
- Tigers are the first species selected for the initiative.
- CA|TS is being adopted for use beyond tigers, including potentially jaguars, lions and freshwater dolphins.
- CA|TS is a partnership of tiger range governments, inter-governmental agencies, institutions, NGOs and conservation organizations.
- WWF is helping tiger range countries to implement CA|TS.
- National Tiger Conservation Authority (NTCA) announced the adoption of the across all of the country's 50 Tiger Reserves.
- These 50 Tiger Reserves are spread across 18 states containing over 70% of the world's tiger population.
- By this India becomes first among the 13 tiger range countries to nationally adopt CA|TS.
- This brings India's total number of registered sites to 94 (which includes sites outside the Tiger Reserves).
- This announcement further strengthens India's contribution to the global goal set in 2010 to double the number tigers in the wild, known as TX2.

5.9 Source - Sink Dynamics & Tiger Population

- Source–sink dynamics is a theoretical model used by ecologists to describe how variation in habitat quality may affect the population growth or decline of organisms.
- In this model, organisms occupy two patches of habitat.
 1. Source, is a high-quality habitat that on average allows the population to increase.
 2. Sink, is very low-quality habitat that, on its own, would not be able to support a population.
- However, if the excess of individuals produced in the source frequently moves to the sink, the sink population can persist indefinitely.
- The tiger survey has highlighted that the tiger population in the source-sink is in the ratio of 60:40.
- 33% of the tiger population in India lives outside its source i.e, tiger reserves.
- 17/50 tiger reserves in India are going to achieve its maximum capacity to hold the tiger populations.
- Tiger survey suggested that there is a need to create buffer areas around the habitat zones of tigers where guided land-use and faster conservation interventions can help reduce human-tiger conflict.

Ecological Trap

- Ecological trap theory describes the reasons why organisms may actually prefer sink patches over source patches.
- The concept stems from the idea that organisms that are actively selecting habitat must rely on environmental cues to help them identify high-quality habitat.
- If either the habitat quality or the cue changes so that one does not reliably indicate the other, organisms may be lured into poor-quality habitat.
- It thought to occur when the attractiveness of a habitat increases disproportionately in relation to its value for survival and reproduction.
- The result is preference of falsely attractive habitat and a general avoidance of high-quality but less-attractive habitats.

5.10 Bhagirathi Eco-Sensitive Zone

Recently MoEF&CC has approved Zonal Master Plan (ZMP) of Bhagirathi Eco-Sensitive Zone.

- Bhagirathi is the source stream of Ganga, It emanates from Gangotri glacier at Gaumukh at an elevation of 3,892 m.



- Bhagirathi Eco Sensitive Zone extends from Gaumukh to Uttarakashi covering an area of 4179.59 sq. kilometer.
- The Bhagirathi Eco-Sensitive Zone notification was issued by the Ministry of Environment, Forest and Climate Change (MoEF&CC) in 2012.
- The notification was subsequently amended on 16th April, 2018 in consultation with the
 1. Ministry of Road, Transport and Highways.
 2. Government of Uttarakhand
 3. Indian Road Congress.
- The Bhagirathi Eco-Sensitive Zone notification mandated the State Government of Uttarakhand to prepare Zonal Master Plan (ZMP) to be implemented under the supervision of the Monitoring Committee.
- The ZMP is based on watershed approach and includes governance in the area of forest and wildlife, watershed management, irrigation, energy, tourism, public health and sanitation, road infrastructure, etc.
- It aims to safe guard local people without affecting their rights and privileges and also ensuring eco-friendly development for their livelihood security.

5.11 BIS' Draft Standard

The Bureau of Indian Standards (BIS) has prepared a draft standard for the supply system of piped drinking water.

- The draft is labelled as 'Drinking water supply quality management system - requirements for piped drinking water supply service'.
- It has been prepared by the BIS' Public Drinking Water Supply Services Sectional Committee.
- It has been developed keeping in view the Centre's Jal Jeevan Mission.
- Jal Jeevan Mission wants to provide safe and adequate drinking water to all rural households by 2024 through tap connections.
- The draft **outlines the process of water supply**, from raw water sources to household taps.
- The standard is expected to make the process of piped water supply more uniform, especially in rural and underdeveloped areas of the country.
- At present, the standard is not expected to be made mandatory.
- After the draft is notified, states or water utilities planning to implement the standard can approach BIS for a license.
- It **outlines the requirements** for a water supplier or utility.
- These requirements are regarding how they should establish, operate, maintain and improve their piped drinking water supply service.
- The process begins with identification of a water source.
- The source can either be groundwater or surface water sources such as rivers, streams or reservoirs.
- It states that after treating, the drinking water should conform to the BIS' Indian Standard (IS) 10500.
- [IS 10500 outlines the acceptable limit of various substances in drinking water, like heavy metals such as arsenic.
- It also sets the limits on parameters like the pH value of water, its turbidity, the total dissolved solids in it, and the colour and odour.]
- The draft standard also contains **guidelines for top management** of the water utility.
- These guidelines are in terms of accountability and customer focus, establishing a quality policy for their service, monitoring the quality of water released to people, and conducting a water audit.
- **Source Identification** - The supply system as outlined in the draft should begin with the identification of a raw water source.



- Water should then be pumped into the treatment plant and treated to achieve the acceptable drinking standards.
- After the water is released from the plant, there should be,
 1. Reservoirs in the distribution system for storage of this water, and
 2. Disinfection facilities to get rid of contamination at any stage of distribution.
- **Accessories** - The draft says that, if necessary, the pumping stations could be provided with accessories shall be installed throughout the distribution system.
- These accessories shall be used as control devices and for water audit.
- **Automation** - The draft reads that the emphasis should be given to operate the systems on automation mode.
- **DMA** - The document also states that the concept of district metering area (DMA) should be adopted where possible.
- DMA would control the leakages in the water network, which is divided into a number of sectors.
- Here, flow meters are installed to detect leaks.
- **Water audit** - The water supplier/utility may provide bulk water meters in the water distribution system to ensure water audit.
- However, the provisions should be made for domestic meters also.
- It shall ensure that the consumers do not have direct access to the meters to avoid possible tampering of the meters.
- It reads that the provision should be made to have automatic meters at household level which shall support in water audit.
- **Quality assurance** - The draft mentions that water should be sampled at the treatment plant every four hours against quality parameters.
- In the distribution system, the sampling should be done every 8 hours at the water reservoirs. Random sampling should also be done at household levels.
- It states that a water audit should be conducted on a quarterly basis.
- [Water audit is a calculation of the amount of water put into distribution against the amount that is consumed.]
- It says that effort should be made by the water agency to bring down the water loss up to 15% of the total water supplied in the system.
- The water utilities are required to conduct surveys among consumers and obtain feedback on their service as per the draft.

5.12 Section 5 of Environment Protection Act

- Section 5 of the Environment Protection Act that allows the Centre to shut down industrial units that grossly violate the law.
- **Violation Committee Rules of MoEFCC** - These rules allow industrial projects in violation of environmental laws to apply to a special panel of experts called the 'Violations Committee' of the MoEFCC, provided they meet certain criteria and make appropriate modifications become compliant operations.
- The Union Ministry of Environment, Forests and Climate Change ordered closure of the LG Polymers plant in Vishakapatnam, Andhra Pradesh.
- The ministry has also sought updated information on whether the company had abided by the MSIHC rules by MoEFCC.
- Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules, 1989 prescribe how hazardous and industrial chemicals ought to be stored.
- From LG Polymers plant styrene gas leaked on May 17, 2020.



- The chemical factory had been working since 1997 without appropriate clearances and had applied for clearance, in 2018, under rules made by the MoEFCC itself.
- LG Polymers had applied to violation committee and its case was under consideration.

5.13 Aarey Forest land

- Maharashtra Chief Minister designated a 600-acre parcel of land in Aarey Milk Colony, the heart of urban Mumbai as a reserved forest.
- The Aarey Milk Colony was established in 1949 as a center for processing and marketing milk for Mumbai and adjoining areas.
- It is spread over 3,162 acres, a part of the sprawling western suburb known as Goregaon.
- The land falls under the eco-sensitive zone of the Sanjay Gandhi National Park.
- Under new announcement only 600 acres will be earmarked as forest out of 1,800-plus acres of open space available.

Indian Forest Act, 1927

- Under Section 4 of The Indian Forest Act, 1927, the state government can “constitute any land a reserved forest” by issuing a notification in the Official Gazette.
- Under the law, the government must also appoint a Forest Settlement Officer (FSO) “to determine the rights alleged to exist in favor of any person in or over any land comprised within such limits or in or over any forest-produce, and to deal with the same”.

5.14 Net Present Value (NPV)

- Net Present Value (NPV) is a mandatory one-time payment that a user has to make for diverting forestland for non-forest use, under the Forest (Conservation) Act, 1980.
- It is calculated on the basis of the services and ecological value of the forests.
- It depends on the location and nature of the forest and the type of industrial enterprise that will replace a particular parcel of forest.
- These payments go to the Compensatory Afforestation Fund (CAF) and are used for afforestation and reforestation.
- The CAF is managed by the Compensatory Afforestation Management and Planning Authority (CAMPA).
- The Forest Advisory Committee (statutory body) constituted by the Ministry of Environment, Forest and Climate Change (MoEF&CC) decides on whether forests can be diverted for projects and the NPV to be charged.
- Some projects have been provided exemption from paying NPV like
 - (i) Construction of Schools,
 - (ii) Hospitals,
 - (iii) Village tanks,
 - (iv) Laying down of optical fiber etc.
- Projects like underground mining and wind energy plants have been given a 50% exemption from NPV.
- Recently Ministry of Mines has requested the Forest Advisory Committee to exempt digging exploratory boreholes from Net Present Value (NPV).

Exploratory Boreholes

- An exploratory borehole is drilled for the purpose of identifying the characteristics, location, quantity and quality of a resource (coal, metal or petroleum).
- It is a part of prospecting a site for future use for mining and extraction activities.

5.15 Forest Rights Act in J&K

J&K government's decision to implement the Forest Rights Act is a cause of concern.

- Forest Rights Act provides Adivasis access and ownership rights, forest-based livelihood rights, and minor forest produce rights.
- The forest rights committees will assess the nature and extent of rights being claimed at the village-level.
- Subsequently, these claims would be scrutinised by the sub-divisional committees which will then prepare a record of forest rights.

- District-Level Committees will give the final approval and grant forest rights.
- On October 31, the J&K governments decided to declare **State Land (Vesting of Ownership to the Occupants) Act, 2001**, also known as the **Roshni Act**, null and void.
- This Act was struck down due to the questionable transfer of ownership of state land to many influential people, including Ministers, legislators, bureaucrats, and police officers.
- But some say that it provided ownership rights to many poor, landless Adivasis & now the land will be retrieved from them.
- In case of J&K, there is no cut-off date mentioned in the FRA unlike rest of India, where the act provides recognition of forest rights to forest dwellers who had occupied forest land before December 13, 2005.
- Without a cut-off date & declaring the **Roshni Act** null and void, will lead to forceful evictions & tribal families will not benefit from the implementation of the FRA.
- In the last few weeks, there was intensified eviction and demolition drives against nomads without any rehabilitation plans in place.
- Moreover, Adivasis largely depend on non-tribal leadership to represent their issues and demands as they lack of political reservation leading to further marginalisation.

5.16 National Bamboo Mission

- The restructured NBM was launched in 2018-19 for the holistic development of the complete value chain of the bamboo sector and is being implemented in a hub (industry) and spoke model.
- It aims to connect farmers to markets so as to enable farmer producers to get a ready market for the bamboo grown and to increase the supply of appropriate raw material to the domestic industry.
- The Sector Skill Councils established under the National Skill Development Agency (NSDA) will impart skills and recognition of prior learning to traditional artisans, encouraging the youth to carry forward their family traditions.
- NBM also supports local artisans through locally grown bamboo species, which will actualize the goal of Vocal for Local and help increase the income of farmers, reducing dependency on imports of raw material.
- Recently Union Minister for Agriculture and Farmers' Welfare has virtually inaugurated 22 bamboo clusters.
- The bamboo clusters has been inaugurated in 9 states viz. Gujarat, Madhya Pradesh, Maharashtra, Odisha, Assam, Nagaland, Tripura, Uttarakhand and Karnataka.

Indian Forest Act & Bamboo cultivation

- The Indian Forest Act 1927 was amended in 2017 to remove bamboo for the category of trees.
- As a result, anyone can undertake cultivation and business in bamboo and its products without the need of a felling and transit permission.
- Import policy has also been modified to ensure the progress of the bamboo industry in the country

5.17 BEAMS

- On the lines of Blue Flag certification, Recently India has also launched its own eco-label BEAMS.
- BEAMS (Beach Environment & Aesthetics Management Services) is launched under ICZM (Integrated Coastal Zone Management) project.
- This is launched by the Society of Integrated Coastal Management (SICOM) and the Union Ministry of Environment, Forest and Climate Change (MoEFCC).
- The objectives of BEAMS program are as follows:
 1. Abate pollution in coastal waters,
 2. Promote sustainable development of beach facilities,
 3. Protect & conserve coastal ecosystems & natural resources,
 4. Strive and maintain high standards of cleanliness,
 5. Hygiene & safety for beachgoers in accordance with coastal environment & regulations.

- This program promotes beach recreation in absolute harmony with nature.

5.18 Initiatives Launched on G20 EMM

- G20 Environment Ministers Meeting (EMM) was held under the Presidency of the Kingdom of Saudi Arabia recently.
- Following Initiatives has been launched
 1. **Global initiatives to reduce Land Degradation** - It aims to strengthen the implementation of existing frameworks to prevent, halt, and reverse land degradation within G20 member states.
 2. **Coral Reef Programme** - It is an innovative action-oriented initiative aimed at creating a global research and development programme to advance research in all facets of coral reef conservation, restoration and adaptation.
 3. Documents on managing emissions and climate change adaptations.

5.19 Buldhana Pattern

- 'Buldhana Pattern' of water conservation' has won national recognition, NITI Aayog is in the process of formulating National Policy on water conservation based on it.
- It is based on the synchronization of national highway construction and water conservation.
- It was achieved for the first time in Buldana district of drought-prone Vidarbha region, (Maharashtra) by using soil from the water bodies, nallas and rivers.
- This leads to the increase in capacity of water storage across the water-bodies and it came to be known as 'Buldhana Pattern'.
- Creation of State Water Grid and adopting water Conservations works under this pattern will increase the agriculture production.
- With this activity 225 lakh cubic metre of soil was used in National Highway construction and the resultant widening / deepening resulted in increase of 22,500 Thousand Cubic Metre (TMC) of water storage capacity with no cost to state government.

5.20 Green Strategic Partnership

India and the Kingdom of Denmark have launched the Green Strategic Partnership for delivering sustainable solutions to India.

- The Partnership will focus on expanding economic ties, green growth, and cooperation on global challenges such as climate change.
- Green growth is a term to describe a path of economic growth that uses natural resources in a sustainable manner.
- Highlights of the deal are as follows
 1. Danish companies with niche technologies and expertise have offered to help India in meeting its air pollution control targets, including in the key area of tackling the problem of burning crop stubble.
 2. Other key points under the partnership include dealing with the Covid-19 pandemic and cooperation in water efficiency and water loss.
 3. The creation of India-Denmark energy parks in areas with large numbers of Danish firms and an India-Denmark skill institute to train Indian manpower has been proposed.
 4. The Green Strategic Partnership will build on an existing Joint Commission for Cooperation and existing joint working groups.

5.21 Project Lion

Project Lion was launched on 15th August, 2020, on the lines of Project Tiger and Project Elephant.



- The programme has been launched for the conservation of the Asiatic Lion, whose last remaining wild population is in Gujarat's Asiatic Lion Landscape (ALL).
- The Wildlife Institute of India, along with the Gujarat Forest Department, had created a Project Lion proposal.
- Under the proposal six new sites has identified for possible lion relocation in the future include:
 1. Madhav National Park, Madhya Pradesh
 2. Sitamata Wildlife Sanctuary, Rajasthan
 3. Mukundra Hills Tiger Reserve, Rajasthan
 4. Gandhi Sagar Wildlife Sanctuary, Madhya Pradesh
 5. Kumbhalgarh Wildlife Sanctuary, Rajasthan
 6. Jessore-Balaram Ambaji WLS and adjoining landscape, Gujarat
- The proposal sought to create free-ranging lion populations within Gujarat and in other states to counter this problem.
- Currently, the only free-ranging population of about 674 Asiatic lions exists in Gir National Park and Sanctuary and covers 8 districts of Gujarat, including Junagadh, Amreli, Bhavnagar, Porbandar, Rajkot, Gir-Somnath, Botad and Jamnagar.
- Asiatic Lion is listed in Schedule I of Wildlife (Protection) Act 1972, in Appendix I of CITES and as Endangered on IUCN Red List.

Kuno-Palpur Wildlife Sanctuary

- Kuno National Park is a protected area in Madhya Pradesh that received the status of national park in 2018.
- The protected area was established in 1981 as a wildlife sanctuary.
- It is in the Khathiar-Gir dry deciduous forests ecoregion.
- Union government has chosen this place for translocating Asiatic Lions and re-introduction of African Cheetas.

5.22 Vulture Action Plan 2020-25

Recently, the Union Minister for Environment, Forests and Climate Change has launched a Vulture Action Plan 2020-25.

- Conservation project for vultures is being carried out by the MoEFCC since 2006, and the plan is to now extend the project to 2025.
- The action plan was launched after, DCGI banning the veterinary use of diclofenac in the same year and the decline of the vulture population being arrested by 2011.
- Diclofenac is a veterinary non-steroidal anti-inflammatory drug (NSAID) used to treat pain and inflammatory diseases such as gout.
- The action plan aims to carry forth what has already been set in motion by ensuring that sale of veterinary NSAIDs is regulated and livestock are treated only by qualified veterinarians.
- The four rescue centres have been proposed for treatment of vultures in the country different geographical areas like
 1. Pinjore in the north,
 2. Bhopal in Central India,
 3. Guwahati in Northeast
 4. Hyderabad in South India.
- Under the 2020-25 plan, the ministry will also work for conservation breeding programme of Red Headed Vulture and Egyptian Vulture.
- The action plan will also help states in establishing at least one 'Vulture Safe Zone' in each state for the conservation of the remnant population.

