



# IAS PARLIAMENT

*Information is a Blessing*

A Shankar IAS Academy Initiative

## TARGET 2019

## ENVIRONMENT I

Shankar IAS Academy

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## TARGET 2019

### ENVIRONMENT I (June - November 2018)

#### 1. POLLUTION

##### 1.1 Petcoke

*The Supreme Court last year banned the use of petcoke in New Delhi and adjacent states. It however allowed its use in cement companies.*

- Government of India is planning to propose a ban over burning petroleum coke as a fuel nationwide to comply with a Supreme Court request.
- Petroleum coke or petcoke is an oil refinery by-product.
- It is a carbonaceous solid delivered from oil refinery coke units or other cracking processes.
- It is a bottom-of-the-barrel residue while refining crude oil, which is high-calorific value petroleum residue, helps to conserve natural resources.
- It is over 90% carbon and emits 5 to 10% more carbon dioxide (CO<sub>2</sub>) than coal on a per-unit-of-energy basis when it is burned.
- It is used as a fuel because of its higher energy content than coal.
- It contains 75,000 ppm of sulphur content when compared to coal which has just 4,000 ppm of sulphur.
- So it releases larger amounts of SO<sub>2</sub>, which can cause lung disease and acid rain.
- It can contain vanadium, a toxic metal which is toxic even in tiny quantities.
- It is a key input material for cement producers.
- It holds the second-biggest share of India's source for fuel after diesel, outstripping even LPG and petrol.
- It has become an attractive fuel mainly because of loophole in India's environmental taxes.
- Normal coal attracts a clean-energy levy that has risen to Rs.400 a metric ton.
- On the other hand, petcoke has been exempt from this levy.
- Similar levy issues have favoured petcoke over natural gas as well.
- Cement plants escape the ban on the grounds that all the sulfur is removed in the production process.
- More than half of India's petcoke demand of 27 million tones is imported, mostly from the U.S.

##### 1.2 Uranium Contamination in Ground Water

*Reports of widespread uranium contamination in groundwater across India demand an urgent response.*

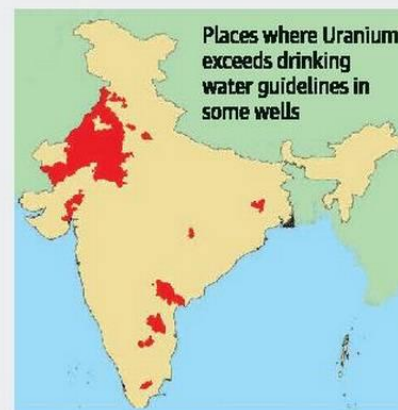
- Two types of terrains have been identified with heavy contamination, namely:
  - i. Alluvial aquifers in Rajasthan & other north-western regions
  - ii. Crystalline rocks such as granite in southern regions like Telangana.
- Reports of uranium contamination has cropped up across India in recent years, with south Bangalore recording 2000 mcg/l of uranium in groundwater.
- AP and Telangana were found to have over 500 mcg/l of uranium in their aquifers.
- The mechanism by which uranium enters groundwater is still under research.
- Some researchers have hypothesized that over-extraction of ground water exposes uranium to air, which triggers its release from the rocks.

- **Regulations** - Drinking such water can damage one's kidneys, and the World Health Organization (WHO) prescribes 30 mcg/l as an upper limit.
- But the residents of the regions surveyed were using wells recording far greater uranium levels as their main source of drinking water.
- Bureau of Indian Standards also does not specify a norm for uranium level.
- **Health effects** - Preliminary studies on the health effects of drinking uranium-tainted water among animals and humans have revealed that it causes kidney damage.
- This is said to be caused by the chemical effect of uranium, rather than a radiological, even though uranium is radioactive.

## Tainted groundwater

Sixteen States show a high prevalence of uranium concentrations above the WHO provisional guideline value (30 µg/L)

- India has no standards for uranium levels in groundwater
- There have been reports of high levels of uranium in Andhra Pradesh
- Over-pumping of groundwater causes a decline in water levels
- This induces oxidation conditions that enhance uranium enrichment in shallow groundwater



Source: "Large-Scale Uranium Contamination..." Rachel M. Coyte et al.

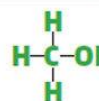
### 1.3 Moving to Methanol

- Ethanol is made largely from plant-based sources, such as sugarcane and vegetable oil.
- A land-constrained country like India cannot afford this.
- Unlike this, methanol can be derived from various renewable, non-renewable sources & abundant feedstock.
- These include agricultural biomass, urban solid waste, coal, and natural gas.
- It includes even carbon dioxide (CO<sub>2</sub>) present in the air.
- **Production** - Methanol is a liquid chemical which is made from the destructive distillation (pyrolysis) of wood and is chiefly synthesized from carbon monoxide and hydrogen.
- Its principal uses are in organic synthesis, as a fuel, solvent, and antifreeze.
- It is also used to produce biodiesel via trans-esterification reaction.
- It can fully or partially replace petrol, diesel or liquefied LPG.
- **Potential** - India has over -
  - 125 billion tonnes of proven coal reserves
  - 500 million tonnes of biomass (generated annually)
  - substantial quantities of stranded natural gas
- **Uses** - Unlike LPG, which can explode if it combusts, the methanol canister will burn without explosion.
- In terms of heat value, a 14-kg LPG cylinder is equivalent to about 20 kg of methanol. But estimates show methanol is 30% cheaper and saving on an equivalent quantity of LPG is expected to be Rs.350.
- In the gaseous form, it can be blended in 20% ratio with LPG and it is estimated that even partial use of methanol could help reduce India's import bill \$100 billion and pollution 40%.
- **Concerns** - Though almost totally non-polluting as fuel, a large amount of CO<sub>2</sub> is emitted during the process of making methanol from coal.
- This will need to be either captured and stored or recycled into methanol.

## Methanol Economy

### WHAT IS IT?

- ▶ It is also known as methyl alcohol
- ▶ Colourless, light, flammable liquid



### HOW IT IS MADE

- ▶ Manufactured industrially
- ▶ Derived from coal, oil or biomass

### WHAT ARE ITS USES

- ▶ Antifreeze
- ▶ Solvent
- ▶ Fuel



### KEY BENEFITS

- ▶ Cheaper to produce compared to other fuels
- ▶ Safer than others because of low flammability
- ▶ Wide variety of feed stock can be used to produce methanol

### BIG USERS

- ▶ Methanol demand expected to grow strongly with its use as a fuel
- ▶ China, Brazil, Mexico and the US significant players





### 1.4 Methanol Cooking Fuel Program

- NITI Aayog has prepared a comprehensive plan advocating adoption of methanol as the preferred cooking fuel in households as well as commercially.
- A plant each would be set up in Bengaluru and Assam for manufacturing methanol cooking stoves based on a technology from Sweden.
- Accordingly, a state-owned company has recently launched Asia's first canisters based and India's first "Methanol Cooking Fuel Program" in Assam.
- It can directly substitute LPG, Kerosene, Wood, Charcoal and any other fuel for cooking.

### 1.5 Bharat Stage Emission Standards

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

- The court ordered that only BS-VI vehicles will be allowed after the April 1, 2020, at the same time BS-VI grade petrol and diesel would also come into force across the country.
- BS standards are emission standards instituted by the Government of India in the year 2000, based on EU standards.
- It is to regulate the **output of air pollutants** from internal combustion engines and Spark-ignition engines equipment, including motor vehicles.
- It includes both emission standards for new vehicles as well as specifications for commercial petrol and diesel fuels.
- The standards and the timeline for implementation are set by the Central Pollution Control Board under the Ministry of Environment & Forests and climate change.
- All new vehicles manufactured after the implementation of BS norms must be compliant with the regulations.
- Major emissions governed under these norms are carbon monoxide & hydrocarbon emission limits. Nitrogen Oxides and particulate matter are also significant metrics.
- BS-IV standard was brought into place in country-wide in April 2017.
- Implementation of the BS V standard that was earlier scheduled for 2019 has now been skipped.
- In 2016, the Indian government announced that the country would skip the BS-V norms altogether and adopt BS-VI norms by 2020.
- The government has also announced that BS-VI fuel will be available in Delhi by April 2018 and NCR by 2019.
- **BS IV Vs BS VI** - The main difference between BS-IV and BS-VI (comparable to Euro 6) is in **the amount of sulphur in the fuel**.
- BS-VI fuel is estimated to bring around an 80% reduction in sulphur content — from 50 parts per million (ppm) to 10 ppm.
- Another major difference is NOx. BSVI is expected to cut NOx emissions from diesel cars by nearly 70% and from cars with petrol engines by 25%.
- Also, BS VI will bring down the cancer-causing **particulate matter** in diesel cars by a phenomenal 80%.
- **Implications** - This measure is expected to

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



help mitigate the problem of air pollution in NCT of Delhi and surrounding areas.

- The move is also in line with India's commitment under the Paris Climate Change Agreement to reduce its vehicular emission as part of the effort to cut emission intensity of the gross domestic product.
- The government statement does not mention any plans on seeking automakers to sell only BS-VI vehicles in the city.
- **Recent development** - International Centre for Automotive Technology (ICAT) releases first Bharat Stage - VI engine certificate for a heavy-duty engine model.
- It is much ahead of the implementation date of 1st April 2020 for rolling out of Bharat Stage-VI norms in the country.

### 1.6 Chromium

- According to a survey by Central Groundwater Board, groundwater in 5 districts of Tamil Nadu is contaminated by chromium with more than 0.05 mg/l, which is above Bureau of Indian Standards limits.
- Chromium is a naturally occurring heavy metal that is commonly used in industrial processes and can cause severe health effects in humans.
- It is used in the manufacture of alloys, inhibitory paints, wood preservatives, fixatives for dyes and tanning, photographic sensitizers and as anticorrosive in cooking systems and boilers.
- The industries with the largest contribution include leather tanning operations, metal processing, stainless steel welding, chromate production, and chrome pigment production.
- It can exist in air, water, soil, food, and common exposure pathways include ingestion, inhalation, or dermal contact.
- It is commonly found in two forms - trivalent chromium (Cr III) and hexavalent chromium (Cr VI).
- Cr III is the most stable form of the element and occurs naturally in animals, plants, rocks, and soils and is non-toxic.
- Cr VI rarely occurs in nature and is usually the product of anthropogenic activities and it is neurotoxic, genotoxic and a carcinogen.

### 1.7 Non-Attainment Cities

- Non-attainment cities are those cities marked by Central Pollution Control Board that have fallen short of the National Ambient Air Quality Standards (NAAQS) for **PM 10 and NO<sub>2</sub> over 5 years**.
- There are 94 non-attainment cities in the country.
- These cities were asked be part of the National Clean Air Campaign (NCAP) to mitigate air pollution.
- The measures include control of vehicular emissions, re-suspension of road dust and other fugitive emissions, bio-mass, municipal solid waste burning, industrial pollution and construction & demolition activities.
- The aim of pollution mitigation measures was to cut overall pollution in these cities by 35% in the next three years.

### 1.8 Advanced SAFAR

- Ministry of Earth Sciences has recently launched the most advanced System of Air Quality and Weather Forecasting (SAFAR) in New Delhi.
- The system, **first of its kind in the country**, was developed indigenously by Indian Institute of Tropical Meteorology, Pune and operationalized by IMD.

#### National Ambient Air Quality Standards (NAAQS)

- Central Pollution Control Board (CPCB) notifies NAAQS in pursuance of its power conferred under Air (Prevention and Control of Pollution) Act, 1981.
- The pollutants covered under it are as follows,
  1. Ground-level Ozone or O<sub>3</sub>
  2. Particulate Matter (soot and dust) - PM<sub>2.5</sub> and PM<sub>10</sub>
  3. Carbon Monoxide or CO
  4. Sulphur Dioxide or SO<sub>2</sub> and
  5. Nitrogen Dioxide or NO<sub>2</sub>
  6. Ammonia or NH<sub>3</sub>
  7. Lead or Pb
  8. Benzene or C<sub>6</sub>H<sub>6</sub>
  9. Benzo Pyrene
  10. Arsenic or As
  11. Nickel or Ni



- It will also measure sun's UV-Index, PM1 and Mercury in addition to monitoring and forecasting regular air quality.
- In addition to regular air quality parameters like PM2.5, PM10, Sulfur Dioxide, Ozone, Nitrogen Oxides, Carbon Monoxide, the system will also monitor the existence of Benzene, Toluene and Xylene.
- Based on UVI, skin advisories will be issued on display.

#### **Air Quality Index**

- It is a number used to communicate to the public how polluted the air currently is or how polluted it is forecasted to become.
- As AQI increases, an increasingly large percentage of the population is likely to experience increasingly adverse health effects.
- Different countries have their own air quality indexes, corresponding to different national air quality standards.
- AQI is most commonly used by CPCB to describe ground-level ozone levels.
- The classifications of air quality are part of a 6 grade, colour coded taking into account 8 pollutant levels.
- These pollutants are:
  1. Ground-level Ozone or O<sub>3</sub>
  2. Particulate Matter (soot and dust) - PM<sub>2.5</sub> and PM<sub>10</sub>
  3. Carbon Monoxide or CO
  4. Sulphur Dioxide or SO<sub>2</sub> and
  5. Nitrogen Dioxide or NO<sub>2</sub>
  6. Ammonia or NH<sub>3</sub>
  7. Lead or Pb

#### **1.9 International Nitrogen Initiative**

- It was established in 2003 under sponsorship of the Scientific Committee on Problems of the Environment (SCOPE) and International Geosphere-Biosphere Program (IGBP).
- The key aims of the INI are,
  1. To optimize nitrogen's beneficial role in sustainable food production,
  2. To minimize nitrogen's negative effects on human health and the environment resulting from food and energy production.
- The INI holds a conference every three years to discuss ideas and exchange knowledge on nitrogen issues.
- The last INI conference was held in Melbourne, in December 2016, adopting Melbourne declaration.
- The 5<sup>th</sup> Conference was organized in 2010 in New Delhi.
- The conference enabled INI to bring together its contributions to the Global Nitrogen Assessment.
- Under this, Indian Nitrogen Group has released "**The Indian Nitrogen Assessment**", India's first-ever such attempt to study nitrogen pollution.
- INI is coordinated by a Steering Committee, led by a chair and six regional centre directors representing, Africa, Europe, Latin America, North America, South Asia and East Asia.
- Recently, Indian scientist-academician, N Raguram, has been elected Chair of the Steering Committee of INI.

#### **Highlights of "The Indian Nitrogen Assessment"**

- In India, nitrogen emissions grew at 69% from 2001 to 2011 and has replaced methane as the second largest Greenhouse Gas (GHG) from Indian agriculture.





- Agricultural soils contributed to over 70% of nitrous oxide (N<sub>2</sub>O) emissions, followed by waste water (12%) and residential and commercial activities (6%).
- As fertilizer, nitrogen is one of the main inputs for agriculture, but inefficiencies along the food chain mean about 80% of nitrogen is wasted.
- Annual nitrogen emissions from coal, diesel and other fuel combustion sources are growing at 6.5% a year currently while emission from poultry industry is growing at the rate of 6%.

#### 1.10 Continuous Emission Monitoring System

- It is a real time air and water pollution monitoring system.
- It comprises of analytical components and software designed to provide continuous real time measurements of pollution by analyzing representative samples of air and water.
- It is an initiative by Ministry of Environment and Forest and CPCB to strengthen pollution regime.
- In 2014, CPCB makes installation of CEMS compulsory for 17 categories of highly polluting industries, Common Bio-Medical Waste and Common Hazardous Waste incinerators.
- Recently, CPCB has recommended that even non-polluting industries should also consider installing CEMS.

#### 1.11 WAYU

- It is a device developed by the National Environmental Engineering Research Institute (NEERI), Nagpur-based laboratory of the Council of Scientific and Industrial Research (CSIR).
- It is to address air pollution at high traffic zones, which have lot of buildings in the neighbourhood leading to restricted flow of air called "Street Canyon" effect.
- **Working** - A fan sucks air around the device and pollutants like dust and particulate matter are separate using three filters of different dimensions.
- The air is led into a specially designed chamber where carbon monoxide and hydrocarbons content in the air are oxidized.
- After oxidation, the pollutants will turn into less harmful carbon dioxide using activated carbon coated with titanium dioxide.
- The purified air is then ejected with force into the atmosphere so as to help dilute pollutant content in the outside air.

#### 1.12 Supreme Court Ruling on Firecrackers

*The Supreme Court recently gave some guidelines in line with the sale, manufacture and use of firecrackers.*

- **Guidelines** -The court banned crackers that are loud and toxic to man, animal and the environment.
- It banned the manufacture, sale and use of joined/series crackers or 'laris'.
- It held that they caused "huge air, noise and solid waste problems."
- It allowed the manufacture and sale of only "green" and reduced-emission or "improved" crackers.
- **Sale** - The sale of green and improved crackers would be only through licensed traders.
- The court banned the online sale through e-commerce websites, including Flipkart and Amazon.
- Any e-commerce company sale would amount to contempt of court.
- It may also invite orders of monetary penalties from the court.
- **Community** - The court urged the Central and State governments to permit "community" bursting of crackers during festivities in pre-designated areas.
- In the case of Delhi and the National Capital Region (NCR), the court made it mandatory.
- It gave the Centre, the Delhi and other State governments, whose areas fall within the NCR, a week's time to identify these pre-designated areas.
- It directed that the public should be informed about the designated places a week before Diwali.



