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Classroom Study Material

# ENVIRONMENT

**October 2016 – June 2017**

***Note: July, August and September material will be updated in September last week.***

Student Notes:

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Student Notes:

# 1. ENVIRONMENTAL POLLUTION

## 1.1. AIR POLLUTION

### 1.1.1. AIR POLLUTION IN INDIA: STATUS

Various studies, including the one conducted by WHO, have suggested that air quality in India has been slowly deteriorating over the past decade.

**Details of various studies:**

**WHO:**

- The World Health Organisation (WHO) recently reported that 13 of the 20 international cities with the worst fine particulate matter (PM2.5) in air pollution are in India, and Delhi is at the top of the list.
- As many as 54% of India's population lives in regions that do not meet the National Ambient Air Quality Standard (NAAQS) for fine particulate matter, and nearly every Indian (99.5%) lives in a region with air pollution levels above the stricter guidelines of the WHO.
- WHO has also ranked outdoor air pollution among the top killers in India.

**CPCB:**

- According to the Central Pollution Control Board (CPCB), 77% of Indian urban agglomerations exceed the NAAQS for respirable suspended particulate matter (PM10).

**Other reports:**

- A new Report of International Energy Agency (IEA) has said that due to rising energy needs in India, air quality is bound to deteriorate further unless preventive steps are taken.
- A recent study by Greenpeace also shows that India has overtaken China's air pollution levels and that the average particulate matter exposure for Indians was even higher than that for Chinese.

**India and State Global Air Report 2017**

It is the first report on air quality by using the latest global data from 1990 to 2015.

- Outdoor air pollution has increased the death rate in India, surpassing the most polluted country China. India is facing some 1.1 million early deaths from air pollution.
- The report highlights that the underlying reason for increasing pollution in India can be attributed to its growth, which is happening in terms of industries and its consumption of coal as the main source of energy.

**Major strategies/steps to tackle increasing air pollution in Indian cities and urban areas,** including recent steps taken, are:

- Control and mitigation measures related to emissions from automobiles, industrial activities, notification of NAAQS;
- Formulation of environmental regulations / statutes;
- Setting up of monitoring network for assessment of ambient air quality, eg - Launching of National Air Quality Index;
- Introduction of cleaner / alternate fuels like gaseous fuel (CNG, LPG etc.), ethanol blending;
- Promotion of cleaner production processes;

- Universalization of BS-IV by 2017; leapfrogging from BS-IV to BS-VI fuel standards by 1st April, 2020;
- Comprehensive amendments to various Waste Management Rules and notification of Construction and Demolition Waste Management Rules;
- Ban on burning of leaves, biomass, municipal solid waste;
- Promotion of public transport and network of metro, e-rickshaws, promotion of car pooling, Pollution Under Control Certificate, lane discipline, vehicle maintenance;
- Installation of on-line continuous (24x7) monitoring devices by major industries;

## 1.1.2. DELHI SMOG

**About**

- Last year Delhi witnessed the worst smog in almost two decades, with consistently hazardous pollution levels being recorded for over a week.
- A number of factors were seen as responsible for the smog- stubble burning from Punjab and Haryana, vehicular pollution, Diwali crackers and rising levels of dust from construction and allied activities formed the major reasons.
- Adverse weather conditions, such as low wind speed coupled with drop in temperature and high humidity, which had blocked dispersal of pollutants, deteriorated the conditions further.

**Immediate Measures taken**

- Implementation of Odd-Even policy,
- Ban on 10 years old diesel vehicles
- Diversion of commercial vehicles not destined for Delhi and levy of **environmental compensation charge (ECC)** on commercial vehicles to discourage them from passing through Delhi.

But the **Issues with the above steps is**

- These measures are not comprehensive and do not address the root cause of the problems.
- Support needed from neighboring states has not been forthcoming.
- Even the ECC that has been collected has not been fully utilized.

**Long term Suggestions**

- Comprehensive road transport policy whereby promotion of public transport is needed. Several studies have shown that public transport provides more than 65 per cent of Delhi's commuting needs but occupies less than five per cent of road space.
- This should be coupled with imposing disincentives to purchase private vehicles. In this a combination of pollution taxes, rationalizing licensing and registration of vehicles, congestion tax, car free areas etc should be implemented.
- Urban planning should be long-term which should give enough space for non-motorised transport like cycling and walking.
- The challenge is political will as automobile is one of the most important industry in India.

**Supreme Court: graded action plan to fight Air Pollution in Delhi NCR**

The Supreme Court approved a comprehensive action plan prepared by Union Ministry of Environment, Forest and Climate Change (MoEFCC) to tackle air pollution emergencies in the capital.

**Salient Features**

- It categorizes four levels of air pollution based on atmospheric particulate matter (PM2.5 and PM10) levels.
- Based on the air quality the grades have been classified as Emergency, Severe, Very Poor and Moderate poor. It will be enforced by Environment Pollution Control Authority (EPCA).
- Emergency measures will be automatically enforced in NCR if level of PM2.5 breaches 300 micrograms per cubic metre (µgm/m3) and PM10 levels stay above 500 (µgm/m3)for two consecutive days.
- The plan recommends measures like odd-even car rationing scheme and ban on construction activities to combat air pollution. During 'very poor' air quality, it recommends banning diesel generators and parking fee increased by three to four times.
- It also lists a number of other measures such as closing brick kilns, stone crushers, hot mix plants and intensifying public transport services and increasing the frequency of mechanised cleaning and sprinkling of water on roads.


## 1.1.3. STUBBLE BURNING

**Why this problem of stubble burning?**

- **Cost Factor:** The straw management equipment is costly and the process is time consuming. Also, the cost of stubble management is not taken into account while determining the minimum support price (MSP).
- **Increasing mechanisation of agriculture:** Stubble problem was not as severe when paddy was harvested manually because the farmers use to cut it as close to the ground as possible. Due to mechanisation the crop residue that remains in the field is of larger quantity.
- **Time Factor:** The paddy-wheat system leaves farmers with the sowing time of less than a month between the two crops. Delay in sowing means yield decline. This leaves very little time to clear the farm for sowing.
- **Monoculture of wheat and paddy**. In Andhra, bean gram and black gram are planted while rice stubble decomposes on its own.

**Impacts**

- Straw burning releases pollutants especially particulate matter (PM), CO2 and ash.

- Stubble burning in the northern States significantly contributes to the poor air quality in large parts of the Indo-Gangetic Basin, with local and cascading impacts felt from Punjab and NCR region all the way to West Bengal.
- Burning leads to decline in the bacterial and fungal population in the top 2.5cm of the soil, increasing farmers' dependence on fertilizers.
- Air pollution is strongly linked to severe health impacts like pulmonary disorders, heart diseases etc.

**Efforts taken**

- National Green Tribunal has imposed a fine ranging from Rs. 2,500 to Rs. 15,000 - depending on the farm size - on farmers who indulge in burning stubble.
- Punjab has imposed a prohibition on the burning of paddy straw and has constituted a special task force for the same. It further launched initiatives aimed at better utilisation of biomass, including as a fuel to produce power, for instance Jalkheri Biomass Powerplant.
- NGT has banned crop burning in the NCR region.

**Suggestions**

- Most of the biomass is burned during the winter when the demand for fodder is rising and thus the surplus material could be efficiently utilized.
- Power production from biomass, mechanized composting and bio-gas production should be scaled up by increasing investment.
- Policy support should be given to farmers to incentivize their liberal adoption.
- Conservation agriculture needs to be popularized which would encourage farmers to use newer low-till seeding technologies allowing much of the crop residues to remain on site, and curb the release of a variety of pollutants.
- Eminent agriculture scientist MS Swaminathan has suggested **commercializing the paddy straw** to address the problem. Paddy straw can be used for making animal feed, cardboard, paper and other products. Thus, if sufficient financial incentives are given to the farmers, they would not resort to burning them.

**Way ahead**

- Agricultural experts said the government needed to address the issue holistically and not just by penalising farmers. Penalising farmers will not help because it is difficult to identify them. Moreover, the farmer is burning it out of compulsion.
- The government can support some mechanisation at the village level for taking out the straw and then putting it to use by, say, composting it. The farmer should see economic value in the exercise.
- The government should also procure pulses and oil seeds which are suitable for north India. This will change the cropping pattern.

## 1.1.4. INDOOR AIR POLLUTION

Indoor Air Quality (IAQ) refers to the air quality within and around buildings and structures, especially as it relates to the health and comfort of building occupants.

**Causes**

- The quality of air in and around buildings is seriously affected by gases (like CO2, CO, radon, volatile organic compounds), particulates, microbial contaminants or any mass or energy stressor that can induce adverse health conditions.

- Cooking fuel especially wood, charcoal, coal, dung, crop wastes in rural areas
- poorly ventilated dwellings

**Impacts**

- **Health impacts**: Exposure to household air pollution can lead to a wide range of child and adult disease outcomes, including acute and chronic respiratory conditions (e.g. pneumonia, chronic obstructive pulmonary disease), lung cancer, ischemic heart disease, stroke and cataract. The health problems due to indoor pollution is increasing, a syndrome called **Sick Building Syndrome (SBS)**.
- **Social and Environmental Impacts**: The inefficient use of solid fuels for cooking and heating is a major source of short-lived climate pollutants (e.g. black carbon) and the unsustainable harvesting of fuelwood contributes to local forest degradation. Fuel collection places a burden on the household, especially women and children.
- **Gender issues**: Women are therefore particularly affected by smoke in the home as well as the time loss due to fuel collection and stove tending.

**Interventions to reduce indoor air pollution:**

- Source control, filtration and the use of ventilation to dilute contaminants are the primary methods for improving indoor air quality in most buildings.
- Switch to Alternative fuels viz LPG, Biogas, electricity, solar power etc.
- Improved stoves
- Changes in user behaviour can also play a role in reducing pollution and exposure levels. For example, drying fuel wood before use improves combustion and decreases smoke production

**Constraint in identifying indoor pollution**

- A **big problem is absence of an effective air quality measurement system**. Many of the harmful chemical gases have low concentrations of ppb (parts per billion) levels and are extremely difficult to detect with current environmental sensor technology, which can only detect concentrations of parts per million (ppm)

**Recent development**

- Govt has launched Pradhan Mantri *Ujjwala* Yojana (PMUY) to provide LPG connection to BPL households.
- Scientists have developed **graphene-based sensor and switch** to detect air pollution at homes.
- **Neerdhur:** Recently, National Environmental and Engineering Research Institute **(Neeri) and CSIR** has developed 'Neerdhur', a novel **multi-fuel domestic cooking stove.**

## 1.1.5. FLY ASH UTILIZATION POLICY

**Why in news?**

- The Maharashtra state cabinet has recently approved the State Thermal Power Plant Ash Utilisation 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.

Student Notes:

**Key features of the Policy**

- The government has announced cluster development of ash-based industries, such as cement, in the vicinity of all thermal power plants. The industries, in joint venture with the government, will be given land, ash and tax incentives.
- Fly ash can be used for making cement, pre-fabricated building material, bricks, laying roads, housing and industrial buildings, dams, flyovers, reclaiming low-lying areas, wasteland development, stowing of mines and all other construction works. These uses will be suitably promoted.
- The government has directed departments like Rural Development, PWD, Urban development, Tribal, Social Justice and premier schemes such as Housing for All and Mukhya Mantri Sadak Yojna to use at least 15% ash component in their works.
- The coal ash can be used in the agricultural land to increase its productivity and hence agriculture department has also been roped in to promote the fly ash among farmers.
- The government has also decided to export fly ash after treating it with cenospheres, which is expected to generate revenue of Rs 1,500 crore.
- The government has decided to set-up a company, Maha Gen Management Services (MahaGeMS), to manage the ash generated at all government-run and private thermal plants in the state.