Vultures in India

There are nine recorded species of vultures in India, they are

1. Oriental white-backed - Critically Endangered (IUCN)
2. Long-billed - Critically Endangered
3. Slender-billed - Critically Endangered
4. Red-headed - Critically Endangered
5. Egyptian - Endangered
6. Himalayan Griffon - Near Threatened
7. Bearded Griffon - Near Threatened
8. Cinereous Griffon - Near Threatened
9. Indian Griffon - Near Threatened



5.23 NMR Test for Honey

- Nuclear Magnetic Resonance (NMR) can ascertain the composition of a product at the molecular level.
- The Centre for Science and Environment (CSE) researchers subjected 13 brands of raw and processed honey to NMR tests, only 3 passed.
- The NMR test, a key test of purity, is not required by Indian law for honey that is being marketed locally but is needed for export.
- The CSE also said some Indian companies were importing synthetic sugar syrups from China to adulterate honey.
- These were capable of passing off as honey, even up to half of which were mixed with sugar, as 'pure honey'.
- Now, among the tests employed as per Indian regulations is one to check whether the honey is adulterated with C4 sugar (cane sugar) or C3 sugar (rice sugar).

Testing of Honey

- Honey is a complex of the fructose, glucose and sucrose sugars. Honey is classified as,
 1. 'Blossom' or 'Nectar Honey', which comes from nectar of plants, or
 2. 'Honeydew', which comes from excretions of plant-sucking insects (Hemiptera) on the living parts of plants.
- Honey has a relatively high fructose content, which is why it is sweeter than commercial sugar, which is heavier on sucrose.
- There are purity tests which determine the acceptable ratios of these sugars and tolerance limits of certain chemical contents i.e., impurities.
- There is also a tolerance for 'ash' content and HMF (hydroxyl methyl furfural), which forms when honey is heated. HMF is toxic for bees.
- Then, there are minimal levels of pollen count and foreign oligosaccharides that a quantity of honey must have.
- In all, there are 18 parameters for a product to be certified as honey.
- The most common tests that determine if sugar from corn, sugarcane or rice was used to adulterate honey are C4 and C3 tests.
- To know more, click [here](#).

5.24 Ethanol Blended Petrol

- Indian government has proposed the adoption of E20 fuel for vehicular use to curb vehicle emissions and reduce the country's oil import bill. Currently, only 10% of ethanol blend is permissible in India.
- E20 is a blend of 20% ethanol with gasoline (petrol) and can be used as an alternative to the fuels currently available.
- Ethanol is a common by-product that comes from agricultural feedstock like corn, hemp, potato, etc.
- It can be used as a bio-fuel in Flexi-fuel vehicles.
- Ethanol is greener than gasoline because the corn and crop plantations absorb CO₂ from the atmosphere as they grow.
- However, ethanol is less efficient as a fuel. It has lower energy content than energy-rich gasoline and diesel.
- The rule delivers less power when burned, which in return results in more fuel consumption and lower mileage.
- Also, blends over E15 (15% ethanol) is highly corrosive for older vehicles as the alcohol can break down old rubber seals and can damage engines.



5.25 Firefly Bird Diverters

- Ministry of Environment Forest and Climate Change and the Wildlife Conservation Society (WCS) India has installed firefly bird diverters to conserve Great Indian Bustard (GIB) populations found in the wild.
- The selected stretch is opposite the Pokhran Field Firing Range, which offers a safe habitat to a breeding population of GIBs outside the Desert National Park Sanctuary in Jaisalmer.
- **Firefly bird diverters** are flaps installed on power lines that work as reflectors for bird species.
- Birds can spot them from a distance of about 50 meters and change their path of flight to avoid collision with power lines.
- This diverter model has been endorsed by the International Union for Conservation of Nature (IUCN) Species Survival Commission's (SSC) Bustard Specialist Group.
- To know more about GIB, [click here](#).

5.26 iCommit Initiative

Recently, the iCommit initiative was launched on the occasion of the World Environment day (5th June).

- The initiative is driven by Energy Efficiency Services Limited (EESL), under the administration of the Ministry of Power, Government of India.
- iCommit initiative is centred around the idea of building an energy resilient future.
- It is a clarion call to all stakeholders and individuals to continue moving towards energy efficiency, renewable energy, and sustainability to create a robust and resilient energy system in the future.
- The prerequisite for this goal is to create a flexible and agile power system.
- A healthy power sector can help the nation in meeting the objective of energy access and security for all.
- It seeks to bring together a diverse spectrum of government and private players to build a new energy future for India.

5.27 Healthy and Energy Efficient Buildings

- The Energy Efficiency Services Limited (EESL), in partnership with the U.S. Agency for International Development's (USAID) MAITREE program, launched the "Healthy and Energy Efficient Buildings" initiative that will pioneer ways to make workplaces healthier and greener.
- The initiative was launched on the occasion of the World Environment day (5th June).
- This initiative is to address the challenges of retrofitting existing buildings and air conditioning systems so that they are both healthy and energy efficient.
- The initiative, implemented by the EESL in its office, will pave the way for other buildings to take appropriate steps to be healthy and energy efficient.
- This will help in developing specifications for future use in other buildings throughout the country, as well as aid in evaluating the effectiveness and cost benefits of various technologies and their short and long-term impacts on air quality, comfort, and energy use.
- Energy Efficiency Services Limited (EESL) is under the administration of the Ministry of Power, Government of India.

5.28 Time Stamped Card System

- Recently, the Karnataka Forest Department has decided to put in place a traffic monitoring mechanism along the roads adjacent to Nagarahole National Park.
- The forest department will introduce a time-stamped card system for vehicles passing through the roads, adjacent to Nagarahole National Park, which have high traffic density 24x7.
- The time stamped card will have complete details on the speed limit to be maintained and the exit time at the next check post.
- Such a system is already in place on the road cutting through Nagarahole Tiger Reserve.

- It will help ensure that motorists don't stop midway and litter the area or cause disturbance to wildlife.
- It will also ensure better compliance of forest laws by motorists and will also minimize road kills.

5.29 Kaleshwaram project

The National Green Tribunal (NGT) wants a relook at Kaleshwaram project.

- The Kaleshwaram Lift Irrigation System is considered to be one of the world's largest multi-purpose projects.
- Kaleshwaram is a town on Godavari right bank about 300 km downstream of major dam, Sriram Sagar project (SRSP).
- At Kaleshwaram, the major tributary Pranahita, which merges with Godavari brings large quantity of water, the place is also known as Sangam and Dakshin Ganga.
- The project is unique as Telangana will harness water at the confluence of two rivers with Godavari by constructing a barrage at Medigadda.
- The water will be reverse pumped into the main Godavari River.
- From here, it will be diverted through lifts and pumps into a huge and complex system of reservoirs, water tunnels, pipelines and canals.
- The project proposes to lift about 180 TMC (about 5 billion cubic meters) of water.
- It includes construction of barrages, high speed pumps for transport of water upstream for providing for irrigation. It involves digging of 20 reservoirs with total capacity to store 145 TMC.
- It is designed to provide water for irrigation and drinking purposes to about 45 lakh acres in 20 of the 31 districts in Telangana, including the twin cities of Hyderabad and Secunderabad.
- The total length of the entire project is approximately 1,832 km. Of this, 1,531 km is gravity canals and 203 km comprise water tunnels.
- Except for a few stretches involving pipelines and canals, much of the project is complete.
- **Recent NGT Order** - The Principal Bench of the National Green Tribunal, New Delhi, ruled that the Environmental Clearance given to the project in 2017 was void.
- It ruled so, saying that the Telangana government changed the design of the project to increase its capacity to pump from 2 TMC to 3 TMC water.
- The NGT observed that major changes were made in the project, due to which large tracts of forest land and other land was taken over.
- Massive infrastructure was built causing adverse environmental impact.
- Telangana government argued that the expansion of the project to extract 3 TMC did not involve any infrastructural changes and so a fresh EC was not required.
- This argument was not accepted by the NGT.
- The NGT directed the Union Ministry of Environment, Forests, and Climate Change (MoEFCC) to constitute an Expert Committee.
- This Committee would assess the extent of damage caused in going ahead with the project's expansion and to identify restoration measures.
- The Expert Committee will complete its exercise within six months.



5.30 Dam Rehabilitation and Improvement Programme

The government has decided to grant approval to Phase 2 and 3 of the DRIP (Dam Rehabilitation and Improvement Programme).

- The DRIP envisages comprehensive rehabilitation of 736 existing dams located across the country and complements the Dam Safety Bill, 2019.
- It is implemented by Ministry of Water Resources (MoWR) with assistance from the World Bank.
- The main objectives of DRIP are
 1. To improve the safety and performance of selected (223 dams across 7 different states) existing dams in a sustainable manner.
 2. To strengthen the dam safety institutional setup in participating states as well as at central level.
- Currently 18 states are serviced by the DRIP's flagship project, the DHARMA (Dam Health And Rehabilitation Monitoring Application).
- The Seven DRIP States includes Jharkhand, Karnataka, Kerala, Madhya Pradesh, Odisha, Tamil Nadu, and Uttarakhand.
- The DRIP Phase 1 was doing a stellar job according to its mandate of providing dam safety since 2012.
- So, a third-party evaluation recommended the initiation of new phases.
- The DRIP will be implemented over a period of 10 years in two phases.
- These phases will have each of six years, with two years overlapping from April 2021 to March 2031.
- The upcoming phases will bolster its operational mandate of dam safety like structural integrity, surveillance and maintenance, monitoring, etc.

5.31 Deemed Forests

Karnataka government may declassify 67% of the 9.94 lakh hectares of deemed forests in the state and hand it over to Revenue authorities.

- The concept of deemed forests has not been clearly defined in any law including the Forest Conservation Act (FCA) of 1980.
- But, the Supreme Court (SC) in T N Godavarman Thirumalpad case (1996) accepted a wide definition of forests under the Act.
- The SC said that the term 'forest land' occurring in Section 2 of the FCA will include,
 1. 'Forest' as understood in the dictionary sense,
 2. Any areas recorded as forest in the government record, whether designated as reserved, protected or otherwise, irrespective of the ownership.
- The SC said that the provisions of the FCA 1980 for the conservation of forest and the matters connected therewith must apply to all forest irrespective of the ownership or classification.
- **Expert Committee Recommendation** - Karnataka constituted an expert committee to identify 'deemed forests' as land having the characteristic of forests irrespective of the ownership.
- In 2002, the committee said in a report that the following could be 'deemed forests',
 1. Thickly wooded areas of the Revenue Department not handed over to the Forest Department;
 2. Thickly wooded areas recommended to be handed over to the Forest Department;
 3. Thickly wooded land distributed to grantees but not cultivated; and
 4. Thickly wooded plantations of the Forest Department.
- In 2014, the then government said that some of the 'statutory forests' had been wrongly classified as 'deemed forest' by the expert committee.
- The government also said that where the dictionary definition of forests was applied to identify deemed forests, scientific criteria was not used.
- This resulted in a subjective classification of areas as deemed forests.
- This classification in turn resulted in conflicts between the Forest Department and other departments like Revenue, Irrigation, etc.



- There is also a commercial demand for mining in some regions designated as deemed forests.
- Committees constituted during this regime identified 5.18 lakh hectares of deemed forest that could be released from the total deemed forest.
- An affidavit was filed in the SC in 2019 following a Cabinet decision.
- Preservation of forest areas in India under the FCA, 1980 has been continuously monitored by the SC since the Godavarman case judgment.
- The state government must obtain clearances from the SC for affecting changes to land classified as deemed forests since the verdict.

5.32 Forest Landscape Restoration

In the **United Nations Biodiversity Summit** held on October 1 Environment Minister reiterated India's commitment to restore 26 million hectares of land by 2030.

- Forest landscape restoration is a process of restoring the ecological integrity, improving the productivity and economic value of degraded forest landscapes.
- Article 5 in the 2015 **Paris Agreement** urges countries to act on deforestation and forest degradation for enhancing sinks and reservoirs of greenhouse gases.
- The Government of Germany and IUCN launched voluntary **Bonn Challenge** in 2011 with the target of restore 150 mha of degraded and deforested landscapes by 2020 and 350 mha by 2030.
- India joined the Bonn Challenge in 2015 with a pledge to restore 21 mha of degraded and deforested land & raised it to 26 mha by 2030.
- India's NDC targets to create an additional carbon sink of 2.5-3 billion tonnes of CO₂ equivalent from additional forest and tree cover until 2030.
- There are no proper standard documents to arrive at common definitions, figures and methods on FLR in India.
- The Desertification and Land Degradation Atlas (2016) by Space Applications Centre (SAC), ISRO, says almost 96.4 m ha of India's geographical area are undergoing the process of desertification/land degradation.
- Whereas Forest Survey of India's reports identifies 63 m ha of potential areas for restoration.
- However, remote sensing-based area delineation can only point towards potential areas for FLR.
- Another concern is around establishing a baseline for FLR.
- Whether 2011, the year when the Bonn Challenge was launched or 2015 when India made the Bonn Challenge pledge should be considered.
- Bonn Challenge Consultative Committee is constituted to guide the progress and achievements in respect of commitments under the Bonn Challenge.

5.33 Glyphosate

- It was developed in 1970, and its scientific name is N-(phosphonomethyl) glycine under the International Union of Pure and Applied Chemistry (IUPAC) system of nomenclature.
- It is applied to the leaves of plants to kill weeds.
- In India it has a very good market size in the tea sector of West Bengal and Assam.
- Presently, its consumption is highest in Maharashtra as it is becoming a key herbicide in sugarcane, maize and many fruit crops.
- In 2015, the World Health Organization published a study that found glyphosate "probably carcinogenic to humans".
- France, Italy, and Vietnam banned its use after the finding.
- Union government decided no person shall use glyphosate except through Pest Control Operators.



- Glyphosate is among the 39 widely-used agrochemicals by the farmers in India to control weeds in tea plantations, non-crop and cropped areas, for about four decades now.

5.34 Mission Mode for Green Railways

- The Ministry of Railways is on a mission mode with the goal of transforming Indian Railways into Green Railways by 2030.
- The Ministry of Railways has taken a number of major initiatives towards mitigation of global warming and combating climate change.
- Initiatives taken by the Ministry of Railways are as follows
 1. It has completed electrification of more than 40,000 Route km (63% of Broad-Gauge routes).
 2. It has fixed a target of electrification of 7000 RKM for the year 2020-21.
 3. It is working to harness the potential of 500 MegaWatt (MW) energy through rooftop Solar panels (Developer model).
 4. A project at Bina, Madhya Pradesh with a potential of 1.7 MW has already been installed in collaboration with BHEL, which is a first of its kind of solar project in the world.
 5. It has also planned to set up 200 MW wind energy plants in next 2 years in Tamil Nadu, Gujarat, Rajasthan and Karnataka.
 6. In the field of Green Initiatives, a total of 69,000 coaches have been fitted with more than 2,44,000 bio-toilets in Indian Railways.

6. PROTECTED AREAS

6.1 Haldwani Bio-Diversity Park

Uttarakhand opened its biggest biodiversity park in Haldwani on the World Environment Day (5th June).

- Inside the Park, there are thematic gardens, a soil museum, species of plants, lichens, mosses and algae from the Jurassic era, a vermicomposting unit, an interpretation center, and a state-of-the-art weather station.
- The Park has 40 unique sections having 479 rare plant species of cactus, medicinal herbs, different types of trees, etc.
- The various species of plants have been brought to the park from diverse terrains like Niti Mana Valley and even from some glaciers around Kedarnath.
- Niti Mana Valley is located near the India Tibetan Border in Chamoli district of Uttarakhand.
- The plant species in the biodiversity park is divided into spiritual & religious, scientific, human health, and aesthetic value sections.
- The spiritual section has trees that find mention in holy scriptures like Guru Granth Sahib, Quran, Bible, and others.
- It showcases the different kinds of soil found in various topographies of Uttarakhand — alpine, bhabhar, sub-mountainous, mountainous, tertiary, loam, terai.

Dibru-Saikhowa National Park

- It is in Dibrugarh and Tinsukia districts, Assam.
- It was designated a Biosphere Reserve in July 1997.
- It is bounded by the Brahmaputra and Lohit Rivers in the north and Dibru river in the south.
- Climate- Tropical monsoon climate with a hot and wet summer and cool and usually dry winter.
- Annual rainfall - 2,300 to 3,800 mm.
- Forests - Moist mixed semi-evergreen forests, moist mixed deciduous forests, canebrakes and grasslands.
- It is the largest salix swamp forest in north-eastern India.

6.2 Maguri Motapung Beel

- Maguri Beel is a large wetland located near Dibru-Saikhowa National Park and Biosphere Reserve.
- A small channel connects Maguri Beel with the Dibru River to the North.
- It has been declared as an Important Birding Site (IBA)



by Birdlife International.

- It is home to some of the rarest of the bird species and attracts varied species of birds from around the globe.
- Some of them includes - Ruddy Shelduck, Baikal Teal, Bar-Headed Goose, Falcated Duck, Ferruginous Duck, Northern Pintail etc.
- It is also very rich in aquatic life and this has led to development of many fishing camps near it.
- The nearby areas of the beel displays grassland environment, creating a safe haven for grassland birds.

6.3 Kole Wetlands

- It is spread over Thrissur and Malappuram districts of Kerala.
- It is a Ramsar site and IBA (Important Bird and Biodiversity Area)
- It accounts for more than 40% of the rice production in the State.
- It is situated in the Central Asian Flyway of migratory birds.
- It contains subterranean habitats that are important habitats for some fresh water fish species which are endemic to southern Western Ghats.
- The Society for Odonate Studies has been conducting Odonate surveys at the Kole wetlands since 2018.
- 37 species of dragonflies and damselflies have been reported from the wetlands so far.

6.4 Expansion of Kaziranga National Park

Recently Assam government has approved the addition of 30.53 sq km to the 884 sq km Kaziranga National Park.

- Kaziranga National Park in Assam hosts two-thirds of the world's great one-horned rhinoceroses.
- It is a World Heritage Site (designated in 1985) and located on the edge of the Eastern Himalaya biodiversity hotspot.
- It is home to the highest density of tigers and was declared a Tiger Reserve in 2006.
- It also hosts large breeding populations of elephants, wild water buffalo, and swamp deer.
- The rivers Brahmaputra, Diphlu, Mora Diphlu and Mora Dhansiri flow through it.
- The great one-horned rhinoceros is native to India and listed as Vulnerable on the IUCN Red List
- It has an estimated 2,413 rhinos and 121 tigers.
- The additional areas straddling two districts Nagaon and Sonitpur would make the larger Kaziranga National Park and Tiger Reserve (KNPTR) grow to 1085.53 sq km.

