IES GS

HYPERLOOP 2018

ENVIRONMENT

CONSOLIDATED PRELIMS CURRENT AFFAIRS

1. WATER, LAND AND FOREST, ETC. RELATED ISSUES

1.1 Groundwater Crisis

- Use of groundwater for irrigation exploded after Green Revolution
- Cheap electricity was primarily responsible for this explosion
- Water-intensive crops like sugarcane and paddy are mostly grown in the naturally water-starved areas of the country.

How to avoid the crisis?

- A new regulatory regime for groundwater, that provides for equitable use
- Recognition of water as a public trust.

1.2 National Forest Policy

The Ministry of Environment and Forests (MoEF) has released the draft of India's new National Forest Policy (NFP), proposing the levy of a green tax. It has also touched upon the contentious issue of human-animal conflict. It will be replacing the National Forest Policy, 1988.

Forest

Forest is a self-sown and self-regenerating community of plants that supports a community of creatures dependent on those plants, and on each other, for food and shelter.

Features of policy:

- Incorporating consequences of climate change
- but ignored one of the three forest related laws, the Forest Rights Act
- brings new focus to plantations, growing trees outside forest lands and wood industry
- The policy continues with the national goal of a minimum of one-third of the geographical area under forest or tree cover.
- But it does away with the goal for hill and mountainous regions to maintain two-thirds of the geographical area under forest cover.
- Proposes to launch a new Community Forest Management Mission, bringing government, community and private land under the new proposed management system.
- The plans prepared by the gram sabhas for their forestlands would also have to be vetted by the forest department
- Drafted by the Indian Institute of Forest Management, the research arm of the environment ministry

The existing Policy Objectives

60% of the land in the hills and 20% in the plains and in all 33% of the total geographical area should be under forest/tree cover.

Forest Cover Status

- Reports show increase of over 5,000 square kilometre in total forest cover in India between 2013 and 2015
- Very dense forests in India cover 2.61 percent of the total forest area, moderately dense forests account for 9.59 percent while open forests stand at 9.14 percent
- Among all the states and Union Territories, Mizoram has the highest forest cover with 88.93 percent of the total area, followed by Lakshadweep

Recent government initiatives:

Ministry of Environment, Forest &Climate Change (MoEF&CC) is implementing two major afforestation/tree plantation schemes

- **National Afforestation Programme (NAP) scheme - Quantitative**
  - To implemented for afforestation of degraded forest lands
- **National Mission for a Green India (GIM) - Qualitative**
  - improving the quality of forest/increase in forest cover
  - Cross-sectorial activities on landscape basis

1.3 Environmental Disasters caused by heavy rain

The heavy monsoon rain had played havoc in India, Nepal and Bangladesh.

Landslide in Himachal

- NHAI is asked to include soil stabilization, land protection wall, geo static and slope stabilization for all highway projects in Himachal Floods
- The Kaziranga National Park (KNP) and the Pobitora Wildlife Sanctuary in Assam are getting submerged; rhinos and other animals have taken shelter on the highlands
- Flash floods in parts of Bihar, Arunachal Pradesh and West Bengal

What is a Landslide?

- It is a sudden fall of land mass due to acute slopes with lubricant action of water.
- Vibrations due to earthquakes or volcanic activities and sudden downpour can trigger landslide

Cloudburst

A cloudburst is an extreme amount of precipitation, sometimes accompanied by hail and thunder that normally lasts no longer than a few minutes but is capable of creating flood conditions

HADR Operations

- Humanitarian Assistance and Disaster Relief (HADR) operations of Indian Armed forces have been very helpful in these disasters

1.4 Earthquake alert system in Uttarakhand

The Indian Institute of Technology Roorkee is setting up a network of 100 earthquake sensors between Chamoli and Dharchula in the Kumaon region of Uttarakhand

- To provide an alert in case of any high magnitude earthquake occurs in the Himalayas.
- The sensors will stream data in real-time basis processed by computers and issue an alert immediately
- Data compiled over the last two centuries has shown that large magnitude earthquakes have occurred in different regions of the Himalayas except one segment in its central part.
- This is called 'Seismic gap'
- The possibility of future earthquakes are more in this region

1.5 SAUNI Project

SAUNI Yojana is multipurpose project that aims to solve the water problems of a parched Saurashtra region of Gujarat.

Key Facts:

- Technically, SAUNI is a 'linking' project where the water will be filled in irrigation dams that are already equipped with canal network.
- Under this project, 115 dams in the Saurashtra region will be filled with excess water from the Sardar Sarovar dam.
- SAUNI project involves making pipe canals instead of the conventional open canals which has led to no acquisition of land for the project.

1.6 River Interlinking

A river interlinking project, which is likely to end excessive floods and drought in the country, will take off by the end of this year.

Key Projects:

- Ken-Betwa
- Damanganga-Pinjal
- Par-Tapi Narmada

Two more – the North Koel reservoir project in Jharkhand and Bihar Pancheshwar project in Uttarakhand is on anvil

The national river linking project

- The national river linking project will ease the water shortages in western and southern India while mitigating the impacts of recurrent floods in eastern India.
- The river interlinking project can adversely affect land, forests, biodiversity, rivers and the livelihood of millions of people
- Government is all set to begin work on an estimated $87 billion plan to connect around 60 of India's largest rivers including the Ganga.
- A full-fledged architecture to solve disputes and technical support for data related to the water sector are required at this time.

1.7 MoU between India and Morocco on cooperation in the field of water resources

Conception, realization and maintenance of the hydraulic infrastructure, notably big dams and water transfer projects; Integrated water resources management, Flood and drought management; Sustainable development and management of groundwater resources including recharge augmentation; and Harvesting and valuation of rainfall water and resilience and adaptation to climate

1.8 Droughts and Floods

Each year without fail, a vicious cycle of crippling drought and then devastating floods plays out before us.

- Water management is very important
- We are building in floodplains, destroying our water bodies and filling up our water channels. Climate change is beginning to show its impact on the monsoon.
- We now see more rain and more extreme rain events.
- Over the last three decades, about 25 per cent of world populations have experienced abnormal rainfall episodes each year.

- There exists a link between dry spell, expansion of cropland and dwindling forestland

1.9 Flood Management in the Cities

Chennai

- Chennai is a lower elevation coastal city with very high population density.
- Scientific management should have ensured the preservation of the many traditional lakes and canals that existed in the city's core a century ago to absorb the intense downpour
- Mindless draining of wetlands and their conversion into expensive real estate has catastrophic consequences.

Way Forward

- Creating tanks and lakes for water storage, and rejuvenating old silted ones, in order to harvest the floods and replenish depleted groundwater
- Inviting the community to monitor the health of the tanks and lakes
- Better waste management is a need of hour as poor waste management is exacerbating the problem by blocking drains, canals and lakes

1.10 Water diversion by China

Diversion of rivers in Tibet is imminent as China has a pressing need to provide water to its dry regions. But China has denied reports that it is constructing a 1000-km-long tunnel to divert the Brahmaputra River, known as Yarlung Tsangpo in Tibet.

- If this happens, nearly 1.4 billion people who are dependent on water from rivers originating in Tibet including Brahmaputra, will be in great danger
- Tibetan plateau is known as 'Water tower' of Asia.
- A large number of rivers originate from Himalayan glaciers.
- Environmental scientists have expressed concerns about the fragile nature of Tibet's ecosystem.
- Tibet's 46,000 glaciers are likely to get reduced in volume to 50 per cent by 2100 because of global warming

1.11 Urban heat island effect

IIT team found that cities are cooler during the day than the surrounding non-urban areas only when the non-urban areas lack vegetation and moisture either due to lack of irrigation or water bodies.

- This observation is in variance with the globally witnessed phenomenon of urban areas getting significantly warmer during the day compared with the surrounding areas as a result of urban heat island effect.

How to mitigate the urban heat island effect?

- Using more sustainable building materials that absorb less heat during the day.
- Passive cooling measures such as increased tree cover
- Increased ventilation in buildings
- Orientation of buildings in modern building designs to reduce the nighttime urban heat island effect

1.12 Forest Fires

Parliamentary Standing Committee on Science and Technology submitted its report on forest fires.

- The frequency of forest fires across Central Indian forests and the Himalayan Pine forest have increased by 55% in 2016
- The States of Odisha, Chhattisgarh, and Madhya Pradesh accounted for 1/3rd of the forest fires.
- Chir pine needles, which are highly inflammable due to its high resin content, are a prominent factor in occurring and spreading of forest fires.

The Committee suggested that a national policy on managing forest fires should be prepared.

2. BIODIVERSITY

2.1 Species in News

2.1.1 Snow leopard

- The conservation status of snow leopard has been improved from “endangered” to “vulnerable”.
- The decision was announced by the International Union for Conservation of Nature (IUCN) – the global standard for assessing extinction risk.

- The status change followed a three-year assessment process by five international experts.
- However, experts have warned that the species still faces serious threats from poaching and habitat destruction.
- The elegant yet elusive creatures, which live in the mountains of central Asia, were first listed as endangered by the IUCN in 1972

2.1.2 Bonnet Monkey

Researchers have found that the common bonnet monkey of South India may soon become an endangered species

Habitat:

They typically share their habitats with humans and endemic to the southern part of the country

Causes for their population decline

- slow incursion of the larger, more aggressive rhesus monkey from the northern region.
- many single roads have now been converted into lane roads and the dense vegetation of banyan trees has been replaced by barren lands and urban structures.

2.1.3 Bhupathy's Purple Frog

- Indian scientists have discovered a new species of frog that has a snout-shaped nose, just like a pig's named as Nasikabatrachus bhupathi , after the Indian herpetologist S. Bhupathy
- Found in the eastern slopes of the Western Ghats, near the Srivilliputhur GrizzledGiant Squirrel Wildlife Sanctuary in Tamil Nadu
- Has comparisons with the Purple frog found in Seychelles, and it constitutes additional evidence in favour of the theory of continental drift.
- The discovery suggests that the Indian subcontinent was part of the ancient landmass of Gondwana before splitting from Seychelles 65 million years ago

2.1.4 Clouded Leopards

- Mizoram's Dampa Tiger Reserve now holds the distinction of housing the highest number of clouded leopards in Southeast Asia.
- Locally known as 'Kelral' found along Mizoram-Bangladesh-Tripura
- In addition to these reserve has density of population of marbled cats, also known as 'Sanghar'

2.1.5 Sawfish

- The sawfish is included in Schedule I of the Indian Wildlife (Protection) Act 1972.
- Saw fish appear to be more threatened than tigers and elephants
- It is considered as sacred among fishermen.
- There are only five species of the sawfish ever identified — dwarf sawfish, knifetooth sawfish, smalltooth sawfish, largetooth sawfish and green sawfish.
- The sawfish family has been assessed either 'Endangered' or 'Critically Endangered' in the International Union for Conservation of Nature Global Red List

2.1.6 Living Fossils

● Cycas are one of the most ancient plants whose fossils date to the Jurassic period and are often referred to as "living fossils".
● Andaman and Nicobar Islands home to thriving adult populations of these slow growing trees
● Despite being a contemporary of the dinosaur, the genus continues to thrive

2.1.7 Sangai Brow- Antlered Deer

The scientists of Wildlife Institute of India (WII) have been assigned with the task of providing second home to Sangai due to its depleting population in the area.