**Significance**

- It will help in cutting down air pollution as much of the fly ash pollutes the air while transportation.
- This would help in saving the ash transportation cost, a whopping Rs. 2000 crore at present, which is borne by the power stations.
- This could lead to cutting the cost of power to consumers.
- This would become the source of additional revenue for the government.

**About Fly Ash**

- 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.

**Situation in India**

- Indian coal has very high ash content - 30-40% ash content as against 10-15% in imported coal.
- Indian government has realized that this limitation can be converted into an advantage and thus steps have been taken:
  - **2009 notification of MoEF provided guidelines** on ash utilization advocated its usage within 100 km radius of thermal power plants.
  - **New and innovative uses** e.g. Manufacture of pre-stressed railway concrete sleepers
  - **Transportation cost:** Some States like Orissa have ordered the plants to subsidize the transport costs.
  - Recently Maharashtra government has decided to come up with an **export policy** for fly ash in the light of demand from places like Singapore and Dubai.
- However, India is still not able to match the potential of its fly ash use. As per a recent study by CSE only 50-60% of the fly ash generated is being utilized.
- There is a need to increase the capability, giving incentives to industry and new technology introduction in this field.

## 1.1.6. BHARAT EMISSIONS STANDARDS

**Why in News?**

- From April 2017, **all of India has moved to Bharat Stage IV (BS-IV)** vehicular emission norms. **Earlier BS-IV norms were followed across 63 Indian cities** for petrol and diesel, while the rest followed BS-III fuel.

**Technologies used in vehicles for emission reduction**

1. **Diesel Particulate filter (DPF)**:
   - It is a cylinder mounted vertically in engine compartment.
   - It is used for BS-V emission standard.
   - It removes Particulate Matter/soot from the diesel exhaust.
   - It needs temperature of 600 degree Celsius to function, difficult in Indian conditions.
2. **Selective catalytic reduction technology (SCR)**:
   - It reduces the nitrogen oxides by injecting an aqueous solution having ammonia.
   - It is used for BS-VI emission standard.
   - It is fixed in the engine exhaust.

**Background**

- India introduced emission norms in 1991 and by 1996 most vehicle manufacturers had to incorporate technology upgrades like catalytic converters to cut exhaust emissions.
- Supreme Court in 1999 made Centre notify Bharat Stage-I (BIS 2000) and Bharat Stage-II norms, broadly equivalent to Euro I and Euro II respectively,
- In 2014, Saumitra Chaudhary committee gave recommendations on **Auto Fuel Vision Policy2025** which had recommended implementation of BS-IV (2017), BS-V (2019) and BS-VI (2024) standards.
- In recent times, government has decided to move up to the toughest emission standards of BS-VI from the current BS-IV **by April 2020** skipping BS-V standard.

**Bharat Stage emission standards**

- These are norms instituted by the government to regulate the output of air pollutants from internal combustion engine equipment, including motor vehicles.
- The standards and the timeline for implementation are set by the Central Pollution Control Board under the Ministry of Environment & Forests and climate change.
- The standards, **based on European regulations were first introduced in 2000.** India has been following the European emission norms with a time-lag of five years.
- The BS-IV compliant fuels have Sulphur concentration of 50 parts per million (ppm). This will come down to as low as 10 ppm in BS-VI compliant fuels and auto engines.
- By switching to BS-VI, India will join the league of the US, Japan and the European Union, which follow Euro Stage VI emission norms.
- BS-VI is the Indian equivalent of Euro Stage VI.

**Significance**

- This would mean a lower level of harmful emissions and **reduced incidence of lung diseases**.
- At the BS-VI level, the gap maintained between emissions from diesel and petrol, wherein diesel cars are allowed to emit more particulate matter and nitrogen oxide, narrows.
- This would significantly **bring down share of vehicular pollution** by reducing concentration of carbon monoxide, un-burnt hydrocarbons, nitrous oxide and particulate matter from emissions.

**Challenges**

- Moving to BS-VI directly will **require significant technological upgrades for which auto companies may have to invest heavily**.
- Smaller bonnet cars of India may not be able to imbibe DPF in them.

- Normally it takes 4 years to upgrade and the government's vision may be too revolutionary.
- This can have the effect of making cars and other vehicles **more expensive**.
- Directly aping the Euro norms is problematic, considering that driving conditions in India are different from Europe.
- Further, improving the emission will not alone solve the problem of vehicular pollution as the **number of vehicles is disproportionately high** in Indian cities.

**Way forward**

- Government should make the emission standards transition gradual along with searching for alternative fuels like ethanol and methanol blending.
- Apart from that the government should focus on lowering the demand of fuels on the first place by promoting more physical mobility rather than vehicular mobility by following Transit Oriented Development policy.

## 1.1.7. NOISE POLLLUTION

**Why in news?**

- **"Worldwide Hearing Index"** claims Delhi to be the second worst city with highest noise pollutions.

**Report Analysis**

- Most of the people living in the noise polluted cities face hearing loss. Around **360 million people** worldwide have been facing hearing loss out of which **32 million are children**
- In next few years around **1.1 billion teenager**s worldwide are at risk of developing hearing loss due to **unsafe use of personal audio devices** and exposure to damaging levels of sounds in **noisy entertainment venues**.

**Noise pollution**

Noise can be defined as an unpleasant and unwanted sound. Noise is a physical form of pollution and is not directly harmful to the life supporting systems namely air, soil and water. Its effects are more directly on the receiver i.e. man.

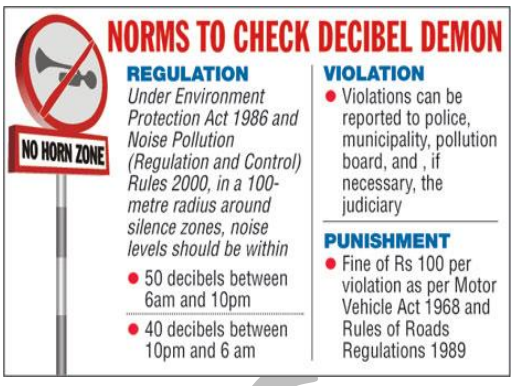
**Causes of Noise Pollution**

- **Industrialization:** Most of the industries use big machines which are capable of producing large amount of noise.
- **Poor Urban Planning:** Congested houses, large families sharing small space, lack of tree cover leads to noise pollution which may disrupt the environment of society.
- **Social Events:** Noise is at its peak in most of the social events. Whether it is marriage, parties, pub, disc or place of worship, people normally flout rules set by the local administration and create nuisance in the area.
- **Transportation:** Large number of vehicles on roads, aeroplanes flying over houses, underground trains produce heavy noise.
- **Construction Activities:** Construction activities like mining, construction of bridges, dams, buildings, stations, roads, flyovers are too noisy.

**Effects of Noise Pollution**

- **Physical Effects:** Continuous exposure to loud levels of noise can easily result in the damage of our ear drums and loss of hearing. It also reduces our sensitivity to sounds that our ears pick up unconsciously to regulate our body's rhythm.

- **Physiological effects: The psychological manifestations of noise pollution are:**
  - ✓ Depression and fatigue which considerably reduces the efficiency of a person.
  - ✓ Straining of senses and annoyance as a result of slow but persistent noise from motorcycles, alarm clocks, call bells, telephone rings etc.
  - ✓ Affecting of psychomotor performance of a person by a sudden loud sound.




- **Effect on Wildlife:** Wildlife faces far more problems than humans because noise pollution since they are more dependent on sound. The ill effects of excessive noise begin at home. Pets react more aggressively in households where there is constant noise. In nature, animals may suffer from hearing loss, which makes them easy prey. Others become inefficient at hunting, disturbing the balance of the eco-system.

**Solutions of Noise Pollution**

- Public awareness is essential for prevent and control the noise pollution.
- Transport terminals, Industries, Airport, and railway terminals sight should be far from living spaces. Construction of some soundproof machines in industrial and manufacturing installation must be encouraged.
- Avoid uses of sound processing instruments and make proper regulations for the utilize of a loudspeaker and other devices.
- Scientific urban planning: There is a need to create silence zone like Schools, Colleges, and Hospitals.
- Tree plantation: it absorbs the sound and reduces the pollution and also healthier for breathing of body.

**Steps taken by the government**

- The Govt has enacted **Noise Pollution (Regulation and Control) Amendment Rules, 2010** to control noise pollution due to loud-speakers and public address system.
- Ambient standards in respect of noise for different categories of areas (residential, commercial, industrial) and silence zones have been notified under the Environment (Protection) Act, 1986.
- Noise limits have been prescribed for automobiles, domestic appliances and construction equipment at the manufacturing stage.
- Standards have been evolved and notified for the gen sets, fire crackers and coal mines. Regulatory agencies have been directed to enforce the standards for control and regulate noise pollution.
- The recently launched Green Highway Mission will also help in reducing noise pollution around highways.

# 1.2. WATER POLLUTION

## 1.2.1. WATER PROBLEM IN INDIA

**Reforms in Water Governance**

**Why in News?**

- United Nations World Water Development Report, '**Wastewater: the Untapped Resource',** has advocated a paradigm shift from wastewater as a problem towards as a resource.
- UN Environment Programme forecasts the water crises to be the top global risk over the next decade because water demand for industry, energy and agriculture will increase by 50% by 2030.

**India and water scenario**

- India has 63 million people living in rural areas without access to clean water and half of the total households with access to water supply in their premises, depend on untreated tap-water.
- India's farms consume more water to grow the same amount of crops, compared to global averages. That crop production, grazing and animal water supply accounted for a little **over 92% of total water** use in the India. Whereas Industry and domestic use accounted for only 4.4% and 3.6%, respectively.
- Due to poor water sanitation, there is a 15% increase in water-born health problems during the last decade.
- Wastewater generation is one of the biggest challenges associated with the growth of informal settlements (slums) in India.
- A large proportion of wastewater is still released into the environment without being either collected or treated. For instance, only 8% of domestic and industrial wastewater is treated in India.
- The phenomenon of global warming has modified the ecology of major rivers of India. For instance, Ganga and Indus suffer significant-to-severe levels of water scarcity for 7 to 11 months in a year.

**Reason for Water problem in India**

- Farmers are dependent on ground-water irrigation.
- High energy subsidies to farmers have encouraged relentless exploitation.
- Lax regulation on water use.
- Lopsided price incentives, for example, incentivising paddy cultivation which in itself is a water gurgling crop.
- Lack of water expertise in government organisations.
- Underutilization of government water reservoirs.
- Centralized water treatment plants.

**Waste water treatment in India**

- There are two types of treatment in India- Sewage treatment & Effluent Treatment
  - ✓ Sewage treatment: It includes treating of water which contains waste generated by human beings
  - ✓ Effluent treatment: Includes waste generated from industrial segments
- The norms and guidelines are primarily set by Central Pollution Control Board (CPCB).

**Issues with present waste water treatment system**

- Problem of making available **adequate land and project sites for sewerage facilities**
- **Low capacity**: Only around 31% of wastewater generated and that too with huge inter-city variations.