6.5 New Ramsar Sites

Recently, the following sites have been designated as Ramsar Sites. With this, the total number of sites is increased to 42 which is highest in South Asia.

- **Kabartal Wetland** - It is known as Kanwar Jheel, it covers 2,620 hectares of the Indo-Gangetic plains in the Begusarai district of Bihar.
- It acts as a vital flood buffer for the region besides providing livelihood opportunities to local communities.
- It is also a valuable site for fish biodiversity with over 50 species documented.
- It is an important stopover along the Central Asian Flyway, with 58 migratory waterbirds using it to rest and refuel.
- Five critically endangered species inhabit the site, including three vultures – the red-headed vulture (*Sarcogyps calvus*), white-rumped vulture (*Gyps bengalensis*) and Indian vulture (*Gyps indicus*) – and two waterbirds, the sociable lapwing (*Vanellus gregarius*) and Baer's pochard (*Aythya baeri*).
- **Asan Conservation Reserve** - It is a 444-hectare stretch of the Asan River running down to its confluence with the Yamuna River in Dehradun district of Uttarakhand.



- It is Uttarakhand's first Ramsar Site.
- The damming of the River by the Asan Barrage in 1967 resulted in siltation above the dam wall, which helped to create some of the Site's bird-friendly habitats.
- These habitats support 330 species of birds including the critically endangered red-headed vulture (*Sarcogyps calvus*), white-rumped vulture (*Gyps bengalensis*) and Baer's pochard (*Aythya baeri*).
- Other non-avian species present include 49 fish species, one of these being the endangered *Putitora mahseer* (*Tor putitora*).
- **Meteor lake at Lonar, Maharashtra** - The Lonar lake, was created by the impact of a meteor 35,000 to 50,000 years ago.
- It is part of Lonar Wildlife Sanctuary which falls under the unified control of the Melghat Tiger Reserve (MTR).
- It is the second Ramsar site in Maharashtra after Nandur Madhmeshwar Bird Sanctuary in Nashik district.
- The water in the lake is highly saline and alkaline, containing special microorganisms like anaerobes, Cyanobacteria and phytoplankton.
- **Soor Sarovar, Agra** - It is also known as Keetham lake situated within the Soor Sarovar Bird Sanctuary.
- This lake is situated alongside river Yamuna in Agra, Uttar Pradesh.
- The Soor Sarovar bird sanctuary covered an area of 7.97 sq km.
- It also has a Bear Rescue centre for rescued dancing bears.
- **Tso Kar Wetland Complex** - It is a high-altitude wetland complex situated in the Changthang region of Ladakh. It has two water bodies,
 - a) Startsapuk Tso – Freshwater Lake
 - b) Tso Kar (White Lake) – Hypersaline Lake
- It is called white lake, because of the white salt efflorescence found on the margins due to the evaporation of highly saline water.
- The Tso Kar Basin is an A1 category Important Bird Area (IBA).

6.6 Elephant Corridors

The Supreme Court recently upheld the Tamil Nadu government's authority to notify an 'elephant corridor' and protect the migratory path of the animals through the Nilgiri biosphere reserve.

- Elephant corridors allow elephants to continue their nomadic mode of survival, despite shrinking forest cover, by facilitating travel between distinct forest habitats.
- These corridors play a crucial role in sustaining wildlife by reducing the impact of habitat isolation.
- Nilgiri biosphere reserve is the largest protected forest area in India, spanning across Tamil Nadu, Karnataka and Kerala.
- SC's judgement said its State's duty to protect a "keystone species" like elephants, which are immensely important to the environment.
- The corridor is situated in the ecologically fragile Sigur plateau, which connects the Western and the Eastern Ghats and sustains elephant populations and their genetic diversity.
- It has the Nilgiri hills on its south-western side and the Moyar river valley on its north-eastern side.
- The elephants cross the plateau in search of food and water depending on the monsoon
- **High Court's stand on Elephant Corridor** - In 2011, the High Court had held that the government was authorised by the Centre's 'Project Elephant' to earmark the corridor since there was no impediment in the Wildlife Protection Act.
- It had held that the State government's action to identify the corridor was in complete obligation to its duties under Article 51-A(g) of the Constitution.



- It said it was the duty of every citizen to protect and improve the natural environment, including wildlife.

6.7 Mansar Lake Development Plan

- Surinsar Lake and Mansar Lake are considered to be twin lakes.
- Surinsar is rain-fed without permanent discharge, and Mansar is primarily fed by surface runoff and partially by mineralized water through paddy fields, with inflow increasing in the rainy season.
- Mansar is of immense importance from Pilgrimage as well Heritage point of view beyond being the most scenic attraction due to vast Mansar Lake and its flora and fauna.
- It is one of the 26 Ramsar Sites designated as Wetlands of International importance located in Jammu & Kashmir.
- The Surinsar Mansar Wildlife Sanctuary is nestled in the midst of both the lakes.
- The site is socially and culturally very important with many temples around owing to its mythical origin from the Mahabharata period.
- Union government has recently inaugurated the Mansar Lake Development Plan in Jammu and Kashmir.
- The project is eyed to attract almost 20 lakh tourists every year and create employment for 1.15 crore man-days with an income generation of ₹ 800 crore per year.

6.8 Critical Tiger Habitats

- The tiger reserves are constituted on a core/buffer strategy.
- The core areas have the legal status of a national park or a sanctuary, whereas the buffer or peripheral areas are a mix of forest and non-forest land, managed as a multiple use area.
- Buffer area is the area peripheral to the critical tiger habitat or core area providing supplementary habitat for dispersing tigers, besides offering scope for co-existence of human activity.
- The limits of the buffer/ peripheral areas are determined on the basis of scientific and objective criteria in consultation with the Gram Sabha and an Expert Committee constituted for the purpose.
- CTH's are identifies under the wildlife protection Act (WLPA), 1972.
- It is notified by state government in consultation with expert committee.

6.9 Lichen Park

Uttarakhand forest department develops India's first lichen park in Kumaon.

- Uttarakhand has more than 600 species of lichens followed by Himachal Pradesh and Jammu and Kashmir.
- A lichen is a composite organism that arises from algae or cyanobacteria living among filaments of multiple fungi species in a mutualistic relationship.
- They come in many colours, sizes and forms.
- The properties are sometimes plant-like but lichens are not plants. Lichens may have tiny, leafless branches, flat leaf-like structures.
- They are one of the oldest living things, grow in a wide range of habitat including some of the most extreme conditions like the arctic, tundra, hot dry desert rocky coasts, toxic heaps, roofs bare rocks, walls, exposed soil surfaces are some of the places where it can be easily found.
- It is considered as the most significant bio-indicator of ecosystem fluctuations as they are more sensitive towards habitat and climate change.
- Lichen need pure air to grow. If pollution levels increase in a certain area, the lichen species decline there. So it serves as a natural indicator of pollution levels in an area.
- In Uttarakhand lichens are found in Chamoli, Champawat, Pithoragarh, Nainital, Dehradun region.



7. BIO-DIVERSITY

7.1 China & its Pangolin Protection

China accorded pangolin the highest level of protection and removed its scales from its list of approved traditional medicines.

- **Eightspecies** of pangolins, the scaly insectivorous creatures, are distributed across Asia and Africa.
- They have long been hunted for their meat and scales, which indigenous tribes in central and eastern India are also known to have worn as rings.
- Two of these species are found in 15 states in India, although their numbers are yet to be completely documented.
- The creatures are **strictly nocturnal**, repelling predators by **curling up into scaly spheres** upon being alarmed.
- The same defence mechanism however, makes them slow and easy to catch once spotted.
- They do not occur in large numbers and their **shy nature** makes encounters with humans rare.
- Their alleged health benefits in TCM prompted a booming illicit export of scales from Africa over the past decade.
- Conservation of pangolins received its first shot in the arm when the 2017 Convention on International Trade in Endangered Species (CITES) enforced an international trade ban.
- **Latest decision** - The Chinese State Forestry and Grassland Administration had issued a notice upgrading its protection of pangolins.
- It has also banned all commercial trade of the endangered mammal.
- The move came about after the 2020 edition of the “Chinese Pharmacopoeia” excluded traditional medicines made from four species.
- This 2020 edition also listed alternatives sourced from species which are not endangered.
- Some experts say that the immediate impact would be pangolin scales losing their legitimacy in TCM.
- However, some say that the history of the ban of wildlife trade in China is not encouraging.
- There is a continued availability of **tiger bone wine** believed to have health benefits despite its ban on tiger products in 1993.
- The price of the **elephant ivory** plummeted by two-thirds after China banned it. The same trend would apply to pangolin scales.
- India, where the trade largely remains local, has been registering a decline from before China’s ban.
- This decrease is attributed to the border closures, shifts in law enforcement priorities, or decreased reporting on wildlife seizures.
- This decrease may also be credited the decline to the disappearance of public transport due to the national lockdown.

7.2 Rise in Population of Asiatic Lion

Recently, the Gujarat Forest Department has announced an increase in the population of Asiatic lions in the Gir forest region.

- Total 674 lions were recorded compared to the 523 in the Lion Census of 2015.
- The count was estimated from a population observation exercise called Poonam Avlokan in place of the 15th Lion Census.
- Poonam Avlokan is a monthly in-house exercise carried out every full moon.
- It was a mechanism developed by the Forest Department in 2014 as part of preparations for the 2015 Lion Census.

- According to recent estimates the lion population has grown by almost 29% from the last count in 2015, the lion population in the state of Gujarat has doubled since 2001.
- The first Lion Census was conducted by the Nawab of Junagadh in 1936.
- Since 1965, the Forest Department has been regularly conducting the Lion Census every five years.
- The regular Lion Census is conducted once every five years. The last Census was conducted in 2015.
- **Asiatic lion** – They are listed as “Endangered” in IUCN Red list and Schedule I of wildlife Protection Act, 1972, CITES Appendix I.
- Asiatic lions are slightly smaller than African lions.
- Males have only moderate mane growth at the top of the head so that their ears are always visible.
- The most striking morphological character, which is always seen in Asiatic lions, and rarely in African lions, is a longitudinal fold of skin running along its belly.
- At present Gir National Park and Wildlife Sanctuary is the only abode of the Asiatic lion.

7.3 Reintroduction of African Cheetahs

Recently three African hunting cheetahs from South Africa has been introduced in Mysore zoo.

- A year after zoo lost its last surviving African hunting Cheetah Mysore zoo has received three big cats from Ann Van Dyke Cheetah Centre, South Africa.
- Mysuru is the second zoo to house hunting cheetah in India, Hyderabad zoo has a pair of big cats.
- In January 2020 SC has lifted its seven-year stay on a proposal to introduce African cheetahs from Namibia into the Indian habitat on an experimental basis.
- The plan was to revive the Indian cheetah population.
- In May 2012, the top court had stalled the plan to initiate the foreign cheetahs into the Palpur Kuno sanctuary in Madhya Pradesh fearing they may come into conflict with a parallel and a much-delayed project to reintroduce lions into the same sanctuary.

African Cheetahs

- Around 6,500-7,000 African cheetahs present in the wild.
- These are bigger in size as compared to Asiatic Cheetah.
- Were as Asiatic cheetahs has more fur, a smaller head and a longer neck and they have a more cat-like appearance.
- IUCN Status is Vulnerable for the animal.
- It is protected under CITES Appendix-I of the List.
- This List comprises of migratory species that have been assessed as being in danger of extinction throughout all or a significant portion of their range.

7.4 Sandalwood Spike Disease (SSD)

- SSD is caused by phytoplasma, a bacterial parasites of plant tissues which are transmitted by insect vectors.
- SSD has been one of the major causes for the decline in sandalwood production in the country for over a century.
- The disease was first reported in Kodagu in 1899.
- The devastating impact in natural habitats resulted in sandalwood being classified as “vulnerable” by the International Union for Conservation of Nature in 1998.
- Presently, there is no option but to cut down and remove the infected tree to prevent the spread of the disease.
- With between 1 and 5% of sandalwood trees lost every year due to the disease, scientists warn that it could wipe out the entire natural population if measures are not taken to prevent its spread.
- Recently it is reported that Karnataka’s sandalwood trees are facing a serious threat with the return of the destructive Sandalwood Spike Disease (SSD).
- The natural population of sandalwood in Marayoor of Kerala and various reserve forests in Karnataka, including MM Hills, are heavily infected with SSD for which there is no cure as of now.



7.5 Beaching/Stranding Events

- Beaching refers to the phenomenon of dolphins and whales stranding themselves on beaches.
- There are around 2,000 stranding each year worldwide, with most resulting in the death of the animal.
- Whales strand themselves on beaches either singularly or in groups. While individual stranding are mostly attributed to injury or sickness, it is not clear why exactly whales beach themselves in groups.
- Possible Reasons behind Whale Mass Stranding are as follows
 1. Some whales follow schooling fish or other prey into shallow waters, which causes the whales to become disoriented, as a result of which they get stranded.
 2. Another reason could be panic from being trapped by a predator such as killer whales or sharks.
 3. Another possibility is that whales might be drawn to land by prey-rich currents.
 4. Some scientists believe that sonar signals and other man-made loud underwater noises may contribute to beaching events.
 5. Further, the shape of the beach and the coastline could also have a role to play.
- To protect stranding scientists and workers try to drag the whales away from the shore and guide them back into the water.
- Recently over 450 long-finned pilot whales have died in Australia's largest recorded mass-stranding event.

7.6 Death of Elephants in Botswana

- In the past two months, hundreds of elephants have died mysteriously in Botswana's Okavango Delta.
- The elephant deaths were due to ingesting toxin-producing cyanobacteria at waterholes.
- Several live elephants appeared to have been weak, lethargic and skeletal, with some showing signs of disorientation, difficulty in walking or limping.
- Okavango Delta is one of the very few major interior delta systems that do not flow into a sea or ocean.
- It comprises permanent marshlands and covers part of Kalahari Desert and owes its existence to the Okavango (Kavango) River.
- It is home to some of the world's most endangered species of large mammal, such as the cheetah, white rhinoceros, black rhinoceros, African wild dog and lion.

8. MAN-ANIMAL CONFLICTS

8.1 CrocBITE

- CrocBITE is an online database of crocodile attacks reported on humans.
- The non-profit online research tool helps to scientifically analyse crocodile behaviour via complex models.
- Users are encouraged to feed information in a crowdsourcing manner, the uploaded information needs to be verifiable.
- The database provides key insights into crocodile attack patterns and draws inferences to save human lives.
- The information is vital for Australia and Africa where such attacks are more likely than in other parts of the world.
- This is the only database of its kind with such comprehensive collection of information made available online.

Crocodile species found in India includes

1. Muggor or Marsh Crocodile
2. Estuarine or Saltwater Crocodile
3. Gharial or River water Crocodile

Human-crocodile conflict Hotspots in India includes

1. Vadodara in Gujarat (in Vishwamitri river)
2. Kota in Rajasthan,
3. Bhitarkanika in Odisha
4. Andaman and Nicobar Islands (Culling had been recommended a few years back in the Andaman and Nicobar islands by the forest department to the MoEFCC)



8.2 Indian Crocodile Conservation Project

- The Crocodile Conservation Project was launched in 1975 in different States.
- The Gharial and Saltwater crocodile conservation programme was first implemented in Odisha in early 1975 and subsequently the Mugger conservation programme was initiated.
- Gharial crocodile project started in Tikarpada (1975) aims to increase the sighting to five crocodiles per kilometre length of water.
- As a result of the programme, the estimated number of the saltwater crocodiles increased from 96 in 1976 to 1,640 in 2012 in India.

8.3 Kerala Elephant Killing

A pregnant elephant in Kerala died due to the treacherous use of a food bomb by the locals.

- Many elephants are killed every year in India as their paths cross those of humans.
- **Reasons for conflict - Shrinking ranges and feeding grounds for elephants** cause serious worry, because the animals look for soft landscapes adjoining forests such as coffee, tea and cardamom estates.
- In the **absence of these soft landscapes**, they wander into food-rich farms falling in their movement pathways.
- Research in Karnataka showed that 60% of elephant distribution was encountered outside protected areas.
- In Kerala, such movement along human-dominated landscapes routinely produces conflict.
- **Politicians** in the State were opposed to the Madhav Gadgil Committee Report calling for the Western Ghats to be classified as ecologically sensitive and spared of destructive development.
- With such **fundamental philosophical disagreement**, and a vision of lush landscapes as just a resource to be exploited, animals have little chance of escaping deadly conflict.
- These conflicts are only destined to grow, as commercial pressures eat into already diminished habitat.
- India has just under 30,000 elephants but no strong science-imbued policy that encourages soft landscapes and migrating passages that will reduce conflict.
- It is the **lack of a scientific culture** and the **readiness** to spare forested lands from commercial exploitation.

9. INDEX & REPORTS

9.1 State of India's Environment 2020

Recently, the 'State of India's Environment 2020 in Figures' report was published by the Centre for Science and Environment (CSE).

- The report outlines the status of sustainable development, livestock, forests, water, waste, air, land, wildlife and other natural resources, environmental crimes and global economic risk.
- It states that India had around 50 lakh internal displacements caused by disasters and extreme weather conditions like floods, cyclones and drought in 2019.
- According to it, the internal displacements in India were the highest in the world in 2019.
- Internal Displacement refers to the forced movement of people within the country they live in, due to conflict, violence, development projects, natural disasters and climate change.
- It refers to the number of movements, not people, as individuals can be displaced several times.
- Major Factors of Internal Migration in India are as follows
 1. Natural Disasters (such as cyclones, flood and droughts)
 2. Forced Migration
 3. Impact of Covid-19

9.2 Global Forest Resources Assessment

- Global Forest Resources Assessment is released by the United Nations Food and Agriculture Organization (FAO), every five years since 1990.
- This report assesses the state of forests, their conditions and management for all member countries.