- The Sangai is an endemic and rare subspecies of brow antlered deer found only in Manipur.
- It is the state animal of Manipur
- Its habitat is restricted to the marshy wetland of Keibal Lamjao National Park

- Loktak Lake is the largest freshwater lake in Northeast India, located in this NP. It is famous for the phumdis which are floating biomass in the lake.
- Popularly called as 'dancing deer' of Manipur.
- It is classified as 'endangered' by the IUCN
- Is part of MoEF's 'Recovery Programme for critically endangered species and habitats'?

2.1.8 Himalayan brown bears

Recently a group of eight Himalayan brown bears were spotted in Ladakh's Drass Sector.

- No Himalayan bear had been spotted in the region for many years.
- Himalayan Brown Bear Largest mammal in the Himalayan region
- Critically endangered status under IUCN due to loss of habitat and human persecution.
- There are four major wildlife regions in Ladakh- Suru, Zanskar, Drass and Kargil.

2.1.9 Great Indian Bustard

The Rajasthan government is formulating a long-term plan to save this bird from extinction in collaboration with the Wildlife Institute of India (WII).

- It is found in the exclusively in north-western plains particularly parts of Rajasthan and also Pakistan.
- It is one of the heaviest flying birds.
- It is critically endangered bird.
- The reasons are depleting habitat, i.e. grasslands especially due to development of infrastructure intrusions.
- It is the state bird of Rajasthan.

2.1.10 Hangul

- Also known as Kashmir Deer
- Is an endangered species mainly concentrated at Srinagar's Dachigam National Park.
- The reasons for its dwindling numbers are: Domestic livestock grazing and other human activities inside the park

2.1.11 Pondicherry Shark, Red Sea Torpedo and Tentacled Butterfly Ray

Three marine species, the Pondicherry Shark, the Red Sea Torpedo and the Tentacled Butterfly Ray might have become possibly extinct in the oceanic waters of the Arabian Seas Region (ASR)

- No evidence of its existence has surfaced in the last three decades.
- The Guitar fish found in coastal waters of Kerala and Tamil Nadu and the Ganges Shark found in Arabian Sea were classified as Critically Endangered, among others.
- By-catch was found to be the biggest threat
- Increasing decline in the extent and quality of habitat as a result of coastal development
- India has banned the exploitation and trade of 10 species of sharks and rays, and in 2015 banned the export and import of shark fins of all species.

2.1.12 Gangetic Dolphins

Scientists and wildlife conservationist feel that the development of the Ganga under the National Waterway-1 project is threat to the survival of the Gangetic dolphins.

- Ganges River Dolphin is a sub-species of river dolphins, found in the Ganga and Brahmaputra rivers.
- The first phase of the project from Haldia to Varanasi (1300 km) is now underway. The stretch that covers that NW1 is also home to river dolphins.
- River dolphins have been classified as “endangered” by IUCN (International Union for Conservation of Nature)
- These species are practically blind and rely on bio-sonar waves to move around.

2.2 Conservation Efforts

2.2.1 Water Bird Census

Aim

- To obtain information of water bird population on an annual basis during non-breeding period of most species
- Annual monitoring of the status and condition of wetlands

2.2.2 Conservation and management of the Loktak Lake

The MoEF recently constituted a four member team for conservation and management of the Loktak Lake.

- The team will review the implementation of various work carried out with financial assistance provided by the central and state governments so far for the conservation and management of the Lake.
- It will also suggest further interventions required for conserving the lake in a holistic manner.
- The Keibul Lamjao National Park is the last natural refuge of the endangered Sangai deer.

2.2.3 Country's first repository on tigers

- Constituted under the new Tiger Cell of Wildlife Institute of India (WII)
- WIII works with the National Tiger Conservation Authority (NTCA) on tiger conservation and population estimation
- The repository will help in identification of possible source of tiger skin if caught at any place, studying projects before clearances.

2.2.4 Increase in Tiger Population

The number of wild tigers has gone up globally by 22 per cent to 3,890, according to the World Wildlife Fund and the Global Tiger Forum (GTF).

- India leads with an estimated population of 2226, up from 1706 in 2010.
- Karnataka has the highest number of tigers followed by Uttarakhand.

2.2.5 Nepal India to conduct joint tiger count

For the first time, Nepal and India will undertake a joint tiger census in their national parks, forests and protected areas adjoining the two countries

- Tiger is an endangered animal listed in the Convention on International Trade in Endangered Species (CITES).
- At the International Tiger Conference in Russia in 2010, participating countries including Nepal had made a commitment to double the tiger population by 2022.

- The 13 tiger range countries include Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Lao PDR, Malaysia, Myanmar, Nepal, Russia, Thailand, and Vietnam.

2.2.6 Gyps Vulture Reintroduction Programme

It was launched last year by Government of Haryana

- It is Asia's first Gyps Vulture Reintroduction Programme.
- The programme is an ex-situ means of conservation whereby some vultures are kept at the breeding center for some time and then released into the wild.
- Four critically endangered vultures are found in India
- Indian Vulture (Gyps indicus), Indian White-rumped Vulture (Gyps bengalensis), Red-headed Vulture (Sarcogyps calvus) and Slender-billed Vulture (Gyps tenuirostris) are Critically Endangered species
- Egyptian Vulture (Neophron percnopterus) is Endangered
- Cinerous Vulture (Aegypius monachus) is Near Threatened
- Himalayan vulture, Griffon Vulture and Bearded Vulture are not endangered

Why is population of vulture declining?

Mainly due to use of Diclofenac, a drug which is given to cattle for inflammation and pain. The drug results in kidney failure in vultures when it enters its body through the Caracas. The government has banned Diclofenac since 2006 but its illegal use remains in force.

2.2.7 The RED list

The International Union of Conservation of Nature's Red list Provides the most comprehensive and authoritative information on the conservation status of animal and plant species

- IUCN has three categories of risk: Critically endangered, Endangered and Vulnerable
- 665 animal and 387 plant species in India face higher risk of extinction.
- Indian Animal species under higher risk of extinction are Jordon's Courser, Gharial (Gavialis gangeticus), Pygmy Hog (Porcula salvania, Malabar Civet (Viverra civettina) and Forest Owlet (Heteroglaux blewitti)

2.2.8 Allahabad's Turtle Sanctuary

Turtle sanctuary in Allahabad and a River Biodiversity Park at Sangam have been approved under Namami Gange programme.

2.2.9 Blackbuck conservation reserve to come up in U.P.

A wildlife conservation reserve dedicated exclusively to the blackbuck is coming up over 126 hectares in the trans-Yamuna region of Allahabad in Uttar Pradesh.

- Blackbucks, known for their majestic spiral horns and coat colour contrasts, are found in grasslands and open forests
- There are a few national parks and sanctuaries inhabited by blackbuck in the country like the Velavadar Wildlife Sanctuary in Gujarat and the Ranibennur Blackbuck Sanctuary in Karnataka

Importance of conservation reserve:

- It will create awareness about biodiversity conservation
- Provide opportunities for people's participation.
- Eco-tourism will be encouraged

2.2.10 Elephant Corridors

Increasingly fragmented landscapes are driving elephants more frequently into human-dominated areas, giving rise to more man-animal conflicts

- Elephant corridors are narrow strips of land that connect two large habitats
- 'Right of Passage', an authored by experts and published by the Wildlife Trust of India (WTI) , identifies and records details pertaining to 101 elephant corridors across India.
- All the corridors in northern West Bengal and almost all in central India and northeastern India have agriculture land.
- About 400 to 450 humans are losing their lives due to human-elephant conflict annually in India and around 100 elephants are being killed in retaliation
- It is high time that the migratory corridors that elephants have traditionally used are saved before it is too late

2.3 Others

2.3.1 WWF'S Living Planet Report 2016

Global population of mammals, fish, amphibians and reptiles declined by 58 percent between 1970 and 2012, according to World Wide Fund for Nature (WWF) report. The report is compiled with data from the Zoological Society of London (ZSL)

- Rivers and lakes are the worst hit with animal population down by 81 percent since 1970.
- The report warns that increased human pressure could trigger human-nature conflicts.
- food production to meet the complex demands of an expanding human population is the primary factor responsible for the destruction of habitats and overexploitation of wildlife.
- As of now, only 15 percent of the Earth's land area is protected for nature.
- Poaching and exploitation for food is another major factor, due to unsustainable fishing and hunting.
- Pollution is another problem. Many sea animals are being harmed due to high levels of pollutants.
- Pollutants also travel down the food cycle and harm other animals.

2.3.2 GM Crops

GM crops are cultivated over 185 million hectares of land, by more than 18 million farmers across 26 countries.

GM crops benefits:

- GM technology helped increase crop yields
- Reduced the use of chemical pesticides and Increased farmer profits

But its effect on environment and health in the long run is still debatable

Bt cotton

A Parliamentary panel headed by Congress MP Renuka Chowdhury in a report said the government agencies have portrayed "a rosy picture" on Bt Cotton which is far removed from the truth.

- Bt stands for Bacillus thuringiensis, a bacteria whose genome codes for a protein that kills the bollworm, a pest that has perennially plagued the cotton plant.

- Monsanto, which invented this Genetically Modified technology, patents cover most of these patents.

Controversy:

- Plants were treated with intensified chemical use
- As a result they are showing resistance to insecticides.
- For increasing chemical costs and decreasing price of cotton thousands of cotton farmers in India were pushed to debt in India

Patents rules in India

- Plants and animals are ineligible for patent protection in India, as are ordinary biological processes for creating them.
- However, microbiological processes (such as methods of creating transgenic varieties) and microorganisms are patentable under the terms of the Indian Patents Act.

GM Mustard

Scientific analysis has shown that the Indian gene pool of mustard is very narrow.