- **Technological backwardness** of treatment plants
- **Non-competitive pricing:** Thus, it does not appeal to industries.
- **Treatment quality is low:** Use of treated water limited to some low-end industrial purposes like gardening, service water.
- **Distribution network is weak**: to transport treated water

**UN World Water Development Report 2017 Four-pronged strategy (Wastewater)**

**Reducing**
- Minimising waste water flow.
- Priority over traditional 'after-use' treatment.
- Prohibiting or controlling the use of certain contaminant.
- Monitoring and reporting of pollutant discharges.

**Removing**
- Low-cost decentralized systems of wastewater treatment systems.
- Effluent of adequate quality for several potential uses, including agriculture and allied activities.
- Can provide a safe, affordable and effective alternative to more costly centralized systems to meet the needs of unnerved populations.

**Reusing**
- Enhance water availability and offset water scarcity.
- Treating wastewater to the level most appropriate for its intended 'safe' use.
- Enhance food security and provides opportunities for improved nutrition.

**Recovery**
- Energy can be recovered from wastewater in the form of biofuel, biogas, heat, and electricity generation.
- Recovering nutrients like **nitrogen, and especially phosphorus**, from sewage sludge.

**Governance on Water**

- Water Footprint Network has identified that water related policies of the Government of India emphasis on **symbolic aspect** rather than factual outcome.
- The existing Water governance framework faces **complete lack of coordination and clarity**. For example, Mihir Shah Committee 2016 identified that India's existing water-governance system as silo-based which views ground water, river basin rejuvenation and other such challenges as isolated tasks.
- Agriculture related policies of India are indifferent to water scenario. For example, guaranteed procurement policy by the Food Corporation of India neglects the water consumption by major crops.
- Moreover, National Water Policy 2012 does not mandate any **legally liability** for any damage caused to the water resources as a result of over extraction.

**Reforms**

- **On Governance**
  - ✓ Water has multidimensional impact on life; thus, policies pertaining to it must be based on its myriad usages, for example, **WFN (Water Footprint Network) classifies water usage into three types**: green (rain water); blue (surface and groundwater); and grey (amount of water required to carry off pollutants).
  - ✓ Mihir Shah Committee advocated the coordination approach for water governance with international studies. For example, independent studies which are based on internationally comparable evapotranspiration rates (sum of water lost to atmosphere due to evaporation and transpiration via plants) must be considered for water related governance.
  - ✓ Robust infrastructure and reframe of water governance mechanism ranging from agricultural to domestic usage is the need of the hour. For instance, committee on

restructuring of Central Water Commission and Central Ground Water Board advocate for **National Water Commission (NWC**) as the nation's apex facilitation organisation dealing with water policy, data and governance.

- **On Sanitation**
  - ✓ World Health Organisation released UN-Water Global Analysis and Assessment of Sanitation and Drinking-water **(GLASS) report 2017**, advocating the need for increase in spending on sanitation, drinking-water and hygiene.
  - ✓ Robust awareness programmes in informal settlement is need of the hour; this is because, GLASS report 2017, highlighted that there is neglect of WASH (Water Sanitation and Hygiene) approach in government policy.
- **On Conservation**
  - ✓ Community based water quality monitoring guidelines should be encouraged. Infrastructure intrinsically linked to ground water recharge must be adopted for sustainability.
  - ✓ Besides reducing pollution at the source, policy initiatives must shift focus towards removing contaminants from wastewater flows, reusing water, and recovering useful by-products. For instance:
    - In Singapore and the southern California coastal city of San Diego, residents already drink recycled water.
    - Japan's sewage operators use bio-solids as a carbon-neutral form of energy.
    - According to World Water Development Report 2017, more than a fifth of global phosphorus demand worldwide could be met by recycled human urine and faeces.
    - Waste water is a rich source of nutrients, minerals and energy all of which can be cost-effectively extracted.

**National Hydrology Project**

- It will set up a system for timely and reliable water resource data acquisition, storage, collation and management
- It will help to build capacity of state and central organisations in water resource management through the use of information systems and adoption of state-of-the-art technologies like remote sensing
- It will assist in promoting 'efficient and equitable' use of water, especially groundwater, down to the village level and provide information on quality of water as well.

**Groundwater Management**

Water crisis has become a major problem in India. The unchecked exploitation of ground water is a cause as well as consequence of this. The government early this year has taken steps towards the successful management of ground water.

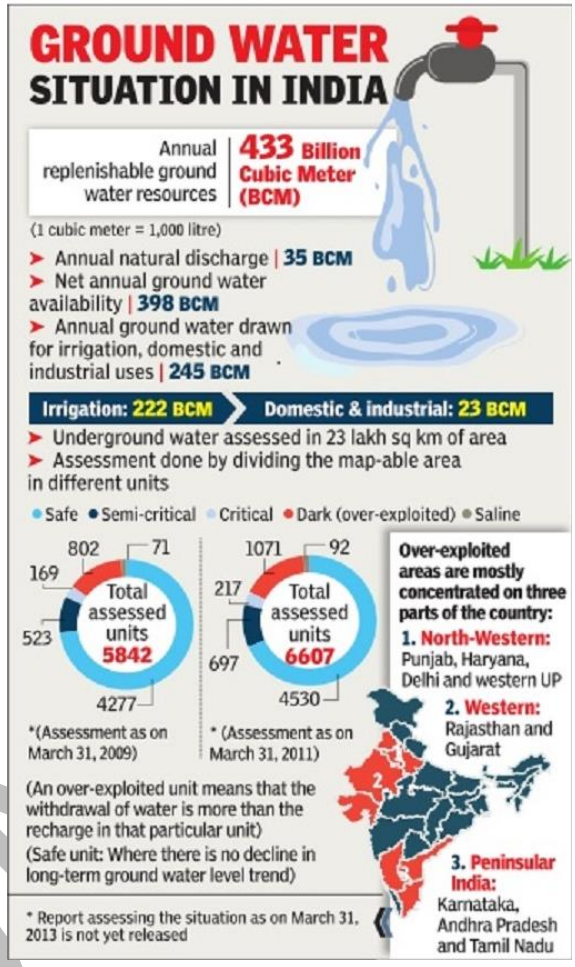
**What is groundwater exploitation?**

- **Excessive withdrawal of groundwater** for various purposes including **irrigation, domestic and industrialization**, which result in decline in ground water levels.
- On the other hand, ground water recharge in many areas is reduced due to varied & **erratic rainfall pattern** as well as change in land use.

**Government Efforts**

- The **National Water Policy (2012)** was formulated which **advocates conservation, promotion and protection of water and highlights the need for augmenting the availability of water** through rain water harvesting, direct use of rainfall and other management measures.
- **Building pools**, dug wells using MNREGA- this was also announced in this year's budget speech

- Watershed development in specific areas**; Neeranchal scheme** was launched for this
- **Rainwater harvesting**- awareness, education, tax incentives, easy infra availability
- **National Acquifer map**; for location based implementation
- **Promoting rational use of ground water**; Cropping patterns, rationalization of electrical subsidy, agro-forestry, micro-irrigation practices etc
- **Greater awareness**- making use of extension services. CGWB has been organizing **mass awareness programmes** in the country to promote rain water harvesting and artificial recharge to ground water.




**National Water Framework Law**

The draft bills — the National Water Framework Bill and the Model Bill for the Conservation, Protection, Regulation and Management of Groundwater were uploaded by the government. They aim to decentralise water management and give more power to panchayats and gram sabhas to decide how water can be better used

**Important Features**

- Acknowledgment of citizen's right to safe water
- Stringent rules on how corporations and large entities can extract ground water; ownership of land doesn't extend to ground water which is a community owned product. Groundwater would not be a free resource; even paid use will be allowed in a sustainable manner- ensuring equitable availability to all.
- fines ranging from Rs.5,000 to Rs. 5,00,000 depending on the level of infraction and who the perpetrators were
- More say to end-users of water, Panchayats and local bodies
- Priority wise use of ground water; top priority in the use of groundwater ought to be in meeting drinking, sanitation, food security, sustenance agriculture, the needs of women and only after that for industry.
- There will be an incentive for those who cultivate less water-intensive crops.

There would also be groundwater security boards and groundwater protection zones that would be overseen by State bodies

## 1.2.2. CLEANING GANGA

**Why in News?**

National Green Tribunal recently prohibited all camping activity on beaches along the Ganga which fall within 100 meters from the middle of the river during lean season flow from Shivpuri to Rishikesh, a hub for eco-tourism and river rafting.

**Why rejuvenating Ganga is important?**

- The river has immense religious significance and considered as the holy river of the Hindus.
- The Ganga drains an area of approximately 10 lakh sq. kms (26% of land mass of India).
- The river basin directly and indirectly affects the largest population of any river in the world with over more than 53 crore people (43% of population).
- Power generation: 4000 MW of power projects on Ganga alone.

**Background of Ganga Cleaning**

The various types of pollution abatement schemes taken up to clean Ganga may be categorized into core and non-core schemes.

- **Core Schemes** include Interception and diversion (I&D) of sewage discharging into the Ganga River and creating treatment infrastructure to treat the intercepted sewage.
- **Non-Core Schemes** include Providing Low Cost Sanitation (LCS) at community and individual levels at identified locations, Installation of Crematoria (electric as well as wood based improved crematoria), River Front Development (RFD) including bathing ghats, Afforestation, protecting bio-diversity and creating Public awareness and participation.

**History of Cleaning Ganga process**

**Ganga Action Plan(GAP) Phase I & II:**

- Phase I was launched in 1985, covering 25 Ganga towns in three states.
- Phase II launched in 1993 covered 59 towns in five states;
- Rivers such as Yamuna, Gomti, Damodar, Mahananda had separate action plans.

**NGBRA**

- Setting up of National Ganga River Basin Authority NGRBA in 2009
- Focused on a basin-specific approach; 43 towns were covered in five states.

**National Mission for Clean Ganga**

- National Mission for Clean Ganga(NMCG) was registered as a society on 12th August 2011 under the Societies Registration Act 1860.
- It acted as implementation arm of National Ganga River Basin Authority (NGRBA).

**Why they failed:**

- Increase in population, urbanization, industrialization was much more than cleaning efforts.
- Lack of concerted efforts by all the stakeholders.
- The plan was not able to connect with the population at the ground level.
- Gap in capacity creation for sewage treatment and daily discharge. Also a lot of this capacity has remained underutilised or non-functional.
- The discharge of urban sewage is only one of several interventions required to rid the river of pollution.

**Namami Ganga Programme**

- In May 2015, the Centre had approved the Namami Gange Programme with an outlay of Rs 20,000 crores for five years i.e. till 2020.
- It has three components: 'aviraldhara' (uninterrupted flow), 'nirmaldhara' (clean flow) of Ganga; and ensuring ecological and geological integrity.

- Following are proposed to be taken up under NamamiGange:
  - Ensuring ecological rejuvenation by conservation of aquatic life and biodiversity.
  - Promotion of Tourism and Shipping in a rational and sustainable manner.
  - Knowledge Management on Ganga through Ganga Knowledge Centre.

**Mechanism/ functioning of Namami Gange Programme**

- **Institutional mechanism**:
  - ✓ The **program would be implemented by** the National Mission for Clean Ganga (NMCG) and State Program Management Groups (SPMGs).
  - ✓ A **three-tier mechanism has been proposed for project monitoring** comprising of –
    - High level task force chaired by Cabinet Secretary assisted by NMCG at national level
    - State level committee chaired by Chief Secretary assisted by SPMG at state level
    - District level committee chaired by the District Magistrate.
- **Administration**:
  - ✓ Centre will **provide for operation & maintenance** of the assets for a minimum 10 year period (unlike previous Ganga Action plans)
  - ✓ **Adopt a PPP/SPV approach** for pollution hotspots.
  - ✓ **Focus on pollution abatement interventions namely** Interception, diversion & treatment of wastewater through bio-remediation, appropriate in-situ treatment, innovative technologies, sewage treatment plants (STPs) and effluent treatment plant (ETPs).
- The **River Ganga Authorities Order 2016** has created **National Council for River Ganga** under Prime Minister for superintendence of pollution prevention of Ganga basin.