Highlights of 2020 report -

1. The top 10 countries that have recorded the maximum average annual net gains in forest area during 2010-2020 are China, Australia, India, Chile, Vietnam, Turkey, the United States, France, Italy and Romania.
2. In India the forest area managed by local, tribal and indigenous communities in India increased from zero in 1990 to about 25 million ha in 2015.
3. The area of naturally regenerating forests worldwide decreased since 1990, but the area of planted forests increased by 123 mha.
4. Africa had the largest annual rate of net forest loss in 2010–2020, at 3.9 mha, followed by South America, at 2.6 mha.
5. On the other hand, Asia had the highest net gain of forest area in 2010–2020, followed by Oceania and Europe.
6. The largest proportion of the world's forests were tropical (45%), followed by boreal, temperate and subtropical.

9.3 Environment Performance Index

- Environment Performance Index is a biennial index released by Yale University.
- The global index considered 32 indicators of environmental performance, giving a snapshot of the 10-year trends in environmental performance at the national and global levels.
- India secured 168 rank in the 12th edition of the biennial (EPI Index 2020) out of 180 countries, the country scored 27.6 out of 100 in the 2020 index.
- India's rank was 177 (with a score of 30.57 out of 100) in 2018.
- India needs to re-double national sustainability efforts on all fronts, according to the index.
- The country needs to focus on a wide spectrum of sustainability issues, with a high-priority to critical issues such as air and water quality, biodiversity and climate change.
- All South Asian countries, except Afghanistan, were ahead of India in the ranking.
- India's rank on Sustainable Development Goals (SDGs) among the South Asian countries was low, according to State of India's Environment 2020.
- India scored below the regional average score on all five key parameters on environmental health, including air quality, sanitation and drinking water, heavy metals and waste management.
- Among South Asian countries, India was at second position (rank 106) after Pakistan on 'climate change'.
- A ten-year comparison progress report in the index showed that India slipped on climate-related parameters.
- The performance on climate change was assessed based on eight indicators, adjusted emission growth rates; composed of growth rates of four greenhouse gases and one pollutant; growth rate in carbon dioxide emissions from land cover; greenhouse gas intensity growth rate; and greenhouse gas emissions per capita.
- The report indicated that black carbon, carbon dioxide emissions and greenhouse emissions per capita increased in 10 years.
- Its overall score under climate change has dipped 2.9 points.

9.4 IEP's Ecological Threat Register

- The Institute for Economics and Peace (IEP), a think tank has released annual global terrorism and peace indexes.



- According to the IEP's report 1.2 billion people lived in 31 countries that are not sufficiently resilient to withstand ecological threats.
- The world had 60% less fresh water available than it did 50 years ago, while demand for food was predicted to rise by 50% by 2050 and natural disasters were only likely to increase in frequency because of the climate crisis.
- IEP states that 19 countries facing the highest number of threats, including water and food shortages and greater exposure to natural disasters, are also among the world's 40 least peaceful countries.
- Out of 157 countries' assessed, 141 countries faced at least one ecological threat by 2050.
- **Ecological Threat** - Sub-Saharan Africa, South Asia, Middle East and North Africa the regions facing the largest number of ecological threat.
- Some countries, such as India and China, are most threatened by water scarcity.
- Countries such as Pakistan, Iran, Kenya, Mozambique and Madagascar face a combination of threats and a growing incapacity to deal with them.
- **Mass Migration** - It judged Pakistan to be the country with the largest number of people at risk of mass migration, followed by Ethiopia and Iran.
- 16 countries including Sweden, Norway, Ireland, and Iceland, faced no threat.

9.5 Living Planet Report 2020

- WWF's has released the Living Planet Report 2020.
- The report has found that there has been a reduction of 68 % in the global wildlife population between 1970 and 2016.
- 75 % of the Earth's ice-free land surface has already been significantly altered, most of the oceans are polluted, and more than 85% of the area of wetlands has been lost during this period.
- The highlights of the report are as follows
 1. The most important direct driver of biodiversity loss in the last several decades has been land-use change, primarily the conversion of pristine habitats into agricultural systems, while much of the oceans have been overfished.
 2. The highest biodiversity loss due to land use change globally has been found in Europe and Central Asia at 57.9 %, then in North America at 52.5 %, Latin America and Caribbean at 51.2 %, Africa at 45.9 % and then Asia at 43 %.
 3. The largest wildlife population loss, according to the Living Planet Index, has been in Latin America at an alarming 94 %
 4. One of the most threatened biodiversity globally has been freshwater biodiversity, which has been declining faster than that in oceans or forests.
 5. Almost 90 % of global wetlands have been lost since 1700 and global mapping has recently revealed the extent to which humans have altered millions of kilometers of rivers.
 6. India, a "megadiverse country" with over 45,000 species of plants in only 2.4 % of the world's land area, has already lost six plant species to extinction, according to the IUCN Red List.

9.6 World Risk Index

- World Risk Index (WRI) is part of the World Risk Report 2020 released by the United Nations University Institute for Environment and Human Security (UNU-EHS), Bundnis Entwicklung Hilft and the University of Stuttgart in Germany.
- It is calculated on a country-by-country basis, through the multiplication of exposure and vulnerability and describes the disaster risk for various countries and regions.
- Released annually since 2011, it indicates which countries are in the greatest need to strengthen measures for coping with and adapting to extreme natural events.
- Highlights of the report are as follows

1. A comparison with the WRI 2019, shows that all south Asian countries have slipped on their ability to adapt to the reality of climate emergency.
2. Countries with a score above 52.73, are 'very poor' in their adaptive capacities for extreme natural disasters.
3. Among continents, Oceania is at the highest risk, followed by Africa and the Americas.
4. According to the World Risk Index (WRI) 2020, India is 'poorly prepared' to deal with 'climate reality', due to which it is vulnerable to extreme natural disasters.
5. It becomes more important given that India's first ever comprehensive climate change assessment report highlighted the impacts of the climate crisis.

9.7 Human Cost of Disasters Report

- United Nations has released the Human Cost of Disasters 2000-2019 Report.
- Highlights of the report
 1. Climate change is largely to blame for a near doubling of natural disasters in the past 20 years.
 2. 7,348 major disaster events had occurred between 2000 and 2019, claiming 1.23 lives, affecting 4.2 billion people and costing the global economy some \$2.97 trillion.
 3. The figure far outstrips the 4,212 major natural disasters recorded between 1980 and 1999.
 4. The sharp increase was largely attributable to a rise in climate-related disasters, including extreme weather events like floods, drought and storms.
 5. The report relied on statistics from the Emergency Events Database, which records all disasters that kill 10 or more people, affect 100 or more people or result in a state of emergency declaration.
 6. While a warming climate appeared to be driving the number and severity of such disasters, there had also been an increase in geophysical events like earthquakes and tsunamis that are not related to climate but are particularly deadly.
 7. The deadliest single disaster in the past 20 years was the 2004 Indian Ocean tsunami, with 226,400 deaths, followed by the Haiti earthquake in 2010, which claimed some 222,000 lives.

9.8 State of Global Air 2020

- Recently, a global study, State of Global Air 2020 (SoGA 2020) has been released by the Health Effects Institute (HEI).
- It highlights that air pollution is the largest risk factor for death among all health risks and it is the first-ever comprehensive analysis of air pollution's global impact on new-borns.
- HEI is an independent, non-profit research institute funded jointly by the USA's Environmental Protection Agency and others.
- Highlights of the report are as follows
 1. India, Bangladesh, Pakistan and Nepal are among the top ten countries with the highest PM_{2.5} (particulate matter) exposures in 2019 and all of these countries experienced increases in outdoor PM_{2.5} levels between 2010 and 2019.
 2. India is also among the top ten countries with highest ozone (O₃) exposure in 2019.
 3. Also, among the 20 most populous countries, India recorded the highest increase (17%) in O₃ concentrations in the past ten years.
 4. Long-term exposure to outdoor and household (indoor) air pollution contributed to over 1.67 million annual deaths from stroke, heart attack, diabetes, lung cancer, chronic lung diseases, and neonatal diseases, in India in 2019.
 5. Although the link between air pollution and Covid-19 is not completely established, there is clear evidence linking air pollution and increased heart and lung disease.
 6. Average pollution levels in India are declining over the past three years but these have been marginal, particularly in the Indo-Gangetic plains which see extremely high PM pollution especially during winter.



7. After a decline in pollution due to the nationwide lockdowns after March, pollution levels are again rising and air quality is dipping to the 'very poor' category in several cities.

9.9 Confronting Carbon Inequality

- Confronting Carbon Inequality is a report released by Oxfam International and the Stockholm Environmental Institute (SEI).
- It highlights that a rich person contributes more to the climate crisis than a poor person.
- According to the report an Indian emitted only 1.97 tonnes of CO₂ (tCO₂) annually, while Americans and Canadians both emitted well over 16 tCO₂.
- The per capita CO₂ emissions of the richest 10% of Indians were about 4.4 tons in 2018, in comparison to the per capita emissions of the richest 10% Americans were 52.4 tons, almost 12 times that of the richest Indians.
- Highlights of the report are as follows
 1. **Cumulative Emissions** - The richest 1% of humanity accounted for 15% of cumulative emissions, while the poorest 50% accounted for only 7%.
 2. **Depletion of Global Carbon Budget** - The richest 10% depleted the global carbon budget by 31% and the poorest 50% used only 4% of the carbon budget.
 - A carbon budget is a cumulative amount of carbon dioxide (CO₂) emissions permitted over a period of time to keep within a certain temperature threshold.
 3. **Emissions Growth** - While the richest 10% accounted for 46% of emissions growth, the poorest 50% accounted for only 6%.
 - About half of the emissions of the richest 10% are associated with North America and the European Union (EU).

9.10 WWF Report on Water Scarcity

- World Wide Fund for Nature (WWF) has recently release a report on water scarcity.
- According to the recent report hundred cities worldwide, including 30 in India, face the risk of 'severe water scarcity' by 2050.
- This will be due to a dramatic increase in Cities population percentage to 51 per cent by 2050, from 17 per cent in 2020.
- The cities include global hubs such as Beijing, Jakarta, Johannesburg, Istanbul, Hong Kong, Mecca and Rio de Janeiro.
- In the report more than half of the identified cities are from China and India.
- Thirty Indian cities are included in the list, the top five cities are Jaipur, Indore, Thane, Vadodara and Srinagar
- The report suggested that, Cities needed to invest more in nature-based solutions and enhance the health of river basins, watersheds and wetlands to build resilience to water risks.

9.11 Climate Change Performance Index

- CCPI is published annually by Environment think tank Germanwatch since 2005.
- It is an independent monitoring tool for tracking countries' climate protection performance.
- It compares the climate protection performance of 57 countries and the European Union (EU), which are together responsible for more than 90% of global greenhouse gas (GHG) emissions.
- India, for the second time in a row ranked among the top 10, along with the EU and the UK. It scored 63.98 points out of 100.
- It received high ratings on all CCPI indicators except 'renewable energy', where it was categorised as having a 'medium' performance.
- The index found that no country was doing enough to meet the goals of the 2015 Paris Agreement.

- Six G20 countries were ranked among very low performers.
- The United States, with a rank of 61, was the worst performer.

9.12 State of the Global Climate Provisional Report

- This report was released by the World Meteorological Organization.
- The decade 2011-2020 would be the warmest ever on record.
- Also, the year 2020 is set to be among the three warmest on record.
- The record heat in 2020 has been despite La Niña conditions prevailing in the equatorial Pacific Ocean.
- Scientific evidence indicates increasing temperatures are a direct result of human-led global warming, an impact of Green House Gas emission.
- After record GHG levels of 2019, there has been a slight dip this year due to measures taken by countries to fight the ongoing COVID-19 pandemic.
- Global sea-level rise was similar to 2019 values and the general decreasing trend has continued.
- Extreme weather events such as tropical cyclones, floods, heavy rainfall and droughts which are an expensive consequence of global warming impacted many parts of the world.
- The report states that climate induced human migration is one of the least understood impact of anthropogenic climate change.

9.13 Emissions Gap Report 2020

- This annual report is released by the United Nations Environment Programme (UNEP).
- It measures the gap between anticipated emissions and levels consistent with the Paris Agreement goals of limiting global warming this century to well below 2°C and pursuing 1.5°C.
- The year 2020 is on course to be one of the warmest on record, while wildfires, storms and droughts continue to wreak havoc.
- The findings from the report are:
 1. **Record high GHG emissions:** These emissions continued to grow for the third consecutive year in 2019.
 2. **Record carbon emission:** Fossil CO₂ emissions dominate total GHG emissions and consequently the growth in GHG emissions.
 3. **Forest fires increasing GHG emissions:** Since 2010, GHG emissions have grown at 1.3% per year on average.
 4. **G20 countries:** They account for the bulk of emissions.
 5. **Slowing GHG emission rate:** This is happening. But, GHG emissions are declining in OECD economies and increasing in non-OECD economies.
 6. **Consumption-based emissions:** Rich countries have higher consumption-based emissions than territorial-based emission.
 7. **COVID-19 impact:** CO₂ emissions could decrease by about 7% in 2020 compared with 2019 levels due to COVID-19.
 8. **Other GHGs level:** Although CO₂ emissions will decrease in 2020, the resulting atmospheric concentrations of major GHGs and nitrous oxide continued to increase in both 2019 and 2020.
 9. **Net zero level:** 126 countries covering 51% of GHG emissions have net-zero goals that are formally adopted, announced or under consideration.
- Another major UNEP report is Global Environment Outlook.



9.14 Snakebite Mortality in India

- Centre for Global Health Research (CGHR), Canada has recently released a study titled 'Snakebite Mortality in India: A Nationally Representative Mortality Survey'.
- The study found that India has recorded 1.2 million snakebite deaths in the 20-year period from 2000 to 2019 with an average of 58,000 deaths caused by snakebite annually.
- Around 70% of these deaths occurred in low altitude, rural areas of eight States namely Uttar Pradesh, Andhra Pradesh, Bihar, Jharkhand, Madhya Pradesh, Odisha, Telangana, Rajasthan and Gujarat.
- Half of all the snakebite deaths occurred during the monsoon period from June to September.
- The World Health Organization (WHO) recognizes snakebite as a top-priority neglected tropical disease.
- Indian anti-venoms neutralize venom from only the following snakes such as
 1. Spectacled Cobra (there are three other Indian cobra species),
 2. Common Krait (there are seven other krait species),
 3. Russell's Viper,
 4. Saw-scaled viper,
- Whereas there are 12 other snake species causing fatal bites in the country.

10. DISASTER MANAGEMENT

10.1 Delhi Earthquakes

An earthquake of magnitude 2.1 was detected near Delhi on June 08, 2020 which was the 11th minor earthquake that is being recorded in and around Delhi since May.

- Scientists assert that no unusual seismic activity is taking place around Delhi in the last few months.
- Delhi and its surrounding areas usually experience between two and three earthquakes of magnitude 2.5 and above every month.
- But there are monthly and annual variations as well.
- Geological and seismological processes are not very smooth.
- So nothing special has happened in Delhi in the last couple of months.
- **Detection** - Detection of earthquakes, especially those of smaller magnitude, being recorded in an area also depends on the number of seismic recorders installed in that area.
- The area around Delhi has the densest concentration of seismometers in the country, even more than the seismically active Himalayan region.
- Out of the 115 detectors installed in India, 16 are in or around Delhi.
- As a result, even the earthquakes of smaller magnitude are recorded, and this information is publicly accessible.
- **Scientifically** - Earthquakes of magnitude 4 or below hardly cause any damage anywhere and are mostly inconsequential for practical purposes.
- Thousands of such earthquakes are recorded around the world every year, and most of them are uneventful.
- They certainly do not signal any big upcoming event.
- **Foreshocks** -Foreshocks are post-event definitions, which is something that is largely applied in hindsight.
- When a big event happens, all the smaller earthquakes that have occurred in that region in the near past are classified as foreshocks.
- The description does not exist before any big earthquake has happened.
- So, the talk of these being foreshocks of a big earthquake in Delhi have no basis at all.



- **Reality** - A big earthquake might still occur, which no can rule out. But they cannot be predicted.
- So to say that these *small earthquakes are precursors to the big one is totally unscientific.*
- Scientists have been working for years to identify “precursors” to an earthquake, but have so far met with no success.
- Some special earthquakes, triggered by volcanic activity, can be predicted to some extent but nothing else.
- Predicting earthquakes in a region like Delhi is all the more difficult because the place does not lie on any fault lines.
- We know a little bit about the tectonics in the Himalayan region, where two tectonic plates are meeting each other.
- But *Delhi is located on a single plate*, and the seismic activity is generated by internal deformities.
- Therefore, predicting earthquakes in advance is out of the question.
- Scientists say that the Himalayan region is due for a big earthquake, of **magnitude 8** or even higher.
- That is because they have been able to measure the **energy that is getting trapped under the surface** as a result of one tectonic plate trying to move beneath the other one.
- Even here, scientists have no idea when this big earthquake will occur.
- The prediction about the big one is based only on the estimate of the energy that is ready to be released.
- An earthquake of magnitude 6 is typically associated with the kind of energy that was released by the atom bomb in Hiroshima.
- An earthquake of magnitude 8 would be almost 1,000 times more powerful than a magnitude 6 event.
- Even the argument that the smaller quakes are helping release the energy bit by bit so that a big one would not be necessary does not hold.
- 1,000 earthquakes of magnitude 4 are needed to release the energy equivalent of a magnitude 6 earthquake. These arguments have no basis.

10.2 Assam Gas Leak

Since 27th May 2020, natural gas has been continuously flowing out of a gas well in Assam following a blowout.

- The Baghjan 5 well is a purely gas-producing well in Tinsukia district.
- It is at an aerial distance of 900 metres from the Dibru-Saikhowa National Park.
- It was drilled by Oil India Limited (OIL) in 2006.
- It is one of the most prolific gas reservoirs owned by OIL.
- It produces around 80,000 standard cubic metres per day (SCMD) of gas from a depth of 3,870 metres.
- The current discharge is at 90,000 SCMD at a pressure of 4,200 PSI, far higher than the normal producing pressure of around 2,700 PSI.
- **Reason for Blowouts** - Sometimes, the pressure balance in a well may be disturbed leading to ‘kicks’ or changes in pressure.
- If these are not controlled in time, the ‘kicks’ can turn into a sudden, uncontrolled release of gas/oil or blowout.
- The possible **reasons** behind blowouts include simple lack of attention, poor workmanship, bad maintenance, old age, sabotage, morpho-tectonic factors, etc.
- A device called a **blowout preventer** is usually installed in wells.
- The gas well at Baghjan was being **serviced**, and a new sand was being tested at another depth in the same well.
- The existing well-head (the exposed top portion) was also being repaired.
- For repairing the well-head, the well was temporarily killed or the producing zone was shut down.