- GM - Mustard is a transgenic food crop
- Was cleared by the Genetic Engineering Appraisal Committee (GEAC) for commercial release
- National Academy of Agricultural Sciences (NAAS) had passed a resolution unanimously supporting the commercial release of Dhara Mustard Hybrid 11 (DMH-11).

DMH-11

- uses a combination of genes from a soil bacterium that makes mustard amenable to hybridization.
- Mustard is self-pollinating plant unlike wheat so we need hybrid technology to overcome narrow pool of diversity

Centre puts commercial release of GM mustard on hold

- GM mustard faced stiff opposition from anti-GM activists and NGOs.
- A poor experience with BT cotton made farmers and agricultural experts skeptical about its prospects.

2.3.3 Biggest and Smallest animals at high extinction risk

Animals in the Goldilocks zone - neither too big, nor too small, but just the right size face a lower risk of extinction than those on both ends of the scale, according to an extensive global analysis.

- Threats to big animals Killed and consumed by humans, and about 90 per cent of all threatened species larger than one kilogram in size are being threatened by harvesting.
- Threats to small animals these diminutive species are mostly threatened by loss or modification of habitat.

2.3.4 Himalayas losing rare fossils

- Spiti valley is called the "museum of Indian Geology".
- The Spiti valley contains almost a continuous succession of fossils ranging from the Cambrian to the Cretaceous and the giant scorpion traces are unique and found only in Antarctica, Australia and Spiti Valley.
- The fossils are being mined and sold as cheap tourist souvenirs, destroying key links in the ancient geological history of the Indian subcontinent.

2.3.5 Western Ghats biodiversity 'faces threat', says report by IUCN

Biodiversity in India's iconic Western Ghats s facing a threat from forest loss, encroachment and conversion, says a global environment agency in its report.

- It also put the hills in "Significant Concern" category in its new outlook in the conservation prospects of natural World Heritage sites.
- The pressure from the human population in the Western Ghats region is greater than that faced by many protected areas around the world.
- The Western Ghats spread over Gujarat, Maharashtra, Goa, Karnataka, Tamil Nadu and Kerala.
- The Western Ghats represents geomorphic features of immense importance with unique biophysical and ecological processes.

The new report – 'IUCN World Heritage Outlook 2', which assesses for the first time changes in conservation prospects of all 241 natural World Heritage sites.

- It warns that climate change will probably exacerbate a system already under pressure.
- It warns the potential to impact the large-scale monsoonal processes which the Western Ghats influence

3. NEW METHODS

3.1 Waste Management

3.1.1 Detection of Chromium Contamination

Bhabha Atomic Research Centre (BARC) has developed a portable kit to check chromium contamination in water.

- As per Indian standard IS10500 for drinking water, the maximum permissible concentration of Cr (VI) in drinking water is 50 microgram per litre.
- Detection of Cr (VI) at such low levels is technically challenging
- Chromium is widely used in various industries like leather, steel, chrome plating, paint manufacturing, wood preservation etc.
- Hexavalent Chromium Cr(VI) is toxic and the World Health Organization has classified it as carcinogenic and can cause stomach ulcers and cancers and severe damage to kidneys and liver.

Removing chromium

- Removing hexavalent chromium from industrial effluents, particularly untreated tannery waste, will become easier and more efficient using fungal biomass.
- Cr (VI) is found in very high concentration in tannery waste.
- The heat-dried fungal biomass converts Cr(VI) to a non-toxic trivalent form of chromium, thus eliminating the problems of disposing Cr(VI)-containing waste

3.1.2 Removing Pollutants from Water

A chemical compound (Meisenheimer complex) synthesised through a simple, single-step process of mixing two chemicals at room temperature has been found to be highly effective in removing fluoride and metal ions such as lead, mercury, cadmium, copper, and iron from drinking water.

Properties:

- The compound repels water by nature.
- A polystyrene sponge that absorbs water became a water-repelling material when coated with the compound and was able to absorb a wide variety of oils and organic solvents from water.

- The compound has negative and positive charged parts and this helps it absorb metal ion pollutants and fluoride from water,
- One gram of the compound was able to remove a large amount of lead (817 mg) and mercury (830 mg) from water and nearly half its weight of copper (451 mg) and iron (511 mg)

3.1.3 Nano Tech for Waste Management

Traditional methods available for treating industrial dyes are expensive and do not completely break them down to non-toxic constituents but merely concentrate them.

- Scientists have developed a photo-catalytic degradation agent using titanium dioxide nano-particles doped with sulphur and carbon by treating it with red seaweed polymer carrageenan.
- There are several advantages of this doping as the energy required to activate the catalyst is less when it is doped, making the dye degradation faster than the traditionally available ones.
- The scientists have been able to completely degrade three industrial dyes - methyl orange, methylene blue and reactive black-5 - in the presence of sunlight.
- When a solar concentrator is used the intensity of visible light is more and this plays an important role in the degradation process
- Another advantage is that the nano-composites are thermally stable and can be reused up to six times with the degradation efficiency remaining at over 97 per cent

3.1.4 Gold nanoparticles can detect lead in wastewater

The new technique makes of specially-produced miniscule particles of gold, and the property of gold nanoparticles to change colour when they 'bunchup' in the presence of metal particles such as lead because of their optical properties.

- Lead in small amounts in wastewater even in the presence of other major toxic heavy metal particles is easily picked up by this simple test.
- Exposure to lead is known to cause severe and irreversible damage to the brain and nervous system in children, and to the kidneys in adults.
- It can also result in complications during pregnancy and lead to birth defects.

- Lead contamination Industrial activities such as smelting, use of pesticides, battery production, landfill leaching are major sources of lead contamination in the environment.

3.1.5 Bioremediation

The Malabar Botanical Garden and Institute of Plant Sciences, Kozhikode, has joined hands with Bharat Petroleum Corporation Limited (BPCL) for field trials to establish the oil-degrading properties of three new strains of bacteria.

- Active enzyme (Catechol 2, 3- dioxygenase) produced from three new strains of oil-degrading bacteria (two species of Burkholderia and one species of Pseudomonas)

What is Bioremediation?

- Use of microorganisms to degrade environmental pollutants
- Less expensive
- Conventional methods like mechanical removal, burial, evaporation,dispersion, and washing are expensive and can lead to incomplete decomposition, leaving residual contaminants to pollute soil and water.
- Can be employed in areas that are inaccessible

3.2 Technology Applications

3.2.1 Geo engineering

Geoengineering is the deliberate large-scale intervention in the Earth's natural systems to counteract climate change. The main advantage of geo engineering is that it costs less.

Recent Development

- A combination of two methods — stratospheric sulphate aerosol increase and cirrus cloud thinning could change both temperature and precipitation at the same rate at which they are being increased by carbon dioxide
- Hence could simultaneously restore both temperature and rainfall to pre-industrial levels

What is Stratospheric Sulphate Aerosol increase method?

- To spray minute sulphate aerosol into the stratosphere.
- Achieved using sulfide gases such as dimethyl sulfide, sulfur dioxide (SO2), carbonyl sulfide, or hydrogen sulfide (H2S)

- These aerosols reflect the incoming solar radiation, thus cooling the earth
- It can reduce the rate of precipitation but at a much higher rate than the required rate

Possible side effects are

- Ozone depletion, Tropopause warming, Stratospheric temperature change.
- Could potentially impact on the stratospheric circulation

What is Cirrus cloud thinning?

- Cirrus clouds trap the heat, so thinning them could cool down the Earth system.
- Seeding is done using aerosols, and ice crystals could grow rapidly around the aerosols and deplete water vapour in the clouds.

Cautions

There must be a strict governance framework set up while exploring these options, as they involve ethical and moral questions.

3.2.2 Carbfix Project

The project was able to solidify 95% of the injected 250 tonnes of CO2 into calcite in 2 years, using 25 tonnes of water per tonne of CO2.

- It is a project in Iceland that aims to lock away CO2 by reacting it with basaltic rocks.
- Carbonated water is injected into the rocks so that it reacts with Calcium, Magnesium or Silicate material present in Basaltic rocks.
- This is called enhanced weathering.
- Thus, the CO2 is captured permanently without releasing any harmful by-products.

3.2.3 Cloud Observatory

A high altitude cloud physics observatory has been established at Munnar (Kerala).Another High altitude cloud physics laboratory is functional at Mahabaleshwar (Konkan)

Aims:

- To observe cloud and rain processes over the region in Western Ghats that will helps in modeling of forecasting methods.

- To improve the skill of rainfall prediction for severe weather phenomena via, heavy rainfall, thunderstorm etc., not only over Kerala but for the whole country
- The four climate sensitive regions of the country are - Himalayan Region, Western Ghats, North Eastern Region and Coastal Areas

3.2.4 Cloud Seeding

Karnataka government planning to increase rainfall by seeding the clouds
It is a form of weather modification done by dispersing substances into the air that serve as cloud condensation or ice nuclei to change amount of precipitation.

Static cloud seeding

- Involves spreading a chemical like silver iodide into clouds.
- The moisture is already present in the clouds, but silver iodide essentially makes rain clouds more effective at dispensing their water by providing a crystal.

Dynamic cloud seeding

- Aims to boost vertical air currents, which encourages more water to pass through the clouds, translating into more rain.
- Up to 100 times more ice crystals are used in dynamic cloud seeding than in the static method.

Hygroscopic cloud seeding

- It disperses salts through flares or explosives in the lower portions of clouds and the salts grow in size as water joins with them.

3.2.5 TANSAT Satellite

- China has launched this satellite to monitor CO2 levels.
- It is the third country, after US and Japan, in the world to monitor this global warming contributor.
- It is a 3 year mission which will take readings after every 16 days.

3.2.6 Climate-Proof Urban planning

Make Cities Climate-proof urban planning is key to making cities resilient to weather changes

- Climate scientists have long warned about changing rainfall patterns.

- The UN's climate science body, the Intergovernmental Panel on Climate Change, stressed the increased risk of flooding and alterations in rainfall patterns due to global warming.
- Planning for climate change Climate change concerns need to be mainstreamed into the urban planning and governance processes
- Central and state governments should identify the problem States must amend their laws to suit the requirement
- People's participation is vital

3.2.7 CO2 capture technology

India will explore the possibility of introducing technologies for capturing carbon dioxide emitted while burning coal and other fossil fuels

- To either reuse or store it so it will not enter the atmosphere
- CO2 has commercial and industrial uses
- Enhanced Oil Recovery (EOR) in depleting oil fields
- To change the properties of oil and make it easier to extract

3.2.8 Drones to restore mangrove cover

Drones could plant trees 10 times faster and cut costs by half, according to UK-based start-up BioCarbon Engineering (BCE). Once the process is fully automated, a single pilot operating six drones can plant up to 100,000 trees per day.