**Recent Initiative by the government under Namami Gange**

- **Ganga Manthan**- a national conference to discuss issues and solutions for cleaning the river.
- **Ganga Task force**- first company of Battalion was deployed at Garhmukteshwar.
- **Ganga Gram Yojana:** 1600 villages situated along the banks of river Ganga will be developed under this scheme.
- MoU with Rotary India to implement **'WASH in school'** program. The program includes the implementation of Water, Sanitation and Hygiene services in the targeted government schools.

**Present hurdles in cleaning program of Ganga**

- 'Unreasonable' directions by the National Green Tribunal (NGT) questioning the operating capacity of sewage treatment plants in Uttar Pradesh. This has led to delay in clearances of STPs by State governments to execute projects.
- Lack of coordination between the Centre and state governments
- According to Parliamentary Committee on Environment and Forests the mission has failed due to
  - ✓ Undue investment on technical aspects like creating sewage treatment plants to prevent the pollution in river Ganga without involving people living on the banks of the river.
  - ✓ Ignoring of the social aspects of pollution in the rivers.
  - ✓ Encroachment of the catchment areas and diversion for construction and developmental activities.

Student Notes:

**Major factors of Ganga pollution and steps to solve them**

**(a) Treating Urban Sewage**

- Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal together generate over 7,300 million litres of sewage per day that flows directly or indirectly into the river.
- Creating sewage treatment plants (STPs) is one major task to be completed to solve the problem of sewage.
- The government has now decided to rope incorporates to do this work in all the 118 urban centres along the river.

**Others Initiatives that can be taken**

- They include the launch of a public awareness exercise, regeneration of aquatic biology, plantations, and riverfront development.
- GIS data and Spatial Analysis for Ganga basin
- Afforestation – Conservation of Flora
- Capacity building of urban local bodies
- A comprehensive law on the Ganga can also help in giving legal backing.

**(b) Rural Sewage**

- About 1,650 gram panchayats lie directly on the banks of the Ganga About half the population in these villages defecates in the open.
- The government plans to use biological means to deal with this waste. It wants to experiment with **Seechwal model** (inculcated the practice of segregation of solid and liquid waste, treatment of waste water through oxidation ponds, use of treated water for irrigation, and composting of solid waste with a sense of community participation and ownership of the river.)

**(c) Industrial Effluents**

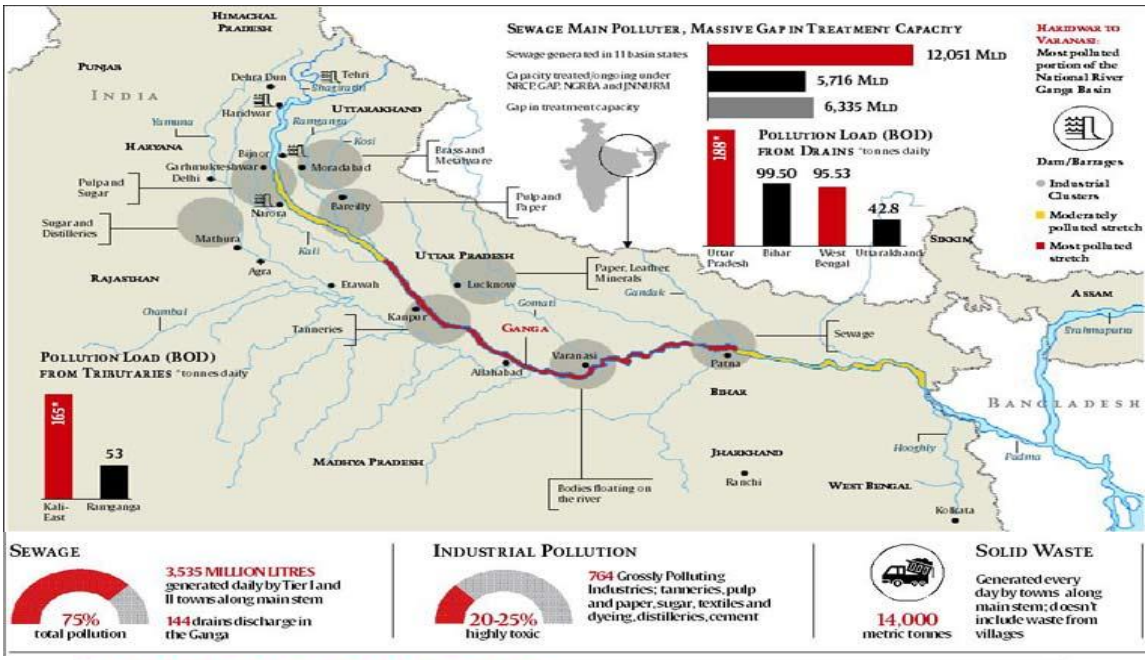
- There are 764 polluting industries on the banks of the Ganga, mostly in Uttar Pradesh. These include tanneries, paper and pulp industries, sugar mills, dyeing factories, distilleries, and cement plants. Effluents from all these flow untreated into the river.
- Industries must install Common effluent treatment plants (CETPs), install new technologies, and ensure zero liquid discharge into the river.

**(d) Surface Cleaning**

- Solid waste, clothes, polythene, and all kinds of religious offerings are dumped into the river, and float on its surface.
- Machines called trash skimmers have been ordered from abroad to clean the river surface.

**(e) Burning the Dead**

- Cremation along rivers and immersion of remains is a unique reason for pollution in Indian rivers, and especially the Ganga. Burning of wood leads to air pollution as well.
- Need to build gas or electric crematoriums, especially in religious centres like Varanasi and Allahabad.




# RIVER CLEAN-UP ACT

**DRAFT GANGA ACT:** Centre will bring a bill after consulting states and central ministries

**KEY POINTS**

1. Sets December 31, 2020 as deadline to free the river from pollution

**2 STRICT PENALTY PROVISIONS FOR VARIOUS POLLUTING ACTS**

**a. No person will spoil or deface 'ghats' and stairs** by disposing of any kind of solid waste on river bank by any means, including incineration/burning

Punishment | One-month jail or fine up to **₹10,000** or both

(Exception: Ritual ceremonies of human corpses as per prevailing practice will not be an offence)

**b. Encroachments on the river bank or flood plain**

Punishment | Three months' jail or fine up to **₹5,000** or both; fine will increase by **₹5,000** for every day during which contravention continues

(Exception: Temporary encroachment for religious or traditional ceremony will be allowed for specific time period)

**c. Punishment for adopting non-organic farming in flood plain**

Punishment | One month jail or **₹2,000** fine or both. Fine may increase to **₹10,000** if violation continues

**d. Punishment for contaminating river by throwing non-degradable plastic, waste batteries or hazardous chemicals**

Punishment | Jail up to 7 years with fine as fixed by local bodies

**e. Disrupting flow of river through construction or change of design of storage capacity of dams:** Two years' jail or fine up to **₹100 crore** or both

**f. Discharge of industrial effluent or untreated sewage**

Punishment | Up to seven years jail or **₹10 lakh** fine or both; **₹5 lakh** for every day if violation continues

3. Setting up Integrated Development Council for overall monitoring of Ganga —PM will be ex-officio chairperson, central ministries, CM will be members

4. Setting up National River Ganga Management Corporation (headed by Ganga rejuvenation minister) for implementation of various river cleaning projects

5. Setting up Ganga Volunteer Force for protection, security and enforcement activities

## 1.2.3. COMMITTEES RELATED TO GANGA

**Background**

- **In 2016, government had formed 2 committees** on cleaning of river Ganga and prepares adequate law on it.
  - **Girdhar Malviya committee** given the charge to **prepare** a draft law on clean and uninterrupted Ganga. It recently submitted its draft model law to the government on cleanup of river Ganga and its tributaries.
  - **Madhav Chitale committee** was formed to prepare guidelines for de-silting the river stretch between Bhimgauda (Uttarakhand) and Farakka (West Bengal).
- Recently, **Uttarakhand High Court has given Ganga and Yamuna the status of 'living rivers',** thus allowing petitions on behalf of rivers from anyone.

**Girdhar Malviya Committee**

- The committee recognized the challenges being faced to maintain the wholesomeness - Nirmalta (cleanliness) and Aviralta (uninterrupted flow) of Ganga perpetuated due to
  - Over stressed water demand from agricultural, domestic and industrial sectors
  - Sustaining the religious faith, historical and social belief
  - No possible increase in availability of water in river course in comparison to the increasing demands
  - Apprehension of climate change affects.
- It has also come up with a draft model law (*See provision in the box).*

**Significance**

- A law with penalties defined for individual acts of polluting Ganga **will deter** the polluters to pollute rivers.
- **Target specific timeline** will enable the government to **effectively plan the cleaning of the rivers**.
- Such law combined with the High court judgment of living rivers would **help in the easy use of the judicial process to keep the executive government accountable** to clean Ganga.

**Challenges**

- The draft law tries to give exceptions. These exceptions could be hard to monitor because of their subjectiveness.

**Living Rivers - The Court's verdict**

- The Ganga and TheYamuna, all their tributaries, glaciers like Gangotri, Yamunotri and forests are declared as living person with all corresponding rights, duties and liabilities.
- Director of the Namami Gange programme, the Uttarakhand Chief Secretary, and the Advocate-General of Uttarakhand would serve as "parents" for the rivers.
- In July, SC put a stay order on the High Court's decision.

**Earlier precedents**

- Earlier New Zealand has recognised the Whanganui River aecosystem as living being after relentless effort by the Iwi indigenous peoples who live along the bank of river by passing Te Awa Tapua bill.

**Significance**

- Recognition of the rivers' rights is based on its value for socio-political-scientific development and the spiritual significance as they serve us but it should be due to their innate qualities and being a part of overall ecosystem.
- It has potential ramification of legal litigations if a situation arises when private and public property are damaged by river and other streams as they are considered legal living person now.

- Civil society also needs to be involved in the monitoring and the implementing process which has not been explicitly dealt in the draft law.

**Chitale Committee Recommendations**

- It observes that it is **impossible to apply a "one-size-fits-all" approach to sediment management and control** because of regionally-specific issues like topography, river control structures, soil and water conservation measures, tree cover, and riparian land-use or land disturbance having impact on sediment loads in rivers.
- It has recommended to -
  - **Study reach wise sediment transport processes** along with establishing annual sediment budgets to guide de-silting activities
  - **Prepare annual reports (Sand registry)** describing the previous de-silting/ dredging activity.
  - **Entrust a technical institute to conduct the sediment budget**, morphological and flood routing studies that would examine and confirm the necessity of the de-silting of the reach under consideration.
  - River morphological studies should be carried out to initiate in-stream channel improvement works.
- **Catchment Area Treatment and Watershed Development works**, along with good agricultural practices and river bank protection are necessary to reduce silt inflow.
- Instead of "keeping the silt away", **strategy to "giving the silt way" should be adopted**.
- In case where constriction is causing large scale siltation, de-siltation along the preselected channel to deepen and attract the flow could be tried to guide the main course of flow.
- **De-silting of the confluence points**, especially with huge silt carrying tributaries, such as Ghagra, Sone, etc., may be necessary to make confluence hydraulically efficient.
- The Ganga Flood Control Commission should be entrusted with additional mandate to carry out necessary studies on sediment management in river Ganga.