- The **blowout preventer** was also **removed**. But suddenly, gas started to ooze out of the exposed well.
- Before anyone could do anything, it broke through our cement barrier.
- The control of a blowout depends on two things:
 1. The size of the reservoir and
 2. The pressure at which the gas/oil is flowing out.
- This reservoir was particularly difficult to control since it was a gas well and ran the risk of catching fire at any point.
- While many blowouts automatically collapse on their own, it can take up to months.
- To control a blowout, the first step is to pump in water, so that the gas does not catch fire.
- **Impact** - As many as **1,610 families** with 2,500-3,000 people have been evacuated to relief camps.
- There are reports of deaths of a river dolphin, and a variety of fish.
- While the administration has kept an **ambulance** with paramedical staff on standby, locals have complained of symptoms like headache, etc.
- The gas (a mix of propane, methane, propylene and other gases) is flowing with the wind, towards the northeast.
- That is a radius up to 5 km and condensate is mostly falling on bamboo, tea gardens, banana trees and betel nut trees.
- Since the gas is moving through the air, the condensate is falling into **Dibru-Saikhowa National Park** too.
- Also close is the **Maguri-Motapung wetland** —an Important Bird Area notified by the Bombay Natural History Society.
- The park is famous for its birds, butterflies, wild cats, and feral horses.
- The impact is visible in the sense that one can see,
 1. Traces of condensate on the water bodies,
 2. The numbers of birds have decreased, not because they have been killed but because they have flown away.

10.3 IFLOWS-Mumbai - Integrated Flood Warning System

Maharashtra's CM recently launched an Integrated Flood Warning System called 'IFLOWS-Mumbai', which is the second city after Chennai to get this system.

- IFLOWS is a joint initiative between the Ministry of Earth Sciences (MoES) and Brihanmumbai Municipal Corporation (BMC).
- It is a monitoring and flood warning system.
- It will be able to relay alerts of possible flood-prone areas anywhere between 6 to 72 hours in advance.
- The system can provide all information regarding possible flood-prone areas including -
 - i. the height the floodwater could attain
 - ii. location-wise problem areas across all 24 wards
 - iii. calculation on the vulnerability and risk of elements exposed to flood
- The early warning forecast would include alerts on -
 - i. rainfall information
 - ii. tide levels
 - iii. storm surge for low-lying areas anticipated to be affected
- The system is designed to generate flood warnings for specific geographical areas of the city.
- All this information will then be routed to authorities.

- It thereby will minimize the damage from cyclones and heavy rain events in Mumbai by evacuating people to safe areas.
- **Working** - The primary source for the system's flood assessments is the amount of rainfall.
- However, Mumbai being a coastal city, the system also factors in tidal waves and storm tides.
- In the last 2 years, researchers have been conducting studies to provide real-time weather information.
- This is being done by measuring -
 - i. the city's rainfall, how much water drained out
 - ii. topography, land use, infrastructure development
 - iii. population
 - iv. lakes, creeks
 - v. data on river bathymetry of all rivers namely Mithi, Dahisar, Oshiwara, Poisar and Ulhas
- The system incorporates -
 - i. weather models from the National Centre for Medium Range Weather Forecasting (NCMRWF), India Meteorological Department (IMD)
 - ii. field data from the rain gauge network of 165 stations set up by Indian Institute of Tropical Meteorology (IITM), BMC and IMD
- The system has provisions to capture the urban drainage within the city and predict the areas of flooding.
- It comprises of various modules namely Data Assimilation, Flood, Inundation, Vulnerability, Risk, Dissemination and Decision Support System.
- Similar systems are being developed for Bengaluru and Kolkata.



10.4 Russian Oil Spill

Russia declared a state of emergency, five days after a power plant fuel leak in its Arctic region.

- The thermoelectric power plant at Norilsk is located around 3000 km northeast of Moscow.
- It is built on permafrost, which has weakened over the years owing to climate change.
- This caused the pillars that supported the plant's fuel tank to sink, leading to a loss of containment on 29th May 2020.
- Around 20,000 tonnes of diesel oil was released into the Ambarbaya river, which has since drifted 12 km on its surface turning it crimson red.
- This river is part of a network that flows into the environmentally sensitive Arctic Ocean.
- The emergency measures were announced within Russia's Krasnoyarsk Region, located in the vast and sparsely populated Siberian peninsula.
- World Wildlife Fund described this as the second-largest known oil leak in modern Russia's history in terms of volume.
- The Russian chapter of activist group Greenpeace said damages to the Arctic waterways could be at least 6 billion rubles (over \$76 million).
- It has compared the incident to Alaska's 1989 Exxon Valdez disaster.
- Its estimate does not include atmospheric damage due to greenhouse gases and soil pollution.



- The installed buoys will only help collect a small part of the pollution, nearly all the diesel fuel will remain in the environment.

10.5 Neyveli Boiler Blast - Safety Protocols

Six workers were killed and 17 injured after a boiler exploded in Unit V of the thermal power station-II of the NLC India Ltd. (NLCIL) in Neyveli, Tamil Nadu.

- The power station has seven units of 210 MW each, totalling 1,470 MW.
- On 7 May 2020, a boiler explosion occurred in Unit VI. Power generation in the unit was stalled after the accident.
- The boiler blast is inexplicable, as the power producer had encountered a boiler explosion only on May 7, 2020.
- High-pressure and superheated steam make for a lethal combination at the event of an explosion.
- Given the safety threat, boilers are regulated strictly under the Indian Boilers Act, at least on paper.
- The terrible consequences of lax boiler safety were evident 3 years ago in Rae Bareilly.
- Back then, a blast at an NTPC power plant killed a few dozen people.
- But States have clearly not internalised a culture of zero tolerance to boiler accidents.
- In the Neyveli incident, it is said that the boiler was not in operation as it had tripped.
- Notably, the major operations of this equipment involve a furnace and production of steam.
- So, what led to an unexpected blowout should be inquired into.
- How vapours of a stable but acutely toxic chemical escaped should be looked into.
- It should be ensured that there is an upgrade to safety protocols.

NLC India Limited

- NLCIL was formerly the Neyveli Lignite Corporation Limited.
- It is a 'Navratna' company of the Government of India in the fossil fuel mining sector in India and thermal power generation.
- It annually produces about 30 million tonne lignite from opencast mines at Neyveli in the state of Tamil Nadu and at Barsingsar in Bikaner district of Rajasthan state.
- The lignite is used at pithead thermal power stations to produce electricity.
- Lately, it has diversified into renewable energy production.
- It has installed 1404 MW solar power plant to produce electricity from photovoltaic (PV) cells and 51 MW electricity from windmills.
- It was incorporated in 1956, and it is under the administrative control of Ministry of Coal.

10.6 Idukki Landslides

- Idukki district lies in the Western Ghats region of Kerala, it's known as "Spice garden of Kerala".
- Recently a landslide occurred in the hamlet of pettimudi in Munaar's Rajamala.
- The landslide was triggered from a Chola forest region in the eravikulam national park that lies in Rajamala.
- Factors that triggered land slide are
 1. **Heavy rain fall** recorded in Rajamala made the epicenter of the landslide vulnerable to slippage, because of the high sand content in the soil and 40 degree slope.
 2. **Human Interventions** – Buildings on the slopes without adequate protective measures
 3. **Blockage of river** channels and change of river course due to previous landslides.

10.7 Zombie Fires

- Zombie Fire is a fire from a previous growing season that can smoulder under the ground which is made up of carbon-rich peat.
- When the weather warms, the fire can reignite, these are also known as holdover fires.

- According to a new study, the fire regimes in the Arctic are changing rapidly, with ‘zombie fires’ becoming more frequent in addition to fires occurring in the once-frozen tundra.
- The fires in the Arctic spreading to areas which were formerly fire-resistant is a more worrying feature.
- The tundra is drying up and vegetation there like moss, grass, dwarf shrubs, etc. are starting to catch fire.
- In 2019 and 2020, burning occurred well above the Arctic Circle, a region not normally known to support large wildfires.
- Wildfires on permafrost in Siberia south of the Arctic are not uncommon.
- The reason for this anomaly is that temperatures in winter and spring were warmer than usual during 2019-20.
- Temperature in Siberia in 2020 had gone through the roof, with the region recording a severe heatwave.
- Nearly all of this year’s fires inside the Arctic Circle occurred on continuous permafrost, with over half of these burning on ancient carbon-rich peat soils.

10.8 IFFCO Ammonia Leak

- A major ammonia gas leakage has happened at the Indian Farmers Fertilizer Cooperative Limited (IFFCO) unit at Prayagraj.
- Ammonia is stored for industrial use in liquid form under high pressure or in gaseous form at low temperature.
- It is the tri-hydrogen of nitrogen (NH_3), which is a building block for ammonium nitrate that is a high-nitrogen fertiliser in agriculture.
- Even in moderate concentration, ammonia causes irritation to eyes, skin, nose and throat, as it forms ammonium hydroxide upon contact with moisture present in the different body parts.
- [Ammonium hydroxide is very caustic and disrupts the cell membrane lipids, ultimately leading to cellular destruction.
- As cell proteins break down, water is extracted, resulting in an inflammatory response that causes further damage.]
- When inhaled in excess, Ammonia affects the lungs and may cause chemical pneumonitis - lung inflammation caused by aspirating or inhaling irritants.

10.9 Disaster Management Fund

Recently Ministry of Home Affairs has applied an unused provision in the Disaster Management Act, 2005.

- It aims to allow any person or institution to contribute to the National Disaster Response Fund (NDRF) for the purpose of disaster management.
- The Ministry of Home Affairs (MHA) had invoked the Disaster Management Act, 2005 for the first time in March this year in wake of COVID-19.
- The pandemic was notified as a “disaster,” paving the way for the States to utilize the State Disaster Response Fund (SDRF) for treatment of patients and other logistics such as quarantine centers, setting up laboratories among other things.
- The other notified disasters are cyclone, drought, earthquake, fire, flood, tsunami, hailstorm, landslide, avalanche, cloudburst, pest attack, frost and cold waves.
- As per Section 46 of the DM Act, the “NDRF supplements the State Disaster Response Fund (SDRF) in case of a disaster of severe nature, provided adequate funds are not available in the SDRF.
- The States have to submit utilization certificates, pending which no future allocation is made.
- The SDRF is the primary fund available with State governments to meet the expenses of relief operations of an immediate nature, for a range of specified disasters.
- The Centre contributes 75% of the SDRF allocation for general category States and Union Territories,



- 90% for special category States (northeast States, Sikkim, Uttarakhand, Himachal Pradesh, and Jammu & Kashmir).

10.10 State Disaster Response Fund (SDRF)

- Union government has increased the limit of using the State Disaster Response Fund for COVID specific infrastructure from 35 per cent to 50 per cent.
- The decision will help States have more finances at their disposal to fight the virus.
- Recently, the Ministry of Home Affairs issued an order authorizing the States to use State Disaster Response Funds (SDRF) to provide “for temporary accommodation, food, clothing, medical care, etc.” to homeless people, including the stranded migrant laborers.
- The government has decided to treat COVID-19 as a “notified disaster”.
- The State Disaster Response Fund (SDRF), constituted under Section 48 (1) (a) of the Disaster Management Act, 2005.
- It is the primary fund available with State Governments for responses to notified disasters.
- The Central Government contributes 75% of SDRF allocation for general category States/UTs and 90% for special category States/UTs (NE States, Sikkim, Uttarakhand, and Himachal Pradesh, Jammu and Kashmir).
- The annual Central contribution is released in two equal installments as per the recommendation of the Finance Commission.
- Disaster (s) covered under SDRF are as follows Cyclone, drought, earthquake, fire, flood, tsunami, hailstorm, landslide, avalanche, cloudburst, pest attack, frost and cold waves.
- A State Government may use up to 10% of the funds available under the SDRF for providing immediate relief to the victims of natural disasters that they consider to be ‘disasters’ within the local context in the State and which are not included in the notified list of disasters of the Ministry of Home Affairs.

10.11 National Crisis Management Committee

- It is a committee set up by the Government of India in the wake of a natural calamity for effective coordination and implementation of relief measures and operations.
- It is headed by the Union Cabinet Secretary
- Its functions are to:
 1. Review contingency plans formulated by various Ministries
 2. Measures required for dealing with a natural disaster
 3. Coordinate the activities of the Central Ministries and the State Governments in relation to disaster preparedness and relief.

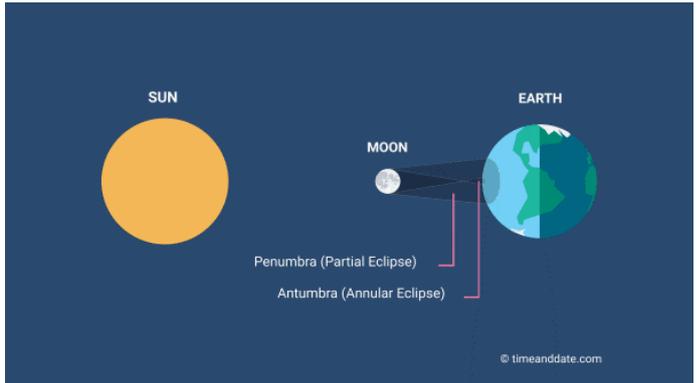
GEOGRAPHY

GENERAL GEOGRAPHY

11.1 Umbra, Penumbra and Antumbra

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

- *Umbra* - The shadow's dark center portion.
- *Antumbra* - The lighter part of the shadow that begins where the umbra ends.



11.2 Role of Anti-cyclone in North-East Asia

- New research has revealed a link between an increase in extreme summer heat events in Northeast Asia and the role of anticyclones in the region.
- Extreme heat events have increased across the world and are responsible for a large number of deaths and harming crops and livestock as well.
- Nearly half of the magnitude of the 2018 extreme heat event across China and Japan was caused by anomalous anticyclones in Northeast Asia.
- There are mainly 2 factors which make the extreme heat events more likely to occur over Northeast Asia.
- Dynamic (anticyclone) and thermodynamic (mean temperature shifts to warmer states and increasing greenhouse gases) changes in the atmosphere.
- Anticyclones similar to those in 2018 became more common and worse in recent decades (1991-2017) than the past (1958-1990).
- The more extreme the heat event, the larger the contribution of the thermodynamic change will be.

11.3 Artic Sea

- It is located mostly in the Arctic North Polar Region in the middle of the Northern Hemisphere, besides its surrounding waters the Arctic Ocean is surrounded by Eurasia and North America.
- It is partly covered by sea ice throughout the year and almost completely in winter.
- The Arctic Ocean is the smallest and shallowest of the world's five major oceans and it is also known as the coldest of all the oceans.
- The International Hydrographic Organization (IHO) recognizes it as an ocean, although some oceanographers call it the Arctic Sea.
- It is sometimes classified as an estuary of the Atlantic Ocean, and it is also seen as the northernmost part of the all-encompassing World Ocean.
- The Arctic Ocean's surface temperature and salinity vary seasonally as the ice cover melts and freezes.
- Its salinity is the lowest on average of the five major oceans, due to low evaporation, heavy fresh water inflow from rivers and streams, and limited connection and outflow to surrounding oceanic waters with higher salinities.

11.4 Decline in Artic Sea Ice

- Sea ice arises as seawater freezes, because ice is less dense than water, it floats on the ocean's surface.
- Sea ice covers about 7% of the Earth's surface and about 12% of the world's oceans.
- Recently, National Centre of Polar and Ocean Research (NCPOR) has observed the largest decline in the Arctic Sea ice in the last 41 years.
- According to recent observations in the last 40 years (1979-2018), the sea ice has been declining at 4.7% per decade, while the





current declining rate was found to be 13% in July 2019.

- Thus, it has been noted that the volume of ice formation during winters is unable to keep pace with the volume of ice loss during summers.
- Additionally, it has been predicted that if this trend continues, there would be no ice left in the Arctic Sea by 2050.
- The decrease of the Arctic Sea ice area and the increase in the duration of summer and autumn seasons affected the local weather and climate over the Arctic Ocean and its marginal seas.
- It may affect other components of the climate system such as reduction of heat, water vapor, and other material exchange between the atmosphere and the sea.
- The northern hemisphere experienced record high-temperature rise, especially during the spring and summer months.

11.5 Last Glacial Maximum

- About 19,000-21,000 years ago, ice-sheets covered North America and Eurasia, and sea-levels were much lower, with Adam's Bridge exposed so that the Indian subcontinent and Sri Lanka were contiguous.
- This period, the peak of ice age conditions, is called the Last Glacial Maximum.
- Global sea-level is rising and glacial ice is melting today, whereas the opposite was true for the Last Glacial Maximum.
- Researchers analyzed simulations of this past climate and predicted that the ongoing climate change could reawaken an ancient climate pattern of the Indian Ocean.
- They find that this could be similar to the El Nino phenomenon of the Pacific Ocean bringing more frequent and devastating floods and drought to several densely-populated countries around the Indian Ocean region.
- If current warming trends continue, this new Indian Ocean El Nino could emerge as early as 2050.
- It could bring more frequent droughts to East Africa and southern India and increased rainfall over Indonesia.

11.6 Study on Regional Climatic Features

- Indian Institute of Geomagnetism (IIG) has tracked climate change by following the Paleomonsoonal pattern of the subcontinent by harnessing magnetic mineralogy.
- The magnetic minerals are sensitive to the physical and chemical environment that they are embedded in.
- These external changes bring about modifications in the innate structure of these magnetic minerals, transitioning them from one magnetic phase to another.
- In this process, the magnetic mineralogy also changes. For example, from magnetite to hematite and vice versa.
- The mineral magnetic studies have unraveled 4 regional climatic features encompassing the entire Indian subcontinent and one localized climatic event, they are as follows
- Higher monsoon precipitation in the western part of India was shown to be analogous with glacial melt in the Himalayas.
- The weakening of monsoon was inferred in the Himalayas and the hinterland of Arabian Sea, analogically cold and dry conditions were prevalent at Dhakuri (Uttarakhand), which led to the formation of loess deposits.
- The monsoon intensification is deciphered in the western and eastern part of India with major implications in the hinterlands of the Arabian Sea and Bay of Bengal.
- Holocene aridity and weakened monsoon was inferred to be prevalent across the subcontinent (Holocene is the current geological epoch).
- The localized feature of Younger Dryas cooling seems to be confined to just the upper reaches of the Himalaya, Younger Dryas is a period of rapid cooling in the late Pleistocene.