Characteristics of Mangroves

- Evergreen land plants growing on sheltered shores, typically on tidal flats, deltas, estuaries, bays, creeks and the barrier islands.
- They require high solar radiation and have the ability to absorb fresh water from saline/brackish water.
- It produces pneumatophores (blind roots) to overcome respiration problem in the anaerobic soil conditions.
- Mangroves exhibit viviparity mode of reproduction i.e. seeds germinate in the tree itself (before falling to the ground).

Use of Mangroves

- Mangroves protect coastlines by
    - slowing coastal erosion and shielding against tsunamis and storm surges and rising sea levels
- Absorb carbon from the atmosphere

- Boost fish stocks and stem saltwater invasion of farmland

3.2.9 Technique developed in Kenya to map tree cover

A new approach to monitor changes to the earth's surface uses maps that consist of physical and human geographic data to explain what's changed.
New technique

- Uses satellite images and maps to show patterns linked to land use cover change on a yearly basis.
- It can be used regionally and potentially across the world.

3.2.10 Restoring the Great Barrier Reef

The Great Barrier Reef is suffering from recent unprecedented coral bleaching events. There's a deforestation frenzy happening in Great Barrier Reef catchments, which means more erosion and more muddy and polluted water smothering coral and sea grass.
Coral Bleaching
When corals are stressed by changes in conditions such as temperature, light, or nutrients, they expel the symbiotic algae living in their tissues, causing them to turn completely white.

How to protect?

- Reducing greenhouse gas emissions will dampen coral bleaching risk in the long term, but will not prevent it.
- Continued improvement of water quality, controlling Crown-of-Thorns Starfish, and managing no-take areas will all help.
- Assisted gene flow and assisted evolution could help the reef.

What is assisted gene flow?
To move warm-adapted corals to cooler parts of the reef. Corals in the far north are naturally adapted to 1C to 2C higher summer temperatures than corals further south. Also could help overcome the physical limitation of natural north-to-south larval flow.
What is assisted evolution?
Assisted evolution is artificial selection on steroids. These are aimed at producing a hardier coral without the use of genetic engineering.

4. POLLUTION

4.1 Black carbon heats up atmosphere

Aero planes may be ejecting significant amounts of black carbon (BC)
What is Black Carbon?

- Black carbon consists of pure carbon in several linked forms.
- It is formed through the incomplete combustion of fossil fuels, biofuel, and

Biomass

- Is a pollutant known to aggravate breathing disorders, upset the monsoon and quicken glacier melt and a potential ozone depleter
- BC particles absorb heat, they warm the surrounding air, become lighter and rise to greater heights by a process called 'self-lift' and persist in the air.

4.2 WHO Study on Air Pollution

A study conducted by the World Health Organisation revealed that air pollution could have killed at least 600,000 Indians in 2012.

- The study findings are based on data derived from satellite measurements, air transport models and ground station monitors for more than 3000 locations, both rural and urban.
- It also relies on publicly available national data on pollutant levels.
- Delhi is no longer the most polluted city in the world

Major causes of Air Pollution

- Particulate matter.
- Chemicals and toxic pollutants likes Sulphur dioxide, nitrogen oxides
- These pollutants come from factories, automobiles and any industrial or manufacturing plants.
- Dust from agricultural and construction industry.
- Household chemicals without adequate ventilation is a major source of indoor air pollution.
- Volcanoes, dust storms, and forest fires are causes of natural air pollution.

4.3 India and State Global Air Report

It is the first report on air quality by using the latest global data from 1990 to 2015. Report is conducted jointly by the independent research institute; 'Health

Effects Institute (US-based nonprofit corporation)' and The Institute of Health Metrics and Evaluation (Independent research institution University of Washington)

- As per the report, approximately, 90% of the world's population lives in areas with unhealthy air in 2015.
- There is a significant increase in inhalable fine particles of PM 2.5 since 1990.
- Outdoor air pollution has increased the death rate in India, surpassing the most polluted country China.
- The rate of increase in ozone-related deaths is alarming.
- Ground level or "bad" ozone - It is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight.
- Emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are some of the major sources of NOx and VOC.
- Breathing ozone can trigger a variety of health problems, particularly for children, the elderly, and people of all ages who have lung diseases such as asthma.
- Ground level ozone can also have harmful effects on sensitive vegetation and ecosystems.

4.4 Most pollution-linked deaths occur in India

With 2.51 million deaths in 2015, India has been ranked No. 1 in pollution related deaths, according to a report by The Lancet Commission on pollution and health.

- In the case of air pollution, the number of deaths in India from was 1.09 million.
- In the case of water pollution, 0.5 million deaths were caused by unsafe water source, while unsafe sanitation caused 0.32 million deaths.
- Exposure to household air pollution accounts for about four million premature deaths every year globally; of these, a million occur in India.

4.5 Smog in Delhi

Delhi witnessed the worst smog in almost two decades, with consistently hazardous pollution levels being recorded for over a week.

- Smog is a type of fog which has smoke or soot in it.

- Smog is a yellowish or blackish fog formed mainly by a mixture of pollutants in the atmosphere which consists of fine particles and ground level ozone.

Causes:

- A big contributor to Delhi's air pollution is road dust, which accounts for about 35% of PM 2.5 in the air, followed by vehicles at 25%.
- High humidity level and no winds are major causes of accumulation of dust.
- Stubble burning by farmers in Malwa region (southern Punjab) in this season is another reason
- Other contributors are domestic cooking, power plants and industries.

4.6 Pollutants

Particulate matter

- It is the term for a mixture of solid particles and liquid droplets found in the air.
- they reduce visibility and cause the air to appear hazy
- It includes 'Inhalable coarse particles', with diameters larger than 2.5 micrometers and smaller than 10 micrometers (PM 10); and 'Fine particles', with diameters that are 2.5 micrometers and smaller (PM 2.5)
- They are formed in two ways Primary particles; emitted directly from a source, such as construction sites, unpaved roads, fields, smokestacks or fires.
- Secondary particles; formed due to complicated reactions in the atmosphere of chemicals such as sulfur dioxides and nitrogen oxides that are emitted from power plants, industries and automobiles.
- Particulate matter triggers or worsens asthma, heart attack, bronchitis and other respiratory problems.
- Exposure to fine particulates is linked to premature death from heart and lung disease.
- It includes sulphates, nitrates, black carbon, particle-bound water, metals (cadmium, copper, nickel, zinc) and hydrocarbons.
- In addition, biological components such as allergens (pollen, dust mites) and microbial compounds (fungi) are also PM.

What are the harmful effects of PM?

- When inhaled, PM can cause a wide range of respiratory disorders.
- Continuous exposure to PM can cause asthma, chronic obstructive pulmonary disease and any type of bronchitis.

- PM can penetrate deep inside the lungs and damage it.

NOx, or oxides of nitrogen, are also major pollutants. They are a family of poisonous, highly reactive gases that form when fuel is burned at high temperatures.

4.7 Ammonia in upper troposphere

Researchers for the first time detected trace amount of Ammonia in upper troposphere.

- It was most concentrated in the upper layer of the troposphere above India and China due to high agricultural emission from livestock farming and fertilisation.
- It shows that ammonia released survives all the way to the upper troposphere, and is not washed out completely by monsoon.
- It means that ammonia not only pollutes the local ecosystem but also plays a role in formation of Aerosols.
- The accumulation of aerosols in the troposphere is thought to have a cooling effect, as clouds reflect the sun's energy.

4.8 Aerosols

Aerosols are tiny particles made from super-fine solid particles and liquid droplets carried in the atmosphere

- They often act as 'cloud condensation nuclei' around which cloud droplets are formed.
- Aerosols can also modify the size of existing cloud particles, and change how the clouds reflect and absorb sunlight.

4.9 Pollution Affects Monsoon

Researchers have found that the high pollution in Northern and Central India, can affect the monsoonal systems. This happens due to change in formation of clouds.

- The Indian summer monsoon season begins when the land surface becomes hot enough to drive a powerful rising motion of air in the atmosphere, producing heavy precipitation.

- At the smallest scales, an increase in tiny particles in the atmosphere can shade the land surface causing a reduction in the heat that reaches the surface.
- Clouds that do form in these polluted environments are less likely to rain
- These longer-lived clouds further cool the surface and weaken the circulation.

4.10 Arsenic Contamination

- Arsenic is highly toxic in its organic form and presence of high levels of arsenic in groundwater renders it toxic.
- Long-term exposure to arsenic from drinking-water and food can cause cancer and skin lesions.
- It has also been associated with developmental effects, cardiovascular disease, neurotoxicity and diabetes.
- The government of India has kept the maximum arsenic level in water at 50 µg/L while WHO has kept it at 10 µg/L.

What causes arsenic contamination?

- Population burden on groundwater resources causes over exploitation
- Low replenishment of groundwater

4.11 Microplastics or Microbeads

- Are plastic pieces or fibre, which are very small, generally measuring less than 1mm.
- They have a variety of use, most notably being personal care products like toothpaste, body creams, clothing and industrial use.
- They have an ability to spread easily and provide silky texture and colours to the product.
- They are non-biodegradable and flow through sewers to seas and oceans
- They have a potential to disrupt the aquatic ecosystem.
- Once they enter water bodies they accumulate as act as carriers for other pollutants.
- They carry carcinogenic chemical compounds in the food chain.
- Due to their small size they pass through the waste water treatment filtration system as well.

4.12 Ganesha idols immersion

- Today's idols are usually gypsum plaster, semihydrated calcium sulphate, more commonly known as plaster of Paris (PoP)
- PoP is easy to cast in a mould, yields a smooth surface, dries quicker, is friendlier to paint, and is much lighter and cheaper. So PoP is preferred over clay
- But PoP does not dissolve readily, and it turns water hard
- The bright paints and dyes contain toxic chemicals like mercury, zinc oxide, chromium, lead, and cadmium.
- They poison water bodies and aquatic life, and they can cause cancer, respiratory ailments, and skin infections.

4.13 e-Waste

The growing consumption of digital products is generating mountains of e-waste

- Disposal is posing serious health and environmental risks.
- Recycling of e-garbage is providing jobs to hundreds of thousands in many parts of the developing world.
- Guiyu, a coastal township in China is world's e-waste capital
- But problems began to arise when people fell sick, and the drop in air, water and soil quality caught global attention
- Mercury, fluorine, barium, chromium, and cobalt, which either leach from the waste or are used in processing, are blamed for skin rashes and respiratory problems.