**Significance**

- Recommendations if implemented can improve hydraulic performance of the river and also be a solution towards reducing the impact of pollution of rivers.
- Desiltation of this stretch would also provide easier navigability of water transport. Promotion to river transport would also have ancillary benefits like lesser pollution, more employment etc.

**Challenges**

- The de-siltation may result into some adverse impacts like River bed degradation, Bank erosion, Channel widening, lowering of water surface elevations etc. This should be prevented to the maximum extent.

## 1.3. E-WASTE

Last year, the Ministry of Environment and Forests has issued the E-waste (Management and Handling) Rules 2016 that have replaced the earlier Rules of 2011.

**E-waste situation in India**

- As per report by Assocham-KPMG, India is the 5th largest producer of e-waste in the world discarding roughly 18.5 lakh metric tonnes of e-waste each year.

- **12% of the waste is contributed by the telecom sector alone**, with 25% of the mobiles in circulation ending up in e-waste annually.
- 95% of the e-waste in the country in handled by unorganized sector. They adopt a highly unscientific way of handling waste that is extremely hazardous to environment and health. The new rules would help in putting a check on this.

**Main Features of the new Rules**

- **Applicability**
  - ✓ Earlier it was applicable only to producers and consumers, dismantlers and recyclers. Now extended to Manufacturer, dealer, refurbishers and Producer Responsibility Organisation (PRO). This will help in stopping leakage of e-waste to informal sector
  - ✓ Earlier only Electric and Electronic equipments were covered. Now even their components and spare parts are also covered. Also Mercury containing lamps like CFLs also included.
- **Extended Producers' Responsibility (EPR)**:
  - ✓ Single EPR Authorization for Producers is now being made CPCB's responsibility to ensure pan India implementation.
  - ✓ Further, flexibility is given for ease of implementation of EPR provisions. Options like setting up of PRO, e-waste exchange, e-retailer, Deposit Refund Scheme are given to Producers to ensure efficient channelization of e-waste.
- **Deposit Refund Scheme** is an additional economic instrument introduced.
  - ✓ Under **E-waste exchange** independent companies could offer services of sale and purchase of end-of-life equipments.
  - ✓ Collection is now exclusive responsibility of the Producer. There is no separate authorization needed for this as was required earlier.
  - ✓ A target based approach has been mandated for collection. This is 30% of the quantity of waste generated in first phase and will eventually move to 70% in 7 years.
- **Bulk Consumer responsibility**: They have to file annual returns. Health facilities have been added to the definition.
- **Participation of State government**: Involvement of state government for effective implantation of the rules and simultaneously ensure welfare, safety and health of the workers.
- Provision on **Reduction of Hazardous Substances (RoHS) during manufacturing stage** has been brought in line with existing EU regulations. A provision for withdrawal and recall of the products in case of non-compliance is added.

**What is EPR?** Extended producer responsibility (EPR) is a strategy designed to promote the **integration of environmental costs associated with goods** throughout their life cycles into the market price of the products.

**Why EPR is important?**

EPR makes manufacturers of electronic products responsible for the end-of-life management of their products. They have to set up collection centres and ensure that waste is recycled and disposed of in an environment-friendly manner.

By shifting the burden of waste management onto manufacturers, the EPR framework, in theory, creates incentives for more environment-friendly product designs. Since manufacturers are incurring the cost of disposal, their designs will incorporate less toxic and easily recyclable materials, thereby reducing input material requirement because more inputs get reused.

**What is Deposit Refund Scheme (DRS)**: In a DRS, an upfront deposit is charged to the consumer at the time of purchase of the product and the deposit is refunded when the product is safely returned to the producer.

**Challenges**

- The recycling capacity needs to increase. Presently it can handle only half of the waste produced.
- Segregation of urban solid waste management has to improve where many e-waste get mixed.
- Habit of Indian households to cling on to defunct gadgets and not letting them go.

**Evaluation of e-waste rules 2011**

- **Growth of formal sector:** The number of registered (regulated) waste processing units has gone up from 23 to about 150, according to the Central Pollution Control Board. Despite this increase, only about 5-15% of e-waste is channelled through the formal sector.
- **EPR performance:** Although most manufacturers provided information on how to deposit used equipment, but not much is happening on the ground.
- **Low consumer awareness:** On the consumer side, most institutional waste generators such as educational institutions and industries, which generate close to 70% of the e-waste, are not aware of the rules and continue to sell their e-waste to the informal sector. Overall, the impact of the e-waste rules is disappointingly limited.

**Why rules not effective?**

- Unlike EPR regulations in other countries, no collection or recycling targets are imposed on producers. In the absence of targets, and in a relatively lax regulatory environment, producers have little incentive to ensure collection of their used products.
- Low consumer awareness: Only highly environmentally- conscious consumers will search for the nearest collection centre. In contrast, a rag-picker will come to the consumer's house to pick up the waste and, to top it off, will pay the consumer.
- Ignoring of informal sector in formal planning

**Way ahead**

We need to integrate the large informal sector into the formal waste processing industry. The government and the manufacturers have to recognize the informal sector and find mechanisms to bring it into the fold of formal waste management. The results of a few efforts currently underway will help us better understand how successful waste management can include all stakeholders.

# 1.4. SOLID WASTE MANAGEMENT

## 1.4.1. PLASTIC POLLUTION

### A. NEW PLASTIC WASTE MANAGEMENT RULES

**Why in news?**

Government in 2016 has amended the Plastic Waste (Management and Handling) Rules, 2011.

**Main Changes**

- **Increasing the minimum thickness of plastic carry bags** from 40 microns to 50 microns. This would increase the cost and the tendency to provide free carry bags would come down.

- **Responsibility of local bodies**: Rural areas are brought under the rules since plastic has reached rural areas as well. The *gram sabhas* have been given responsibility of implementation.
- **Extended Producer Responsibility**: Earlier, EPR was left to the discretion of the local bodies. First time, the producers and brand owners have been made responsible for collecting waste generated from their products.
- **Record Keeping**: Producers are to keep a record of their vendors to whom they have supplied raw materials for manufacturing. This is to **curb manufacturing of these products in unorganised sector**.
- **Responsibility of waste generator:** All institutional generators of plastic waste shall segregate and store the waste generated by them in accordance with the Rules, and handover segregated wastes to authorized waste disposal facilities.
- **Responsibility of street vendors and retailers**: Not to provide such carry bags or fine would be imposed. Only the registered shopkeepers on payment of a registration fee to local bodies would be allowed to give out plastic carry bags on charge.
- To promote the use of plastic for road construction or energy recovery.

**Why not ban plastic bags?**

- As per the Environment ministry an eco-friendly product, which is a complete substitute of the plastic in all uses, has not been found till date. In the absence of a suitable alternative, it is impractical and undesirable to impose a blanket ban on the use of plastic all over the country.

**Plastic Pollution: A brief**

**Causes:**

- **Plain Old Trash:** Trash dumps and landfills are unfortunate major problems, as they allow pollutants to enter the ground and affect wildlife and groundwater for years to come.
- **It is Overused:** As plastic is less expensive, it is one of the most widely available and overused item in the world today. When disposed, it does not decompose easily and pollutes the land or air nearby when burned in the open air.
- **Fishing Nets used in** Commercial fishing.

**Impacts**

**(a) MARINE POLLUTION**

- Photodegradation of plastics makes plastics small enough to be ingested by aquatic organisms thereby entering the food chain.
- floating debris can absorb organic pollutants from seawater, including PCBs, DDT
- facilitate the spread of invasive species that attach to floating plastic in one region and drift long distances to colonize other ecosystems.
- On the macroscopic level, the physical size of the plastic kills fish, birds and turtles as the animals' digestion cannot break down the plastic
- toxic chemicals such as bisphenol A and polystyrene can leach into waters from some plastics.

**(b) LAND DEBRIS/LAND FILLING:**

- Harmful for terrestrial animals as ingestion leads to chocking and death
- Landfills pollutes the water sources and may clog drains leading to flooding by rain water
- Acts as an adsorbent for various chemicals which further increase its toxicity

**(c) AIR POLLUTION**

Burning of plastics produces harmful toxins which pollute the air

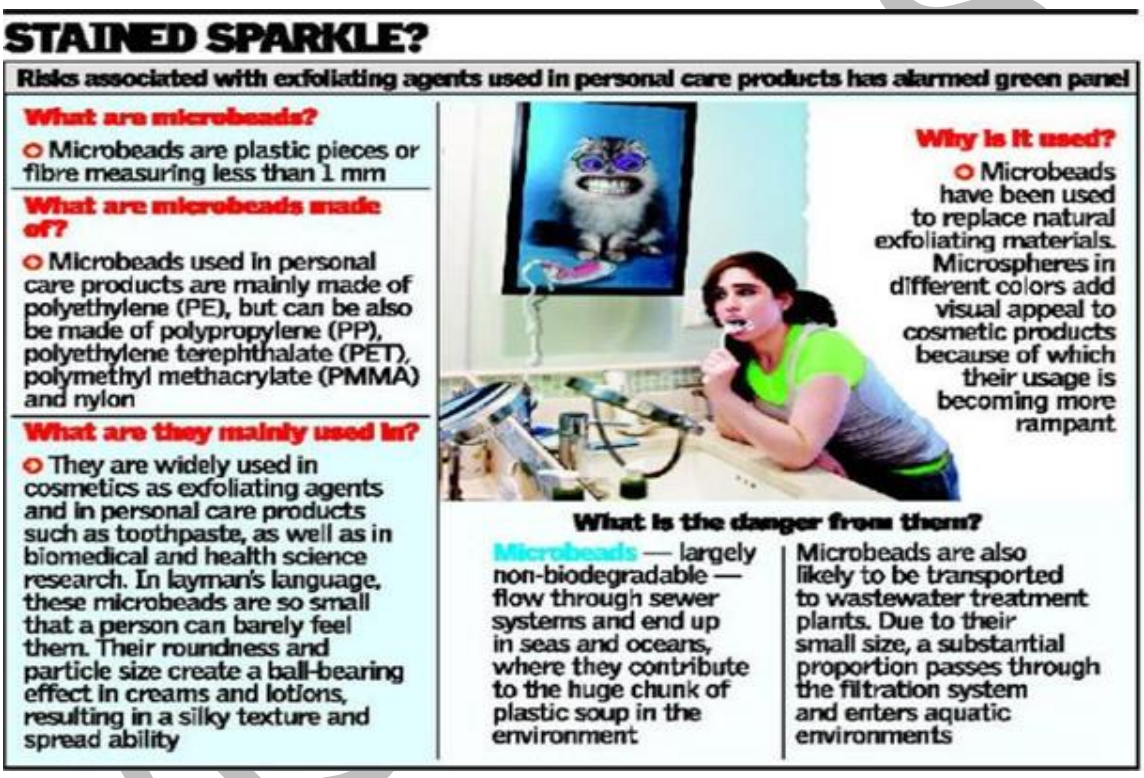
**(d) Impact on animals/wildlife:** plastic ingested by animals leads to their death.

**B. MICROPLASTICS**

**What are they?**

Microplastics are small plastic particles in the environment that are generally smaller than 1mm. They can come from variety of sources including cosmetics, clothing and industrial processes.

- Primary microplastics are manufactured and are direct result of human material and product use. Secondary Microplastics are microscopic plastic particles derived from the breakdown of larger plastic debris. Both types are found to persist in the environment at high levels.
- As they do not breakdown for many years they can be ingested and incorporated into and accumulated in the bodies and tissues of many organisms.