- **Time** - The Supreme Court restricted the use of fireworks during Deepavali and other festivals to an 8-10 pm window.
- For Christmas and New Year, the time slot allowed is half-an-hour, between 11.55 p.m. and half-past midnight.
- **Violation** - Local Station House Officers would be held personally liable and hauled up for contempt by the court if there was any violation of the judgement.
- This applies both to the time slots for bursting crackers and the sale of banned crackers.
- **Banned Chemicals** - SC has banned the use of 5 chemicals in firecrackers last year.
- The banned chemicals include antimony, lithium, mercury, arsenic and lead.
- It also banned the use of barium salts in fireworks.
- The court entrusted the responsibility to ensure compliance to the Petroleum and Explosive Safety Organisation (PESO)
- **PESO**—It is under the Department of Industrial Policy and Promotion, Ministry of Commerce and Industry.
- It is a statutory authority, which is entrusted with the responsibilities under the Explosives Act, 1884; Petroleum Act, 1934; Inflammable Substances Act, 1952, Environment (Protection) Act, 1986.
- It frames rules related to safety in manufacture, storage, transport and handling of explosives, petroleum, compressed gases and other hazardous substances.
- It will have to ensure that only fireworks with permitted chemicals are sold or purchased during festivities or celebrations.
- It should also test and check for the presence of banned chemicals like lithium/arsenic/antimony/lead/mercury.
- It has to ensure that only those crackers whose decibel (sound) levels were within the limits are allowed in the market.
- PESO has been empowered to suspend the licences and appropriately dispose of stocks of manufacturers who violated the court's directions.
- **Chemistry of fireworks** - Explosive fireworks depend on four primary ingredients - oxidizer, fuel, coloring agents & binder.
- The oxidizers release oxygen to allow the explosion to take place. Ex: Nitrates, chlorates.
- The fuel for burning is usually charcoal.
- Colouring agents like aluminium compounds are for brilliant whites, barium nitrate for greens.
- Binders are used to hold the mixture of the firework together in a paste while burning.
- Also, other metals like titanium & strontium are added to regulate the speed of the burning reaction.

#### Green crackers

- They do not contain harmful chemicals that would cause air pollution.
- Components are replaced with others that are less dangerous and less harmful to the atmosphere.
- The idea was carried forward by a network of CSIR labs.
- The team came up with 3-4 formulations and looked at 30-40% of active materials which reduce particulate matter.
- Potential sound-emitting functional prototypes that do not emit sulphur dioxide were also developed.
- These crackers are named as Safe Water Releaser (SWAS), Safe Thermite Cracker (STAR) and Safe Minimal Aluminium (SAFAL).
- These have the unique property of releasing water vapour and/or air as dust suppressant and diluent for gaseous emissions.

### 1.13 Report on Pollution

Centre for Science and Environment (CSE), a New Delhi-based think tank has released a report titled "**The urban Commute**".

- The report highlighted that the increase in greenhouse gas emissions from transport sector were highest among all other sectors in India.

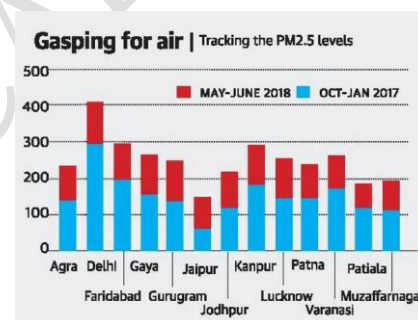


- It collected statistics from 14 cities - Delhi, Mumbai, Kolkata, Chennai, Bengaluru and Hyderabad, Ahmedabad, Pune, Jaipur, Lucknow, Kochi, Bhopal, Vijayawada and Chandigarh.
- Bhopal has got the top spot for lowest overall emission and energy use from urban commute.
- On the other hand, Delhi ranked last in overall emission and fuel use.
- Kolkata and Mumbai are among the mega cities which emit least due to high usage of public transport and walking.
- The reason attributed for this is sheer number of people, high volume of travel and personal vehicles, and long trip distance.

#### 1.14 WHO Report on Air Pollution

WHO has recently released report on “Air Pollution and Child Health”, on the eve of its first ever Global Conference on Air Pollution and Health in Geneva.

- According to the report, every day around 93% of the world’s children under the age of 15 years (1.8 billion children) breathe air that is so polluted it puts their health and development at serious risk.
- In poorer countries, 98% of all children under five are exposed to PM<sub>2.5</sub> above WHO guidelines.
- The report highlights the reason why children are particularly vulnerable.
- One is that the children breathe more rapidly than adults and so absorb more pollutants.
- The other reason is that pollutants are often more concentrated nearer to ground level.
- It added that their developing organs and nervous system are also more susceptible to long-term damage than those of adults.



#### 1.15 Construction and Demolition Waste

The Supreme Court has stayed construction activity in States that do not have a solid waste management policy.

- Construction and demolition waste (C&D) is generated during the construction, renovation, and demolition of buildings or structures.
- It includes materials like concrete, bricks, wood and lumber, roofing, drywall, landscape and other wastes.
- Construction and Demolition Waste Management Rules 2016 was released by Ministry of Environment.
- It clearly defines the duties of Waste Generator, Service providers and Contractors, State Government and Local Authorities and Pollution Control boards.
- It mentions clear timelines on
  - formulating policies
  - identifying sites for processing
  - commissioning the wastes
- Despite the above, the performance of industry and the State pollution control boards is poor.
- Around 25-30 million tons of C&D waste is generated annually in India of which only 5% is processed.
- It is significant that 36% of C&D waste comprises soil, sand and gravel.
- This waste impacts soil fertility and is a health hazard in urban areas.

#### 1.16 Emission Standards for Thermal Plants

Thermal power plants failed to comply with new emissions standards notified in 2015, by December 2017 deadline.

- CPCB issued an order in December 2017 that lays out a clear implementation plan for
  - electrostatic precipitator (ESP) retrofits (components) aimed at particulate matter



- ii. flue-gas desulfurisation (FGD) units for reducing sulphur oxides (SOx) emissions from power plants
- A successful reduction in emissions from power plants will depend on:
  - i. plant operators investing in retrofits
  - ii. regulators permitting a full price revision for additional costs
  - iii. decline of bulk procurement costs for utilities
- Implementation remains unclear, even with the new opportunity to comply over a five-year period that ends in 2022.

#### **Electrostatic Precipitator**

- It is a device that uses an electric charge to remove certain impurities either solid particles or liquid droplets, from air or other gases in smokestacks and other flues.
- It works by applying energy (high-voltage electrostatic charge) and collects the particles on the charged plate.

#### **1.17 Status of Ambient Noise Level in India 2017**

- It is a report published by the CPCB.
- According to it, **Delhi** is ranked as **the noisiest metro** followed by Kolkata, Bengaluru and Chennai.
- As per the National Environment Policy 2006, ambient noise is included as an environmental quality parameter and must be monitored in specified urban areas regularly.
- Thus, CPCB has developed National Ambient Noise Monitoring Network Programme which includes installation of Noise Monitoring Stations all over India.
- The cities include Bengaluru, Chennai, Delhi, Hyderabad, Kolkata, Lucknow and Mumbai.

### **2. RENEWABLE ENERGY**

#### **2.1 National Policy on Bio-fuels 2018**

*The Union Cabinet has approved National Policy on Bio-fuels 2018 recently.*

- The Policy categorises bio-fuels as
  1. Basic Bio-fuels i.e First Generation (1G) bio-ethanol & biodiesel
  2. Advanced Bio-fuels i.e Second Generation (2G) ethanol
  3. Third Generation (3G) bio-fuels, bio-CNG etc.
- It is to enable the extension of appropriate financial and fiscal incentives under each category.
- The Policy allows use of surplus food grains for production of ethanol for blending with petrol with the approval of National Bio-fuel Coordination Committee.
- It is aimed at raising ethanol doping of petrol to 10% by 2022 & 20% by 2030 (present national average - 2%).
- It is likely to help farmers to get appropriate price during surplus production.
- It also indicates a viability gap funding scheme for 2G ethanol Bio refineries of Rs.5000 Cr in 6 years in addition to additional tax incentives, higher purchase price as compared to 1G bio-fuel.
- It encourages setting up of supply chain mechanisms for biodiesel production from non-edible oilseeds, Used Cooking Oil, short gestation crops.
- Also, bio-fuel blending of diesel, which is almost negligible now, is proposed to be stepped up to 5% by 2030.
- One of the expected benefits is that the Used Cooking Oil can be used as potential feedstock for biodiesel and its use for making biodiesel will prevent diversion of used cooking oil in the food industry.
- This is estimated to help save Rs.120 billion in import bill.
- The intended objective is to create Rs.1 trillion bio-fuel economy.

#### **2.2 Ethanol Bio-refineries**

- Bio-fuels are fuels produced directly or indirectly from organic material biomass, including plant materials and animal waste.



- Primary bio-fuels are organic materials used in an unprocessed form, primarily for heating, cooking or electricity production.
- Ethanol is a secondary biofuel which is produced through processing of biomass.

### Generations of Biofuel

Generation	Aim	Source	Example
1 <sup>st</sup>	To provide an alternate to conventional fuels	Produced directly from food crops.	Wheat and Sugarcane's feedstock
2 <sup>nd</sup>	To solve the 'fuel vs food' debate raised by 1 <sup>st</sup> Generation fuels	Produced from non-food crops produced in marginal croplands.	Jatropha
3 <sup>rd</sup>	To solve the problem of bio-mass i.e more energy/acre	Produced from specially engineered energy microorganisms	Algae
4 <sup>th</sup>	To find a way of capturing and storing Co <sub>2</sub>	Produced by petroleum-like hydro-processing and advanced bio-chemistry and other revolutionary processes	Joule's "solar-to-fuel" method

- **Developments** - In 2016, the foundation stone of India's first 2G ethanol bio-refinery in Bathinda, Punjab has been laid.
- In the National Policy on Bio-fuels 2018, Government has allowed B grade molasses, sugarcane juice and damaged food grains as feedstocks to increase availability of ethanol.
- "A" molasses is intermediate by-product resulting from initial processing of sugarcane juice at the sugar factory
- "B" molasses/"second" molasses is an intermediate product, obtained from boiling together "seed-sugar" & A molasses to extract an additional 12% of raw sugar.
- "C" molasses/"final" is the end product of the sugar extraction process. It still contains considerable amounts of sucrose but there is no economically viable method to date to extract this.
- While in many nations, ethanol is directly produced from sugarcane juice, in India ethanol has been produced from C-heavy molasses.
- It is because of a general perception that diverting a food crop for producing fuel would lead to a shortage of sugar in the country.
- However, newer cane varieties led to a record-breaking sugar production of 32 million tonne in the 2017-18 season, much higher than the annual domestic demand of 25 million tonne, leading to a crash in sugar prices. Thus government has allowed to extract ethanol from B molasses.

### 2.3 Bio-Gas

- It is produced naturally through a process of anaerobic decomposition from waste/bio-mass sources.
- Bio-mass sources include agriculture residue, cattle dung, sugarcane press mud, municipal solid waste, sewage treatment plant waste, etc.
- After purification, it is compressed and called Compressed Bio-Gas (CBG), which has pure methane content of over 95%.
- CBG is exactly similar to the commercially available natural gas in its composition and energy potential.
- CBG's calorific value (~52,000 KJ/kg) and other properties are similar to Compressed Natural Gas (CNG).
- CBG can be used as an alternative, renewable automotive fuel.
- Benefits of production of CBG on a commercial scale includes,





1. Responsible waste management, reduction in carbon emissions and pollution
2. Additional revenue source for farmers
3. Boost to entrepreneurship, rural economy and employment
4. Support to national commitments in achieving climate change goals
5. Reduction in import of natural gas and crude oil
6. Buffer against crude oil/gas price fluctuations

#### 2.4 Solar Park

- Gujarat, Andhra Pradesh and Rajasthan have topped the list of states with maximum solar power generation capacity approved under solar parks in India.
- A solar park is a concentrated zone of development of solar power generation projects.
- It provides developers an area with proper infrastructure and access to amenities and where the risk of the projects can be minimized.
- The solar park scheme provides for reduced number of statutory approvals to facilitate faster development.

#### 2.5 Energy Efficiency Revolving Fund

- Asian Development Bank and Energy Efficiency Services signed a USD 13 million grant to set up Energy Efficiency Revolving Fund.
- The fund is to be administered by ADB.
- It aims to expand and sustain investments in the energy efficiency market in India, build market diversification, and scale up existing technologies.
- Global Environment Facility (GEF) will provide the additional financing for the ongoing projects under this fund.
- Additional grants from GEF will be used by EESL for making investments in new and emerging technologies.
- EESL is under the administration of Ministry of Power and is working towards mainstreaming energy efficiency.

#### 2.6 Off-Shore Wind Energy Project

*Ministry of New and Renewable Energy has proposed first off-shore wind energy project with a capacity of 1000 MW in Gulf of Khambhat, Gujarat*

- The proposed area is located 30 km from Pipavav port.
- National Institute of Wind Energy is the nodal agency to carry out the necessary studies/surveys before final bidding.
- The first offshore Light Detection and Ranging (LiDAR) was installed in Gulf of Khambhat in Gujarat for measurement of wind resource.
- Areas off the coasts of **Gujarat and Tamil Nadu** are two identified areas for development of offshore wind power. The second LiDAR would be installed off Tamil Nadu coast.
- Offshore wind energy is better than onshore in terms of efficiency. It is also becoming competitive and comparable in terms of tariffs.
- Renewable Energy Ministry plans to install at least 5 GW of offshore wind capacity by 2022.



### Onshore and Offshore wind farms

- **Onshore wind farms** - It refers to turbines located on **land**.
- Costs half the cost of offshore wind but it is still slightly more expensive than fossil fuels.
- Less voltage drop between the windmill and the consumer as compared to offshore.
- Cannot produce energy all year round due to the poor wind speed and/or physical blockage of the wind by buildings and/or hills
- Visual impact, endangering birds and noise pollution.
- **Offshore wind farms** - Turbines are located out at **sea or in freshwater**.
- More efficient as wind speed and direction are more consistent at its location therefore less turbines are required.
- Can be built in larger area since there will be fewer physical restrictions.
- Risk of wear and tear from wind and waves.

## 2.7 Bio-Jet Fuel

- The country's first ever bio-jet fuel powered flight between Dehradun and Delhi was launched recently.
- A blend of 25% of bio jet fuel and 75% of aviation turbine fuel (ATF) was used.
- International standards permit a blend rate of upto 50% bio fuel with ATF.
- It was developed by the Council for Scientific and Industrial Research based in Dehradun along with Indian Institute of Petroleum (IIP).
- It has been prepared from the seeds of Jatropha plant source.
- The fuel was recognised by American Standard for Testing and Material and received a patent by 2011.
- It can also be produced from animal fat, used cooking oil, waste dairy fat, sewage sludge, etc
- It is 1.8% more energy dense as compared to ATF and is, therefore, more efficient.
- A lower sulphur content also means that it causes less wear and tear.
- Conditions for its usage- The oil needs to have a freezing point below -47 degrees so it doesn't freeze at altitudes at which planes fly.
- It should not catch fire on ground when being transferred into a plane.
- It must have the same density as ATF, have a certain calorific value and should not choke the filters.

## 3. CLIMATE CHANGE

### 3.1 Greenhouse Gas Emission

*According to a recent study, rice farming could be responsible for up to twice the level of climate impact.*

- Methane from global rice cultivation currently accounts for 50% of all crop-related greenhouse gas emissions.
- So several international organizations advocate intermittent flooding of fields to reduce methane (CH<sub>4</sub>) emissions
- But the study found that intermittently flooded rice farms can emit 45 times more Nitrous oxide (N<sub>2</sub>O) as compared to the maximum CH<sub>4</sub> released from continuously flooded farms.
- It found an inverse correlation between methane and N<sub>2</sub>O emissions i.e water and organic matter management techniques that reduce methane emissions can increase N<sub>2</sub>O emissions.
- This is alarming because N<sub>2</sub>O is a long-lived greenhouse gas that traps several times more heat in the atmosphere than methane.
- It also stated that CH<sub>4</sub> and N<sub>2</sub>O emission from rice farms could have the same long-term warming impact as about 600 coal plants.
- India, china, Indonesia, Vietnam and Bangladesh are the world's biggest producers of rice.

### 3.2 Share of Tourism in Greenhouse Gas Emission

- Researchers found that tourism-related greenhouse gas emissions are larger than previously estimated.
- Domestic and international tourism industry contributes to 8% of the global greenhouse gas emissions.
- It is about 4 times greater than previously estimated.
- Small islands attract a disproportionate share of carbon emissions through international arrivals.
- The U.S. is responsible for the majority of tourism-generated emissions overall.
- It is growing faster than international trade and is already responsible for almost a tenth of global GHGs.