4.14 Cigarette butts Pollution

- Cigarette butts contain hazardous chemicals such as cadmium, arsenic and lead that are partially filtered out during smoking.
- But when the butt is discarded, these chemicals leach into the environment contaminating our waterways and land.
- Encapsulated cigarette butts with bitumen and paraffin wax can lock in the chemicals and prevent any leaching and also can be used in construction material.

4.15 Pesticides

Reports of farmers dying from pesticide in Maharashtra's cotton belt in Yavatmal make it evident that the government's efforts to regulate toxic chemicals used in agriculture have failed.

Actions to be taken:

- Aligning the new pesticides regulatory framework with food safety laws and products used in health care
- Minimise the use of toxic chemicals
- Encourage organic methods

The Pesticide Management Bill

- Bill seeks to regulate the manufacture, inspection, testing and distribution of pesticides.
- The Bill establishes a Central Pesticides Board
- It establishes a registration committee to register pesticides.
- No pesticide can be registered unless tolerance limits for its residues on crops and commodities are specified under the Food Safety and Standards Act, 2006.
- The Bill establishes a procedure to licence manufacturers, distributors and retailers of pesticides, to be administered by state governments.
- Pesticide inspectors shall inspect facilities and collect pesticide samples while pesticide analysts shall test the samples collected

4.16 Toxicity in Food Chain

The Western Ghats have been witnessing an unusual number of frogs with deformities. Scientists and public health experts are alarmed by the phenomenon, which they suspect to be symptomatic of underlying toxicity in the environment and the food chain.

- frogs are very sensitive to changes in their habitats
- studying them would yield clues to the state of the environment
- Independent studies on the excessive use of pesticides and on the impact of pesticides on amphibians in laboratory conditions suggest a strong link between pesticide use and frog deformities
- The cardamom plantations use a large number of illegal pesticides

4.17 Centre eases norms for sewage plants

The Central Pollution Control Board (CPCB) has relaxed standards for upcoming sewage treatment plants (STP), including those to come up on extremely polluted stretches of the Ganga. The earlier 10 mg criteria for BOD was impractical and required advanced technology that was too costly for most States

The standards proposed in 2015 for upcoming sewage treatment plants have been relaxed in the final plan citing technological limitations

Parameter	Proposed plan (Nov. 2015)	Final plan (Oct. 2017)
pH	6.5-9.0	6.5-9.0
Biochemical oxygen demand	10 mg/l	<20 or <30*
Total dissolved solids	20 mg/l	<50
Faecal coliform	<100	<1,000

*20 in major State capitals, five major cities, 30 in the rest of country

4.18 Oil Spill

Oil spill occurred in Chennai due to a collision between two ships. A large quantity of oil was released into the sea, affecting marine life and livelihoods of coastal communities.

Effects of oil spill:

- Toxic chemicals kill fish and animal life.
- The thick oil also washes ashore.
- Causes death of fish and turtles and of birds because wings will get coated by heavy oil.
- The oil destabilises the entire marine food chain, by blocking the sunlight for phytoplanktons.
- Toxic chemicals leached from the oil and some of the oil itself sink to the seabed, damaging coral reefs and endangering the fish.
- Coastal water resources get contaminated due to oil pollution.

Cleaning up oil spills

- Bioremediation - bacteria are used to clean up oil spills.

- Skimmers - are boats that help scoop the spilled oil from the surface of the polluted water.
- Vacuum trucks - can suck up spilled oil from the beaches and the surface of water.
- Sorbents - are big sponges which absorb oil. Sorbents are insoluble materials or mixtures of materials used to recover liquids through the mechanism of absorption, or adsorption, or both.
- Chemical dispersants - effectively break down oil into its corresponding chemical constituents.

4.19 Ocean pollution

Ocean pollution also known as marine pollution, is the spread of harmful substances such as oil, plastic, industrial and agricultural waste and chemical particles into ocean.

Causes of Ocean pollution

- Sewage: Sewage or polluting substances flow through sewage, rivers, or drainages directly into the ocean
- Toxic chemical from Industries: Industrial and agricultural waste are another most common form of wastes that are directly discharged into the oceans.
- Land Runoff: This occurs when water infiltrates the soil to its maximum extent and the excess water from rain, flooding or melting flows over the land and into the ocean
- Large Scale oil Spills: Ship pollution is a huge source of ocean pollution, the most devastating effect of which is oil spills
- Ocean mining: Deep sea mining causes damage to the lowest levels of the ocean and increase the toxicity of the region.
- Littering: This occurs when objects that are far inland are blown by the wind over long distances and end up in the ocean. These objects can be anything from natural things like dust and sand, to man-made objects such as debris and trash.

5. CLIMATE CHANGE

5.1 Calving of the iceberg at the Larsen C Ice Shelf

- NASA has released images which show the movement of one of the largest ever recorded the iceberg that recently broke off from Antarctica, which is called as Larsen C
- Icebergs will not raise the sea level, but the Land ice that have been blocked by the breaking iceberg, will drop into the ocean and eventually would raise the sea level.

Larsen A (collapsed in 1995) and Larsen B (collapsed in 2002).
What is an Ice shelf?
It is a floating extension of land-based glaciers which flow into the ocean.

5.2 Freshwater increase near Greenland

Ocean data from Northeast Greenland has shown, for the first time, an increase in freshwater content in Greenland fjords.

- Increased influx of fresh water will affect the marine environment
- More fresh water in the surface water layers makes it harder for the nutrient-rich bottom water to rise to the upper layers
- Lower algae production would mean lesser fish.

5.3 Global warming Effects

- Is making the spread of diseases among animals and humans.
- Threatening food security across the planet
- Is altering the hibernation periods of animals, disturbing their breeding patterns and metabolism Fisheries:
- Ocean warming
- Increasing atmospheric temperatures
- De-glaciation, and rise of sea levels
- Thermohaline circulations: are thereby affected. Also its depth is getting affected, making it shallower.
- The sea cover around Antarctica is rising, the sea ice in Arctic sea is melting away.

5.4 Ocean Warming

Recently a research report "Explaining ocean warming: causes, scale, effects and consequences" released by the International Union for Conservation of Nature (IUCN) – has shown the effects of ocean warming.

- World's waters have absorbed more than 93 per cent of the enhanced heating from climate change since the 1970s
- Rainfall patterns affected: Increased rainfall in some mid-latitude and monsoon areas and decrease over various sub-tropical regions.
- Yield is impacted: changes in these ocean-focused atmospheric patterns have direct implications on food production.

5.5 Carbon dioxide levels in the atmosphere

Carbon dioxide levels in the atmosphere reached a record high in 2016, according to the World Meteorological Organization (WMO) and Greenhouse Gas Bulletin. Globally averaged concentrations of CO2 reached 403.3 parts per million in 2016, up from 400.00 ppm in 2015.

- The global average concentration of carbon dioxide achieved a milestone of 400 parts per million in 2015 for the first time since record keeping began in 1960.
- In 2016, it surpassed all previous records and created a new one.
- The rise in carbon dioxide levels has been attributed to El Nino.
- Carbon dioxide remains in the atmosphere for thousands of years and even more in case off the ocean.

5.6 Emissions gap

A recent UN Environment Programme Report reveals that global emissions have continued to rise despite some signs of emissions from fossil fuels and industries stabilizing.The UN Environment Emissions Gap Report 2017 warns that a big carbon emissions gap exists between the levels that can be achieved in 2030 with present climate commitments

- The emissions gap for 2030 is 12 to 14 GtCO2e (Giga tonne CO2 equivalent) compared with 2°C scenarios, and for 1.5°C the gap is three GtCO2e larger.
- Full implementation of the unconditional Nationally Determined Contributions (NDCs) and comparable action afterwards could result in a

temperature increase of about 3.2° C by 2100 relative to pre-industrial levels.

- The Paris accord pledges only a third of what is needed to avoid climate catastrophe.
- Indicates that governments will need to deliver much stronger pledges to cut greenhouse gas emissions when they are revised in 2020.
- Fossil fuels and cement production account for about 70% of greenhouse gases

What is Emissions Gap?

Emissions gap is the difference between the required emissions levels in a future time, necessary to meet climate targets, and the levels expected that year if countries fulfill their promises to cut greenhouse gases.

Green steps

- A large part of the potential to close the emissions gap lies in solar and wind energy, efficient appliances and passenger cars, afforestation and stopping deforestation.
- These six factors hold a total potential of up to 22 Gt CO2e per annum.
- Plugging other greenhouse gases, such as hydrofluorocarbons, through the Kigali Amendment to the Montreal Protocol, and other short-lived climate pollutants such as black carbon, could contribute.

5.7 Tropical thunderstorms are set to grow stronger

As the world warms, the amount of atmospheric energy available to thunderstorms will increase in response to climate change.

Thunderstorms

- Thunderstorms represent the dramatic release of energy stored in the atmosphere.
- One measure of this stored energy is called “convective available potential energy”, or CAPE.
- Lightning produced by thunderstorms is an important trigger for bushfires globally
- CAPE values rose in response to global warming.

5.8 Climate Smart Agriculture

Recently the three-day Annual Forum of the Global Alliance for Climate-Smart Agriculture (GACSA) was organised at Rome by FAO.
Climate smart agriculture (CSA) is an integrative approach to address the interlinked challenges of food security and climate change.

- Sustainably increasing agricultural productivity
- Adapting and building resilience to climate change
- Reducing and/or removing greenhouse gas emissions, where possible.

6. ENVIRONMENT CONSERVATION

6.1 National Level

6.1.1 The Supreme Court Verdicts

6.1.1.1 Delhi Air Pollution

SC approved a comprehensive action plan to tackle air pollution emergencies in the capital. The court directed the centre to adopt reports submitted by the Environment Pollution Control Authority (EPCA)

The Action Plan

- EPCA's reports categorize four levels of air pollution in the National Capital Region (NCR) based on atmospheric particulate matter (PM) levels.
- The plan sets in motion a series of steps that every authority-central government, Delhi government, municipal corporations and Delhi's neighbouring states-need to take as pollution levels spike

The "Hawa Badlo App"

- Launched by Environmental Pollution (Prevention and Control) Authority (EPCA), lets people report incidences of air pollution to the government.
- This includes reporting incidents like leaf and garbage burning, and dust generated by construction activities.
- Each complaint would be geo-referenced and will provide the time and location where the evidence of violation has been collected and submitted.
- The app also has a section for officials to resolve cases and upload evidence of the action taken.

- The app will generate weekly report which will be sent to Centre and State Pollution Control Boards.