11.7 Tuting-Tidding Suture Zone (TTSZ)

- In major part of the Eastern Himalaya, the Himalaya takes a sharp southward bend and connects with the Indo-Burma Range.
- Tuting-Tidding Suture Zone (TTSZ) of the Arunachal Himalaya has gained significant importance in recent times due to the growing need of constructing roads and hydropower projects, making the need for understanding the pattern of seismicity in this region critical.
- Recent study in the TTSZ, Arunachal Pradesh, has revealed that the area is generating moderate earthquakes at two different depths.
- The study aims to explore the elastic properties of rocks and seismicity in this easternmost part of India.
- The findings of the study are
- Low magnitude earthquakes are concentrated at 1-15 km depth, and slightly higher than 4.0 magnitude earthquakes are mostly generated from 25-35 km depth.
- The intermediate-depth is devoid of seismicity and coincides with the zone of fluid/partial melts.
- Exhumation and growth of Himalaya is a continuous process, which is because rocks on the lower surface of a fault plane move under relatively static rocks on the upper surface, a process called under thrusting of the Indian plate beneath its Eurasian counterpart.
- This process keeps modifying the drainage patterns and landforms and is the pivotal reason for causing an immense seismic hazard in the Himalayan mountain belt and adjoining regions.

11.8 Fujiwhara Effect

- The Fujiwhara effect, is a phenomenon that occurs when two nearby cyclonic vortices move around each other and close the distance between the circulations of their corresponding low-pressure areas.
- When cyclones are in proximity of one another, their centers will circle each other cyclonically (counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere) about a point between the two systems due to their cyclonic wind circulations.
- The two vortices will be attracted to each other, and eventually spiral into the center point and merge.
- When the two vortices are of unequal size, the larger vortex will tend to dominate the interaction, and the smaller vortex will circle around it.
- Recently two tropical storms, formed in the western Atlantic Ocean at nearly the same time, are likely to impact the Gulf of Mexico, sparking concerns of the rare Fujiwhara effect that occurs when two hurricanes combine to form a mega hurricane.
- The last time two tropical storms formed at the same time and struck the region was in 1933.
- Marco is the 13th named storm of the Atlantic hurricane season which runs from June to November.
- It is likely to make landfall along the Louisiana state coastline August 24 evening.
- Tropical storm Laura is the 12th named storm of the season and is currently hovering over the Caribbean.
- This makes Marco and Laura the earliest 13th and 12th named storms respectively in the recorded history of Atlantic Hurricane season.
- Their simultaneous formation in the western Atlantic Ocean created a Fujiwhara effect scare.





11.9 Boreal Summer Intra-Seasonal Oscillation (BSISO)

- BSISO is a movement of convection (heat) from the Indian Ocean to the western Pacific Ocean roughly every 10-50 days during the monsoon (June-September).
- The BSISO of the Asian summer monsoon (ASM) is one of the most prominent sources of short-term climate variability in the global monsoon system.
- Researchers at the Indian National Centre for Ocean Information Services (INCOIS), Hyderabad have reportedly found a way to better forecast the Boreal Summer Intra-Seasonal Oscillation (BSISO).
- They found that waves induced by active phases of BSISO are nearly 0.5 meters higher than those which occur during other phases of BSISO.
- The active phase (between June and August) enhances monsoon winds and hence the surface waves.
- Some other phases induce high wave activity in the north Indian Ocean and the Arabian Sea
- Compared with the related Madden-Julian Oscillation (MJO) it is more complex in nature, with prominent northward propagation and variability extending much further from the equator.
- Wave forecast advisories based on the BSISO would be more useful for efficient coastal and marine management.

11.10 Madden Julian Oscillation (MJO)

- MJO is an oceanic-atmospheric phenomenon which affects weather activities across the globe. It brings major fluctuation in tropical weather on weekly to monthly timescales.
- It can be defined as an eastward moving 'pulse' of clouds, rainfall, winds and pressure near the equator that typically recurs every 30 to 60 days.
- It's a traversing phenomenon and is most prominent over the Indian and Pacific Oceans.
- The MJO consists of two parts or phases.
- **Enhanced rainfall (or convective) phase** - winds at the surface converge, and the air is pushed up throughout the atmosphere.
- Such rising air motion in the atmosphere tends to increase condensation and rainfall.
- **Suppressed rainfall phase** - winds converge at the top of the atmosphere, forcing air to sink and, later, to diverge at the surface.
- As air sinks from high altitudes, it warms and dries, which suppresses rainfall.
- The Indian Ocean Dipole (IOD), El Nino and MJO are all oceanic and atmospheric phenomena, which affect weather on a large scale.
- IOD only pertains to the Indian Ocean, but the other two affect weather on a global scale-up to the mid-latitudes.
- IOD and El Nino remain over their respective positions, while MJO is a traversing phenomenon.

11.11 Sea Surface Temperature

- Sea surface temperature (SST) is the water temperature close to the ocean's surface.
- The exact meaning of surface varies according to the measurement method used, but it is between 1 millimetre (0.04 in) and 20 metres (70 ft) below the sea surface.
- Air masses in the Earth's atmosphere are highly modified by sea surface temperatures within a short distance of the shore.
- SST changes diurnally, like the air above it, but to a lesser degree, there is less SST variation on breezy days than on calm days.
- A new study on variability in the Mascarene High (MH) during global warming hiatus (GWH) revealed that the Southern Indian Ocean has experienced significantly increased sea surface temperature (SST) during this period (1998-2016).



- **The Mascarene High (MH)** is a semi-permanent subtropical high-pressure zone in the South Indian Ocean.
- Apart from its large influence on African and Australian weather patterns, it also helps in driving the inter-hemispheric circulation between the Indian Ocean in the south and subcontinental landmass in the north.
- **A global warming hiatus** is referred to a global warming pause, or a global warming slowdown, which is a period of relatively little change in globally averaged surface temperatures.
- The hiatus, however, can result in an increase in the SST.
- This warming in SST, resulted in a decrease in the pressure gradient between the MH and the Indian landmass.
- This in turn suppressed the intensity of low-level cross-equatorial winds over the western Indian Ocean affecting the onset of the monsoon over the Indian subcontinent and rainfall over East Asia.
- The southwest monsoon caused by this high-pressure area is the strongest component of the Indian subcontinent monsoon that contributes about more than 80 per cent of the annual rainfall in entire East Asia.
- The weakening of the MH in the southern Indian Ocean during GWH may affect the strength of the upwelling along the coast of Somalia and Oman and thus, influence the Arabian Sea ecosystem.

11.12 Indus Suture Zone (ISZ)

- A suture zone is a linear belt of intense deformation, where distinct terranes, or tectonic units with different plate tectonic, metamorphic, and paleo geographic histories, join together.
- The ISZ represents a belt of tectonic compression caused by the under thrusting of the Indian shield/ plate against the Tibetan mass.
- It marks the boundary between the Indian and Eurasian plates.
- The suture zone stretches from the North-Western Himalayan syntaxes bordering the Nanga Parbat to the East as far as the Namche Barwa Mountain.
- The fault line runs all along the Indus River, from China through India and Pakistan.
- According to a recent survey has found that a tectonic fault line that runs through Ladakh, along the Indus River, is moving northward.
- The Karakoram Range and the Ladakh plateau lie to the north of ISZ and originally formed a part of the European plate.
- The zone has been neo-tectonically active for the past 78,000-58,000 years.
- While the frontal and central parts of the Himalayas, the Shivaliks, Himachal Pradesh, Uttarakhand, Jammu and Kashmir and Sikkim are still known to be active and moving.

Thrusts of Himalaya

- Himalaya were known to be made up of north dipping thrusts like
 1. Main Central Thrust (MCT),
 2. Main Boundary Thrust (MBT),
 3. Main Frontal Thrust (MFT).
- As per the established models, all of these thrusts except MFT are locked, and overall deformation in Himalaya is being accommodated only along with the MFT.

11.13 Glacial Lake Outburst

- Glacial lake outburst floods will happen all over the Indian Himalaya, however not all of these events have catastrophic outcomes.
- It largely depends on urban planning, the size of the lake, the distance between the lake and affected villages, the valley section and some more aspects.
- In some cases, cloudbursts can also trigger glacial lake outburst flood events like in the Kedarnath disaster in 2013.
- These events have been regarded as a major risk in the central Himalayan region including Sikkim.
- Glacial lake outburst floods in the arid Trans-Himalayan regions of Ladakh have received attention only recently.



- In August 2014, a glacial lake outburst flood hit the village of Gya in Ladakh, destroying houses, fields and bridges.
- The cause of this was not spill over but rather a tunnelling drainage process. i.e. There was a thawing of the ice cores in the moraine [a field of dirt and rocks that have been pushed along by the glacier as it moves] which drained through the subsurface tunnels.
- Recently using remote sensing data, researchers from Germany have mapped the evolution of Gya glacial lake and note the cause of the flood.
- This illustrates the problem of potentially hazardous lakes being overlooked.
- The team notes that thawing of ice cores may accelerate in the future due to global climate change, and there is an urgent need to use multiple methods for better risk assessment and early warning.

11.14 La Niña Influence

- The ongoing winter season from December 2020 to February 2021 will be colder than usual in several parts of India.
- The minimum temperatures in north, northwest, central and some areas in eastern India may be lower than the average.
- The maximum temperatures in some of the same regions of north, northwest, eastern and some parts of central India may be higher than the average.
- There would be wider gap between day and night temperatures.
- One reason for this could be the prevailing La Niña conditions in the Equatorial Pacific Ocean.

La Niña

- La Niña means the large-scale cooling of ocean surface temperatures in the central and eastern equatorial Pacific Ocean, together with changes in the tropical atmospheric circulation, namely winds, pressure and rainfall.
- It has the opposite impacts on weather and climate as El Niño, which is the warm phase of the El Niño Southern Oscillation (ENSO).
- La Niña will result in sea surface temperatures between 2- and 3-degrees Celsius cooler than average.
- La Niña could last into 2021, affecting temperatures, precipitation and storm patterns in many parts of the world.
- The La Niña of 2020 is expected to be moderate to strong.
- According to World Meteorological Organization, La Niña weather phenomenon is back in the central and eastern equatorial Pacific Ocean after nearly a decade's absence.
- In India, La Niña means the country will receive more rainfall than normal, leading to floods.
- It usually brings in colder than normal winters in India.
- It influences the Indian subcontinent by piping in cold air from Siberia and South China, which interacts with the tropical heating to produce a north-south low-pressure system.
- The cold air associated with this north-south trough tends to extend much farther south into India, but won't affect the North East that much.
- This is remarkably different than the more northwest-southeast blast of cold air associated with an El Niño.
- Generally, the La Niña cold air occupies a larger part of India than the El Niño cold air.

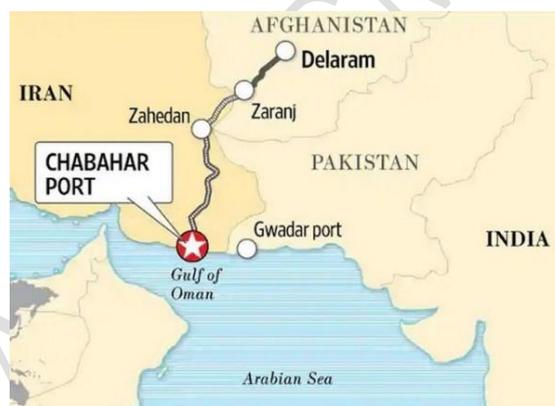
11.15 Medicanes

- Medicanes are tropical-like cyclones formed over the Mediterranean Sea.
- With the surrounding dry climate and the relatively shallow waters of the sea, the occurrence of tropical-like cyclones is infrequent.
- They typically form in the fall or winter months and occur once or twice a year.

- On September 2020, a medicane named Lanos made landfall along the coast of Greece and caused heavy rainfall and flooding in Greece and surrounding islands.
- Recently Scientists have warned that ‘Medicanes’ could become more frequent due to human-induced climate change.
- Due to global warming, warmer sea surface temperatures in the Mediterranean can allow the storms to take on more tropical appearances and characteristics, increasing the wind speeds and making the storms more intense and cause heavier rainfall.
- Increase in frequency of medicanes will be a threat for already vulnerable populations living in North Africa, possibly triggering human migration.
- They could also be a menace for European countries like Italy and Greece.

11.16 Chabahar-Zahedan Railway Line

- In 2016 India and Iran signed an agreement to construct a 628 km rail line from Chabahar port to Zahedan, along the border (Zaranj) with Afghanistan.
- The railway project was being discussed between the Iranian Railways and the state-owned Indian Railways Construction Ltd (IRCON).
- It is a part trilateral agreement between India, Iran and Afghanistan to build an alternate trade route to Afghanistan and Central Asia.
- Recently, Iran has decided to proceed with the construction on its own, citing delays from the Indian side in funding and starting the project.
- The entire project would be completed by March 2022, and that Iranian Railways will proceed without India’s assistance.
- Iran will be using approximately \$400 million from the Iranian National Development Fund.
- The development comes as China finalizes a massive 25-year, \$400 billion strategic partnership deal with Iran.



11.17 Milne ice shelf

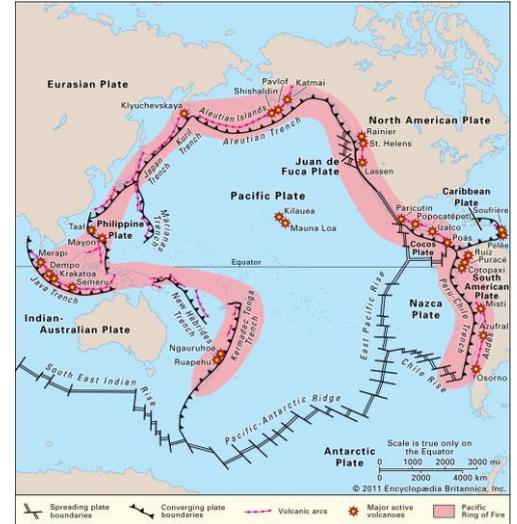
- Ice shelves are large floating pieces of ice that form when a glacier or ice sheet flows into the sea surface.
- Milne ice shelf is in Ellesmere Island, Canada and recently it was broken.
- The Milne ice shelf lost more than 40 % of its ice over 2 days end of July 2020.
- This has increased concerns over the rapid melting of ice and the breaking of old ice shelves due to global warming.
- This also meant the last known Epishelf Lake, a water body dammed by the ice shelf and floating on the ocean surface on the Milne ice shelf, no longer exists.



11.18 Mount Sinabung

- Indonesia’s active volcano Mount Sinabung erupted recently.
- A volcano can erupt when magma (a thick flowing substance), formed when the earth’s mantle melts, rises to the surface.

- Because magma is lighter than solid rock, it is able to rise through vents and fissures on the surface of the earth.
- After it has erupted, it is called lava.
- Not all volcanic eruptions are explosive, since exclusivity depends on the composition of the magma.
- Indonesia is home to many active volcanoes, due to its position on the “Ring of Fire”, or the Circum-Pacific Belt, which is an area along the Pacific Ocean characterized by active volcanoes and frequent earthquakes.



11.19 Kilauea Volcano

- This volcano erupted from at least two vents inside its deep summit crater after a two-year break.
- It is found within Hawaii Volcanoes National Park.
- It is one of the world’s most active volcanoes, which has erupted almost continuously between 1983 and 2018.
- It had a lava lake in its crater from the last decade of that eruption.
- When erupting, Kilauea spews large amount of sulfur dioxide.
- This sulfur dioxide forms **volcanic smog**, or vog, when it mixes with oxygen, sunlight and other gases in the air.

11.20 Pripyat River

- Recently World Wide Fund (WWF) for Nature has warned that dredging of Pripyat River could wreak havoc on an estimated 28 million people in Ukraine.
- Pripyat River flows near the site of the infamous nuclear accident at Chernobyl.
- It is Ukraine’s most important river, on which its capital city of Kiev is located.
- The city of Pripyat, with a population of 45,000, was completely evacuated after the Chernobyl disaster and is now a ghost town.



11.21 E40 Project

- The E40 project envisions connecting the Black and Baltic Seas for ocean-going ships to ply.
- It seeks to connect the ports of Gdansk in Poland on the Baltic, with that of Kherson in Ukraine on the Black Sea.
- The Pripyat will become a permanent source of radioactive contaminants because annual dredging will be needed to ensure the successful operation of the E40 waterway.
- The E40 waterway will dry up rivers, damage landscapes, negatively impact wildlife and destroy the livelihoods of local people.
- The Pripyat River is being dredged as part of the restoration of a bilateral waterway between Ukraine and Belarus and is being seen as the first step of the much larger E40 project.
- The dredging of Chernobyl exclusion zone on Pripyat River could increase the radiation risk.

11.22 Barbados

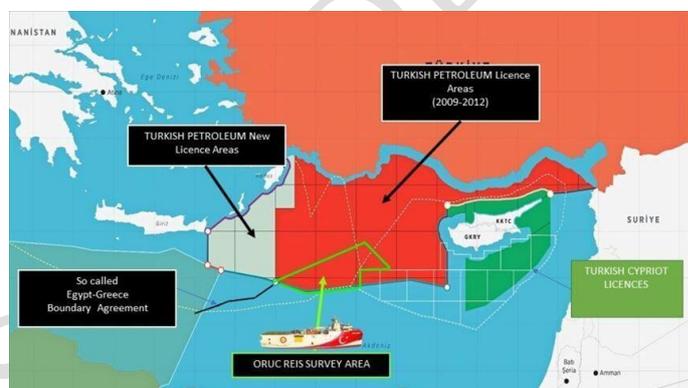
- Barbados is a former British colony, gained its independence in 1966.
- Although it is an independent state, Queen Elizabeth remains its constitutional head, as did other self-governing Commonwealth nations such as Canada and Australia.