### 3.3 Shipping Industry Emission

- CO<sub>2</sub> emission from shipping industry is expected to rise dramatically by 2050 with progress in global trade.
- The sector contributes to about 3 % of total annual carbon dioxide emissions.
- Currently, ships rely heavily on carbon-rich fuels such as heavy diesel.
- When heavy oils are used by ships it emits black carbon, CO, CO<sub>2</sub>, nitrogen oxide and hydrocarbons.
- The Members of the International Maritime Organization (IMO) recently reached an agreement on halving greenhouse gas emissions from shipping by 2050.
- IMO is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships.

#### Lake Victoria

- Also called Victoria Nyanza, it is the largest lake in Africa and chief reservoir of the Nile.
- It is the second largest freshwater lake of the world, exceeded in size only by Lake Superior.
- Its fill a shallow depression that stretches between the Western and Eastern Rift Valleys and is not a part of the Rift valley system.
- It is bordered by Tanzania, Uganda, Kenya & the basin includes Burundi & Rwanda.

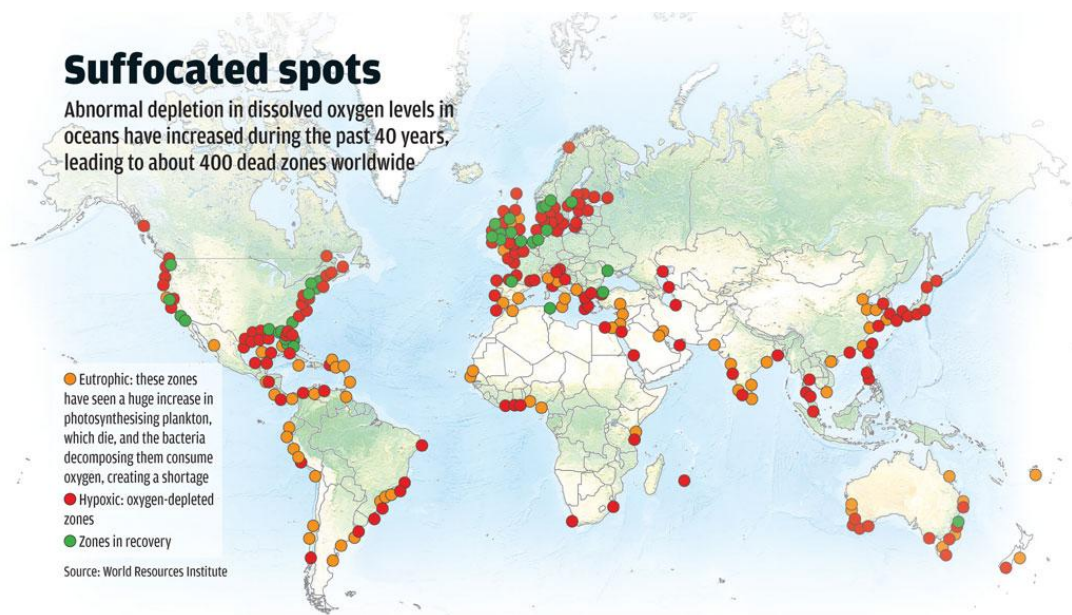
### 3.4 Lake Victoria species under threat

- About 75 % of freshwater species endemic to East Africa's Lake Victoria basin face the threat of extinction.
- It includes freshwater species like fish, mollusks, dragonflies, crabs and aquatic plants native to Africa's largest lake.
- These freshwater species are important sources of food, medicine for the millions of people living in the area surrounding the lake.
- It is known for its high-level of unique biodiversity.

### 3.5 Dead Zones

*The Gulf of Mexico's annual "dead zone" will likely persist for decades.*

- Hypoxic zones or Oxygen minimum zones (OMZ) are areas in the ocean of such low oxygen concentration that animal life suffocates and dies or leaves the area, and as a result are sometimes called "dead zones."
- Hence, habitats that would normally be teeming with life become, essentially, **biological deserts**.
- These zones are reversible if its causes are reduced or eliminated.
- One of the largest dead zones forms in the Gulf of Mexico every spring.
- Nutrients such as nitrogen flow from North America's Corn Belt through streams and rivers and end up in the Gulf.
- The dead zones in the Arabian Sea have also been growing in size.
- It is the thickest and the most intense OMZ among the world's oceans and covers an area of around two million sq km.



### 3.6 IPCC Draft Report on Global Warming

*The Special Report on Global Warming of 1.5°C was recently approved by the Intergovernmental Panel on Climate Change (IPCC).*

- The report comes on the direction of the UN Framework Convention on Climate Change in 2015.
- It focuses on keeping warming to under 1.5°C as compared to pre-industrial times.
- The report details how Earth's weather, health and ecosystems could be made better.

#### Highlights of the report

- The basic message is that the world is not doing enough to keep the planet from heating up excessively.
- If emissions continue at the present rate, global warming will exceed by 1.5°C over the reference period by around 2040.
- Preventing an extra single degree of heat could make a life-or-death difference in the next few decades.
- So, it calls for the world's leaders to limit future human-caused warming to just 0.5°Celsius from now.
- This is, notably, well below the earlier globally agreed-upon goal of 1° C from now.
- Current measures such as rise of renewable energy and electric vehicles are just not enough.
- The governments will review the Paris Agreement to tackle climate change in the Katowice Climate Change Conference.

#### Current warming scenario

- In 2010, international negotiators adopted a goal of limiting warming to 2°C since pre-industrial times, called the 2° goal.
- In 2015, in Paris climate agreement, they set dual goals - 2°C and a more demanding target of 1.5°C from pre-industrial times.
- The world has already warmed 1°C since pre-industrial times.
- It is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate.
- **Impact** - In that case, climate-related risks to health, livelihoods, food security, water supply, human security and economic growth would increase.
- The world's poor would likely be hit the hardest, and extreme weather, especially heat waves, will be deadlier.



- Diseases such as malaria, dengue, and conditions like premature deaths due to air pollution, undernourishment are likely to multiply.

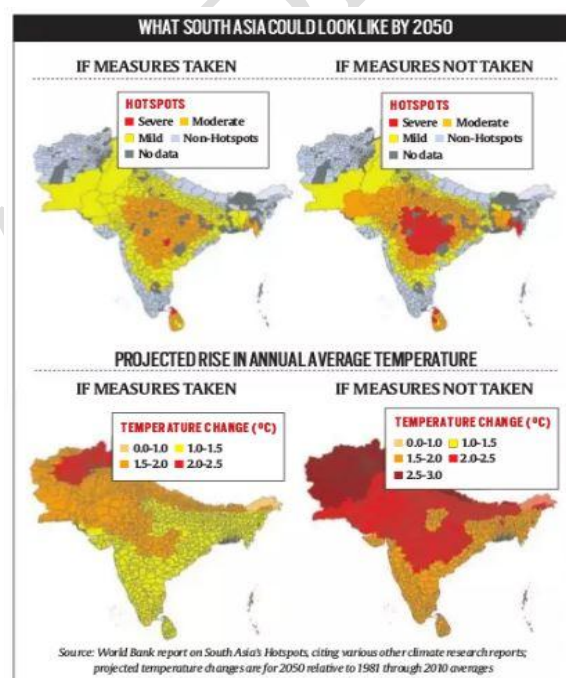
### 3.7 World Bank Report on Climate Change Impacts

World Bank has released South Asia's Hotspots - The Impact of Temperature and Precipitation Changes on Living Standards report.

- It has estimated the impacts of climate change on the GDP and living standards in India and region.
- It found that rising temperatures and changing monsoon rainfall patterns from climate change could cost India 2.8% of GDP, which would also depress the living standards of 50% of the country's population by 2050.
- It looks at six countries in South Asia and how projected changes in temperature and precipitation will affect living standards in these countries.
- The report has used annual household consumption as a proxy for living standards, and identifies "hotspots" districts where these changes will have a notable effect on living standards.

#### Highlights of the Report

- The report looks at two scenarios namely Climate-sensitive and Carbon-intensive.
- **Climate-Sensitive** - It represents a future "in which some collective action is taken to limit greenhouse gas emissions and global annual average temperatures increase 2.4°C by 2100 relative to pre-industrial levels.
- **Carbon-Intensive** - It represents a future in which no actions are taken to reduce emissions and global annual average temperatures increase 4.3°C by 2100 relative to pre-industrial levels.
- The report states the information will be useful for designing a social welfare programme at the national level, and for determining which investments would be most needed in each community.
- If no measures are taken, average temperatures in India are predicted to increase by 1.5-3°C by 2050.
- If preventive measures are taken along the lines of the Paris Agreement, India's average annual temperatures are expected to rise by 1-2°C by 2050, the World Bank report states.
- For the region, the report has found that India, Bangladesh, Pakistan and Sri Lanka will be adversely affected by these changes, while Afghanistan and Nepal will benefit as they are relatively cold.
- Based on the rise in average temperatures over the past six decades and the projected rise, the report predicts more warming inland and less warming in coastal areas beyond 2050.
- For India, it has projected that living conditions in Chhattisgarh and Madhya Pradesh will decline by more than 9%, followed by Rajasthan, Uttar Pradesh and Maharashtra.
- The report states approximately 600 million people in India today live in locations that would become moderate or severe hotspots by 2050 under the carbon-intensive scenario.



### 3.8 MoEFCC Report on Forest Fires

Ministry of Environment, Forests and Climate Change (MoEFCC) and World Bank recently released a joint report on forest fires in India.

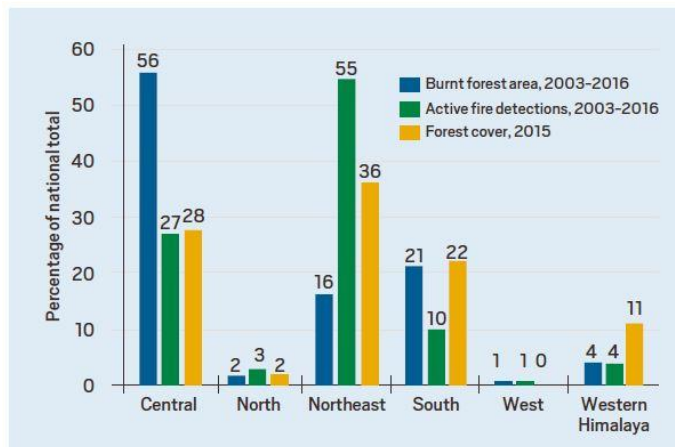
#### Highlights of the report

- At least 60% of districts in India are affected by forest fires each year.





- The **top 20 districts** in terms of area affected by fire from 2003 to 2016 account for 48% of the total fire-affected area and they **mostly fall in Central India**.
- The 16 of the top 20 districts in terms of fire **frequency** are located mainly in the **Northeast**.
- Here, forest fires tend to be concentrated in a smaller area that is subject to repeated burning.
- The peak fire season is the most concentrated (shortest) in the Northeast and the Northern state of Bihar.
- Fires in other regions, particularly districts in Central and Southern India, are more expansive.



- Districts experiencing widespread and frequent forest fires include areas of **dry and moist deciduous forest**.
- These include the borderlands of Chhattisgarh, Maharashtra, and Telangana that are affected by fire on a nearly annual basis.
- Notably, between 2006 and 2015, forest fires were detected in just under half (281 of 614) of the protected areas in India.
- **Reasons for forest fire** - In line with other parts of the world, people are the main driver of fires in India.
- Forest fires are distributed close to people and infrastructure in India.
- Also, India's **monsoons are largely responsible** for the seasonal nature of forest fires in the country.
- The fire season mainly occurs during the four-month period between February and May & peak during the March or April before the arrival of the monsoon.
- **Significance** - Forest fires contribute to global warming and hence climate change, by releasing carbon stored in trees, undergrowth and soil into the atmosphere.
- The findings are crucial for India's own pledge on creating additional carbon sink of 2.5 to 3 billion tonnes of Co<sub>2</sub>-equivalent by 2030.
- In the long run, climate shifts due to anthropogenic global warming may further alter India's forest landscape and fire regime.

#### Forest Fires in India – Statistical Data

- According to the 2017 State of Environment Report of the Centre for Science and Environment, there were 15,937 forest fires in India in 2015 and the number rose to 35,888, a 125% spike over two years.
- In 2017, the maximum number of forest fires were reported in **Madhya Pradesh (4,781)**, followed by **Odisha (4,416)** and **Chhattisgarh (4,373)**.
- A National Institute of Disaster Management report on forest fires says 50% of the country's forests are prone to fire.
- Such uncontrolled fires not only burn down the vegetation but also the surface organic matter, increasing the frequency of flooding and soil erosion.

### 3.9 California Forest Fires

*California is suffering the aftermath of a most devastating wildfire in its history recently.*

- Forest fires have been getting worse in California in recent years, both in terms of their destructive power and their size.
- 9 of the 10 biggest fires by area have taken place in the past two decades.
- It has two fire seasons in the recent past, wherein the first is from June to September, which is driven by warmer, drier weather in Western California.



- The other is from October to April, which is driven by strong gusts called the **Santa Ana winds** in Southern California.
- Many experts point out that **climate change** has made things worse, leading to higher temperatures, lower humidity, earlier springs and changes in wind and rainfall patterns.
- The scale has been huge this year because of the hot, dry summer conditions persisting into the autumn.
- 18% of the state is currently experiencing severe drought, which is exacerbating the seasonal weather patterns that make it difficult to fight fires in the state.
- There are large number of **dead trees** in parts of the state, due to drought and disease, which poses a serious fire risk that needs to be addressed.
- Researchers project that **moist, forested areas are the most likely to face greater threats** from wildfires as conditions in those areas become drier and hotter, becoming more flammable.
- Add to this is the fact that winter seasons, when it rains or snows, are getting shorter.
- **Forest mismanagement** also attributed to it - Nearly 60% of California's forested areas are managed by national agencies and the rest is in private hands.

### 3.10 Black Carbon and Receding Snowlines

*A recent study has revealed that Black Carbon travelling from Mediterranean countries during the western disturbance may be one of the factors for receding snowlines in the Himalayas.*

- The high concentration of black carbon in Himalayas in the winter months is not originating from local sources
- This because life remains standstill as almost entire population migrates to the Plains.
- Western disturbance is an extratropical storm originating from the Mediterranean region that brings sudden winter rain to the northwestern parts of the Indian subcontinent.
- **Black Carbon** is inorganic in nature consisting of soot particles that directly come out of combustion processes.
- It is formed through the incomplete combustion of fossil fuels, biofuel etc.
- **Brown Carbon** comes from complex organic reactions in the airborne atmospheric particles.
- This includes
  - i. Tar materials from smouldering fires or coal combustion.
  - ii. Breakdown products from biomass burning.
  - iii. Mixture of organic compounds from soil and volatile organic compounds given off by vegetation.
- Both Black and Brown carbon absorbs sunlight and thus in turn warms the atmosphere leading to receding snowline.
- When inhaled, they also cause severe health hazards.
- Black carbon absorbs light in the visible spectrum whereas Brown carbon is light brown in colour and absorbs light in the ultraviolet region.
- Brown Carbon leads to the formation of ground level ozone in the atmosphere.
- Increased black carbon also leads to vanishing medicinal herbs due to receding snowline.

## 4. ENVIRONMENTAL ORGANISATIONS, CONVENTIONS & TREATIES

### 4.1 India-United Nations Sustainable Development Framework

- India & UN has signed India-United Nations Sustainable Development Framework (UNSDF) for 2018-2022.
- NITI Aayog is the national counterpart for the UN in India for the operationalization of the UNSDF.
- SDF 2018-22 outlines the work of UN agencies in India, to support the achievement of key development outcomes that are aligned to the national priorities.
- The seven priority areas outlined in the UNSDF are,
  - Poverty and Urbanization
  - Health, Water, and Sanitation
  - Education and Employability
  - Nutrition and Food Security
  - Climate Change, Clean Energy, and Disaster Resilience
  - Skilling, Entrepreneurship, and Job Creation &
  - Gender Equality and Youth Development.

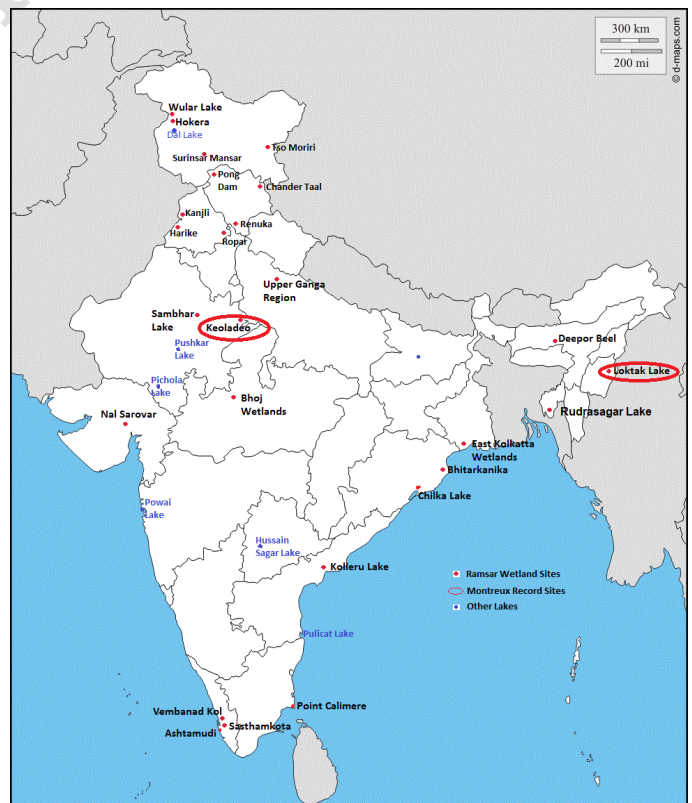
### 4.2 Report by Ramsar Convention

*Ramsar convention has recently issued its first-ever global report titled "Global Wetland Outlook".*

- The report found that around 35% of wetlands were lost between 1970 and 2015.
- Wetlands include lakes, rivers, marshes and peatlands, as well as coastal and marine areas like lagoons, mangroves and coral reefs.
- Ramsar convention, adopted in the year 1971, provides the framework for the conservation and wise use of wetlands and their resources.
- This intergovernmental treaty came into force in 1975.
- It has been ratified by most of the world's nations, including the U.S., China and India.
- It has designated more than 2,300 sites of international importance.
- In India, The Ministry of Environment, Forest and Climate Change is the nodal Ministry for wetlands conservation.
- Wetlands in India account for 4.7% of the total geographical area.