Environmental Pollution (Prevention and Control) Authority (EPCA)

- Is mandated by the Supreme Court to improve the air quality in Delhi and NCR

6.1.1.2 SC bans sale of crackers

The Supreme Court suspended the sale of firecrackers in Delhi and NCR till November 1, 2017 in a bid to test whether a Diwali without firecrackers this year will have a "positive effect" on the health of citizens and a steadily deteriorating air quality

6.1.1.3 Bans toxic chemicals from crackers

- The chemicals banned are - antimony, lithium, mercury, arsenic and lead in any form
- These are labeled as toxic by the Central Pollution Control Board (CPCB) and it fixes the standards and regulations in the use of chemicals in firecrackers

Regulations

- Continuous monitoring and random checks of firecrackers is the mandate of Petroleum and Explosives Safety Organization (PESO) and Controller of Explosives.

Ban on China firecrackers

- These contain potassium chlorate, which is highly unstable and can explode with just a sharp jolt

Ban was only on Chinese firecrackers?

- Use of potassium chlorate in fireworks has been banned in India since 1992.
- China is the world's largest manufacturer of fireworks, makes a wide range of these products, and was the source of most low-cost fireworks coming into India.

Are Indian firecrackers safe?

- Indian fireworks, by contrast, use potassium and sodium nitrates, which are more inert and, therefore, safer.

6.1.1.4 Judgement on illegal mining

The miners in Keonjhar, Sundergarh and Mayurbhanj in Odisha have rapaciously

mined iron ore and manganese ore, and have apparently destroyed theenvironment and forests and perhaps caused untold misery to the tribals in thearea.

- SC ordered heavy expenditure for the welfare of tribal people in affected areas.
- Supreme Court directs the Union of India to have a fresh look at the National Mineral Policy, 2008 , particularly with regard to conservation and mineral development
    - As per act mining was deemed illegal only if ores were extracted without a mining lease and the penalty was equal to the entire output from such an operation.
    - But the penalty for environmental violations is a negligible Rs 50,000.This built a very strong business case to start mining without waiting for green clearances.
- Now Sc has held that extracting minerals without the necessary green clearance should be deemed illegal
- This means that even if you have a mining lease, any extraction without forest and environment clearance is illegal and the state must recover the value of the entire output from the defaulter.

6.1.1.5 SC bans pet coke, furnace oil in Haryana, Rajasthan, UP

Supreme Court banned the use of dirty furnace oil and pet-coke in Haryana, Rajasthan and Uttar Pradesh from November 1, 2017.

- The order comes in response to the recommendations of the Environment Protection (Prevention and Control) Authority (EPCA)
- Very high sulphur levels (20,000 PPM to 74,000 PPM) as opposed to only 50 PPM sulphur in Bharat Stage-IV transport fuels
- It has directed the Ministry of Environment and Forests and Climate Change (MOEFCC) to notify the standards for nitrogen oxide (NOx) and sulphur oxides (SOx) for the industry sector and the industry has to comply with the standards by December 31, 2017.
- Order will have nationwide impact as SOx and NOx are not regulated currently in India

6.2.1 Policies and Actions

6.2.1.1 Air Quality Index

The minister for environment, forests & climate change launched the national air quality index (AQI) on 17 september 2014 under the Swachh Bharat Abhiyan.

- It is outlined as 'one number- one colour-one description' for the common man to judge the air quality within his vicinity.
- There are 6 AQI categories
- The AQI will consider eight pollutants (PM10, PM2.5, NO2, SO2, CO, O3, NH3, and Pb) for which short-term (up to 24-hourly averaging period)
- National Ambient Air Quality Standards are prescribed.
- The value of the AQI is comparable across cities and across pollutants in terms of health impact.

6.2.1.2 Compensatory Afforestation Fund Act

Establishes the National Compensatory Afforestation Fund under the Public Account of India, and a State Compensatory Afforestation Fund under the Public Account of each state to spend on afforestation to compensate for loss of forest cover, regeneration of forest ecosystem, wildlife protection and infrastructure development.

- Reserved Forest or a Protected Area (PA) land may be diverted under the Forest (Conservation) Act, 1980 for non-forest developmental activities like an industrial or infrastructure project with approval of central and state government.
- To compensate for diversion of forestland, afforestation must be done on a separate piece of land called as compensatory afforestation. In addition compensation must be paid for loss of forest ecosystem and biodiversity. Valuation of this forest ecosystem is called net present value.
- The money is collected by the state government for afforestation and forest development.

In 2002, Supreme Court observed that these funds were not been utilized, and for this purpose an ad- hoc authority called compensatory afforestation fund management and planning authority (CAMPA) was set up. In the absence of permanent institutional mechanism more than Rs. 40,000 crores have accumulated which are being kept in Nationalized Banks and managed by CAMPA.

6.2.1.3 Fly Ash Utilization Policy

The Maharashtra state cabinet has recently approved the State Thermal Power Plant Ash Utilization Policy. With this it has become the first state to adopt this policy.

- The policy seeks to curb transport of fly ash produced in the coal-based thermal plants and stipulates measures to utilize all coal waste at source.

Fly ash

- Is one of the coal combustion products and is composed of fine particles that are driven out of the boiler with flue gases.
- Ash that falls at the bottom of the boiler is called bottom ash.
- Fly ash includes substantial amounts of oxides of silica, aluminum and calcium.
- Element like Arsenic, Boron, Chromium, lead etc. are also found in trace concentrations. It, thus, poses hazards to environment and health.
- Due to the presence of these minerals it has certain unique properties.
- It can be used as construction material, filling old mines, building railway embankments, and reclamation of low-lying areas.

6.2.1.4 Cleaning River Ganga

National Ganga Council

The Union Cabinet under the chairmanship of PM Narendra Modi has cleared the River Ganga (Rejuvenation, Protection and Management) Authorities Order, 2016.

- The Order enforces an institutional structure for policy and implementation
- Empowers National Mission for Clean Ganga (NMCG) to discharge its functions in an independent and accountable manner.
- A mission status will be granted to the Authority with corresponding power under the Environment (Protection) Act (1986)
- The new council for River Ganga will replace the existing National Ganga River Basin Authority (NGRBA) for pollution prevention and rejuvenation of Ganga.
- The NMCG will have a two tier structure with a Governing Council and an Executive Committee.
- At the state level, State Ganga Committees would be formed for proper implementation. Similarly, District Ganga Committees would be formed in each Ganga Bank District and they shall be monitored by the State Committees.

- The special focus of the revamped structure would be to maintain ecological flows in Ganga with an aim to ensure water quality and environmentally sustainable development.
- An innovative model based on Hybrid Annuity has also been approved for fast track creation of sewerage and treatment infrastructure in the Ganga basin.

Campaign 'Swachh Yug'

As part of its efforts to make villages located along Ganga open defecation-free, Government has launched a campaign 'Swachh Yug'.

Why is it difficult to clean up the Ganga?

- Coursing about 2,500 km, the Ganga is the longest river within India's borders.
- Its basin constitutes 26% of the country's land mass (8,61,404 sq. km.) and supports 43% of India's population.
- Even as its basin traverses 11 States, five States are located along the river's main stem spanning Uttarakhand, Uttar Pradesh, Jharkhand, Bihar and West Bengal.
- Pollution of Ganga In the Ganga basin, approximately 12,000 million litres per day (mld) of sewage is generated, for which there is now a treatment capacity of just 4,000 mld.
- Though the contribution of industrial pollution, volume-wise, is about 20%, it's toxic and non-biodegradable
- ₹20,000 crore was earmarked for the clean-up and promised that the river would be clean by 2020.
- That involve setting up of sewage treatment plants (STPs), replacing wood fired crematoriums with electric ones, setting up biodiversity parks
- Improving the water table in the surrounding regions and prevent soil erosion.

What clean river means?

- Coliform bacteria level, biochemical oxygen demand, pH and dissolved salts remain within the standards prescribed by the Central Pollution Control Board.
- Maintains minimum levels called ecological flows across all stretches of the river

6.2.1.5 "Carbon neutral" Airport

The Indira Gandhi International Airport in Delhi has become Asia-Pacific's only and one of the world's few airports to achieve a "carbon neutral" status.

- Currently, 25 airports in the world, most of them in Europe, have earned carbon neutral status.
- The Indira Gandhi International airport boasts of green buildings, solar power plants, rainwater harvesting system etc., which have helped reduce and offset carbon emissions.
- The airport has taken a series of measures to reduce carbon footprint, including setting up of a 7.84MW solar power plant.

6.2.1.6 "Carbon neutral" District

Assam government launched a project named, "Sustainable Action for Climate Resilient Development (SACReD)" in December, 2016 to make Majuli the first ever carbon neutral district in the country by 2020.

SACRed

- The project has been initiated to combat climate change and greenhouse gases.
- Mitigation through forestry and biodiversity conservation will be the starting points in this carbon-neutral agenda.

Majuli

- Is the biggest river island in the world.
- It is in river Brahmaputra.
- It is also first such island to be declared a district.

6.2.1.7 First "Green Corridor"

The 114-km-long Manamadurai–Rameswaram stretch of Southern Railway became India's first 'Green corridor'.

- All the trains in this route will have bio-toilets and there would be zero discharge of human waste on tracks in the section.
- Rameswaram railway station had already been developed as a 'Green Station' to handle the bio-toilets in the coaches.

Bio toilets

- Indian Railway had developed the environment friendly 'IR-DRDO Bio-toilets', in association with Defence Research and Development Organisation (DRDO).
- Indian railways aims to install human waste discharge free biotoilets in all its coaches and the same would be completed by September 2019.

- It will help in proving cleanliness and hygiene besides preventing corrosion of the tracks. It is part of the Swachh Bharat Mission.

6.2.1.8 Ban on Use of Polythene Bags

Salient features of Plastic Waste Management Rules (PWMR), 2016:
Producer-consumer responsibilities:

- the generators of waste have been mandated to take steps to minimizegeneration of plastic waste
- ensure segregated storage of waste at source to handover to localauthorities.

Responsibilities of authorities:
Management of plastic waste lies on

- Responsibilities of local bodies, gram panchayats
- Waste generators, retailers and street vendors.

Plastic ban:

- The use of carry bags made from conventional plastic with thickness less than 50 micron is prohibited.
- The use of plastic for packaging gutkha, tobacco and pan masala is also prohibited. These are notified under PWMR, 2016.

Status:

- There is no proposal to impose ban on the use of polythene bags completely throughout the country but states are voluntarily banning.