- Queen Elizabeth II, who is the head of state in the UK and 15 other Commonwealth realms, including Canada, Australia and New Zealand, will be dropped as monarch by Barbados next year.
- The Caribbean nation aims to complete the process of becoming a republic before its 55th anniversary of independence from Britain, in November 2021.
- With this, it will become the first country in almost three decades to sever ties with the British royal family and become a republic; Mauritius being the last to do so in 1992.
- Barbados however, expected to remain a member of the Commonwealth of Nations, the 54-nation club of mostly former British colonies which is led by the queen, and includes India.



11.23 Oruç Reis Vessel

- Oruç Reis is an energy exploration vessel of Turkey.
- The vessel has been deployed in seismic research in the East Mediterranean sea.
- The Turkish vessel is accompanied by two Turkish naval ships, this had created standoff between Greece, Egypt and Turkey in Mediterranean Sea.
- Recently Turkey resumed energy exploration in the region after Greece and Egypt signed a controversial maritime delimitation deal.
- The agreement came only a day after Ankara said it would postpone its oil and gas exploration as a goodwill gesture.
- But, after declaring the Greek-Egyptian deal "null and void," Turkey authorized the Oruç Reis to continue its activities in an area within the country's continental shelf.
- Turkey has consistently opposed Greece's efforts to declare an exclusive economic zone (EEZ) based on small islands near Turkish shores, violating the interests of Turkey, the country with the longest coastline in the Mediterranean.



11.24 Tristan da Cunha

- Tristan da Cunha is a remote group of volcanic islands in the south Atlantic Ocean.
- It is the most remote inhabited archipelago in the world
- It is a British Overseas Territory with its own constitution.
- It is declared as the largest fully protected marine reserves in the Atlantic Ocean at 687,000 square kilometres.
- The island group is also home to the World Heritage Site of Gough and Inaccessible Islands, which is one of the most important seabird islands in the world.
- UK's Blue Belt Programme supports the UK Overseas Territories with the protection and sustainable management of their marine environments.
- After joining the UK's Blue Belt Programme, Tristan da Cunha will become the largest no-take zone in the Atlantic and the fourth largest on the planet.
- This means fishing, mining and any such activities will not be allowed.
- This will close over 90 percent of their waters to harmful activities such as bottom-trawling fishing, sand extraction and deep-sea mining.

11.25 Western Sahara Dispute

- The United States recognised the sovereignty of Morocco over the disputed Western Sahara region.
- In turn, Morocco agreed to normalise its relations with Israel.
- Western Sahara, a former Spanish colony, is an arid region in northwest Africa, which is rich in phosphate reserves.
- This region is under dispute between Morocco and Mauritania since 1975 when Spain partitioned the region between these two countries.
- The recent recognition by US is a major symbolic victory for Morocco.

11.26 Height of Mt. Everest

- Nepal and China jointly certified the elevation of Mount Everest at 8,848.86 metres above sea level.
- This height is 86 cm higher than what was recognised since 1954.
- The elevation of 8,848 m was determined by the Survey of India in 1954.
- The devastating earthquake of 2015 in Nepal triggered a debate among scientists on whether it had affected the height of Mt Everest.
- Nepal's Survey Department decided to measure the mountain on its own, instead of continuing to follow the Survey of India findings of 1954.
- New Zealand, which shares a bond with Nepal over the mountain, provided technical assistance.
- Sir Edmund Hillary, the first climber on the peak in May 1953, worked as the mountain's undeclared brand ambassador to the world.

11.27 Mount Ili Lewotolok

- Mount Ili Lewotolok is located on Lembata Island in eastern Indonesia.
- This volcano has been erupting on and off since October 2017.
- Volcanology and Geological Hazard Mitigation Center raised volcano's alert level to the second-highest level after sensors picked up increasing activity.
- This mountain is one of the three currently erupting in Indonesia along with Merapi on Java island and Sinabung on Sumatra island.
- There are more than 120 active volcanoes in Indonesia prone to seismic upheaval due to its location on the Pacific "Ring of Fire".



11.28 Droughts in Non-El Niño Years

- In an El Niño year, abnormally warm equatorial Pacific waters pull moisture-laden clouds away from the subcontinent, causing droughts.
- But a study shows that in non-El Niño years, droughts are a consequence of a sudden and steep drop in rainfall in late August.
- A non-El Niño-year drought will see rainfall that would weaken in mid-June.
- From mid-July to mid-August, the monsoon will appear to recover.
- However, around August third week, there was a sudden steep decline in rainfall, resulting in drought conditions.

- **Reason** - Winds in the upper atmosphere are interacting with a deep cyclonic circulation above the abnormally cold North Atlantic waters.
- The resulting wave of air currents (**Rosby wave**) curved down from the North Atlantic squeezed in by the Tibetan plateau.
- These waves hit the subcontinent around mid-August, suppressing rainfall and throwing off the monsoon.
- The wave's usual course is to go from west to east, but not towards the equator.
- Thus beyond looking at the Pacific Ocean, it is important to consider other influences on the Indian monsoon from outside the tropics.

INDIAN GEOGRAPHY

12.1 Container Ship to Agartala

- Union Ministry of Shipping inaugurated the first trial movement of a container ship carrying steel and pulses from Kolkata port to Bangladesh's Chattogram port.
- It will transport cargo to Assam and Tripura.
- It will provide a shorter route to connect India's north-east region through Bangladesh.
- This is the first time after 1965 that Bangladesh is allowing its ports to be used as a transit for cargo movement from any part of India to northeastern states.
- It is done under the Agreement on use of Chattogram and Mongla Ports for movement of India's transit cargo through Bangladesh.
- India and Bangladesh have enhanced cooperation in shipping and inland water trade, under the Protocol on Inland Water Transit and Trade, in addition to the six existing Ports of Call.

12.2 Kakrapar Atomic Power Plant

- Kakrapar Atomic Power Plant is the country's first 700 MWe (megawatt electric) unit, located in Gujarat.
- It is the biggest indigenously developed variant of the Pressurized Heavy Water Reactor (PHWR).
- The operationalization of India's first 700MWe reactor marks a significant scale-up in technology.
- It has recently achieved its criticality, which is a landmark event in India's domestic civilian nuclear programme.
- It is significant in terms of optimization of its PHWR design.
- It addresses the issue of excess thermal margins and an improvement in the economies of scale, without significant changes to the design of the 540 MWe reactor.
- 'Thermal margin' refers to the extent to which the operating temperature of the reactor is below its maximum operating temperature.
- The 700MWe capacity would constitute the biggest component of the expansion plan of India to ramp up its existing nuclear power capacity of 6,780 MWe to 22,480 MWe by 2031.
- **Criticality** - The normal operating condition of a reactor, in which nuclear fuel sustains a fission chain reaction.
- A reactor achieves criticality when each fission event releases a sufficient number of neutrons to sustain an ongoing series of reactions.

12.3 Kutch Mainland Fault (KMF)

- The Kutch Mainland Fault (KMF) is the major east-west trending fault.
- The fault line extends for over 150 km from Lakhpat to Bhachau.
- It has been dormant for the last 1,000-odd years



- The fragile crust of Kutch holds four major active faults which frequently liberate energy in the form of earthquakes.
- The devastating January 26, 2001 earthquake had occurred from the South Wagad fault system.
- According to recent study Kutch Mainland Fault (KMF), has been accumulating stress within and could trigger an earthquake.
- The study also gives evidence that there were four major earthquakes on KMF between 5600 and 1000 Before Present.
- Before Present is a time scale used by geologists to define events that happened before the origin of radiocarbon dating technology in the 1950s.

12.4 India's Wind Power Project

- Sembcorp Energy India Limited (SEIL) is a wholly-owned subsidiary of Sembcorp Industries.
- Recently, it announced the completion of the latest 800MW wind power projects, bringing India its renewable energy capacity to 1730 MW.
- Power from these projects to light up more than 600,000 homes and reduce carbon dioxide emissions by over 2 million tonnes/annum
- Sembcorp becomes the first independent power producer to fully commission its projects awarded in the first three wind auctions held by the Solar Energy Corporation of India (SECI).
- This capacity is also the largest operational wind capacity with any developer to-date from SECI auction.

12.5 Rewa Solar Project

- Recently, 750 MW (Mega Watt) solar project set up in Rewa, Madhya Pradesh has been inaugurated.
- It is Asia's largest solar power project, with total area 1500 hectare.
- It was developed by the Madhya Pradesh Urja Vikas Nigam Limited (MPUVN), and Solar Energy Corporation of India (SECI), a Central Public Sector Undertaking.
- It is the first solar project in the country to break the grid parity barrier.
- Grid parity occurs when an alternative energy source can generate power at a cost of electricity that is less than or equal to the price of power from the electricity grid.
- It is the first renewable energy project to supply an institutional customer outside the state, i.e. Delhi Metro.
- It is also India's first solar project to get funding from Clean Technology Fund (CTF), which is available at a rate of 0.25% for a 40-year period from the World Bank.
- It has also received the World Bank Group President's Award for innovation and excellence.

12.6 Finding on Fish landings

- According to Central Marine Fisheries Research Institute (CMFRI) India's marine fish production has registered a marginal increase of 2.1% in 2019 compared to the previous year.
- Tamil Nadu took the first position in landings of fishes with 7.75 lakh tones.
- It was followed by Gujarat (7.49 lakh tones) and Kerala (5.44 lakh tones).
- While States such as West Bengal (55%), Andhra Pradesh (34%), Odisha (14.5%), Karnataka (11%) and Tamil Nadu (10.4%) recorded increase in landings, the fish catch decreased in Maharashtra, Goa and Kerala compared to the previous year.

12.7 Depsang Plains

- Depsang Plains are located at the Line of Actual Control that separates the Indian and Chinese controlled regions.
- The Chinese Army occupied most of the plains in 1962.

- India controls the western portion of the plains as part of Ladakh, whereas the eastern portion is part of the Aksai Chin region, which is controlled by China and claimed by India.
- Depsang is also close to the Karakoram Pass, overlooking the very strategic Salto Ridge and Siachen glacier.
- Daulat Beg Oldie (DBO) is a historic campsite and current military base located in Ladakh, on an ancient trade route connecting Ladakh to the Tarim Basin.
- Recently military level strategic talks were held about the region between India and China at the Daulat Beg Oldie
- This is the first Major General-level talks since the violent clash at Galwan.

12.8 Lonar Lake

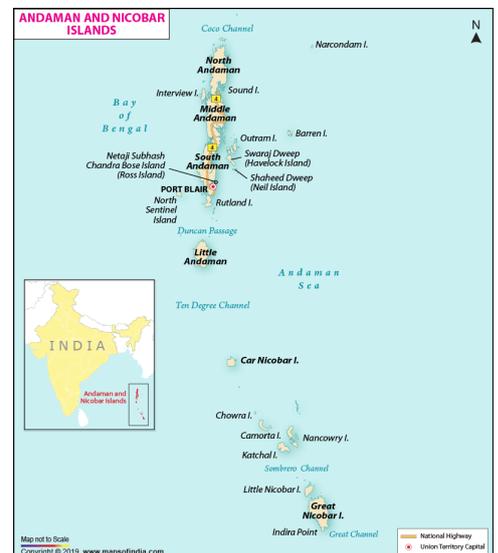
- Lonar Lake is a saline and alkaline lake located in Maharashtra.
- It was created by an asteroid collision with earth impact during the Pleistocene Epoch.
- It is one of the four known, hyper-velocity, impact craters in basaltic rock anywhere on Earth.
- The other three basaltic impact structures are in southern Brazil.
- It is a notified National Geo-heritage Monument, situated inside the Deccan Plateau.
- Recently, the lake turned red/pink due to lowered water levels and high salinity caused growth of Halo bacterium and increased Carotenoid levels.

Bhadbhut project

- Bhadbhut project in Bharuch is planned to be a 1.7-km causeway-cum-weir barrage with 90 gates, across the river Narmada.
- The barrage will stop most of the excess water flowing out of the Sardar Sarovar Dam from reaching the sea and thus create a “sweet water lake” of 600 mcm (million cubic metres) on the river.
- The sweet water from the reservoir will aim to meet the residential and industrial water requirements of Bharuch, Ankleshwar and Dahej.
- The project also aims to prevent flooding in years when rainfall is higher than normal.
- Embankments 22 km long will be made and will extend upstream towards Bharuch, from either side of the river.
- The barrage design also has a navigation lock to enable any future plans to run a ferry service or boats under the inland waterway scheme.
- The Inland Waterway Authority of India has given clearance for this project.
- The project as faced protests from local fishermen for its likely impact on fishing patterns, notably those of hilsa.
- A marine fish, hilsa migrate upstream and arrives in the brackish water of the Narmada estuary near Bharuch for spawning usually during the monsoon months of July and August, and continue doing so till November.
- Once the barrage is built, it is expected to block their natural entry.

12.9 Undersea Optical Fiber Cable

- India's first-ever undersea optical fiber cable has been introduced as part of a new project for Andaman and Nicobar Islands.
- The cable system will help provide for faster internet speeds and get rid of the cobweb of wires needed for the same.
- The 2,312-Kilometers long submarine optical fiber cable project connects Chennai - Andaman and Nicobar Islands (CANI).
- The project allow for high-speed broadband connectivity, i.e. 400



Gbps for Port Blair and 200 Gbps for other islands.

- The project can be used by all the telecom operators for mobile and internet services.
- Apart from Port Blair, the cable will cover other islands namely Swaraj Dweep (Havlock), Long Island, Rangat, Little Andaman, Kamorta, Car Nicobar, and Greater Nicobar.

12.10 Agatti Island

- It is in the UT of Lakshadweep.
- It is at a distance of 459 km (248 nautical miles) from Kochi and is located to the west of Kavaratti Island.
- The lagoon area of this island is habitat of coral growth and multicolored coral fishes in the lagoons.
- Fishing is the most important industry which is perhaps the only island besides Minicoy getting surplus fish.
- Next to fishing, coir (coconut fibre) and copra (dried meat or kernel of the coconut) are the main industries.
- Recently, the southern bench of the National Green Tribunal (NGT) has granted an interim stay on felling of coconut trees on Agatti Island in Lakshadweep.



- The tree-felling is also violating the Union Territory's (UT) Integrated Island Management Plan (IIMP).
- IIMP was formulated on the basis of a report submitted by the Supreme Court-appointed Expert Committee, headed by Justice R.V. Raveendran.
- It includes holistic island development plans prepared by the National Centre for Sustainable Coastal Management (NCSCM) for implementation by coastal States/ UTs.

12.11 Shinkun La Tunnel

- National Highways & Infrastructure Development Corporation Ltd (NHIDCL) has made a project report for the world's longest high-altitude Shinkun La Tunnel.
- The tunnel (13.5 Km long) is proposed to be built on the border between Ladakh and Himachal Pradesh.
- Once it is complete, the Manali-Kargil highway will remain open throughout the year.
- The tunnel will provide all-weather road connectivity between Himachal Pradesh and Jammu and Kashmir in Zaskar valley.

12.12 Daudkandi - Sonamura Inland Waterways

- Recently trial run on new river route from Daudkandi in Bangladesh to Sonamura in Tripura has been inaugurated.
- The route will connect Tripura with Bangladesh using the inland waterways for the first time.
- Cargo ship MV Premier sailed from Daudkandi, which is scheduled to arrive in Sonamura in Tripura after covering a distance of 93 kilometers through river Gumti.
- The opening of the new route follows the signing of the 2nd addendum to the Protocol for Inland Water Trade & Transit (PIWTT) in May 2020 which opened two new routes.

12.13 Regional Rapid Transit System (RRTS)

- National Capital Region Transport Corporation (NCRTC), unveiled the first look of India's first RRTS train.
- It will be first of its kind in India with a design speed of 180 kmph.



- RRTS trains will be lightweight and fully air-conditioned with radiating stainless steel outer body.
- The prototype is scheduled to roll off the production line in 2022 and will be put into public use after extensive trials.
- The 82 km long Delhi–Ghaziabad–Meerut Corridor is the first RRTS corridor being implemented in India.
- The corridor will bring down the travel time between Delhi to Meerut by around 1/3rd.

NCRTC

- NCRTC is a joint venture of the Government of India (50%) and State Governments of Haryana (12.5%), NCT Delhi (12.5%), Uttar Pradesh (12.5%) and Rajasthan (12.5%).
- It is mandated to design, construct, finance, operate and maintain RRTS in NCR and works under the administrative control of Ministry of Housing & Urban Affairs, GOI.
- NCRTC is mandated to implement India's first RRTS in NCR.

12.14 Nechiphu Tunnel

- Recently Foundation stone for Nechiphu Tunnel in Arunachal Pradesh has been laid.
- The tunnel is in the Balipara-Charduar-Tawang (BCT) road in West Kameng district of Arunachal Pradesh.
- The 450m-long tunnel will bypass the existing road, will be D-shaped and comprise two lanes of 3.5m width each.
- Another 1.8 km-long tunnel is also being constructed on the BCT road and both will reduce distance to the area bordering China by 10km.
- This project is of strategic importance and provide connectivity to remote areas.

12.15 Lost River of Thar Desert

- Researchers have found the evidence of a "lost" river that ran through the central Thar Desert, near Bikaner.
- The findings represent the oldest directly dated phase of river activity at Nal Quarry in the central Thar Desert.
- The study indicates that Stone Age populations lived in a distinctly different Thar Desert landscape than we encounter today.
- This evidence indicates a river flowed with phases of activity dating to approximately up to 172 thousand years ago, nearby to Bikaner, Rajasthan, which is over 200 kilometres away from the nearest modern river.
- These findings predate evidence for activity in modern river courses across the Thar Desert as well as dried up course of the Ghaggar-Hakra River.
- The results indicated that the strongest river activity at Village of Nal occurred at a time when the monsoon was much weaker than today in the region.
- River activity continued at the site between 95 to 78 thousand years ago.

Thar Desert

- It is also known as the Great Indian Desert.
- It is a large arid region in the north-western part of the Indian subcontinent and forms a natural boundary between India and Pakistan.
- It extends between the Aravalli Hills in the north-east, the Great Rann of Kutch along the coast and the alluvial plains of the Indus River in the west and north-west.
- About 85% of the Thar Desert is located within India, with the remaining 15% in Pakistan.
- More than 60% of the desert lies in the Indian state of Rajasthan, and it extends into the states of Gujarat, Punjab and Haryana.
- Within Pakistan's Punjab province, the Thar continues as the Cholistan Desert.