#### Wetlands in India

- India currently has 26 sites designated as Wetlands of International Importance (Ramsar Sites).
- Jammu and Kashmir houses 4 Ramsar sites while there are 3 Ramsar sites in Kerala.
- The wetlands in the four extremes of our country
  - Northernmost- Wular Lake
  - Southernmost- Ashtamudi lake
  - Easternmost - Loktak Lake
  - Westernmost – Nalsarovar Lake





- Lake Pichola, situated in Udaipur in state of Rajasthan, is an artificial fresh water lake.
- Powai Lake is an artificial lake that is situated in Mumbai, in the Powai valley.
- Pushkar Lake is located in the town of Pushkar in Ajmer district of the Rajasthan state of western India which is a sacred lake of the Hindus.

#### 4.3 UN Framework Convention on Climate Change Conference

*Bangkok hosted an intermediate session of the UNFCCC prior to the 24<sup>th</sup> session of the Conference of the Parties (COP-24) in Katowice, Poland in December, 2018.*

- The purpose of the meet was to draft a rulebook for the Paris Agreement ahead of COP-24.
- It aims to complete preparations to help an agreement to be reached on guidelines for implementing the 2015 Paris climate change agreement.
- A primary objective of the 2015 Paris agreement, to which 190 nations subscribe, is to limit the global temperature increase by 2100 to less than 2°C and as close as possible to 1.5°C, which is vital to the survival of island nations threatened by rising seas.
- It allowed negotiating Parties to focus on moving forward the Paris Agreement Work Programme (PAWP).
- But it ran into difficulties over the issue of raising funds to help poorer nations.
- Some developed countries led by the U.S. are unwilling to commit to rules on raising climate finance.
- **Performance of Developed Countries** - Earlier, U.S. under the Trump administration, has rejected the Paris agreement in which the rich countries pledged to raise \$100 billion a year by 2020 to help developing countries reduce their greenhouse gas (GHG) emissions.
- Historically, the developed countries have contributed heavily to the accumulated CO<sub>2</sub> burden.
- It now measures at about 410 parts per million (ppm) of CO<sub>2</sub> in the atmosphere, up from 280 ppm before the industrial revolution.
- If scientific estimates are correct, the damage already done to the West Antarctic Ice Sheet is set to raise sea levels.
- A 2° Celsius rise in global temperature will also destabilise the Greenland Ice Sheet.
- This will also drive more mass migrations of people on account of failed agriculture and the associated conflicts.
- Hence the developed countries are ignoring their historical responsibility.
- Obstructing the transition to a carbon-neutral pathway is also short-sighted, simply because the losses caused by weather events are proving severely detrimental to all economies.
- Additionally, walking out of developed countries have created a financial and leadership vacuum.
- This was followed by other developed countries that are unwilling to create sustainable financial commitment to realise the objectives of Paris agreement.
- Responsibilities of India and China - There is international pressure on China and India to cut GHG emissions. Both countries have committed themselves to a cleaner growth path.
- India reported an annual CO<sub>2</sub> equivalent emissions of 2.136 billion tonnes in 2010 to the UNFCCC two years ago.
- Recent estimates show that the GHG emissions intensity of its GDP has declined by 12% for the 2005-2010 period.
- China has suspended construction of 103 new coal-fired power plants last year, and announced plans to invest more than \$360 billion into renewable energy by the end of the decade.

##### **India's Intended Nationally Determined Contributions**

- To reduce the emissions intensity of its GDP by 33 to 35% by 2030 from 2005 level.
- To achieve about 40 per cent cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030.
- To create an additional carbon sink of 2.5 to 3 billion tonnes of CO<sub>2</sub> equivalent through additional forest and tree cover by 2030.



- Both have the responsibility of climate leadership in the developing world and Innovative instruments (climate bond, social impact bond, catastrophic risk insurance, etc.,) could be leveraged to realise a “Green Economy”.
- It needs to be accompanied by a supportive framework in the form of a rulebook that:
  1. Binds the developed countries to their funding pledges.
  2. Provides support for capacity building.
  3. Transfer of green technologies on liberal terms.
- Thus, the responsibility lies in the domain of both developed and developing countries to go beyond expediency and take the actions needed to avert long-term catastrophe.

#### 4.4 Montreal Protocol - World Ozone Day

- 24<sup>th</sup> World Ozone Day is being celebrated with the theme "Keep Cool and Carry on": The Montreal Protocol.
- The Montreal Protocol on Substances that Deplete the Ozone Layer has been recognized as the most successful international environment treaty in history.
- It is the only environmental treaty which enjoys universal ratification of 197 UN numbers countries.
- The protocol and its amendments have banned the use of ozone destroying chemicals and the rate of ozone depletion seems to have slowed.
- Its implementation has not only led to the phase-out of around 98% of ozone depleting chemicals, but also averted more than 135 billion tonnes of carbon dioxide equivalent emissions.

#### 4.5 Global Environmental Facility

- India recently announced that it will increase grants to \$15 million to GEF for the next 4 years.
- GEF was established in 1991 as a pilot program in the World Bank to assist in the protection of the global environment and to promote environmental sustainable development.
- The UNDP and UNEP and the World Bank were the three initial partners implementing GEF projects.
- In 1992, at the Rio Earth Summit, the GEF was restructured and moved out of the World Bank system to become a permanent, separate institution.
- Today it is an **international partnership of 183 countries**, international institutions, civil society organizations and the private sector that addresses global environmental issues.
- Since 1994, the World Bank has served as the Trustee of the GEF Trust Fund and provided administrative services.
- GEF funds are available to developing countries and countries with economies in transition to meet the objectives of the international environmental conventions and agreements.
- The GEF is a financial mechanism for 5 major international conventions
  1. The Minamata Convention on Mercury,
  2. The Stockholm Convention on Persistent Organic Pollutants (POPs),
  3. The United Nations Convention on Biological Diversity (UNCBD),
  4. The United Nations Convention to Combat Desertification (UNCCD) and
  5. The United Nations Framework Convention on Climate Change (UNFCCC).
- The GEF, although not linked formally to the Montreal Protocol on Substances that Deplete the Ozone Layer (MP), supports implementation of the Protocol in countries with economies in transition.
- The GEF has 18 agencies as the operational arm of the GEF.
- These agencies work closely with project stakeholders to design, develop and implement GEF-funded projects and programs.





#### 4.6 Global Soil Biodiversity Atlas

- The Atlas is prepared by **World Wide Fund for Nature**.
- It indicates risk index which takes in to account, threats from loss of above-ground diversity, pollution and nutrient over-loading, over-grazing, intensive agriculture, fire, soil erosion, desertification and climate change.
- The two key drivers of biodiversity loss were the over exploitation of natural resources and agriculture.
- The risk index shows India among countries whose soil biodiversity faces the highest level of risk.
- The report highlighted that, while India's per capita ecological footprint was less than 1.75 hectares/person (which is in the lowest band) its high population made it vulnerable to an ecological crisis.
- The findings under this are part of the bi-annual **Living Planet Report 2018**, also published by WWF.

#### 4.7 Climate Finance Leadership Initiative

- The initiative supports global mobilisation of private capital in response to the challenge of climate change.
- It is led by head of **UN Special Envoy for Climate Action**.
- It works to fulfill the private financing objectives included in the landmark 2015 Paris Agreement.
- It will draw members from top international financial firms and corporations.
- The initiative will have a one-year term culminating in a UN Climate Summit to be held in September 2019.
- It will work closely with the government of France and will provide a first report to G7 Finance Ministers by July 2019.

#### 4.8 Climate Vulnerable Forum

- It is an international partnership of countries highly vulnerable to a warming planet.
- The Forum serves as a South-South cooperation platform for participating governments to act together to deal with global climate change.
- It brings together climate vulnerable developing countries from across Africa, Asia, the Caribbean, Latin America and the Pacific.
- The forum held its first meeting in Maldives in the year 2009.
- CVF High-level meeting was last convened during the UNFCCC Climate Change Conference in Paris (COP21).
- The Manila-Paris Declaration and the 2016-2018 Roadmap of the CVF, adopted at this meeting, spell out the CVF's planned efforts during this time period.
- The forum has a rotating chairmanship that has been held by Maldives, Kiribati, Bangladesh, Costa Rica and Philippines, Ethiopia and currently held by Republic of Marshall.

#### 4.9 Virtual Climate Summit

- It is an innovative climate summit which is an entirely online event to be a carbon neutral event.
- It is the world's first ever political global meeting to be held in online.
- Its focus is on to renew political momentum in tackling climate change.
- It was announced in the Global Environment Facility (GEF) assembly recently held in Vietnam.
- It is the brainchild of Marshall Islands President who insisted upon such summit in the GEF assembly.
- The summit is convened by the Republic of the Marshall Islands (RMI) in its capacity as the Climate Vulnerable Forum (CVF) chair.
- Its main aim is to encourage the international community to keep global warming to 1.5 degrees Celsius above pre-industrial levels.

#### 4.10 Champions of the Earth

- It is the UN's highest environmental honor.



- It was launched in the year 2005 by UNEP.
- It recognizes exemplary individuals and organisations whose actions created positive impact on environment.
- It recognizes laureates in the following categories - Lifetime Achievement, Policy Leadership, Action and Inspiration, Entrepreneurial Vision and Science and Innovation
- In its 2018 edition, Indian Prime Minister and France President has been awarded under Policy Leadership category for their International Solar Alliance (ISA) initiative.
- Indian PM Modi has also been awarded for his pledge to eliminate single use plastic in India by 2022.
- Cochin International Airport has also been honored with the award for Entrepreneurial Vision, for its leadership in the use of sustainable energy.
- The awards will be presented during the Champions of the Earth Gala in New York City, on the sidelines of the 73rd UN General Assembly.

#### 4.11 World Environment Day

- World Environment Day is celebrated on every 5<sup>th</sup> June of the year.
- The theme for this year's Environment Day, organised in partnership with the United Nations Environmental Programme, is "Beat plastic pollution"
- **India is the global host nation** for the 43rd edition of this event.
- According to the Central Pollution Control Board, India generates about 15,000 tonnes of plastic waste every day, of which about 40% remains uncollected.
- About 70% of the plastic packaging products become "waste" in a short span of time.
- While plastics have a wide variety of applications, the global rally is against the single use/disposable plastic used in bottles, cups, wrapping paper and bags.
- Together, they account for over half the plastic produced.

##### Taj Declaration

- The declaration is in line with the Environment Day theme "Beating Plastic Pollution".
- It was adopted as part of which efforts would be made to make the 500-metre area around the 17th century monument litter-free.

#### 4.12 World Oceans Day 2018

- The UN General Assembly designated 8 June as World Oceans Day.
- The concept of a 'World Oceans Day' was first proposed in 1992 at the Earth Summit in Rio de Janeiro as a way to celebrate our world's shared ocean and our personal connection to the sea.
- It is to raise awareness about the crucial role the ocean plays in our lives and the important ways people can help protect it.
- The UN Division for Ocean Affairs and the Law of the Sea is actively coordinating different activities of the World Oceans Day.
- UNESCO's Intergovernmental Oceanographic Commission (IOC) sponsors the World Ocean Network, which has since 2002 been instrumental in building support for ocean awareness events on 8 June.
- This year's theme for World Oceans Day will be preventing plastic pollution and encouraging solutions for a healthy ocean.

#### 4.13 Global Environmental Facility

*The 6<sup>th</sup> GEF Assembly was recently held in Da Nang, Vietnam, held once in 4 years.*

- GEF was established in 1991 as a pilot program in the World Bank to assist in the protection of the global environment and to promote environmental sustainable development.
- The UNDP and UNEP and the World Bank were the three initial partners implementing GEF projects.
- In 1992, at the Rio Earth Summit, the GEF was restructured and moved out of the World Bank system to become a permanent, separate institution.

- Today it is an **international partnership of 183 countries**, international institutions, civil society organizations and the private sector that addresses global environmental issues.
- Since 1994, the World Bank has served as the Trustee of the GEF Trust Fund and provided administrative services.
- GEF funds are available to developing countries and countries with economies in transition to meet the objectives of the international environmental conventions and agreements.
- The GEF is a financial mechanism for 5 major international conventions
  1. The Minamata Convention on Mercury,
  2. The Stockholm Convention on Persistent Organic Pollutants (POPs),
  3. The United Nations Convention on Biological Diversity (UNCBD),
  4. The United Nations Convention to Combat Desertification (UNCCD) and
  5. The United Nations Framework Convention on Climate Change (UNFCCC).
- The GEF, although not linked formally to the Montreal Protocol on Substances that Deplete the Ozone Layer (MP), supports implementation of the Protocol in countries with economies in transition.
- The GEF has 18 agencies as the operational arm of the GEF.
- These agencies work closely with project stakeholders to design, develop and implement GEF-funded projects and programs.

#### Outcome of the assembly

- The assembly brings together environment ministers and other senior officials from all its 183-member countries.
- A record of US\$4.1 billion replenishment by governments of the GEF's trust fund was announced in the assembly.
- GEF fund sees the first budget cut in 27 years after US halving its contribution.
- Germany, Japan, Britain and France are among other developed countries that have increased their contributions to fill the funding hole.
- Large developing countries have also stepped up to the plate, China increasing its pledge to USD 22 million.
- India announced that it will increase grants to \$15 million to GEF for the next 4 years.
- Due to the budget cut, GEF has announced that even the poorest countries have to mobilise 5 times a GEF grant in co-financing before a project is approved. And for developing countries, it is 9 times.
- In the assembly, US and other a few other industrialised countries suggested that there be a new "**index of development**".
- Accordingly, countries that had developed beyond a certain point in this index be ineligible to receive any funding at all.
- Till now, the larger developing countries have been both recipient and donor countries, and the money they have received has been much more than the money they have put in.

#### Bay of Bengal Large Marine Ecosystem

- The project for sustainable management of Bay of Bengal Large Marine(LME) Ecosystem is under GEF.
- It is funded by GEF trust fund and implemented by Food and Agriculture Organisation (FAO).
- Its objective is to contribute to sustainable management of fisheries, marine living resources and their habitats in the Bay of Bengal region for the benefit of coastal states and communities.

#### 4.14 Convention on Biological Diversity

*The 14<sup>th</sup> meeting of Conference of Parties (COP) of Convention on Biological Diversity (CBD) was recently held in Sharm El-Sheikh, Egypt.*

- UNEP has set up an adhoc working group on biological diversity to explore the need for an international convention on biological diversity (CBD).



- In the Nairobi conference of UNEP in 1992, text of the CBD was adopted.
- The convention was opened for signature in Rio Earth Summit in 1992 and entered into force in 1993.
- It has 3 main objectives:
  - The conservation of biological diversity
  - The sustainable use of the components of biological diversity
  - The fair and equitable sharing of the benefits arising out of the utilization of genetic resources
- **The Cartagena Protocol on Biosafety to CBD** is an international agreement adopted in 2000 and entered into force in 2003.
- It aims to ensure the safe handling, transport and use of living modified organisms (LMOs) resulting from modern biotechnology that may have adverse effects on biological diversity, taking also into account risks to human health.
- The **Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization** to CBD was entered into force in 2014.
- It is an international agreement aims at sharing the benefits arising from the utilization of genetic resources in a fair and equitable way.
- **Global Biodiversity Outlook (GBO)** is the flagship publication of the CBD.
- It is a periodic report that summarizes the latest data on the status and trends of biodiversity and draws conclusions relevant to the further implementation of the Convention.
- In its 14<sup>th</sup> COP, **Sharm El-Sheik to Beijing Action Agenda for Nature and People** was launched to catalyze, collect, and celebrate actions taken in support of biodiversity conservation and its sustainable use.
- The meeting also agreed on a comprehensive and participatory process for developing the post-2020 global biodiversity framework.
- The framework is anticipated to be agreed upon in the next COP to be held in Beijing in 2020.
- Governments agreed to accelerate action to achieve the Aichi Biodiversity Targets, agreed in 2010, from now until 2020.