**Sources:** Microplastics enter the oceans through litter when waste such as plastic bags etc are discarded. Another source is microbeads, tiny particles of hard plastic that are used in cosmetics. The entire cycle of Microplastics movement in the environment is not yet known.

**Environmental impact**

- There is growing evidence that the amount of microplastics in marine waters is increasing with unknown ecotoxicological consequences. Studies indicate Microplastics in oceans is causing stunted growth, death and altering of behavior of some fish.
- These are extremely dangerous and are cancer causing contaminants. People could even be breathing microplastic suspended in the air with the risk of noxious effect on lungs.
- There is no way of effectively removing microplastic contamination once it is in the environment.
- It causes severe water pollution. Once these microbeads find their way into the water bodies, they just sit in the water and act as vehicles for other pollutants.

- Research studies released in November 2015 showed presence of plastic microbeads in table salt, which is one of the most basic ingredients used in cooking. It was also observed that the microbeads found in toothpaste can get stuck in our gums and lead to cancer.

**Recent Intervention**

- National Green Tribunal has issued notices to the Union health, environment and water resources ministries seeking their comments on what has been done to identify and curb this growing threat.

## 1.4.2. SOLID WASTE MANAGEMENT

**Background:** The **Deonar landfill in Mumbai caught fire** which lasted for days causing severe hardships for the locals.

**LAND FILLS AND URBAN SOLID WASTE MANAGEMENT**

There are **many categories of MSW (Municiple Solid Waste)** such as food waste, rubbish, commercial waste, institutional waste, street sweeping waste, industrial waste, construction and demolition waste, and sanitation waste.

**As per World Bank** urban solid waste management is the process of collecting, treating and disposing of solid wastes generated by all urban population groups in an environmentally and socially satisfactory manner using the most economical means available.

**Management of Solid waste in India:**

- The rules and stipulations are laid down by the Central government under the Environmental Protection Act, 1986. The Government had notified the Municipal Solid Waste (Management and Handling) Rules in 2016, thereby **making it mandatory for all urban local bodies to manage solid waste.**
- The Central Pollution Control Board and State Board monitor the compliance of the standards with respect to air quality, water quality etc.
- The management of the waste rests with the respective Municipal Corporations.
  - ✓ They receive construction debris, household waste, waste from public bins and other kinds of refuse
  - ✓ While in some cities the Municipal Corporations undertake all the activities, in others like Chennai and Bengaluru the work of collection and segregation is given to private contractors.

**Status**

- Even after 12 years, most cities have **confined themselves only to collection and transportation** of solid waste. **Processing and safe disposal are being attempted only in a few cases.**
- The CPCB report also reveals that **only 68% of the MSW generated in the country is collected of which, 28% is treated** by the municipal authorities. **Thus, merely 19% of the total waste** generated is currently treated.

**Issues:**

- **Segregation is not done at source and Unorganized segregation facility**: Ideally more than 50% of the waste could be segregated and composted at the starting stage. After recycling the left over only 10-15% should be left for dumping at the landfills. However, this is not done so in Indian cities.

- **Issues with Landfill management**:
  - ✓ Violations of rules with respect to the scientific requirements for the location of a landfill and the mandatory security-set up like compound walls, CCTV cameras, fire-fighting equipment and water tanks, and regularization of rag pickers .
  - ✓ Occasional fires drawing on air quality and health. (due to methane production)
  - ✓ Many Landfills have been functioning beyond the stipulated timeline.
  - ✓ With the expansion of cities old land fill need to be reclaimed and new sites should be identified.
  - ✓ The demand for alternate sites gets entangled in the tussle between the Municipal Corporations and the State governments as the matter rests with the latter.
- **Processing Facility**
  - ✓ The composting and waste to energy plants run at under-capacity.
  - ✓ Many of the new projects for garbage processing facility are stuck
  - ✓ Financial issues
  - ✓ The facilities of composting of wet waste is not present everywhere
- **Indifference of citizens/ Lack of community participation** towards waste management due to lack of awareness

**The Kasturirangan report by Planning Commission has** highlighted the need for an integrated approach**:**

- principle of **Reduce, Reuse, Recover , Recycle and Remanufacture (5Rs)** should be adopted
- motivate Resident Welfare Associations (RWA), CBO / NGO's to take up work of community awareness and door to door collection
- Integration of kabadiwalas and rag pickers into MSWM system
- It emphasizes setting up centralised (for incineration, gasification, pyrolysis) or decentralised (for biomethanation, vermicomposting) waste processing facilities keeping in view the quantity and quality of waste generated and financial viability of the processing technology.
- Standard protocols for landfill management to prevent accidents: set up Common Regional Sanitary Landfill Facility, to reduce the land requirement. Cities above a population of one million should set-up their own landfill and permit all cities and towns within 50km periphery of the city to use the facility for disposal of their waste.

**Recent steps**

- Mandating power distribution companies to buy electricity from power plants fueled by solid waste
- Mandating all private fertilizer companies to buy compost that is extracted from municipal solid waste.
- There is a provision of user fee and a 'spot-fine' penalty if the companies violate the directions of Central Monitoring Committee.

**Significance of the step**

- **Alternate energy**: A step towards realizing Center's aim of generating 700 megawatts of electricity from solid waste-run plants in the next five years.
- **Effective disposal of solid waste**. Every day about 1.68 lakh ton of solid waste is collected across the country.
- **Boost to the defunct waste-to-energy plants and compost producing plants**. It will also give incentive for setting up of more such plants in the country.
- **Breaking the monopoly of urea producing companies**

Thus, this is a significant and creative step towards turning the mounting waste into a national asset.

**Solid Waste Management-Buffer Zone**

**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**.**

**Pros**

- The proposed buffer zones will act as a barrier and will provide assistance against flawed handling of waste during storage and transportation.
- It will help protect the surrounding environment against negative impacts of the landfill.
- It will promote responsible land management and conservation practices.

**Buffer Zone**

- Buffer Zone refers to an area of no construction. Such an area is designated in order to segregate two regions (for environmental protection).
- The term buffer zone was first specified by the government in **Municipal Solid Waste (Management and Handling Rules), 2000**.
- The revised rules as under Solid Waste Management (SWM) Rules, 2016 made it a duty of CPCB to issue guidelines regarding buffer zones.
- According to the SWM Rules, 2016, "a buffer zone of no development shall be maintained around solid waste processing and disposal facility, exceeding five tonnes per day of installed capacity."

**Cons**

- The CPCB has in its draft guidelines allowed waste-to energy power plants to come within **20-100 metres** of residential areas.
- This is a far cry from **300-500 metres** specified in the solid waste management manual of the **Swacch Bharat Mission.**
- Unlike previously, the draft guidelines mention **"incineration"** as one of the methods of waste disposal.

**Significance**

- The proposed buffer zones will act as a barrier and will provide assistance against flawed handling of waste during storage and transportation.
- It will help protect the surrounding environment against negative impacts of the landfill.
- It will promote responsible land management and conservation practices.

**New Rules for Management of Construction and Demolition Waste**

**Background**

The Construction and Demolition Waste Management Rules, 2016 notified by the environment ministry **aim at creating a process to recover, recycle and reuse this waste.**

**Need**

- Construction activity is **one of the main reasons for high air pollution** in Indian cities.
- 530 million tonnes of construction and demolition waste is generated in India annually.
- Currently, managed under the existing solid municipal waste management rules which are inadequate. Thus, it is not managed properly.

**Notable points**

- **Responsibility upon local authorities**
  - ✓ Permission for construction and demotion only after a complete waste management plan is presented to local authorities.
  - ✓ To keep a check on those who dispose waste illegally.
- **Responsibility upon large-scale generators:** they will have to pay relevant charges for collection, transportation, processing and disposal, as notified by the concerned authorities.
- **Emphasis on reuse**
  - ✓ Mandatory for local authorities to utilize 10-20% of construction and demolition waste in municipal and government contracts to lay drain covers etc.

**Challenges**

- The **main challenge is with respect to proper implementation of the rules.**
- Appropriate training is needed for contractors and officials before enforcing the clause.
- Appropriate resources, financial and human power, needs to be allocated to local authorities.
- This will also require scaling up of capacity-building and recycling infrastructure.

## 1.4.3. CITY COMPOST POLICY

**Why in news?**

Recently Parliamentary Standing Committee on Chemicals and Fertilisers suggested the government to review the progress of the policy on city compost (2016).

**Key features of Policy**

- For increasing production and consumption of City Compost, provision for Market development **assistance of Rs. 1500 per tonne of city compost** has been added.
- To ensure that environment friendly quality city compost, **Eco-Mark standard** has been made mandatory.
- Fertilizer companies will **co-market** City Compost along with chemical fertilizers.
- It will be mandatory for PSUs and Government Departments to use City Compost for their horticulture.
- Campaigns to create awareness among farmers about benefits of city compost and its uses.

**Recommendations of the committee**

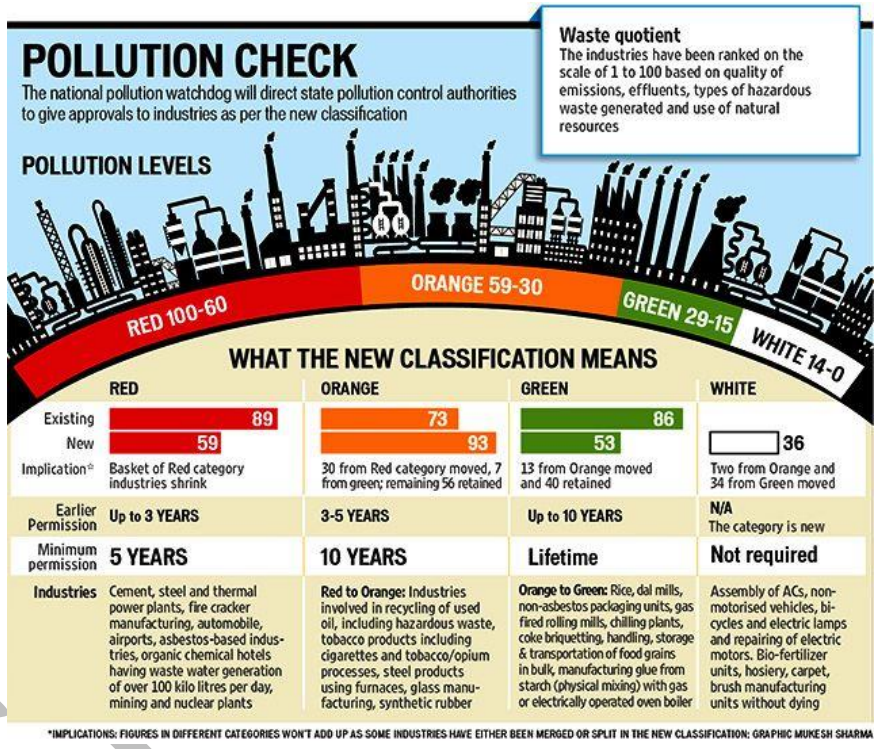
- Review the progress of the policy at regular intervals to remove hurdles being faced by concerned agencies.
- Involve waste collectors and rag pickers from the informal sector for segregation of waste
- The centre should take up issue with states to ensure dysfunctional city compost plants are operational.
- It also pitched for involvement of Central Institute of Plastics Engineering and Technology (CIPET), for proper marketing of city compost and run multi-media campaign to create awareness among farmers.