12.16 Sitwe Port

- Sittwe Port is situated at the mouth of the Kaladan River.
- The project will link Kolkata to Sittwe in Myanmar and then from Myanmar's Kaladan river to India's north-east.
- It is being financed by India as a part of the Kaladan Multi-Modal Transit Transport Project, a collaboration between India and Myanmar.
- The project is aimed at developing transport infrastructure in southwestern Myanmar and north-eastern India.

- Recently India announced a grant of two million US Dollars for the construction of the border Haat Bridge at Byanyu/Sarsichauk in Chin State.
- India and Myanmar have agreed to work towards the operationalization of the Sittwe port in the Rakhine state in the first quarter of 2021.



12.17 Atal Tunnel

- World's longest highway tunnel at Rohtang was recently inaugurated.
- It is a 9.02 km-long-tunnel, at an altitude of above 3,000 metres.
- It connects Manali to Lahaul-Spiti valley.
- It is built by the Border Roads Organisation (BRO).
- It provides all-weather connectivity to the landlocked valley of Lahaul-Spiti, which remains cut-off for 6 months due to bad weather connection.
- It is also strategically important as it provide better connectivity to the armed forces in reaching Ladakh.

12.18 Nagorno-Karabakh Region

- Recently Armenia and Azerbaijan held their first high-level talks after nearly two weeks of fierce clashes over the disputed Nagorno-Karabakh region.
- Armenia and Azerbaijan are part of Transcaucasia or South Caucasia.
- Caucasia is a geographical region in the vicinity of the southern Caucasus Mountains on the border of Eastern Europe and Western Asia consisting of Georgia, Armenia, and Azerbaijan.
- Nagorno-Karabakh region has 95% of the population as ethnically Armenian and is controlled by them but it is internationally recognised as part of Azerbaijan.
- Armenia is Christian majority, while Azerbaijan is Muslim majority country.



12.19 Srisailem Hydroelectric Power Plant

- Recently Srisailem Hydroelectric power station started its operation after, witnessing a massive fire accident in August 2020.
- It is constructed across the Krishna River located between Kurnool and Mahabubnagar districts.
- The construction of the project started in 1980.
- It is a Gravity & Masonry type dam.
- A gravity dam is a type of dam which is constructed from concrete or stone masonry, which remain unaffected even after the strongest earthquake.
- It is designed in such a way so that it is capable of holding the water pressure by using the weight of its material alone and doesn't depend on other parts.
- Tungabhadra Dam, Sardar Sarovar Dam, Bhakra Dam, Hirakud Dam are some of the gravity dams located in India.



12.20 First route of Seaplane project

- The Seaplane project is part of a directive of the Union Ministry of Civil Aviation.
- As per the directive, the Airports Authority of India (AAI) requested state governments of Gujarat, Assam, Andhra Pradesh and Telangana and the administration of Andaman & Nicobar to propose potential locations for setting up water aerodromes to boost the tourism sector.
- The first seaplane services in Gujarat will connect Sabarmati River in Ahmedabad to the Statue of Unity in Kevadia in Narmada district.
- The service will be inaugurated on October 31, the birth anniversary of Sardar Vallabhbhai Patel.
- The proposed sea plane routes in Gujarat are
 1. Dharoi Dam in Mehsana district to connect Ambaji
 2. Shatrunjay dam in Palitana of Bhavnagar district to Tapi.

12.21 Pearl River

- The Pearl River estuary includes Hong Kong, Macau as well as the mainland Chinese cities of Shenzhen, Guangzhou and Dongguan.
- About 22 million people live in the area.
- The estuary is one of the busiest shipping lanes in the world.



12.22 Dhaulasidh Hydro Electric Project

- The project is going to be launched in Beas River in Hamirpur, Himachal Pradesh.
- The capacity of the project will be 66 MW.
- It is a run-of-the river project with little storage capacity for production of electricity during lean period.

12.23 Durand line

- The Durand Line is an important 2430 km international boundary line, running between the countries of Pakistan and Afghanistan.
- It was fixed by British civil servant Sir Henry Mortimer Durand and the then Afghan Emir, Abdur Rahman Khan in 1893.
- The treaty was meant to be for 100 years, but it was not renewed.
- It was established in order to fix the respective spheres of influence and also to improve the diplomatic ties between the British establishment in India and the Afghan Kingdom.
- It was accepted as the then Indo-Afghan border, the modern state of Afghanistan does not accept the Durand Line.
- However, it is internationally recognised as the western border of Pakistan.
- The Pakistani side of the border includes, among others, the North Western Frontier Province, which was renamed Khyber Pakhtunkhwa in 2010.
- India also has a small claim to the borderline, through Pakistan-occupied Kashmir (about 105 km of the easternmost section of the boundary line).
- Recently India has told UNSC, that it calls for an “immediate comprehensive ceasefire” in Afghanistan, while welcoming all opportunities to bring peace to the country.
- India speculates that there are various terrorist safe havens and sanctuaries operating across the Durand Line.



12.24 Distress Migration in Bonda Tribes

- Odisha's Bondas, a particularly vulnerable tribal group, and known for their secluded lives away from the mainstream.
- The endangered Bonda tribe are classified as one of India's Particularly Vulnerable Tribal Groups (PVTGs)
- They are known for their distinctive cultural traditions, the Bondas are divided into two groups:
 1. **Lower Bondas** - who live in south Odisha's Malkangiri district bordering Andhra Pradesh and Chhattisgarh.
 2. **Upper Bondas** - who live in the hilly terrains of the remote villages in the district.
- According to the 2011 census, there are 12,231 Bondas and they speak Remo, one of the Mundari group of languages spoken by Munda peoples in India.
- In recent times they are being forced leave their pristine hamlets for low-paid jobs in distant towns of Andhra Pradesh, Telangana and States even farther.

12.25 Erra Matti Dibbalu

- Erra Matti Dibbalu is dissected and stabilized coastal red sediment mounds.
- It is located between Visakhapatnam and Bheemunipatnam in Andhra Pradesh.
- It is believed to be formed around 12,000 years ago due to sea-land interaction.
- It comprises a mixture of sand (40-50%), silt and clay (another 50%) with oxidation imparting the unique red colour.
- They are geologically important as they represent the geological history of the late Quaternary period and carry the imprints of the fall of sea level and its subsequent rise, the impact of climate, monsoon and geological processes on the sediments.
- They are anthropologically and archeologically important as they possibly contain mesolithic and neolithic cultural materials as well.
- It was recognised as a national geo-heritage site in 2014 and as a protected site by the Andhra Pradesh Government in 2016.
- The Geological Survey of India (GSI) declares geo-heritage sites/ national geological monuments for protection and maintenance
- The only other place in the country to have a similar stretch of red sand dunes is Tamil Nadu, which has the Teri dune complex, Tuticorin District.

12.26 Luhri Stage-I Hydro Electric Project

- It is located on River Satluj in Shimla and Kullu districts of Himachal Pradesh.
- This project will generate 758.20 million units of electricity annually, which will help in providing grid stability and improve the power supply position.
- Besides adding valuable renewable energy to the grid, the project would also lead to a reduction of 6.1 lakh tons of carbon dioxide from the environment annually, thus contributing to an improvement in air quality and less air pollution.
- Himachal Pradesh will benefit with free power worth around Rs. 1140 crore, during the Project Life Cycle of 40 years.
- The project affected families will be provided with 100 units of free electricity per month for ten years.
- It is being implemented by Satluj Jal Vidyut Nigam Limited (SJVN) on Build-Own-Operate-Maintain (BOOM) basis with active support from Government of India and the State Government.
- Recently Cabinet Committee on Economic Affairs has approved the investment for 210 MW Luhri Stage-I Hydro Electric Project.



12.27 Hazira-Ghogha Ro-Pax Ferry Service

- Hazira-Ghogha Ro-Pax ferry service has inaugurated recently.
- It will work as a Gateway to South Gujarat and Saurashtra region.
- It will reduce the distance between Ghogha and Hazira from 370 Kilometres to 90 Kilometres.
- The reduced cargo travel time will result in huge savings of fuel approximately 9000 litres per day and will lead to reduction in CO₂ emission by approximately 24 million tonnes per day.
- With the onset of Ferry services, the port sector, furniture and fertilizer industries in Saurashtra and Kutch region will get a big boost.
- The benefits of enhanced connectivity through this ferry service will also result in increased inflow of tourists in the famous Asiatic lion wildlife sanctuary at Gir.

12.28 Survey of River Ganga

- Survey of Ganga River was initiated by Wildlife Institute of India (WII) on behalf of the National Mission for Clean Ganga.
- This is the first study ever done in the country on the entire river, and the first also of all its biodiversity.
- The institute has been tracking biodiversity through some key aquatic and semi-aquatic species such as the Gangetic Dolphins, gharials, otters, turtles and various species of water birds.
- Highlights of the Survey findings are as follows
 1. Ganga river (main river without its tributaries), has found that 49% of the river has high biodiversity.
 2. 10% of the high biodiversity areas fall alongside national parks and sanctuaries such as Rajaji national park in Uttarakhand, Hastinapur wildlife sanctuary in UP and Vikramshila gangetic Dolphin sanctuary in Bihar.
 3. Increased biodiversity sightings, including of the Gangetic Dolphin and Otters, indicates reduced pollution levels and a healthier state of the river.
 4. Many species that used to be found in the main stem and had disappeared, are now coming back, Few such sightings are as follows
 - a) Nesting colonies of the Indian Skimmer found.
 - b) Seibold's, a species of water snake, disappeared 80 years ago and has now resurfaced.
 - c) New distributions of the puffer fish found.
 5. Many other species have started travelling back from tributaries to the main stem of the river indicating improving water quality and increasing Biodiversity.

12.29 Saffron Cultivation in North East

- Saffron is a plant whose dried stigmas (thread-like parts of the flower) are used to make saffron spice.
- India cultivates about 6 to 7 tonnes of saffron while the demand is 100 tonnes.
- To meet the growing demand of saffron the MoS&T through the Department of Science and Technology (DST), is now looking at extending its cultivation to some states in the Northeast.
- This is because there is a huge similarity of climate and geographical conditions between Kashmir and few regions of Northeast.
- Sikkim was first to implement the pilot project, and later it will be extended to Meghalaya and Arunachal Pradesh.
- North East Centre for Technology Application and Reach (NECTAR) is an autonomous body under the DST.

Pampore Saffron

- Saffron production has long been restricted to a limited geographical area in the Union territory of Jammu & Kashmir.
- Pampore region, commonly known as Saffron bowl of Kashmir, is the main contributor to saffron production.
- Pampore Saffron Heritage of Kashmir is one of the Globally Important Agricultural Heritage systems (GIAHS) recognised sites in India.



- NECTAR in collaboration with the Botany and Horticulture departments of Sikkim Central University implemented a pilot project in Yangyang village of South Sikkim.
- The Yangyang pilot project of saffron cultivation has yielded successful results, which produced its first crop of saffron recently.

12.30 Ideal Conditions for Saffron Cultivation

- In India, saffron Corms (seeds) are cultivated during the months of June and July and at some places in August and September, It starts flowering in October.
- Saffron grows well at an altitude of 2000 meters above sea level.
- It needs a photoperiod (sunlight) of 12 hours.
- It grows in many different soil types but thrives best in calcareous (soil that has calcium carbonate in abundance), humus-rich and well-drained soil with a pH between 6 and 8.
- For saffron cultivation, we need an explicit climatological summer and winter with temperatures ranging from no more than 35 or 40 degree Celsius in summer to about -15 or -20 degree Celsius in winter.
- It also requires adequate rainfall that is 1000-1500 mm per annum.

12.31 Dobra-Chanthi Bridge

- Recently, the Dobra-Chanthi suspension bridge has been dedicated to public in Tehri-Garhwal district.
- Dobra Chanti bridge is India's longest motorable single lane suspension bridge which is 440-metre long.
- It is built over Tehri Lake, it will cut travel time between Tehri and Pratapnagar districts from 5.5 to 1.5 hours.

12.32 Maritime Cluster

- Maritime Cluster is conceived as a dedicated ecosystem of Ports, Maritime Shipping and Logistics services providers.
- The concept of maritime clusters is new to India, but these clusters have been driving some of the most competitive ports of the world like Rotterdam, Singapore, Hong Kong, Oslo, Shanghai, and London.
- To ensure a significant footprint in global supply chains of the world with the help of such innovative Ideas, India is planning to set up its first maritime cluster in GIFT City Gujarat.
- It will host an array of maritime, shipping industry players and service providers, along with relevant Government regulatory agencies.
- The Gujarat Maritime Board (GMB), has been trying to develop such a cluster through its subsidiary Gujarat Ports Infrastructure and Development Company Ltd (GPIDCL).
- While the project was conceptualised back in 2007, it received in-principle approval from the state government in 2015.

12.33 Silver Line

- Kerala has informed NITI Aayog that the semi high-speed rail Silver Line from Kochuveli (Tirvandrum) to Kasaragod is viable and feasible.
- Terming the cost realistic, it said 70% of alignment traversed “at grade” compared with the 100% alignment via viaduct and tunnels of other projects.
- By going for “at grade” alignment instead of the initial proposal of an elevated corridor, the cost had been brought down.
- On NITI Aayog’s concern over cost of land acquisition and displacement, the government said costlier and built-up areas had been avoided.
- The process of granting administrative sanction for land acquisition had commenced.

- Maximum possible revenue generation would be explored and modes adopted by the Kochi Metro would be looked into.
- The government submitted that the project was self-sustainable.

12.34 National Monsoon Mission

- Recently, the National Council of Applied Economic Research (NCAER) has evaluated the economic benefits of the National Monsoon Mission (NMM).
- The study refers to economic benefits as direct monetary gains to crop farmers, livestock rearers, and fishermen in the country.
- National Monsoon Mission was launched by the Ministry of Earth Sciences in 2012.
- It aims to improve the forecasting skills by setting up a state-of-the-art dynamic prediction system for monsoon rainfall different time scales.
- NMM builds a working partnership between the academic and research and development (R&D) organisations, both national and international.
- Its augmentation with the HPC facilities has helped the country in achieving a paradigm shift in weather and climate modelling for operational weather forecasts.
- The benefits are from accurate weather forecasting by the India Meteorological Department (IMD) and other agencies working under the Ministry of Earth Sciences.

12.35 R Cluster

- Reliance Industries Ltd (RIL) and British Petroleum (BP) have announced the start of gas production from the R cluster.
- R Cluster, the deepest off-shore gas field in Asia, is expected to have a peak production of about 10% of India's current natural gas output.
- It is one of the three fields in the Krishna Godavari Basin (KGD6). The other two are the Satellite Cluster and MJ gas fields.
- This field comprises a subsea production system tied back to existing KG D6 Control & Riser Platform (CRP) via a subsea pipeline.
- The three projects are a part of the plan to boost domestic production of natural gas to increase the share of natural gas in India's energy basket from 6.2% now to 15% by 2030.

12.36 Lithium Refinery

- India's first Lithium refinery will be set up in Gujarat.
- It will process Lithium ore to produce battery-grade material.
- Lithium is a rare element not usually found in India, which would be imported from Australia and processed in this refinery.
- The proposed Lithium refinery will help make Gujarat a domestic hub for Li-ion batteries manufacturing.
- TDS Lithium-Ion Battery Gujarat Private Ltd is India's first Lithium-ion battery manufacturing plant in Gujarat.
- This Lithium ion battery manufacturing plant is expected to become operational by January or February 2021.

12.37 Koilwar Bridge

- This bridge, also named as Abdul Bari Bridge, is located in Bihar.
- Three lanes of the newly-built Koilwar bridge on river Son was inaugurated. Three more lanes would be ready by May 2021.
- The bridge will be named after Vashishtha Narayan Singh, a famous mathematician from the state.



- The 1.5 km-long bridge has been built parallel to the 138-year-old rail-cum-road bridge constructed during the British era.

12.38 Organic Lakshadweep

- After Sikkim, India's smallest Union territory Lakshadweep with 32 sq.km. land area has set to become 100% organic.
- The UT's proposal to declare it as organic was approved by the Centre after receiving certifications under the Participatory Guarantee System (PGS) of India through ParamaparagatKrishiVikasYojana.
- [PKVY is the Centre's Organic Farming Improvement Programme.]
- The UT had not spent or earmarked any amount for procurement or distribution of synthetic chemicals since 2005.
- All farmers and other stakeholders were instructed to use only organic fertilisers, including locally available organic inputs and organic waste.
- According to the requirement of organic certification, no genetically modified organism is allowed to be used in the entire territory.
- The Union agriculture ministry has asked for a village-wise certification under PGS-India programme, for making a formal announcement.

12.39 Hazardous Ideas for the Himalayas - Hydroelectric Projects of India and China

Over the past 20 years, China and India have been competing with each other to build hydroelectric dams in the Himalayas.

- Planning hydropower projects in the ecologically fragile and seismically vulnerable area is placing the region at great risk.
- In an article published on the website of the Central Committee of the Communist Youth League, China announced that it was planning to build a major hydropower project as a part of its 14th Five-Year Plan (2021-25).
- This will be built on the Yarlung Zangbo River, in Mêdog County in Tibet.
- The hydropower generation station is expected to provide 300 billion kWh of electricity annually.
- China says that the project would help the country realise its goal of reaching a carbon emission peak before 2030 and carbon neutrality before 2060.
- India's Response - Mêdog County is not far from Arunachal Pradesh.
- So, soon after speculations about China's plan, Indian counterparts were quick to reiterate their plans to dam the Himalayas on this side of the border.
- India is reportedly considering a 10-GW hydropower project in an eastern State.
- Ongoing Projects - There are two hydropower projects in the works in Arunachal Pradesh on the tributaries of the Brahmaputra:
 1. 600 MW Kameng project on the Bichom and Tenga Rivers
 2. 2,000 MW Subansiri Lower Hydroelectricity Project
- On the other side of the border, China has already completed 11 out of 55 projects that are planned for the Tibetan region.
- Both countries ignore how unviable such 'super' dam projects are.
- They are being planned in an area that is geologically unstable and where massive earthquakes are bound to take place.
- In executing the hydroelectric projects, the two countries overestimate their economic potential.
- On the other hand, they grossly underestimate the earthquake vulnerability of the region.