## 5. GOVERNMENT INTERVENTIONS

### 5.1 NGT ruling on INO Observatory

*The National Green Tribunal (NGT) upheld the environmental clearance granted to the India-based Neutrino Observatory (INO) recently.*

- INO project is a particle physics research project to primarily study the elusive sub-atomic particles called neutrinos.
- It primarily aims to study atmospheric neutrinos in a 1,300-m deep cavern in the Bodi West Hills in Theni district, Tamil Nadu.
- The proposed site is about 4.9 km from Mathikettan Shola bird sanctuary bordering Kerala.
- The application for environmental clearance was referred to Environmental Appraisal Committee (EAC) by the State Environment Impact Assessment Authority of Tamil Nadu as it preferred the centre to assess a project of this nature.
- Considering the project's national importance, the Environment Ministry had taken up the proposal for clearance as a "**special case**".
- The ministry has given approval for the project under **Category B** item 8(a) — building and construction projects of the Schedule to the Environmental Impact Assessment (EIA) Notification, 2006



- But the project should have been treated as **Category A**, given its location near an eco-sensitive national park.
- Thus, the environmental clearance was challenged by NGO in the National Green Tribunal (NGT).
- The organization objected to the category under which the project was cleared.
- However, the NGT held that the environment ministry has the legal and technical competence to assess the INO project and upheld the environmental clearance.
- The judgment states that it was correct on the part of the EAC and the ministry to appraise the project at their level.
- However, the court reiterated that the INO must also obtain approval from National Board for Wildlife, because the site is near to the bird sanctuary.
- Any major activity within 5km from any wildlife sanctuary requires a specific approval by the National Board for Wild Life.
- Also, NGT ruled that specific or general condition or recommendation made by the committees and expert groups on Western Ghats will be **mandatorily** made applicable in the current project of INO.

#### Categories under EIA

- The EIA Notification, 2006, broadly divides all projects into two categories, Category A and Category B, based on potential impacts over an area and on human health and natural and man-made resources.
- Accordingly, all Category A projects required to undertake EIA and a public hearing and its clearance are granted by the Union environment ministry.
- Projects that come under category A require “prior environmental clearance” from the Environment Ministry.
- On the other hand, Category B projects prior environmental clearance from the State/UT authorities.
- Category B projects are further classified as B1 and B2.
- While projects under Category B1 also require an EIA and public consultation, those falling under B2 are exempted from requirements of both EIA and public consultation.

#### Neutrinos

- Neutrinos are extremely tiny elementary particles that are omnipresent in universe which carries no electric charge.
- It is considered to be the **second most abundant particle** in the universe after the photon, or light particle.
- Yet, they are very difficult to detect because they pass seamlessly through all kinds of matter undetected.
- Its rest mass is almost zero (1 millionth of an electron).
- It interacts only via weak short range subatomic forces and gravity.
- Hence its detection needs high-end instruments and an environment that is effectively shielded from other radiant interference.
- Hence, neutrino detector is to be placed in cave carved out at the depth of 1,300 meters, as the overhead rock will effectively shield it from natural cosmic radiation from outside.
- Many countries are carrying out research on neutrinos, believing that it holds important clues to some basic questions on the universe.
- It is estimated the project would now cost at least 25% more than that amount.

#### 5.2 Draft India Cooling Action Plan

*The Ministry of Environment, Forests and Climate Change has released a draft India Cooling Action Plan.*

- The many high-temperature cities in India are only set to get hotter in the coming future. The requirement for cooling is thus being recognised as key to health and well-being.
- Its goal is to provide sustainable cooling and thermal comfort for all while securing environmental and socio-economic benefits for the society.
- It provides a 20-year perspective, with projections for cooling needs in 2037-38.



- India is the first country in world to develop such a document.
- The interventions under the action plan includes,
  - i. Recognition of “cooling and related areas” as a thrust area
  - ii. Reduction of cooling demand across sectors
  - iii. Reduction of refrigerant demand
  - iv. Reduction of cooling energy requirements
  - v. Training and certification of 100,000 servicing sector technicians by the year 2022-23, in synergy with Skill India Mission.

### Highlights of the Plan

- **India** - The document puts India at the bottom in “access” to cooling, compared to the rest of the world.
- This is reflected in “low per-capita levels” of energy consumption for space cooling.
- It stands at 69 kWh for India as against the world average of 272 kWh.
- **Requirement** - The cooling requirement in India is projected to grow around 8 times by 2037-38.
- **Approach** - It also involves passive cooling strategies like
  - i. Design that deploys natural and mechanical ventilation
  - ii. Energy-efficient Refrigerant
  - iii. adoption of adaptive thermal comfort standards
  - iv. Renewable-energy-based cold chains for perishable foods
- Such interventions can reduce the total refrigerant demand by 25-30% by 2037-38.
- Even by 2038, a significant percentage of households will not be able to afford refrigerant-based cooling equipment.
- Therefore, wider proliferation of thermally efficient residential built spaces is required.
- This should be coupled with efficient non-refrigerant-based cooling equipment, such as fans and coolers.

Sector	Growth Projection from 2017-18 levels
Building	11 times
Cold-chain & Refrigeration	4 times
Transport Air-Conditioning	5 times

### Global Commitments

- India and few other developing countries agreed to phase down hydro fluorocarbons (HFCs) by 85% of their 2024-26 levels by 2047 in 2016 Kigali Amendment to the Montreal Protocol.
- The protocol regulates on Substances that Deplete the Ozone Layer, and India is a signatory to it.
- HFCs are commonly used in air-conditioners and as refrigerants.

### 5.3 National Action Plan for Conservation of Migratory Birds

*The Environment Ministry has come out with a 5-year national action plan to conserve habitats of migratory birds.*

- It specifically covers species which take long distances from Siberia in Russia to India during winter.
- It is meant for coordinated actions among states for securing and enhancing population of migratory birds in India within their range across the Central Asian Flyway (CAF).
- A flyway is a geographical region within which a single or a group of migratory species completes its annual cycle - breeding, moulting (shed old feathers), staging and non-breeding.
- CAF is one of the 9 flyways in the world.
- CAF covers northernmost breeding ground in Siberia to the southernmost non-breeding grounds in west and south Asia, the Maldives and the British Indian Ocean Territory.

### 5.4 Green Skill Development Program

*The Environment Ministry launched its full-fledged Green Skill Development Program (GSDP).*

- The Ministry has taken up an initiative for skill development in the environment and forest sector.
- It aims to train over 5.5 lakh workers in environment and forest sectors in the country through 30 courses by 2021.
- The pilot project of GSDP was launched in 2017 for skilling Biodiversity Conservationists and Para-taxonomists spread over 9 bio-geographic regions of the country.
- It will also help in the attainment of the Intended Nationally Determined Contributions (INDCs), Sustainable Development Goals (SDGs) and National Biodiversity Targets (NBTs).

### 5.5 ACROSS Scheme

*Atmosphere & Climate Research-Modelling Observing Systems & Services (ACROSS) scheme was recently approved by the Cabinet Committee.*

- It is an umbrella scheme with 9 sub-schemes.
- Its objective is to provide a reliable weather and climate forecast for betterment of society.
- It includes warnings for cyclone, storm surges, heat waves, thunderstorms etc.
- The schemes will be implemented in an integrated manner by 4 institutes of Ministry of Earth Sciences -
  1. India Meteorological Department (IMD),
  2. Indian Institute of Tropical Meteorology (IITM),
  3. National Centre for Medium Range Weather Forecasting (NCMRWF), and
  4. Indian National Centre for Ocean Information Service (INCOIS)

### 5.6 SECURE Himalaya

*SECURE Himalaya project was launched by the union government in association with the United Nations Development Programme (UNDP).*

- It is a six-year project to ensure conservation of locally and globally significant biodiversity, land and forest resources in the high Himalayan ecosystem spread over four states in India.
- Securing livelihoods, conservation, sustainable use and restoration of high range Himalayan ecosystems is meant for specific landscapes.
- It includes Changthang (Jammu and Kashmir), Lahaul - Pangi and Kinnaur (Himachal Pradesh), Gangotri - Govind and Darma - Byans Valley in Pithoragarh (Uttarakhand) and Kanchenjunga - Upper Teesta Valley (Sikkim).

### 5.7 Lab for Conservation of Species

- The Laboratory for the Conservation of Endangered Species (LaCONES) is India's only facility for conservation of endangered species.
- It is a dedicated facility of CSIR's Centre for Cellular and Molecular Biology (CCMB) in Hyderabad.
- It uses modern biotechnologies for conservation of endangered wildlife.
- It supports both in-situ habitat preservation and Ex-situ conservation through captive breeding in controlled environment to restock original wild populations.
- It is the only laboratory in India that has developed methods for collection and cryopreservation of semen and oocytes from wildlife and successfully reproducing endangered blackbuck, spotted deer and Nicobar pigeons.
- It has established Genetic Resource Bank for Indian wildlife and collected genetic resources from 23 species of Indian wild animals.

### 5.8 Hornbill Watch initiative

- It is an interactive web interface that allows a person to report on hornbills anywhere in India.
- It was launched by Scientists from Nature Conservation Foundation and Conservation India.
- Hornbills play essential roles in forest ecosystems as dispersers of seeds of forest plants.



- There are nine hornbill species in India out of which four are found in the Western Ghats. They are,
  1. Indian Grey Hornbill (endemic to India),
  2. the Malabar Grey Hornbill (endemic to the Western Ghats),
  3. Malabar Pied Hornbill (endemic to India and Sri Lanka) and
  4. Widely distributed but endangered Great Hornbill.
- India also has one species that has one of the smallest ranges of any hornbill, **the Narcondam Hornbill**, found only on the island of Narcondam.

#### 5.9 Global Cooling Innovation Summit

- It aims to spur development of a residential cooling solution that has at least five times (5x) less climate impact than today's standard.
- The objective of the competition is to develop a cooling technology that
  1. Requires radically less energy to operate,
  2. Utilizes refrigerants with no ozone depletion potential and with low global warming potential, and
  3. Cost-effective at scale.
- It is organised by Union Ministry of S&T along with Rocky Mountain Institute, Alliance for An Energy Efficient Economy (AEEE), Conservation X Labs and CEPT University.

#### 5.10 'Blue Flag' tag

*Chandrabhaga beach on the Konark coast of Odisha will be the first in Asia to get the Blue Flag certification.*

- The tag is given to environment-friendly and clean beaches, equipped with amenities of international standards for tourists.
- Twelve more beaches in India are being developed by the Society for Integrated Coastal Management, an Environment Ministry's body, in accordance with the Blue Flag standards.
- The standards were established by the Copenhagen-based Foundation for Environmental Education in 1985.

#### 5.11 SATAT Initiative

- It is an initiative by **Ministry of Petroleum and Natural Gas**.
- It is aimed at providing a Sustainable Alternative Towards Affordable Transportation.
- It will promote the use of Compressed Bio-Gas (CBG) production plants and make available CBG in the market for use in automotive fuels.

#### 5.12 Chiller Star Labelling Programme

- A Chiller is a machine that removes heat from a liquid via a vapor-compression cycle.
- Chillers are used extensively for space conditioning of buildings and for industrial process cooling applications.
- It is energy intensive system and contributes to more than 40% of total energy consumption in commercial buildings.
- Chiller Star Labelling programme was recently launched by Bureau of Energy Efficiency.



- It envisages providing star rating to chillers in terms of its energy performance.

#### **Bureau of Energy Efficiency**

- It was set up under the provisions of Energy Conservation Act, 2001.
- Its mission is to assist in developing policies with the objective of reducing energy intensity of the Indian Economy.
- Energy Conservation Act provides for regulatory and promotional functions of BEE.
- BEE is responsible for
  1. Create awareness and disseminate information on energy efficiency and conservation
  2. Promote innovative financing of energy efficiency projects
  3. Give financial assistance to institutions for promoting efficient use of energy and its conservation
  4. Prepare educational curriculum on efficient use of energy and its conservation
  5. Implement international co-operation programmes relating to efficient use of energy and its conservation.

#### **5.13 Flightless Bird Research Centre**

- The Kerala Veterinary and Animal Sciences University has set up a flightless bird research centre in Wayanad district.
- It envisages carrying out research on adaptation and comparative physiological studies of flightless birds such as the ostrich, rhea, and emu, and artificial incubation of their eggs.

#### **5.14 Elephant Hospital**

- India's first fully equipped dedicated elephant hospital has been established in Farah block of Mathura, complete with wireless digital X-Ray, laser treatment and dental X-ray facilities.
- The 'jumbo' hospital is the result of a collaborative effort between the UP Forest Department and conservation NGO Wildlife SOS.
- The hospital complex includes an observation area for the overnight monitoring of elephants under treatment using Close Circuit Infra-Red CCTV cameras.

#### **5.15 Prakriti Programme**

- The programme is launched by the Indian Council of Forestry Research and Education (ICFRE), Navodaya Vidyalaya Samiti (NVS), and Kendriya Vidyalaya Sangathan (KVS).
- It aims to promote awareness about forests and environment among the students of NVS and KVS.
- It focusses upon stimulating interest and maintaining a balanced environment and acquiring skills that reflect care and protection towards forests, environment and society.
- ICFRE is an autonomous body under the Ministry of Environment, Forest and Climate Change.
- The objective of Navodaya Vidyalaya Samiti is to provide modern quality education to talented children, predominantly from the rural areas, without regard to their family's socio-economic condition.

#### **5.16 ZSI survey on Moths**

*Zoological Survey of India has recently conducted a study on moths.*

- It revealed that moths act as pollinators to a number of flowering plants in the Himalayan ecosystem.
- Almost two-thirds of common large moth species have declined over the last 40 years in some parts of world.
- One of main reasons for the decline is light pollution i.e an increase in artificial light in moth habitats.
- The insect order Lepidoptera comprises the butterflies, moths, and skippers.



- They can be distinguished from all other insects by their two pairs of scale-covered wings and are renowned for their sense of smell.
- For most Lepidoptera species, the vast majority of the life cycle is spent in the larval stage.
- Butterflies and moths have numerous physical and behavioral differences. Eg. Moths are nocturnal and butterflies are diurnal.

#### 5.17 Survey on Biodiversity in Andaman & Nicobar

*Zoological Survey of India has recently published a report on faunal diversity of islands of India.*

- It is the first time in India that database of all faunal species found in Andaman & Nicobar (A&N) island has been documented.
- It proves that the A&N Island, comprising only 0.25% of India's geographical area, are home to more than 10% of the country's fauna species.
- There are 1,067 endemic faunal species found only on the Andaman and Nicobar Islands and nowhere else.
- Some of the endemic species in the island are Narcondam hornbill, Nicobar megapode, the Nicobar treeshrew, the Long-tailed Nicobar macaque, and the Andaman day gecko.
- It highlighted that a long period of isolation from the mainland made the islands hotspots for speciation resulting in hundreds of endemic species and subspecies.

#### 5.18 Indian Wind Turbine Certification Scheme

- It is a new scheme drafted by Ministry of New and Renewable Energy, in consultation with National Institute of Wind Energy, Chennai.
- It incorporated various guidelines from turbine certification scheme.
- It will not only present a framework for standards, but also gratify to the technical regulations and requirements issued by Central Electricity Authority (CEA), guidelines issued by MNRE and other international guidelines.

#### 5.19 Digital Knowledge on Bird Species

- Wildlife scientists tried to use online data to study if bird occurrence has altered across India over time.
- However, with little data before 1980 was found digitally, it is difficult to make comparisons.
- The study was carried out with intent to evaluate the "digital accessible knowledge" of bird species occurrences.
- They explored two sources - Global Biodiversity Information Facility and eBird.
- **Global Biodiversity Information Facility (GBIF)** is a network funded by the world's governments focused on making scientific data on biodiversity available online.
- **eBird** is the world's largest biodiversity-related citizen science project where users contribute information on bird sightings.

#### 5.20 Sovereign Blue Bond

*The Republic of Seychelles has recently launched the world's first sovereign blue bond.*

- Blue Bond is a financial instrument designed to support **sustainable marine and fisheries projects**.
- It is partially guaranteed by a US\$5 million guarantee from the World Bank (IBRD).
- It is further supported by a US\$5 million concessional loan from the Global Environment Facility which will partially cover interest payments for the bond.
- Proceeds from the bond will also contribute to the World Bank's South West Indian Ocean Fisheries Governance.
- It combines Public and private investment to mobilize resources for empowering local communities and businesses in achieving a transition to sustainable fisheries.





### 5.21 Private Conservancy Rules

Karnataka recently drafted Private Conservancy Rules in a bid to increase forest area through private land.

- Under the rules, anyone who has a minimum of 100 acres of land bordering a national park can convert it to a “Wildlife Private Conservancy”.
- Of this land, 5% can be used to construct buildings for ecotourism; the rest has to be kept for flora and fauna.
- The purpose is to establish a safe corridor for wild animals between two forest areas.
- The rules state that all forest, wildlife and environment laws and rules will be applicable in these private reserves.
- It also suggests that in case of untoward incidents, no compensation will be given by the government and the resort owner will be held responsible.
- Agriculture, horticulture, plantation crop lands and other landscape areas can be brought under private conservancy and declared as ‘private forests.’
- The management of private wildlife reserves will consist of a management committee which will be responsible for conserving, maintaining and managing the reserve and advise the chief warden on all issues.
- The panel will comprise three members - owner of the private wildlife reserve, a wildlife conservationist and the jurisdictional forest officer.
- Under existing rules, only farming and horticultural activities are allowed within 10 kilometre surrounding forest land.