# 1.5. MISCELLANEOUS: POLLUTION

## 1.5.1. EASING OF RULES FOR CLEARANCE OF NON-POLLUTING INDUSTRIAL PROJECTS

**Background**

- **MOEF** in consultation with the **Central Pollution Control Board** has reclassified the industries into **"Red", "Orange", "Green" and "White"** with an objective to promote "Ease of Doing Responsible Business".
- Projects are supposed to get environmental clearances under **Environment (Protection) Act, 1986** or Consent under **Air (Prevention and Control of Pollution) Act, 1981** and **Water (Prevention and Control of Pollution) Act, 1974.**




**Significance**

- It will **simplify procedures to fast-track industries falling under the "white" category which includes real estate projects.**
- Will **cut procedural delays** to spur growth through improved 'ease of doing business'.

**Criticism**

- The hurry to spare the real estate projects when the similar matter under the December 9 notification is pending in the NGT.
- It also bypasses the Environment (Protection) Act as well as the 2006 EIA notification"

## 1.5.2. COMPREHENSIVE ENVIRONMENTAL POLLUTION INDEX (CEPI)

**Background:** Industrial clusters are an important source of industrial pollution. Any form of pollution that can trace its immediate source to industrial practices is known as **industrial pollution**. Industrial pollution takes on many faces. It contaminates many sources of drinking water, releases unwanted toxins into the air and reduces the quality of soil all over the world.

**Comprehensive Environmental Pollution Index (CEPI):** The concept of Comprehensive Environmental Pollution Index (CEPI) was evolved by Central Pollution Control Board (CPCB) during 2009-10 as a tool for comprehensive environmental assessment of prominent industrial clusters and formulation of remedial Action Plans for the identified critically polluted areas.

**Methodology:** The CEPI was revised in 2016. The index is now calculated on the basis of factors such as the scale of industrial activity, status of ambient environment (air, surface water and groundwater) quality, health related statistics (drawn from major hospitals of the area being studied) and compliance status of industries.

The new norms are based on strict air and water quality monitoring only.

**Importance**

- The purpose of CEPI is to promote industrial development consistent with the environmental objectives. The new concept will encourage industrial sectors to adopt cleaner technologies, ultimately resulting in reduction of the pollution.
- States have also been asked to put the CEPI scores of critically polluted areas in the public domain and implement action plans—short-, medium- and long-term—that would restore the environmental quality of those industrial clusters and bring down their CEPI score. The action plan, the central board said, should be reviewed periodically to monitor the progress of implementation.
- The state governments are required to issue public advisories declaring that such critically polluted industrial clusters are only meant for industrial activity.

**Status of industrial clusters in India now:** As per 2009 CEPI, out of the 88 clusters in India; 43 whose CEPI scores were 70 or higher were declared as critically polluted areas (CPAs) while 32 were described as seriously polluted areas (SPAs).

The pollution control board has been undertaken monitoring activity in the 43 critically polluted areas since 2009.

**Criticism**

- The previous CEPI was based on the effect of industrial clusters on air, water, land, health and ecology. They also served as a yardstick to assess progress in tackling pollution in such areas. The new norms have done away with factors like potentially affected populations in a cluster and the assessment of health impact while calculating CEPI.
- Experts say doing away with the criteria of "potentially affected populations in a cluster" and replacing it with health data drawn from major hospitals will not give a complete picture.
- Environmentalists feel that the present environmental norms and designed to clear more industrial projects. They expressed concern that the new norms could affect millions of people living in and around industrial clusters.

## 1.5.3. POLLUTER-PAY PRINCIPLE

**Why in news:** Last year, the Delhi HC had ordered the organisation 'Art of Living' to pay a fine for polluting river Yamuna. The imposition of the fine traces its legality from the well-established 'Polluter pay principle' of environmental jurisprudence.

**Meaning**

- Liability upon the polluter to pay for restoration and compensation.
- It sets to serve following purposes:
  - ✓ Social justice; it favours a curative approach so that taxpayer's money is not spent for the fault of another.

- ✓ Deterrence effect which would promote efficient utilization of resources. In this way it helps in promoting sustainable development as well as it acts as a negative feedback mechanism upon the polluter.
- ✓ It offers a practical solution which can be implemented.

**Evolution in India**

- It has been recognised as a general principle of international law.
- It was expressly mentioned under Principle 16 of Rio Declaration
- It was first recognised by the Apex Court in Vellore Citizen's case (1996) which read it under Art. 21 r/w Article 47, 48A and 51A(g) of the Constitution.
- It also find place in legislations such as Compensatory Afforestation Act 2016, Nuclear Civil Liability Act.

**Issues**

- Identification of the polluter is difficult as the pollution may pass through several stages
- Common man's financial incapacity, unawareness and reluctance to engage in legal battles would leave many cases non-litigated
- Assessment of damages is difficult and uncertain
- Paying capacity of the polluter may not be enough to restore the damage caused
- Ethical issue whereby polluter is allowed to pollute by paying a penalty- no other liability is imposed which may not be enough deterrent for big and rich companies. Small firms may suffer in the process.

# 2. CONSERVATION MEASURES

## 2.1. FOREST CONSERVATION

### 2.1.1. ROLE OF COMMUNITY FORESTS IN CONTROLLING CARBON EMISSIONS

**Community forestry** is defined, by FAO, as "any situation which intimately involves local people in a forestry activity. It embraces a spectrum of situations ranging from woodlots in areas which are short of wood and other forest products for local needs, through the growing of trees at the farm level to provide cash crops and the processing of forest products at the household, artisan or small industry level to generate income, to the activities of forest dwelling communities".

**Importance:** traditionally these forests have played following role

- Provides fuel and other goods essential to meeting basic needs at the rural household and community level
- Provides food and the environmental stability necessary for continued food production
- Ensures the generation of income and employment in the rural community

**Present time**: in modern times**,** community forests have gained importance due to indiscriminate afforestation of Tropical forests. Today about One tenth of the total carbon contained above ground in tropical forests is in collectively managed forests which lack formal and legal recognition.

- Without secure rights, these communities and their forests are at risk of illegal, forced, or otherwise unjust expropriation and capture by more powerful interests, thus displacing the residents, destroying the forests and releasing the carbon they contain into the atmosphere.

**Advantages of community management**

- Indigenous peoples and local communities are the best stewards of these forests.
- Further, securing the rights of indigenous peoples to own and manage their forests is an inexpensive way to limit emissions while improving communities' economic stability.
- A recent study says that ecosystem services provided by tropical forests like soil retention, pollination, biodiversity, flood control, source of clean water along with tourism and other economic benefits to various sectors amount trillions of dollars. In contrast, the cost of securing these land rights is less than 1% of the total benefits.

**Challenges**

- Many tropical forest nations have not embraced this cost-effective solution to preventing further emissions from forest loss.
- According to a report of Rights and Resources Initiative (RRI) released earlier this year, only 21 of 188 countries included forest people in their national plans for reducing carbon emissions under the Paris Agreement.
- Studies have shown that indigenous people and local communities customarily claim at least 50% of the world's lands—including forests—but legally own just 10% of global lands, and have some degree of recognized management rights over an additional 8%.
- The lack of legal protection makes the forests more vulnerable to exploitation. For example, about 60 per cent of the forest cover of Arunanchal Pradesh is classified as "unclassed state forest, or USF", and is largely under the control of the local communities. The State of

Forest Report (2011) has recorded a decline of 74 sq. km in the forest cover in the community-owned forest land in the State.

**Way Forward**

- Global communities, thus, need to recognize that keeping tropical forests intact will prevent carbon emissions.
- Community management of forest which is a reality must be promoted not only for its environmental benefits but also the various economic and social benefits it offers.
- To effectively monitor the impact of the JFM programme on protection and development of forests, Joint Forest Management Cell is a fine example for tropical countries to provide role for local communities.

## 2.1.2. WESTERN GHATS CONSERVATION

**Background**

A draft notification regarding Ecologically Sensitive Areas (ESA) in Western Ghats, issued by the Ministry of Environment, Forest and Climate Change (MoEF), has been delayed for over a year due to on-going negotiations between the Centre and the states.

Recently the centre issued a notice that earmarked 60,000 square kilometres, or 37 per cent of the Ghats, as ecologically sensitive. However, it was protested by the states, as ESAs restrict developmental activity. The Centre has since decided to accept recommendations from each state government.

**Earlier committees**

**Gadgil Committee:** Government had appointed an expert committee headed by ecologist Madhav Gadgil in 2011. It recommended that all of the Western Ghats be declared as the ESA with only limited development allowed in graded zones.

**Madhav Gadgil committee recommendations**

- It recommended making **entire Western Ghats an Ecologically Sensitive Area** because of its rich biodiversity and its ecosystem services like irrigation and drinking water to people.
- It advocated **zoning of ecological sensitive area** of the Western Ghats in three layers –
  - Most significant area as **Ecologically Sensitive Zone I (ESZ I)**
  - Moderately significant area as **Ecologically Sensitive Zone II (ESZ II)**
  - Least significant area as **Ecologically Sensitive Zone III (ESZ III)**

  Zone 3 was given considerable flexibilities in infrastructure. By this Gadgil asked to protect about 64% of Western Ghats.
- Local self-government should have the authority to regulate and encourage activities in each zone.
- The parameters to be used to identify the Ecologically sensitive zones would be –
  - Biological forces like richness and rarity of species, ecological resilience etc.
  - Cultural and Historical significance of the area
  - Geo-climatic features such as slope, aspect, altitude, precipitation etc.
  - Hazard vulnerability
  - Stakeholders valuation
  - Origin of rivers, contiguous habitats to national parks and sanctuaries etc.
- The activities to be banned in Ecologically sensitive zones would be GM crops, SEZs, change of land use, thermal plants, sand mining etc.

**Kasturirangan Committee**

A committee headed by K. Kasturirangan recommended that only about 60,000 sq km or about 37% of the WG be declared as ESA. This was a significant reduction from that of the Gadgil committee.

**What are ESAs**

- An ecologically sensitive area is one that is protected by the government given the sheer number of species, plants and animals endemic to the region. According to the Environment (Protection) Act, 1986, the government can prohibit industrial operations such as mining, sand quarrying and building thermal power plants in sensitive areas.
- The definition offered by the MoEF: "An ecological sensitive area is a bio-climatic unit (as demarcated by entire landscapes) in the Western Ghats wherein human impacts have locally caused irreversible changes in the structure of biological communities (as evident in number/ composition of species and their relative abundances) and their natural habitats."

**Why opposition to the committee reports**

- The states have objected to the report's recommendations as they feel, if implemented, it would hamper development activities and impact the lives of lakhs of people. The declaration of eco-sensitive zone would lead to banning of sand extraction, quarrying and development activities such as construction of schools, hospitals and group housing.
- The issue has being framed as one of development-versus-conservation. This has led to opposition.

**Way ahead**

The question that needs speedy resolution is how much of the Western Ghats can be demarcated as ecologically sensitive, going beyond the system of national parks and sanctuaries that already exist. As a corollary, are other areas free to be exploited for industrial activity, including mining and deforestation, with no environmental consequences. This needs a framework under which scientific evidence and public concerns are debated democratically and the baseline for ESAs arrived at.

**Importance of Western Ghats**

Western Ghats are 1,500 km ecologically-rich strip along the west coast spanning Gujarat, Maharashtra, Karnataka, Goa, Kerala and Tamil Nadu.