6.2.1.9 Swachhathon 1.0

The Ministry of Drinking water and Sanitation, MDWS is organizing Swachhathon 1.0- the Swachh Bharat Hackathon.
This is to crowd source solutions for the pressing issues pertaining to Sanitation.
The Primary target of this mission is to get innovative solutions to problems in the following categories:

- Innovative, Sustainable, Environmental-friendly and affordable toilet technology for hilly, dry, flood prone and remote areas.
- Monitor the usage of toilets, bringing behavioral change for toilet usage, maintenance of school toilets and hygiene, solutions for, early decomposition of faecal matter.

6.2.1.10 HFCs Phase out Management Plan

India launched the second stage of its plan to phase out Hydrocholoroflurocarbons (HCFCs). This plan is in line with its commitments

made at the Montreal Protocol to end use of Ozone Depleting Substances (ODS). The plan is meant to effective from 2017-23. The long term target is phasing out HCFCs is by 2030. Under the plan, India will use $44. 1 million to help industries to switch over to alternatives and train manpower. It is estimated that with the implementation of this plan, there would be direct carbon equivalent net reduction of about 8.5 million metric tonnes annually from 2023

6.2.1.11 Kyoto Protocol second commitment period

India has ratified the second commitment period (2013-2020) of the Kyoto Protocol on containing the emission of greenhouse gases.

- The Kyoto Protocol was adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005.
- The detailed rules for the implementation of the Protocol were adopted at COP 7 in Marrakesh, Morocco, in 2001, and are referred to as the "Marrakesh Accords."
- Its first commitment period started in 2008 and ended in 2012.
- The protocol was developed under the United Nations Framework Convention on Climate Change-UNFCCC.
- The participating countries have ratified the Kyoto Protocol and committed to cutting the emissions of the Green House Gases such as Methane (CH4), Nitrous oxide (N2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur hexafluoride (SF6) and carbon dioxide (CO2).

6.2.1.12 Ban on Pesticides

The Government of India has decided to ban the use of 18 pesticides following the recommendations of the Anupam Varma Committee.

- Complete ban of 12 pesticides would come into effect from January 1, 2018 while the rest 6 would be banned from December 31, 2020.
- The GOI has also sought objections and suggestions on this draft order from all stakeholders before taking a final decision.
- The Central Insecticide Board and Registration Committee (CIBRC) approves the use of pesticides in India.

Endosulfan

Endosulfan is a hazardous pesticide which is banned in 80 countries. It was used by the Karnataka Cashew Development Corporation and Kerala Government over cashew plantation to combat tea mosquito after 1970s. It has been found to be responsible for various mental and physical deformities among the population of the two respective states. In 2011, Supreme Court banned Endosulfan pan-India.

Anupam Varma Committee

- This committee was constituted in July 2013 to review the use of 66 pesticides which are either banned or restricted in other countries.
- The Committee recommended banning 13 pesticides, phasing out 6 by 2020 and reviewing 27 others in 2018.
- The Committee did not review the use of Endosulfan as the matter is pending in the court

6.2.1.13 Solid Waste Management

Central Pollution Control Board (CPCB) has issued draft guidelines proposing to maintain buffer zones around landfills to minimize/prevent the impact of landfill waste disposal. The proposed guidelines will apply to all future treatment plants while the existing plants will have to incorporate measures such as planting trees and using odour free technology.

Current Status

- The current practice of solid waste management in India includes a host of options such as composting, vermin-composting, biogas, refuse derived fuel (RDF), pelletization and waste-to-energy measures.
- Disposal of garbage is a widespread option in India.
- Close to 62 million tonnes of solid waste is generated every year in the country. Out of this, 43 million tonnes is collected and only 12 million tonnes treated.

Landfills

- It affects the neighbouring environment by fostering air, water, land and noise pollution.
- The only guideline for landfills as of now is that they be at least 500 metres ways from habitable zones.

Waste management

- Separation of biodegradable component of solid waste from the dry waste.
- Use biodegradable waste for composting and biomethanation.
- Processing - incineration of non-recyclables with appropriate filters to check emissions
- Scientific landfills - for the little that remains.

Uses of Compost

- The Solid Waste Management Rules 2016 make the co-marketing of compost mandatory.

- To provide incentive for co-marketing to the fertiliser companies,the Government of India's Department of Fertilisers notified a policy to promote the use of city compost by offering Market Development Assistance (MDA)
- City compost from biodegradable waste provides an alternative to farmyard manure (like cow dung)
- The water holding capacity of the soil which uses compost helps with drought-proofing
- City compost can also be blended with rock phosphate to produce phosphate-rich organic manure.

6.2.1.14 Electric vehicle push

Rather than being a late follower in technology development, the government would like to position India's industry at the forefront of the global quest for clean mobility.

Challenges:

- Ensure indigenization of technology by technology transfers.
- Involving Industry in a leading role in electric vehicles
- Localization is crucial to avoid replacement of an oil import bill with a battery import bill
- Automobile industry is complaining of policy uncertainty.
- e-vehicles are finding it difficult to compete with cleaner and much more fuel-efficient modern cars

Suggestions:

- Must combine the programmes for both clean vehicles and public transport vehicles
- E-mobility for last mile connectivity is preferable.
- Use large scale public procurement to reduce costs
- Battery swapping instead of built in batteries to reduce costs

The National Electricity Mobility Mission Plan 2020

It was launched in 2013 to achieve national fuel security by promoting hybrid and electric vehicles. Preference of customers for hybrid and electric vehicle is expected to reduce fuel consumption and thereby the vehicular emission.

6.2.1.15 Green Highways Mission

The Union government had last year launched Green Highway (Plantation, Transplantation, Beautification and Maintenance) Policy 2015.

- 1% of the total project cost (TPC) of National Highways will be kept aside in a Green Highways Fund to be used for plantation and its maintenance.
- The implementation and progress of plantation will be monitored via images by ISRO and audit will involve modern IT tools

6.2.1.16 India could achieve its 2030 climate targets

India is among the small group of countries that are on track to achieve their self-declared climate targets under the 2015 Paris Agreement with their current policies in place, a new report released at COP 23 in Bonn has revealed.

India's commitments:

- To reduce its emissions intensity—greenhouse gas emissions per unit of GDP— by 33 to 35 per cent below 2005 levels by the year 2030.
- It had also promised to ensure that at least 40 per cent of its energy in 2030 would be generated from non-fossil fuel sources, like solar, wind or bio-fuels.
- In addition, it had said it would rapidly increase its forest cover so that an additional carbon sink equivalent to 2.5 to 3 billion tonnes of carbon dioxide is created by the year 2030.

Meeting climate goals

- Tree-based programmes. In 2015, India made a Bonn Challenge commitment to place into restoration 13 million hectares (Mha) of degraded land by 2020 and an additional 8 Mha by 2030.
- Improving ecology - emphasis on landscape approaches — a model aimed at improving the ecology of a landscape as a whole in order to benefit local livelihoods and conserve biodiversity.

Tree-based interventions

- The nation practises at least 35 types of agroforestry models that combine different trees that provide timber, fruits, fodder, fuel and fertilizers with food crops.
- This diversifies income from farming, and improves land productivity.
- Farmer-managed natural regeneration (FMNR) systems where farmers protect and manage the growth of trees and shrubs that regenerate naturally in their fields from root stock or from seeds.

- NABARD's 'Wadi' model and the Foundation for Ecological Security's re-greening of village commons project are good examples of tree-based interventions
- A tool called the Restoration Opportunities Assessment Methodology (ROAM) is being used in 40 countries to find the best methods for landscape restoration.

6.2.1.17 'Boat Lab' to study Brahmaputra

The Department of Biotechnology will commission a two-tiered barge that will roughly be the size of two large conference rooms and host scientists and a ful-fledged lab that will allow those on board to collect samples from various stretches of the river, perform tests on water quality and biodiversity of the wider eco system.

Brahmaputra Biodiversity Biology Boat (B4), would also be linked to smaller boats and research labs. Boat of this nature would be one of its kind in the world though there were a few precedents in China and mobile laboratories that studied the Amazon river.

6.2.1.18 The Wetlands (Conservation and Management) Rules, 2017

- A State Wetlands Authority in each State and union territories headed by the State's environment minister.
- They will also include one expert each in the fields of wetland ecology, hydrology, fisheries, landscape planning and socioeconomics to be nominated by the state government.
- These authorities will prepare a list of all wetlands, develop a comprehensive list of activities to be regulated and permitted within the notified wetlands and their zone of influence, recommend additional prohibited activities for specific wetlands, define strategies for conservation and wise use of wetlands
- Wise use is defined as the principle of sustainable uses that is compatible with conservation.
- A comprehensive digital inventory of all wetlands within one year which will be updated every ten years.
- The rules prohibit activities like conversion of wetland for non-wetland uses

6.2.1.19 Third National Wildlife Action Plan

The third National Wildlife Action Plan, spells out the roadmap for wildlife conservation until 2031, was unveiled on Global wildlife programme this year.

- The first such plan was implemented from 1983 to 2001and ,second 2002-16.

The Third Plan

- This is the first time India has recognised the concerns relating to the impact of climate change on wildlife It stressed on integrating actions .
- The plan adopts a "landscape approach"in conservation of all wildlife uncultivated flora and fauna that have an ecological value to the ecosystem and to mankind irrespective of where they occur.
- The government has also underlined an increased role for the private sector in wildlife conservation. This includes increasing CSR participation for implementation.

6.2.1.20 Bamboo declassified as a tree

To increase the supply and usage of bamboo.

- Bamboo has carbon sequestering properties.
- Due to policy issues, the supply of bamboo is restricted
- Bamboo is considered a non-timber forest produce under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (FRA).
- However, it is classified as a tree under the Indian Forest Act.

The amendment will encourage farmers and other individuals to take up plantation/ block plantation of suitable bamboo species on degraded land, in addition to plantation on agricultural land and other private lands under agroforestry mission. Thus

- Increasing the income of farmers.
- Increasing the green cover of the country.
- Conservation and Sustainable development

7. INTERNATIONAL LEVEL

7.1 India hosts Global Wildlife Programme

India jointly host the Global Wildlife Programme (GWP) with World Bank and United Nations Development Programme

- The GWP will address issues related to illegal wildlife trade across 19 countries in Asia and Africa

- It will act as a platform to exchange knowledge and coordinate in onground action for combating illegal poaching of wildlife and improve governance on wildlife conservation

7.2 International Agrobiodiversity Congress

The first International Agrobiodiversity Congress (IAC) held in New Delhi has adopted New Delhi Declaration on Agrobiodiversity Management.

- In the declaration, 900 participants from 60 countries have urged researchers and policy-makers to strengthen and promote complementary conservation strategies to conserve and use agrobiodiversity.