### 5.22 Ganga Vriksharopan Abhiyan

- National Mission for Clean Ganga has organised “Ganga Vriksharopan Abhiyan” in Ganga basin states.
- The campaign has been initiated as part of the Forest Interventions in Ganga component of Namami Gange Programme.
- It aims to bring greater awareness among people and other stakeholders regarding the importance of **afforestation** for the task of Ganga Rejuvenation
- The five states covered are Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal.

### 5.23 Recovery Programme for Critically Endangered Species

- The programme is one of the three components of the centrally funded scheme, Integrated Development of Wildlife Habitats (IDWH).
- The other two components of IDWH - Providing support to protected areas, protection of wildlife outside protected areas.
- So far, 17 species have been identified under the recovery programme.
- They are Snow Leopard, Bustard (including Floricans), Dolphin, Hangul, NilgiriTahr, Marine Turtles, Dugongs, Edible Nest Swiftlet, Asian Wild Buffalo, Nicobar Megapode, Manipur Brow-antlered Deer, Vultures, Malabar Civet, Indian Rhinoceros, Asiatic Lion, Swamp Deer and Jerdon’s Courser.
- Northern River Terrapin, Clouded Leopard, Arabian Sea Humpback Whale, and the Red Panda were added recently in the programme.

### 5.24 Landslide Warning System

- A real-time landslide warning system has been set up in the Sikkim-Darjeeling belt of north-eastern Himalayas which is highly vulnerable to landslides.
- It consists of 200 sensors that can measure geophysical and hydrological parameters like rainfall, pore pressure and seismic activities.

#### Landslides

- It is triggered by natural causes like vibrations from earthquakes and the build-up of water pressure between soil layers due to prolonged rainfall or seepage.
- In recent decades, manmade causes have become significant in triggering landslides.
- It includes removal of vegetation from the slopes, interference with natural drainage, leaking water or sewer pipes, modification of slopes by construction of roads, railways, buildings etc.



- It will monitor a densely populated area spanning 150 acres around Sikkim's Gangtok area.
- It is capable of warning about 24 hours in advance.
- The project was partly funded by the Ministry of Earth Sciences.

## 5.25 PARIVESH

- Pro-Active and Responsive facilitation by Interactive, Virtuous and Environmental Single-window Hub is a Single-Window Integrated Environmental Management System, launched on the occasion of World Biofuel Day.
- It has been designed, developed and hosted by the Ministry of Environment, Forest and Climate Change (MOEFCC), with technical support from National Informatics Centre, (NIC).
- It has been rolled out for online submission, monitoring and management of proposals seeking various types of environment clearances from Central, State and district-level authorities.
- It enables project proponents, citizens to view, track and interact with scrutiny officers, generates online mail alerts to state functionaries in case of delays beyond stipulated time for processing of applications.

## 6. PROTECTED AREAS

### 6.1 Biodiversity Heritage Sites

*Tamil Nadu State Biodiversity Board has initiated steps to identify and declare Biodiversity Heritage Sites (BHS).*

- BHS are well defined areas that are unique, ecologically fragile ecosystems that are terrestrial, coastal and inland waters and, marine having rich biodiversity.
- It comprises of one or more of the following components,
  - i. Richness of wild as well as domesticated species or intra-specific categories,
  - ii. High endemism,
  - iii. Presence of rare and threatened species, keystone species, species of evolutionary significance, wild ancestors of domestic/ cultivated species or their varieties,
  - iv. Past pre-eminence of biological components represented by fossil beds and having significant cultural, ethical or aesthetic values with or without a long history of human association with them
- Under Biological Diversity Act, 2002, the State Government in consultation with local bodies may notify in the official gazette, areas of biodiversity importance as BHS.
- The National Biodiversity Authority (NBA) issues the guidelines for selection and management of the BHS.
- The State Government in consultation with the Central Government may frame rules for the management and conservation of BHS and notify the rules after consulting the Central Government through NBA.
- **Ameenpur Lake** in Telangana is the first water body in the country to be declared as a BHS.

### 6.2 Geological Sites in India

- Geological Survey of India has nominated two sites in India for the first time for Global Geoparks status.
- The sites are Lonar Lake in Maharashtra and St. Mary's Island and Malpe beach in coastal Karnataka.
- **Lonar Lake** is an ancient circular lake created by a meteorite strike.

#### Global Geoparks

- They are single, unified geographical areas where sites and landscapes of international geological significance are present.
- It is a designation given by UNESCO.
- In 2004, 17 European and 8 Chinese geoparks came together at UNESCO headquarters in Paris to form the Global Geoparks Network (GGN).
- In 2015, the 195 Member States of UNESCO ratified the creation of a new label, the UNESCO Global Geoparks.
- The Geopark tag is akin to that of a 'World Heritage Site' for historical monuments that can bring famed geological features to the global stage.
- Global Geopark uses its geological heritage, in connection with all other aspects of the area's natural and cultural heritage, to enhance awareness and understanding of key issues facing society.
- At present, there are 140 UNESCO Global Geoparks in 38 countries. There is no site from India in the list.

- It is the only known meteorite crater in basaltic rock and is world famous.
- It became a geo-heritage site in 1979.
- A meteorite estimated to weigh two-million-tonnes slammed into the Earth, creating a 1.83-km diameter crater where the lake formed.
- **St. Mary's island** is a unique phenomenon where hexagonal mosaics of basaltic rocks are present.
- It was declared as a national geo-heritage site in 1975.
- It is estimated to be an 88-million-year-old formation that goes back to a time when Greater India broke away from Madagascar.



Hexagonal Columnar Basaltic Lava in St. Mary's Island

### 6.3 Sloth Bear Sanctuaries

- Sloth bears have been distributed across India, Sri Lanka, Bangladesh, Nepal and Bhutan.
- The largest population in the world can be found in India.
- In the country, they are spread across several States, including Uttarakhand, Uttar Pradesh, Madhya Pradesh, Chattisgarh, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Gujarat and Rajasthan.
- The animals have been declared “vulnerable” by the International Union for Conservation of Nature.
- **Ratanmahal Sloth Bear Sanctuary (1)**
  1. Located in the Dahod district of Gujarat.
  2. It lies on Gujarat's border with Madhya Pradesh and the actual habitat of the bear extends into this neighboring State.
  3. The tree called mahuda locally and a favourite of the sloth bears is found in abundance in the region.
- **Jessore Sloth Bear Sanctuary (2)**
  1. Located in Banaskantha district of Gujarat
  2. The sanctuary spans over 180 sq.km. Of forest tracts of Jessore hill and adjoining areas.
  3. In addition to sloth bears, the region shelters a variety of rare and endangered species of flora and fauna
- **Daroji Sloth Bear Sanctuary (3)**
  1. Daroji is located near Hampi in Karnataka's Ballari district.
  2. it is situated within the Bilikallu reserve forest.





#### 6.4 Sanctuaries that conserve Great Indian Bustard

- The following are the sanctuaries that shelter or were set up to conserve a very unique species that's now critically endangered - The Great Indian bustard.
- Desert National Park, Thar Desert, Rajasthan
  1. It is the State bird of Rajasthan.
  2. The Desert National Park is spread across Jaisalmer and Barmer districts of Rajasthan.
  3. The Park also welcomes the migrant Houbara Bustard and several other bird species
- Kutch Bustard Sanctuary, Gujarat
  1. The sanctuary is dominated by vast swathes of grasslands.
  2. It was declared a sanctuary in 1992
- Great Indian Bustard Sanctuary, Maharashtra
  1. It is also known as the Jawaharlal Nehru Bustard Sanctuary of Maharashtra.
  2. This sanctuary is located in Ninnaj, over 20 km from the city of Solapur.
  3. Unconfirmed reports suggest that today those sprawling grasslands are home to perhaps not a single bustard.
- The great Indian bustard is a large, white-and-brown bird with wing markings and a black crown.
- A bird native to India and Pakistan, it has today lost almost 90 % of its original habitats.
- It is believed to have disappeared from States such as Haryana, Punjab, Uttar Pradesh and Madhya Pradesh.
- The largest population is found in Rajasthan, with a few birds in Gujarat and Maharashtra.
- Recently, officially confirmed reports stated that there have been no sightings of the bird for the last few years at both the Great Indian Bustard Sanctuary (and Ghatigaon Sanctuary) in Gwalior district and the Karera Sanctuary in Shivpuri district of Madhya Pradesh.



#### 6.5 Wild Ass Sanctuary

- The sanctuary is in the **Little Rann of Kutch in Gujarat**.
- It spans the districts of Surendranagar, Rajkot, Patan, Banaskantha and Kutch.
- The sanctuary hosts more than 30 species of rare and endangered animals, including black buck and desert fox due to its proximity to the Rann of Kutch and the variety in the region's vegetation.
- The sanctuary is home to the 'near threatened' wild ass species.
- Asiatic wild asses are native to India, China, Iran, Mongolia and Turkmenistan.
- The Asiatic wild ass is the only one of its species and no sub-species exist.

#### 6.6 Daranghati Wildlife Sanctuary

- The Sanctuary is located near Rampur Bushahr, in Shimla District, Himachal Pradesh.
- It was an erstwhile hunting reserve of the Rampur Bushahr royal family.
- The Sanctuary receives good amount of Snowfall in winters.
- Himalayan Black Bear, Brown Bear, Himalayan Palm Civet, Barking Deer, Musk Deer, Flying Fox, Goral, Indian Hare, Serow, Blue Sheep and Himalayan Weasel are the fauna.

#### 6.7 Keibul Lamjao National Park and Sangai



- The Park is situated in the North Eastern state of Manipur.
- The marshland located south of the Loktak Lake was marked and named Keibul Lamjao National Park.
- The Loktak Lake is under the Montreux Record.
- The Park is said to be the only floating national park in the world.
- Brow-antlered deer is found only in Keibul Lamjao National Park.
- It is known by several other names such as dancing deer, Eld's deer, sangai and thamin.
- The Habitat of Sangai is the floating marsh called phumdis in Manipur's Loktak Lake.
- It is believed that the dancing deer got its name due to its delicate hopping while moving between the phumdis.
- It is the State animal of Manipur.
- The deer population is said to migrate from phumdis to nearby island hillocks when their habitat gets flooded.

### 6.8 Mudumalai Tiger Reserve

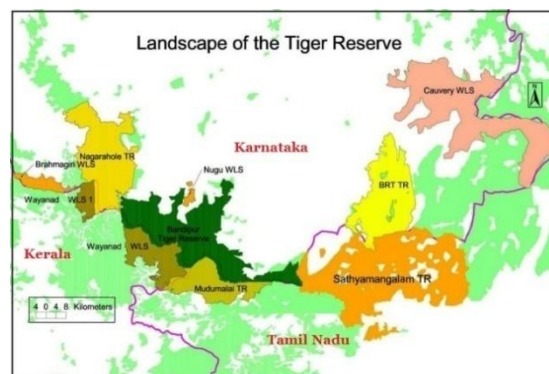
- It is a critical part of the Nilgiris Biosphere Reserve.
- The reserve, comprising the wildlife sanctuary and the national park, was declared a core tiger habitat in 2007.
- It extends over a core area of 321 sq.km and buffer area of 367 sq.km.
- Union Ministry of Environment has recently issued notification declaring 438 sq.km of area around the Mudumalai Tiger Reserve as an **eco-sensitive zone**.
- The notification followed a Supreme Court order calling for an eco-sensitive zone around all national parks.
- The declaration of an eco-sensitive zone would place restrictions on polluting industries but it would not stop agriculture activities in the area.
- The following activities are restricted/prohibited in the eco-sensitive zone,
  1. Commercial mining,
  2. Setting up of industries causing pollution,
  3. Establishment of major hydroelectric projects,
  4. Use or production or processing of any hazardous substances,
  5. Discharge of untreated effluents into natural water bodies or land area and
  6. Setting up of new saw mills or brick kilns.
- But resorts already present in the area would not be forced to stop functioning.

### 6.9 World Network of Biosphere Reserves

- The Khangchendzonga Biosphere Reserve in Sikkim has been included in the UNESCO designated World Network of Biosphere Reserves (WNBR).
- It has become the 11<sup>th</sup> Biosphere Reserve from India to be included in WNBR.
- The core zone of Khangchendzonga National Park was designated a World Heritage Site in 2016 under the 'mixed' category.
- The biosphere reserve is one of the highest ecosystems in the world, reaching elevations of 1,220m above sea-level.

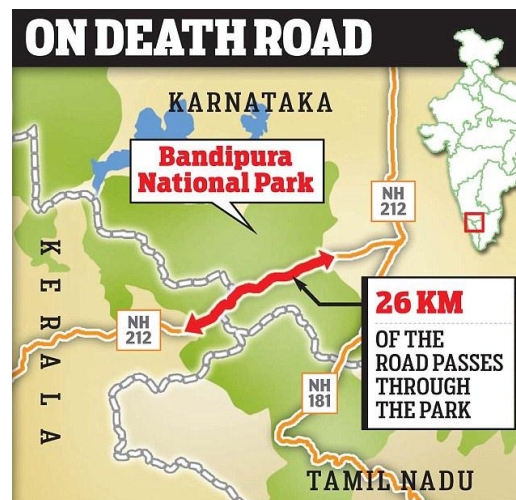
### 6.10 Bandipur National Park

- It was formed from the forest areas of the then Venugopala wildlife park in 1941.
- Subsequently some adjacent **reserve forest areas** were added to the Bandipur reserve.
- This reserve was brought under Project Tiger in 1973.





- The Bandipur, Nagarahole, Wayanad, Mudumalai and Sathyamangalam Tiger Landscape is spread across the states of Karnataka (Bandipur-Nagarahole), Tamil Nadu (Mudumalai-Sathyamangalam) and Kerala (Wayanad).
- It is a fine example of managing inter-state Tiger Reserves for the long-term Conservation of Tiger Source Population.
- The **National Highway (NH) 212** cuts through the Bandipur Tiger Reserve. Speeding vehicles on the highway were taking a toll on the reserve's animals.
- Presently, there is a ban on vehicle movement during night in the reserve forest areas.
- Union Road Transport ministry has recently asked the state government to lift the ban.
- Neighbouring Tamil Nadu has imposed a similar measure in the Mudumalai Wildlife Sanctuary.
- The ministry has also mooted a flyover in the reserve area to avoid the consumption of fuel because of the ban in vehicle movement on NH 766 during night.
- However, the state government has asserted that the ban will continue, citing the highest density of elephants in the reserve area.



#### 6.11 Nahargarh Biological Park

- Nahargarh Biological Park is part of Nahargarh sanctuary in Jaipur.
- It is located in the foot hills of Aravalli.
- The park is known for breeding centre of lions.
- State's first lion safari was recently inaugurated in this park.

#### 6.12 Singphan Wildlife Sanctuary

- Singphan wildlife sanctuary has been declared as an Elephant reserve by the Government of Nagaland.
- With the approval of Government of India, it becomes the 30th Elephant reserve in the country.
- The reserve lies in the North-western part of the State of Nagaland.
- The declaration will boost the elephant conservation in the country especially north eastern region.

#### 6.13 Point Calimere Sanctuary

- It is the only Ramsar site in the State of Tamil Nadu.
- It is a mix of salt swamps, mangroves, backwaters, mudflats, grasslands and tropical dry evergreen forest.
- It is a haven for migratory birds and resident species.
- Chemical companies and small-scale shrimp farms around the wetland have started to pose a threat to the biodiversity and ecosystem of the sanctuary.
- Atmospheric temperature, pH and salinity exceeded the permissible limits for ecologically sensitive zones.
- The presence of salt pans around the sanctuary lead to increase in salinity of the waters.
- Previous studies show that, high acidic or high alkaline water can affect the metabolic and developmental activities of wild animals and birds.
- Coliform microbial infection in the birds have also been reported which can cause a change in their natural behaviour and even affect their long-distance migration.

#### 6.14 Cheetah Reintroduction Project

- Cheetah was declared extinct in India in the year 1952.



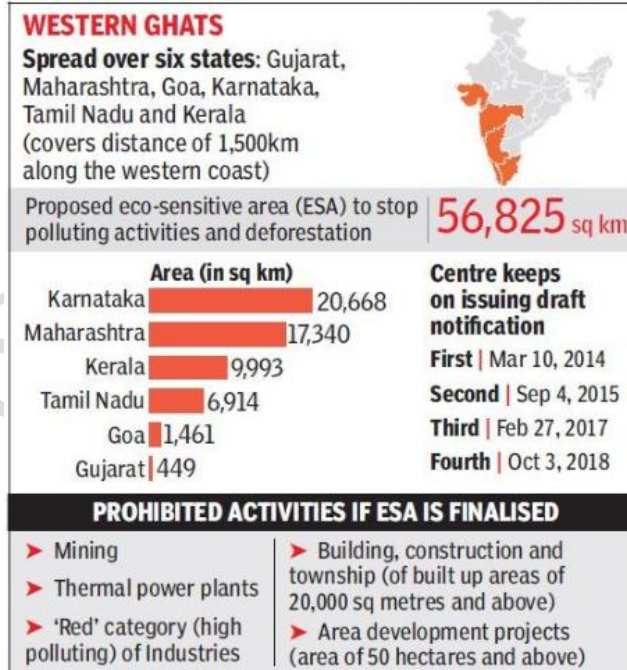
- Wildlife Institute of India started this ambitious Cheetah Reintroduction Project in 2009.
- The project focused on relocating cheetah from Namibia in Africa to Nauradehi sanctuary in Madhya Pradesh.
- This project had hit a roadblock for want of funds.
- The Madhya Pradesh forest department has written to the National Tiger Conservation Authority to revive the plan to reintroduce cheetahs in the State's Nauradehi sanctuary.
- The sanctuary was found to be the most suitable area for the cheetahs as its forests are not very dense to restrict the fast movement and the prey base is also in abundance.
- It is the largest wildlife sanctuary in Madhya Pradesh, extending across the river basins of Narmada and Ganga.

### 6.15 Eco-Sensitive Areas

Central government has come out with 4<sup>th</sup> draft on earmarking of eco-sensitive areas in western ghats, after lack of consensus among Centre and States in the previous 3 drafts.

- Eco-Sensitive Zones (ESZs) are areas notified by the Ministry of Environment, Forests and Climate Change (MoEFCC), around Protected Areas, National Parks and Wildlife Sanctuaries.
- The purpose of declaring ESZs is to create some kind of shock absorbers to the protected areas by regulating and managing the activities around such areas.
- They also act as a transition zone from areas of high protection to areas involving lesser protection.
- An ESZ could go up to 10 kilometres around a protected area as provided in the Wildlife Conservation
- Strategy, 2002. And it may go beyond 10 kilometres in ecologically important patches.
- Though the word - Eco-Sensitive Zones is not mentioned in the Environment protection act, a clause in the act states that central government can prohibit or restrict the location of industries and carrying on certain operations on the basis of considerations like the biological diversity of an area.

### Eco-sensitive area remains on paper



### Draft Notification

- The National Green Tribunal (NGT) had barred any reduction in the ESA area in view of the Kerala floods recently.
- It has directed the environment ministry to not reduce the area covered and issue the notification in to-to.
- However, the affected states raised objection to the draft notification.
- The new notification is based on the assessment by a high-level working group headed by space scientist K Kasturirangan.
- Before that, a working group headed by Gadgil set up in 2010 had recommended 75% of the Western Ghats area be declared ESA as opposed to 37% proposed by the Kasturirangan committee.
- The Gadgil committee had recommended that local bodies and villagers should be consulted before any development project comes up in the ESA.

### Gadgil Committee

- About 8 years ago, the Centre constituted the Western Ghats Ecology Expert Panel (WGEEP).



- It is a 14-member panel under the chairmanship of noted ecologist Madhav Gadgil.
- It was tasked to look into measures to arrest the ecological devastation from human activities in the Western Ghats.
- They divided the Western Ghats into three ecologically sensitive zones (ESZ).
- These are the highest (ESZ1), high (ESZ2) and moderate sensitivity (ESZ3) zones.
- This is in addition to the Protected Areas managed under acts such as the Wildlife Protection Act.
- It suggested that ESZ1 and ESZ2 would be largely 'no-gone' zones.
- So mining, polluting industries as well as large-scale development activities, including new railway lines are restricted.
- It also objected to new dams, thermal power stations or massive windmill farms or new townships in ESZ1.
- The panel however gave importance to the local communities and gram sabhas.
- They were given a larger say in deciding on matters relating to the ecology of these regions.
- It also called for
  - a) stricter regulation on tourism
  - b) phasing out of plastics and chemical fertilisers
  - c) a ban on diversion of forest land into non-forest applications
  - d) a ban on conversion of public lands into private lands
- It faced stiff resistance from all political parties, particularly in Kerala.

#### **Kasturirangan Committee**

- The Kasturirangan committee did away with the graded approach in terms of ecological sensitivity.
- It rather divided the Western Ghats into cultural lands (where there are currently human settlements) and natural lands.
- It recommended declaring cultural lands into ecologically sensitive area (ESA).
- This spanned around 60,000 sq-km or 37% of the total area.

## **7. BIO-DIVERSITY**

### **7.1 Neelakurinji**

*The neelakurinji bloomed in the Anamalai hills near Munnar, a phenomenon that occurs once in 12 years.*

- It is a tropical plant species (shrub) found in Asia and Australia.
- In India, it is found in the shola forests of the Western Ghats in South India.
- It belongs to the genus Strobilanthes which has around 250 species.
- Blooming periods of different species of Kurinji differ from each other.
- Neelakurinji blooms once in 12 years.
- Each shrub reproduces once in its life time and dies after flowering.
- It takes another 12 years for the seeds to sprout again and grow up to 30 to 60 centimetres high, for another glorious bloom.
- It grows at an altitude of 1300 to 2400 metres.
- Neelakurinji Reserve is in Munnar, which is home to highest concentration of neelakurinji plants in the country.
- Besides the Western Ghats, Neelakurinji is also seen in the Shevroys in the Eastern Ghats.



## 7.2 Red Sanders

- IUCN has recently reclassified red sanders (*Pterocarpus santalinus*) as 'near threatened' from the earlier 'endangered' category.
- It is a species of *Pterocarpus* with a common name red sandalwood, and saunders wood.
- It is endemic to the southern Eastern Ghats mountain range of South India.
- It is generally found at altitudes of 150 - 900 m.
- It prefers lateritic and gravelly soil and cannot tolerate water logging.
- It is also listed in the appendix II of the CITES, which means that a certificate is required in order to export it, that should only be granted if the trade is not detrimental to the survival of the species.
- This tree is valued for the rich red color of its wood and it is highly in demand in China.
- The wood is not aromatic, and it is not to be confused with the aromatic *Santalum* sandalwood trees that grow natively in South India.
- It is said to be used in the making of oriental musical instruments like Shamisen, Koto and Erhu and of high demand internationally especially in China.

## 7.3 Bioluminescence

- Scientists study bioluminescence phenomenon in northern Arabian Sea.
- The glow is caused by **Noctiluca algae**, commonly known as sea tinkle.
- It is a parasite and occurs in patches or 'blooms' in the northern Arabian Sea.
- Their bioluminescence has earned them the name 'sea sparkle'.
- These patches ring an alarm bell for ecologists because the algae compete with fish for food and choke their supply.
- Researchers from the Indian National Centre for Ocean Information Services (INCOIS) and the U.S.' National Oceanic and Atmospheric Administration say that "global warming conditions" may be responsible.
- INCOIS is a Ministry of Earth science body.

## 7.4 Uropeltis bhupathyi

- It is the latest addition to the snake fauna of the Western Ghats.
- It has been named after the late herpetologist S. Bhupathy, for his contributions to the field.
- They are non-venomous, burrowing and mostly earthworm-eating snakes.
- They are called shieldtails after the large, flat tips of their tails, which make them appear almost sliced off.



## 7.5 Overfishing of hilsa

- Scientists have raised alarm over the exploitation of hilsa, *Tenualosa ilisha* in West Bengal.
- Hilsa or ilish is a species of fish, intrinsically linked to the culture of the west bengal and makes 11% of the total fish catch of the State.
- The publication by the scientists points out that the annual catch has decreased by 13 % over the past decade.
- The hilsa fishery in the northern Bay of Bengal is targeting smaller fish, which is unsustainable in the long run.
- The hilsa fishery in the northern Bay of Bengal is "being unsustainably exploited" and the over fishing about 38% over the past few years (2012-16) has been noticed.

## 7.6 Invasive aphid

- The brown peach aphid has been recorded in the Kashmir valley for the first time.





- It is a small bug which feeds by sucking sap from plant.
- It attacks temperate fruit trees and it is bad for the fruit bowl of India.
- It is a notorious pest of peach and almond trees in the Mediterranean regions.
- In India, the aphid was recorded for the first time in the 1970s from Himachal Pradesh & Punjab.

#### 7.7 Bengal florican

- The critically endangered Bengal floricans, which are fewer than 1,000 adults, are more threatened than the tiger.
- They remain in two very fragmented populations.
- One of them is in the grasslands of the terai, the fertile foothills of the Himalayas.
- The other area is around Cambodia and Vietnam.
- Scientists found that the Bengal floricans in Terai use not just the protected grasslands but the agricultural fields, too.
- Floricans need alternating patches of short and tall grass to thrive.
- Till several decades ago, the large herbivores of the terai such as rhinoceroses and swamp deer would help in creating these perfect habitats by clearing those grasslands.
- But now there are fewer mega-herbivores left.
- So this could be triggering this movement of floricans into fields in search of short grass.
- This suggests that conserving these cultivated areas could be as important as protecting the grasslands where these birds breed.
- It is also called as Bengal Bustard.
- It inhabits lowland dry, or seasonally inundated natural and semi-natural grasslands.
- The grasslands are often interspersed with scattered scrub or patchy open forest.
- It is under the CITES appendix 1.



#### 7.8 Pelican Festival

- Kolleru hosted Pelican Festival at the Atapaka bird sanctuary earlier this year.
- The Lake is one of the largest freshwater lakes in the country.
- More than 5,000 spot-billed pelicans, also known as grey-headed pelicans, visited the lake.
- The birds roost, breed and fly with their young ones during the winter season in the region.
- Kolleru is located between the delta of Godavari and Krishna River.
- Similarly a three-day annual Flamingo Festival was held at Pulicat Lake and Nelapattu Bird Sanctuary in Andhra Pradesh.

#### 7.9 Microhyla kodial

- It is the latest addition to India's frog fauna.
- It is also known as the Mangaluru narrow-mouthed frog.
- It is christened after the city of Mangaluru, called kodial in the Konkani language.
- The frog is seen only in a small industrial region, a former timber dumping yard.

#### 7.10 Himalayan trillium

- It is a common herb of the Himalayas.
- It is a natural source of steroidal saponins which are important components of steroidal drugs.
- It could soon go locally extinct in many parts of its range in India due to its excessive harvest.



- It is found across India, Bhutan, Nepal and China.
- Increased demands over the last decade have made its illegal collection from the wild.

#### 7.11 Bear cuscus

- Bear cuscus is a rare marsupial mammal.
- They live on the Indonesian island of Sulawesi and their population is shrinking rapidly.
- Marsupials are generally not found in Asia.
- But Sulawesi island is in the "Wallacea" region, which is a transition zone between Asian wildlife in the west and Australian in the east.
- For the first time it has been bred successfully in captivity in south western Poland zoo.
- To preserve the species, 13 animals are held in four zoos around the world – but they have not reproduced there previously.
- A distinctive characteristic common to marsupial species is that most of the young are carried in a pouch.



#### 7.12 Dhole

- Scientists from Wildlife Institute of India (WII) have recently satellite- collared a dhole, the Indian wild dog, for the first time.
- The satellite transmitter will help to study the habits of the endangered species.
- Dhole is native to Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Nepal, Thailand.
- It is included in CITES – Appendix II (2013) and are legally protected in the countries where they occur.
- The term wild dog is a misnomer as dholes are genetically distinct from dogs.
- They also do not fit into any of the subfamilies like foxes or wolves and are classified in a genus of its own called Cuon.
- They do not possess the strength of big cats, but they kill prey larger than themselves by hunting in packs by biting off chunks of meat and tearing the animal apart.
- Despite common myths, they are very shy of human presence.





- It is listed as “Endangered” under IUCN red list of Threatened species.

#### 7.13 Salicornia

- Salicornia is a plant that grows in salty marshes in the mangrove wetlands.
- The plant can be used as a substitute to salt with low sodium content.
- The patients suffering from hypertension, diabetes and gastric related ailments prefer the Salicornia salad and salt.
- The production of the salt substitute has come down drastically in Gujarat with the scarcity of the Salicornia. Thus India is forced to import it from Israel and Scandinavian countries.
- Recently, Andhra Pradesh government has intensified the efforts to tap commercial benefits from the plant through cultivation as well as extraction.
- The government has documented the presence of the Salicornia along the coastline of Krishna district, exploring the possibilities to extract the salt substitute through various methods.

#### 7.14 Pangolin

- A special unit of the Odisha Police has launched a drive to bust an international syndicate that illegally trades pangolin.
- Pangolins are nocturnal mammals, often called “scaly anteaters,” are covered in tough, overlapping scales.
- These burrowing mammals eat ants and termites using an extraordinarily long tongue, and are able to quickly roll themselves up into a tight ball when threatened.
- There are eight different pangolin species can be found across Asia and sub-Saharan Africa.
- The scales of the pangolin are sold raw or fried in Asia for as much as \$500 per kilogram for treating asthma and migraines.
- They are **the most trafficked mammal** in the world.
- They are listed as Endangered in IUCN red list of threatened species and are protected under Appendix I of CITES.



#### 7.15 Harrier birds

- Harrier birds are **migratory raptor species** that regularly visits India.
- India has one of the largest roosting sites in the world for Pallid Harriers and Montagu’s Harriers.
- Recent reports highlights that the numbers of birds visiting the site are declining.
- While a general declining trend was observed in all the monitored sites, researchers noted the most dramatic changes at the **Rollapadu Bustard Sanctuary in Andhra Pradesh's Kurnool district**.
- In Hessarghatta on the outskirts of Bengaluru, Western Marsh Harriers declined significantly, leaving the area nearly deserted.
- The gravest concern is the **loss of grasslands**, either to urbanisation or to agriculture.
- Excessive use of pesticides in farms in and around the roosting sites could also be a reason for the lowered population counts.



#### 7.16 Portuguese man-of-war

- Portuguese man-of-war is a jelly-like marine organism, commonly known as 'bluebottle' or 'floating terror'.
- It was recently spotted in North Goa.
- While most jellyfish stings are harmless to humans and cause only a mild irritation, species like the bluebottle are venomous and can cause harm on contact.
- Goa Tourism's beach safety agency has issued an advisory for tourists as well as residents to refrain from venturing into the sea.



#### 7.17 Indian Roofed Turtle

- It is a species of turtle, protected under Schedule 1 of Wildlife Protection Act, 1972.
- It is found in India, Bangladesh, Nepal and Pakistan.
- In India, it is found in Ganges, Brahmaputra and Indus River drainages.
- It is listed on Appendix I of CITES and as Least Concern in the IUCN list.
- The protected areas in Jalpaiguri, West Bengal is known for protecting this species.
- In addition to it, it is also found in Lota devi temple located on the basin of River Karala in Jalpaiguri.
- Society for Protecting Ophiofauna & Animal Rights (SPOAR), an NGO and the Wildlife Trust of India (WTI) has led an initiative to save the species from severe pollution in the river.
- They have installed the Kurma avatar (form of turtle) of Lord Vishnu on the outskirts of river to reduce pollution and to encompass the religious belief.

#### 7.18 Bonnethead shark

- According to researchers from the University of California, Bonnethead Shark is the first known omnivore shark.
- One possible reason for the shark's omnivorous lifestyle is potentially avoiding conflict with other species such as bull sharks or nurse sharks for food.

#### 7.19 Star Tortoise

- Directorate of Revenue Intelligence (DRI) has recently seized thousands of star tortoises from that were being smuggled to Bangladesh.





- A star tortoise is one of the most expensive reptiles in the international pet market in countries in Asia, like Malaysia, Singapore, Bangladesh and Sri Lanka, as well as in Europe and America.
- Indian star tortoise is native to India (Andhra Pradesh, Karnataka, Orissa, Tamil Nadu), Pakistan and Sri Lanka.
- It naturally inhabits scrub forests, grasslands, and some coastal scrublands of arid and semi-arid regions.
- It has been included on Appendix II of the CITES and listed as "Vulnerable" in IUCN red list of threatened species.
- It is placed under Schedule IV of the Wildlife (Protection) Act 1972.
- It is also prohibited for export under the Foreign Trade Policy.

#### Directorate of Revenue Intelligence

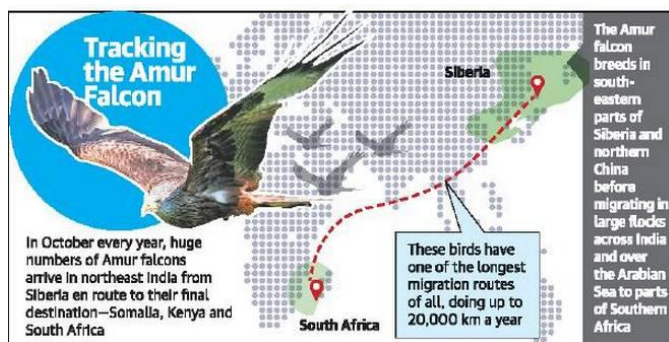
- The Directorate of Revenue Intelligence is the apex anti-smuggling agency of India.
- It is working under the Central Board of Indirect Taxes & Customs, Ministry of Finance, Government of India.
- It is tasked with detecting and curbing,
  - Combating commercial frauds related to international trade and evasion of Customs duty.
  - Illicit international trade in wildlife and environmentally sensitive items,
  - Smuggling of contraband, including drug trafficking,
- DRI was previously 'C.R.I.B.' (Central Revenue Intelligence Bureau) which was made in 1953.