The Congress addressed seven themes:

- agrobiodiversity for food and nutrition;
- agrobiodiversity for adaptation to climate change;
- intellectual property rights (IPRs) and access and benefit-sharing (ABS) and farmers' rights; quarantine, biosafety and biosecurity issues;
- conservation strategies and methodologies;
- science-led innovation for agrobiodiversity management and sustainable use; and
- Capacity-building and strengthening partnerships.

7.3 Biosphere Reserves (BR)

Biosphere Reserve (BR) is an international designation by UNESCO for Representative parts of natural and cultural landscapes extending over large Area of terrestrial or coastal/marine ecosystems or a combination·

- BRs are special environments for both people and the nature and are living examples of how human beings and nature can co-exist while respecting each other needs.
- This is over all development through partnerships between people and nature through innovative ideas

Structure of BR

Core zone:

It should be kept absolutely undisturbed and contain suitable habitat for numerous plant and animal species, including higher predator.

Buffer zone:

It is adjoins core zone with limited recreations, tourism, fishing and grazing and research will be allowed, without disturbing core area.

Transition zone:

This is outermost part, which connect with settlements, crop lands etc.

How BR is different from protected areas?

- BR is for conservation of overall biodiversity and landscape, rather than Some specific flagship species.
- Generally, BRs include of protected area but need not be always around them.

Criteria to select BR

- Primarily a site that must contain an effectively protected and minimally disturbed core area of nature value with additional land and water suitable for research and conservation efforts

Man and Biosphere (MAB) programme:

- It is a Intergovernmental scientific programme guided by UNESCO Man and Biosphere (MAB) programme for the improvement of the relationships between people and their environment globally
- India is a signatory to the landscape approach supported by MAB programme.

There are 18 biospheres recognised by UNESCO in India. Those are
ColdDesert(HimachalPradesh),NandaDevi(Uttrakhand),Khangchendzonga(Sikkim), DehangDebang(ArunachalPradesh),Manas(Assam),DibruSaikhowa(Assam),Nokrek (Meghalaya), Panna(MadhyaPradesh),Pachmarhi(MadhyaPradesh),Achanakmar-Amarkantak(Madhya Pradesh-Chhattisgarh), Kachchh(Gujarat), Similipal(Odisha), Sundarban(WestBengal),Seshachalam(AndhraPradesh), Agasthyamalai(Karnataka-Tamil Nadu-Kerala), Nilgiri(Tamil Nadu-Kerala), Gulf of Mannar(Tamil Nadu)
Great Nicobar(Andaman & Nicobar Island)

7.4 Ozone Layer Protection

Recent observations have showed signs of mending of this ozone hole.

What is Ozone Hole?

Ozone hole is a region of exceptionally depleted ozone in the stratosphere over the Antarctic that happens at the beginning of Southern Hemisphere spring (August–October).

What has caused the healing?

- The Montreal Protocol has led to reduction in the production and release of CFCs in the atmosphere.
- The most dominating factor in the depletion of ozone layer is the release of Chlorine from CFCs molecules.

The Vienna Convention on Protection of Ozone Layer

- Was adopted in 1985 and entered into force in 1988.
- The convention became the first convention of any kind to get universal ratification in 2009.
- The convention promotes research and development on the effects of human activities on the ozone layer and to adopt legislative and administrative measures against activities likely to harm the ozone layer.

Kigali Agreement

- The Kigali Amendment amends the 1987 Montreal Protocol to now include gases responsible for global warming and will be binding on countries from 2019.
- It also has provisions for penalties for non-compliance.
- It is considered absolutely vital for reaching the Paris Agreement target of keeping global temperature rise to below 2-degree Celsius compared to pre-industrial times.
- Under it, developed countries will be provided enhanced funding support
- All signatory countries have been divided into three groups with different timelines to go about reductions of HFCs.
- First group: It includes richest countries like US and those in European Union (EU). They will freeze production and consumption of HFCs by 2018.
- Second group: It includes countries like China, Brazil and all of Africa etc. They will freeze HFC use by 2024 and cut it to 20% of 2021 levels by 2045.
- Third group: It includes countries India, Pakistan, Pakistan, Iran, Saudi Arabia etc. They will be freezing HFC use by 2028 and reducing it to about 15% of 2025 levels by 2047.

7.5 Paris Agreement

The Paris Agreement is an agreement within the United Nations Framework Convention on Climate Change (UNFCCC) dealing with greenhouse gases emissions mitigation, adaptation and finance starting in the year 2020.

- India is the 62nd country to ratify the agreement and accounts for 4.1 per cent of the emissions.

- The Paris Agreement entered into force on 4 November 2016, thirty days after the date on which at least 55 Parties to the Convention accounting in total for at least an estimated 55 % of the total global greenhouse gas emissions have deposited their instruments of ratification, acceptance, approval or accession with the Depositary.

The Agreement

- Aims - Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels
- Aims - Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production
- As nationally determined contributions to the global response to climate change, all Parties are to undertake and communicate ambitious efforts . The efforts of all Parties will represent a progression over time
- Support developing country Parties for the effective implementation of this Agreement

7.6 Bonn Climate Talks (COP-23)

Bonn, Germany hosted the twenty-third round of the climate talks(COP-23) of the United Nations Framework Convention on Climate Change (UNFCCC).

- Chaired by Fiji, the first small island nation to do so
- Bonn hosts the secretariat of the United Nations Framework Convention on Climate Change.

Highlights

- This year's climate meet is taking place in the backdrop of a series of extreme weather events — hurricanes in the US and the Caribbean, devastating floods in South Asia, deficient monsoons in India, drought in Australia
- It is also the first climate meet since US President Donald Trump announced the withdrawal of US from the Paris Agreement. The terms of the treaty means the US will be able to exit only in 2020.
- Aims to finalise the rule book for the Paris Agreement
- The other big moment is the 2018 facilitative dialogue, which is an effort for countries to evaluate their national plans and increase their efforts to slow down global warming.

Status

- The trust deficit between the rich, industrialised countries and the poor, developing nations that has for long marred the negotiations appears to be back
- Developing countries have made it clear that they want a formal discussion on climate actions in the pre-2020 period
- The demand for a formal discussion was first raised by India, along with a group of 20-odd developing countries, including China, known as the Like Minded Developing Countries.
- Developed countries argue that there is no need for it
- In the pre-2020 period, the onus is on industrialised countries for climate actions.
- The second mandate period of the Kyoto Protocol becomes operational after 144 countries ratify the Doha Amendment. So far only 84 have done so. This is one of the sticking points that developing nations want addressed formally as part of the climate talks agenda

2018 Talanoa dialogue (2018 Facilitative dialogue)

- The process of Talanoa involves the sharing of ideas, skills and experience through storytelling.
- Parties should build trust and advance knowledge through empathy and understanding.
- This dialogue is mandated to take stock of the collective efforts of parties toward the long-term goal.
- The dialogue in 2018 must be aimed at finding solutions.
- FD2018 will be the first crucial step towards meeting the goals of the Paris Agreement.

About UN Climate Change

- With 197 Parties, the United Nations Framework Convention on Climate Change (UNFCCC) has near universal membership
- The UNFCCC is also the parent treaty of the 1997 Kyoto Protocol.
- The ultimate objective of all agreements under the UNFCCC is to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system, in a time frame which allows ecosystems to adapt naturally and enables sustainable development

7.7 Aviation Pollution Control

International Civil Aviation Organisation approved a landmark accord to curb aviation pollution.

- The proposal includes a mechanism for a `carbon emission tax' on airlines in order to offset emissions in the aviation sector.
- The accord requires participating countries to reduce emission by 2020 and limit it after it comes into effect from 2021.
- Participation in the deal is voluntary from 2021 to 2026. The deal becomes mandatory from 2027

7.8 The Sustainable Development Goals

The United Nations last year adopted global goals to combat poverty, inequality and climate change over the next 15 years in the most comprehensive international effort ever to tackle the world's ills.

- The SDGs are a set of 17 goals and 169 targets aimed at resolving global social, economic and environmental problems.
- To be met over the next 15 years, beginning on Jan. 1, 2016, the SDGs replace the eight Millennium Development Goals (MDGs) which were adopted in 2000 and expired in 2015.

7.9 Business and Climate Summit 2017

Venue: New Delhi (first summit in India)

- It is a leading annual forum for businesses, investors and policymakers on climate action.
- It is where business and governments come together to agree on a roadmap for reaching net zero emissions over the next half century.
- It demonstrates how low carbon strategies are good for business and good for growth.
- The businesses hold the key to meeting global carbon reduction targets
- Collaboration between business and government is critical to success.
- Focusing on sustainable business and technology models

8. ECONOMICAL SUPPORT

8.1 Green Bonds

Emerging economies are increasingly selling green bonds to Western Investors hungry for environmentally-friendly investments

- Green bonds are intended to finance green environmental projects such as Solar and wind farms.
- Malaysia's Tadau Energy sold the world's first green Islamic bond, or sukuk.
- China accounts for over two-thirds of total emerging market green issuance
- About 62 per cent of the green bond proceeds have been allocated to Renewable energy projects followed by the low carbon transport sector and low carbon buildings.

Green Bonds in India

In 2015, EXIM bank launched India's first dollar denominated green bond and SEBI published its official green bond guidelines and requirements for Indian issuers.

- India's first green masala bond (rupee-denominated bond), was by the International Financial Corporation in London Stock Exchange for investing in Yes Bank's green bond.

8.2 The Green Climate Fund

- Was formally established by the UNFCCC (United Nations Framework Convention on Climate Change) in 2011 in Durban, South Africa.
- The idea behind Green Climate Fund was first proposed at the Copenhagen Accord in 2009.
- It was formed by 194 countries.
- The aim of the GFC is to raise $100 billion per year by 2020 for investing in low emission and climate resilient development projects.

8.3 Adaptation Fund

- Was set up in 2001 under the Kyoto Protocol of the UNFCCC.
- The fund is used to finance projects that help countries more prone to the harmful effects of climate change adapt to it.
- The fund is managed by Adaptation Fund Board

8.4 Climate-induced loss and damage

Climate-induced loss and damage continues to be neglected as the executive committee of Warsaw International Mechanism (WIM) has not been able to mobilise fund for addressing loss and damage in developing countries.

WIM

- The WIM was established at Conference of Parties (COP19) in Warsaw in 2013.
- To address loss and damage associated with impacts of climate change in developing countries, especially those that are not equipped enough to adapt
- WIM runs on subsidiary budget of the UNFCCC.