#### 7.20 India's First Penguin

- India's first penguin was recently born in Byculla zoo in Mumbai.
- It belongs to the category of Humbolt Penguin, named after cold water current in the coastal areas of Chile and Peru in South America.
- The species is listed as "Vulnerable" in IUCN list of threatened species.
- In 2016, 8 humbolt penguins were imported to Mumbai from South Korea for captive breeding.

#### 7.21 Amur Falcons in Disputed territory

- Amur falcons are the world's longest travelling raptors.
- They migrate annually during winter from their breeding grounds in Mongolia, South-east Russia and northern China to warmer South Africa through India and across the Arabian Sea.
- They feed on dragonflies that follow a similar migration path over Arabian Sea
- Generally Doyang Lake near Pangti village in Nagaland's Wokha district is better known as a stopover for the Amur falcons during their annual migration.
- But a flock of these falcons has been seen since 2010 in Umru village on the Assam-Meghalaya border.
- Umru in Block II is one of 12 disputed areas along the Assam-Meghalaya border, since Meghalaya was carved out of Assam in 1972.
- Assam claims the village is under East KarbiAnlong district while Meghalaya asserts it is under Ri-Bhoi district.
- But these disputes are forgotten when the village welcomes the falcons in mid-October, uniting to ensure a safe stay for the birds.
- Both Gorkha and Khasi tribal communities have made common cause in protection of the Amur falcons and have fixed a fine of ₹25,000 for anyone caught ensnaring or killing the birds.
- Amur Falcon Festival is also been organised since 2015.



#### 7.22 Eurasian Otter



- Otter is a carnivorous mammal and there are 7 subspecies found in 3 continents - Europe, Asia and Africa.
- The Eurasian otter found in all the 3 continents is considered to be Near Threatened in IUCN Red List.
- It lives in a wide variety of aquatic habitats, including highland and lowland lakes, rivers, streams, marshes, swamp forests and coastal areas independent of their size, origin or latitude.
- It is the one of the least-known of India's 3 otter species in Western Ghats.
- The other two are smooth-coated & small-clawed otters.
- Eurasian otters have been recorded historically from the Western Ghats - Coorg in Karnataka and Tamil Nadu's Nilgiri and Palani hill ranges.
- Though its range is wide, it is not as frequently sighted as other two otters in India.
- All 3 species of otters in India are protected under the Wildlife Protection Act and are listed in CITES Appendices.
  - i. Eurasian Otter - CITES Appendix I; WPA Schedule II
  - ii. Smooth Coated Otter - CITES Appendix II; WPA Schedule II
  - iii. Clawless Otter - CITES Appendix II; WPA Schedule I



### 7.23 Asiatic Lions

- There are only 700 Asiatic lions in the wild, and they only live in the Gir Forest area, India.
- At present Gir National Park and Wildlife Sanctuary in Gujarat is the only abode of the Asiatic lion.
- It is listed in Schedule I of Wildlife (Protection) Act 1972, in Appendix I of CITES and as Endangered on IUCN Red List.
- The Asiatic lions in Gir Sanctuary, has recently been succumbed to the deadly infection of canine distemper virus (CDV) and tick-borne babesiosis.
- Canine Distemper Virus is a contagious and serious disease that attacks the respiratory, gastrointestinal and nervous systems of species of cats and dogs family.
- Babesiosis is caused by a parasite that infects red blood cells and transmitted by ticks.

### 7.24 Cheetah Reintroduction Project

- Cheetah was declared **extinct in India** in the year 1952.
- Wildlife Institute of India started this ambitious Cheetah Reintroduction Project in 2009.
- The project focused on relocating cheetah from Namibia in Africa to **Nauradehi sanctuary** in Madhya Pradesh.
- This project had hit a roadblock for want of funds.
- The Madhya Pradesh forest department has written to the National Tiger Conservation Authority to revive the plan to reintroduce cheetahs in the State's Nauradehi sanctuary.
- The sanctuary was found to be the most suitable area for the cheetahs as its forests are not very dense to restrict the fast movement and the prey base is also in abundance.
- It is the largest wildlife sanctuary in Madhya Pradesh, extending across the river basins of Narmada and Ganga.

### 7.25 Hog Deer

- Recently searchers reported the presence of a small population of hog deer in KeibulLamjao National Park (KLNP), Manipur.
- The study indicates that the western limit of hog deer is Manipur and not central Thailand as believed earlier.





- Two sub-species of hog deer have been reported from its range.
  1. The western race is distributed from Pakistan and the Terai grasslands (along the Himalayan foothills, from Punjab to Arunachal Pradesh).
  2. The eastern race of hog deer is found in Thailand, Indo-China, Laos, Cambodia, and Vietnam.
- The species has lost ground in most of its distribution range, a small and isolated population of under 250 was reported from Cambodia.
- The hog deer is an endangered species in the IUCN Red List and is protected under Schedule I of the Indian Wild Life (Protection) Act, 1972.

#### 7.26 **Siberian unicorns**

- Genetic analyses have shown that the Siberian unicorn was the last surviving member of a unique family of rhinos.
- Siberian unicorn are giant, shaggy Ice Age rhinoceros, and they are extraordinary single horn.
- Weighing up to 3.5 tonnes they roamed the steppe of Russia, Kazakhstan, Mongolia, and Northern China.
- They were also a very close relative of the extinct woolly rhino and living Sumatran rhino.

### 8. **INDEX & REPORTS**

#### 8.1 **Composite Water Management Index**

- The index is developed by NITI Aayog and it ranked states on how well they managed water.
- It is released by the Ministry of Water Resources.
- It comprises 9 broad sectors with 28 different indicators covering various aspects of groundwater, restoration of water bodies, irrigation, farm practices, drinking water, policy and governance.
- According to the recent report, Gujarat, Madhya Pradesh and Andhra Pradesh have managed water resources efficiently.
- Meghalaya, Uttarakhand and Nagaland are the bottom three states in the index.
- While Tripura has emerged as top performer in north-east, Rajasthan has emerged as the best performer in the incremental progress over last two years.
- Some of the other important findings from the recent report are,
  1. India is facing its “worst” water crisis in history and that the demand for potable water will outstrip supply by 2030, if steps are not taken.
  2. 21 cities, including Delhi, Bengaluru, Chennai and Hyderabad, will run out of groundwater by 2020, affecting 100 million people.
  3. Critical groundwater resources, which accounted for 40% of the water supply, are being depleted at “unsustainable” rates and up to 70% of the supply is “contaminated”.

#### 8.2 **National Disaster Risk Index**

- Union Home Ministry has prepared a draft report on the Disaster Risk Index with the support of **United Nations Development Programme (UNDP)**.
- It ranks states based on the economic vulnerabilities due to disaster and actions taken to mitigate it.
- It does not talk about the possibility of a natural disaster.
- The index takes in to account many factors like the exposure of population, agriculture and livestock, along with the environmental risk.
- The disasters taken into consideration include cyclones, earthquakes, landslides, etc.
- Maharashtra has been ranked at the top of the list of Indian states, vulnerable to natural disasters, followed by West Bengal, Uttar Pradesh, and Madhya Pradesh.
- Among the Union Territories, Delhi is the most vulnerable to such disasters.



- States like Andhra Pradesh and hill states are ranked relatively lower in the index.
- Capacity building by Gujarat, Tamil Nadu, Assam, Tripura and Himachal Pradesh have made significant progress in Disaster Risk Reduction (DRR) by building resilient infrastructure.
- Among districts, Maharashtra's Pune tops the list with a vulnerability factor of 9.48 on a scale of 10.
- Pune is closely followed by Bengal's North 24 Parganas and South 24 Parganas. Bangalore and Gulbarga in Karnataka also make the list.

### 8.3 State Energy Efficiency Preparedness Index

- The 1st edition of the Index was recently released jointly by the Bureau of Energy Efficiency (BEE) and NITI Aayog.
- The index assessed state policies and programmes aimed at improving energy efficiency in five key sectors.
- The sectors are buildings, industries, municipalities, transportation, agriculture and electricity distribution.
- The criteria taken into account includes,
  - a. Sector-wise energy consumption,
  - b. Energy saving potential
  - c. States' influence in implementing energy efficiency
- It has classified states in to four categories - front runner, achiever, contender and aspirant, based upon their efforts towards energy efficiency.
- Kerala topped the list followed by Rajasthan and Andhra Pradesh. These states are categorized as front runners.
- Gujarat, Karnataka, Tamil Nadu and Haryana have been categorised in the second best category of 'achiever' states.

## 9. DISASTER MANAGEMENT

### 9.1 Defining a National Disaster

*Unprecedented rains in Kerala and associated devastation has led to calls for declaring the floods a national calamity.*

- A "disaster" is defined as per the specifications in Disaster Management Act, 2005.
- Accordingly, a "disaster" means a catastrophe, mishap, calamity or grave occurrence in any area.
- This could arise from natural or man-made causes, or by accident or negligence.
- It should result in
  - i. substantial loss of life or human suffering (or)
  - ii. damage to, and destruction of, property (or)
  - iii. damage to, or degradation of, environment
- It should either be of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area.
- By this, a natural disaster may include an earthquake, flood, landslide, cyclone, tsunami, urban flood, heatwave, etc.
- It may also include a man-made disaster of nuclear, biological and chemical nature.

#### A National Disaster

- The central government has examined proposals in the past to define a national disaster.
- However, there is no provision, executive or legal, to declare a natural calamity as a national calamity.
- Hence there is no fixed criterion to define any calamity as a national calamity.
- In this regard, the 10th Finance Commission (1995-2000) examined a proposal.



- The proposal was to term a disaster “a national calamity of rarest severity” if it affects one-third of the state's population.
- The panel did not define a “calamity of rare severity”.
- But it stated that a calamity of rare severity would necessarily have to be adjudged on a case-to-case basis.
- It would have to take into account:
  - i. the intensity and magnitude of the calamity
  - ii. the level of assistance needed
  - iii. the capacity of the state to tackle the problem
  - iv. the alternatives and flexibility available within the plans to provide relief, etc
- Accordingly, 2013 Uttarakhand flood and 2014 Cyclone Hudhud in Andhra Pradesh were classified as calamities of “severe nature”.

### **Benefits of such a declaration**

- On declaration as a calamity of “rare severity”/“severe nature”, support to the state government is provided at the national level.
- The Centre also considers additional assistance from the National Disaster Response Fund.
- A Calamity Relief Fund (CRF) is set up, with the corpus shared 3:1 between Centre and state.
- When CRF resources are inadequate, additional assistance is considered from the National Calamity Contingency Fund (NCCF).
- NCCF is funded 100% by the Centre.
- Relief in repayment of loans or grant of fresh loans to the affected persons on concessional terms are also considered.

### **Funding for Disasters**

- It works as per the National Policy on Disaster Management, 2009.
- The National Crisis Management Committee deals with major crises that have serious or national ramifications.
- It is headed by the Cabinet Secretary.
- The inter-ministerial central teams are deputed to the affected states.
- They make assessment of damage and relief assistance required.
- An inter-ministerial group, headed by the Union Home Secretary, studies the assessment.
- It then recommends the quantum of assistance from the National Disaster Response Fund/National Calamity Contingency Fund.
- Based on this, a high-level committee approves the central assistance.
- It comprises of Finance Minister as chairman, and Home Minister, Agriculture Minister, and others as members.

### **State Disaster Response Fund**

- Under the Disaster Management Act 2005, a financial mechanism has been set up by way of National Disaster Response Fund (NDRF) at national level and State Disaster Response Funds (SDRF) at state level.
- The funds are to meet the rescue and relief expenditure during any notified disaster.
- The funding for disaster relief are governed by the National Disaster Management Policy.
- As per the policy, the State governments have to provide disaster relief from their respective State Disaster Response Funds (SDRFs).



- Additional assistance will be provided from the National Disaster Response Fund (NDRF) only for a “calamity of severe nature”.
- SDRF has been constituted in each state in which the state had been, so far, contributing 75 per cent for general category states and 90 per cent for special category states of hilly regions.
- The Centre has announced to enhance its contribution to the (SDRF) from 75 per cent to 90 per cent for general category states with effect from April 1 this year.
- With the declaration, the contribution of all states to the SDRF fund would be only 10 per cent.
- The NDRF is funded through a National Calamity Contingent Duty levied under GST for selected goods and contribution from any person or institutions.

## 9.2 Reasons behind Kerala Flood

*According to official reports mismanagement of dams was the primary reason for the kerala floods.*

- According to India Meteorological Department’s study, the rainfall in August was only the sixth highest in the past 143 years (1875-2017) in Kerala.
- All dams in kerala reached their full reservoir level by July-end, and were thus incapable of containing the water flow from torrential rainfall in August.
- This forced the State government to open the gates of 34 major dams, thereby submerging all the major towns downstream.
- Admittedly, the change in topography due to human interventions and climate change have contributed to the sporadic and excess rainfall.
- The proliferation in illegal stone-quarrying activity has been a major reason for widespread landslides.
- The decision of the incumbent government to reduce the boundary of a quarry from residential buildings to 50 metres has facilitated the mushrooming of the stone quarrying mafia.
- The operation and maintenance of dams is governed by the **guidelines of the Central Water Commission and water management protocols**.
- The safety, precautions and evacuation measures to be followed while declaring different alerts (blue, orange, red) are clearly mentioned in these guidelines.
- The guidelines state that the reservoir control schedule, release procedure and gate operation procedure have to be done only after assessing the potential impact of the procedures.
- The State government and the KSEB opened 34 of the 39 major dams simultaneously, controlled release from these dams would have reduced the gravity of the calamity.
- Apart from that the disaster management system needs to be revamped by roping in experts from different areas.
- The State government must also order a judicial inquiry into the gross mismanagement of dams in the State.

### Dams in Kerala

- Kerala has 39 major dams, their maintenance is shared between the Kerala State Electricity Board (KSEB) and the Water Resources Department.
- The Periyar is the longest river in Kerala and has the highest discharge potential.
- The major dams across this river that are maintained by the KSEB are Idukki, Lower Periyar, and Madupetty.
- The water from Lower Periyar, Madupetty and Mullaperiyar drains into the Idukki reservoir consisting of the Idukki dam and the Cheruthoni dam.
- The water from the Idukki reservoir and Idamalayar drains directly into the Bhoothathankettu dam, which is the lowermost in the Periyar system, just 15 km from Kothamangalam town.

## 9.3 Kaziranga and Brahmaputra Floods

- Kaziranga National Park is a 117-year-old park and a UNESCO World Heritage Site since 1985.
- Floods have long been beneficial to Kaziranga and Assam.

- Every year, the Brahmaputra takes away portions of land from the Park.
- Resultantly, on paper the park is 1,030 sq km in area, but in reality it is 884 sq km.
- It also continues to shrink year after year.
- It affects mostly hog deer, swamp deer, wild boar and other few animals.
- These are those that fail to reach higher ground in time after floods.
- Despite the above, Brahmaputra contributes more to, than harms, the wildlife in the park.
- It gives more to the habitat of the world's largest population of one-horned rhinos.
- The unique biodiversity of Kaziranga is rejuvenated by a dynamic system that connects the Brahmaputra with its alluvial floodplains.
- The deluge happens up to four times a year between April and October.
- Unlike farmlands across the Brahmaputra floodplain, monsoon floods are essential to Kaziranga's ecosystem.
- Kaziranga's plant and animal life are intrinsically linked to the floods.
- Its vast grasslands and beels (wetlands) are revitalised annually by the Brahmaputra's overflow.
- The floods help deposit mineral-rich alluvial soil.
- This facilitates growth of grass and shrubs that are the main source of fodder for herbivores.
- Besides, the floodwaters, while receding, flush out aquatic weeds and unwanted plants.
- **Concerns** - During floods, animals in Kaziranga flee to higher grounds within the park.
- When 70-80% of Kaziranga is under water, the animals usually flee to the hills of KarbiAnglong, which is located south of the park beyond a National Highway running along its edge.
- Speed of vehicles is regulated during floods, but some animals invariably get killed.
- Of greater worry is the destruction of the hills because of indiscriminate stone quarrying.
- Quarrying has increased, and extracted materials have been dumped at sites adjoining the park. So, if floods happen, Kaziranga's animals could find their escape route blocked or altered.
- Hence, while floods are good for the park, it needs interventions to make them really beneficial for environment and ecology.



#### 9.4 Glacial Lakes Outburst Floods

- Floods caused due to outbursts of lakes formed due to melting of glaciers, known as Glacial Lakes Outburst Floods (GLOF)
- These lakes are a subject of concern in the Sikkim Himalayan region as several lakes have been formed due to melting of scores of glaciers in the region.
- Retreat of glaciers in the wake of global warming is expected to increase the number of glacier lakes and also expand the size of the existing ones.
- The size of the South Lhonak lake in Sikkim, at 7000 meters was small during 1960s and it has since grown many folds.
- It is one of the fast growing lakes out of 14 potentially dangerous lakes susceptible to GLOFs in the Sikkim Himalaya region.
- To prevent any disasters due to outbursts, a project was started in that lake where in high density polyethylene (HDPE) pipes have been installed to siphon off water from the glacial lake.