- They are one of the two biodiversity hotspots in India other being Eastern Himalayas. They are also considered to be one of the most important natural heritage sites in the world.
- It is considered to be one of the most important bio-geographic zones of India, as it is one of the richest centres of endemism. The extent of endemism is high amongst amphibian and reptile species.
- Due to varied topography and microclimatic regimes, some areas within the region are considered to be active zones of speciation.
- The Ghats play an irreplaceable role in mediating the monsoon over the country.
- Changing patterns of rivers flowing through Western Ghats due to destruction of its biodiversity, can lead to **increase in river water disputes in peninsular India**.

**Threats Faced By Western Ghats**

According to the report, **'Protecting people through nature,'** prepared by the **World Wildlife Fund and the International Union for Conservation of Nature (IUCN),** Western Ghats face threats like -

- Ecological destruction due to harmful industrial activities such as mining. It includes oil and gas exploration and extraction, mining, illegal logging and large-scale constructions.
- The harmful industrial development poses a threat to these 'ecosystem services and the communities that depend on them. These are known as **"extractive threats"**

**Western Ghats have shrunk in space** in recent times because of loss of species and degrading habitats – this **might affect rainfall patterns, river flow, water supply and climate of the country**. Therefore its conservation is a must.

## 2.2. WETLAND MANAGEMENT IN INDIA

**Why in news?**

- World Wetlands Day was celebrated at **Bhoj Wetlands** on February 2 to mark the Day the Convention on Wetlands was adopted in the Iranian City of Ramsar in 1971.
- The theme of World Wetlands Day for 2017 was '**Wetlands for Disaster Risk Reduction**'.

**What are Wetlands?**

Wetlands are areas where water is the primary factor controlling the environment and the associated plant and animal life. They are defined as: *"lands transitional between terrestrial and aquatic eco-systems where the water table is usually at or near the surface or the land is covered by shallow water".*

**Importance of Wetlands**

- Wetlands are highly productive, support exceptionally large biological diversity
- Provides services such as waste assimilation, water purification, flood mitigation, erosion control, ground water recharge, micro climate regulation.
- supporting many significant recreational, social and cultural activities besides being a part of the cultural heritage.
- It is **source of livelihood** through fishing and rice farming to travel, tourism and water provision.
- Wetlands host a large variety of life, **protect our coastlines**, **provide natural sponges** against **river flooding and store carbon dioxide to regulate climate change.**

**Present Management Framework**

- Wetlands are managed under the scheme called National Plan for Conservation of Aquatic Eco-systems (NPCA).
- Under this scheme a central policy towards the conservation of wetlands is laid down, the programmes are monitored and an inventory of the wetlands is prepared.
- While the conservation and management of wetlands rests with the state governments, their plans are approved by the central government.

**Ramsar Convention**

- It is international treaty for conservation and sustainable use of wetlands.
- There are **26 Ramsar Sites** in India designated as Wetlands of International importance.
- **Chilika Lake** (Odisha), **Point Cailmere Wildlife** and Bird Sanctuary (Tamil Nadu), **Sambhar Lake**(Rajasthan) and **Upper Ganga River**(Uttar Pradesh) are a few noted ones.

**National Wetland Conservation Programme (NWCP)**

- Under the programme, which was started in 1985-86, 115 wetlands have been identified till now by the Ministry of Environment and Forest and Climate Change **which requires urgent conservation and management initiatives**
- **Aim of the Scheme:** Conservation and wise use of wetlands in the country so as to prevent their further degradation.

**Objectives of the Scheme**:

- To lay down policy guidelines for conservation and management of wetlands in the country;
- To undertake intensive conservation measures in priority wetlands;
- To monitor implementation of the programme;
- To prepare an inventory of Indian wetlands.

**Prevailing Problems**

- Restoration and conservation of wetlands becomes impossible once they are destroyed, as these are neither identified nor categorized.

- States, in coordination with the central government, failed to performed their statutory duty of identifying all wetlands in their respective jurisdiction as per the Wetlands (Conservation and Management) Rules, 2010
- Centre had violated sections of the Environment Protection Act 1986 which has increased the risk of losing the wetlands.
- Govt. has failed to prevent activity in and around the wetlands, as inventoried by ISRO in 2007 and 2011

**New Rules**

- Wetlands (Conservation and Management) Amendment Rules, 2016 were notified in Dec 2016.
- In 2010, the MoEF had notified Rules for conservation and management of wetlands under the Environment Protection Act, 1986. The new rules will replace them.

**Major changes from the old rules**

- The Central Wetlands Regulatory Authority (CWRA) will be removed. The power of notification would rest with the chief ministers of respective states.
- There is no time limit for notification as against the period of 12 months stipulated in 2010 rules
- The numbers of restricted activities have been reduced.
- Earlier the decision taken by CWRA could have been challenged before NGT by a citizen. No provision of citizen check is present under the new rules.

**Concerns with the new Rules**

- The record of states in implementation of the rules has not been encouraging. It is observed that states are susceptible to yielding under local pressure. Recently the NGT reprimanded some states for not even notifying wetlands under the 2010 rules. In this light the decentralization without adequate checks could be counter-productive.
- The draft does away with the Central Wetlands Regulatory Authority, which had suomoto cognizance of wetlands and their protection.
- It contains no ecological criteria for recognising wetlands, such as biodiversity, reefs, mangroves, and wetland complexes as was mentioned in 2010 rules.
- It has deleted sections on the protection of wetlands, and interpretation of harmful activities, which require regulation, which found reference in the 2010 rules. It seems the protection has been diluted as restricted activities have been reduced drastically. Activities under vague terms like 'wise use' have been permitted.
- No role to local people and institutions has been given.

**Other Issues in Wetland Management System**

- Presently, only notified wetlands are given protection. Small wetlands get ignored in the process.
- The process of notification is initiated by the State government. So no avenue is available to the local people or bodies who are the major stakeholders.
- No data bank is available on wetlands except on the Ramsar sites. Without data the extent of wetlands is not ascertained and thus encroachment becomes easier.
- The Municipal bodies that are currently responsible for implementation of the rules related to wetlands lack technical expertise to identify a wetland.

**Suggestions**

- There is need for scientific criteria for identifying wetlands- an independent authority can help with respect to this.
- Use this method to create a data bank on wetlands apart from Ramsar sites.
- Proper checks and balances- both on part of central government and citizens is required.
- The rules should be people-centric; involvement of town and country planning Board in identification of wetlands. More role to locals like fishing community, farming and pastoral community in management-they have experience as well as interest in their protection.
- **Mass awareness campaigns** should be undertaken to educate stakeholders from all walks of society, particularly local communities on the value of wetland ecosystems.

# 2.3. WILDLIFE/BIODIVERSITY CONSERVATION

## 2.3.1. MAN-ANIMAL CONFLICT

**Why in news?**

Instances of many wild animals viz leopaords, tiger, elephants etc entering cities and causing damage to life and property.

**Reasons** for Increasing Man-Animal Conflicts:

- Due to deforestation and habitat fragmentation and shrinkage, the quality of the habitat has declined and prey base has reduced.
- Increase in human population and land use transformation.
- Presence of a large number of animals and birds outside the notified protected areas. Wildlife experts estimate that 29 per cent of the tigers in India are outside the protected areas.

**The NTCA guidelines say that**

- Under no circumstances tiger should be killed unless it is habituated to human death
- Elimination of tiger as "man-eater" should be the last resort after exhausting all the options to capture
- Principal Chief Conservator of Forests should record reasons in writing before declaring a tiger as man-eater
- Identity of the animal must be obtained through a committee constituted for the purpose, through camera trappings or direct sighting or pug impressions, besides collecting pieces of hair/ scats for DNA profiling.

**Laws in Place to Address this Issue**

- **Protocol by Environment Ministry** in 2011 listing the steps to be taken if a leopard strays into human habitation.
  - ✓ Wild carnivores generally attack in self-defense and it is, thus, advisable to avoid provoking them.
  - ✓ The area should be cordoned off with barricades and all attempts should be made to keep the crowd and local people from approaching the animal
- **Translocation** is suggested. However, this does not solve the problem but only shifts it to a different place. In fact studies show that human-animal conflict tend to increase after translocation.
- **Lethal control** has been banned since 1972. Further, lethal control may not reduce the density of a carnivore in an area because, as mentioned earlier, transient individuals may immediately occupy the vacated territories.

**Alternate Suggestions**

- Leopards are adaptable predators, adept at living close to humans as long as food and cover are available. Therefore, there is a need to maintain the existing tolerance by steps like:

- ✓ **Improving techniques to protect livestock** with better pens and sheds.
- ✓ **Reducing organic filth** so that feral dog and pig populations decrease, thereby decreasing the attractiveness of the area for leopards.

- A **robust and timely compensation/insurance scheme** administered by the local community.
- Fragmentation of wild life must be prevented and migratory corridor such as eco-bridge should be notified on priority based
- Develop risk map, regional level conservative strategy with coordination of Joint Forest management committee

## 2.3.2. VERMIN ISSUE: MENACE TO FARMER BOON TO FOREST

**Why in News?**

Tamil Nadu government has planned to allow Forest Department personnel to **cull the wild boar** for a limited period of time.

**What is Vermin?**

- Any animal which poses a threat to human and their livelihood especially farming, can be declared Vermin under Schedule V of Wildlife Protection act 1972.
- States can send a list of wild animals to the Centre requesting it to declare them vermin for selective slaughter.
- Wildlife Protection Act 1972, empower every **State's Chief Wildlife Warden** for culling.
- Wild boars, nilgai and rhesus monkeys are protected under Schedule II and III, but can be hunted under specific conditions.

**Issue Involved**

- Ecologists warn that culling of wild boar will harm biodiversity
- Wild boars: Scavenger in food chain
- Adverse effect on some animals because it is important prey for carnivorous animals.
- Furrowing wild boars ensure germination of seeds in the forest area.
- However Wild boars are among the most significant causes of losses that farmers face. They devour tapioca, bananas, rice and oil seeds.

## 2.3.3. ECO-SENSITIVE ZONE

**Why in news?**

Final Notification for an Eco-Sensitive Zone (ESZ) area of 59.46 sqkms was notified by the government in Sanjay Gandhi National Park in Mumbai.

**What is Eco-Sensitive Zone?**

- It is created to act as a **buffer for further protection** around Protected Areas (PAs) such as National Parks and Wildlife sanctuaries.
- Activities around such areas are regulated and managed so as to protect the environment.
- ESZ is notified under Section 3 of the Environment (Protection) Act, 1986 by the Union Ministry of Environment and Forest.

ESZ Guidelines classify activities under three categories:

- **Prohibited:** Commercial Mining, Setting of Saw Mill, Setting of industries causing pollution, establishment of major hydroelectric projects etc.
- **Regulated:** Felling of Trees, Establishment of hotels and resorts, erection of electrical cables, Drastic change of agricultural systems etc.
- **Permitted:** Ongoing agriculture and horticulture practices by local communities, rain water harvesting, organic farming etc.

**Why opposition to ESZ**

- Many states are opposed to ESZ because of presence of minerals and resources side by side.
- Local people in many areas are also opposed to ESZ for loss of livelihood due to restriction placed by it on various activities.

**Way Forward**

- Local communities should be incentivized and their participation should be ensured for successful implementation of ESZ.
- State governments should balance the need for development, aspirations of local people and environmental conservation needs.

## 2.3.4. PRESERVATION OF COASTAL AREAS

**Website for Obtaining Coastal Clearances:** The Minister of State of Environment, Forest and Climate Change, Shri Anil Madhav Dave, launched the web portal for obtaining Coastal Regulation Zone clearances.

- The web-based system will enable the Project proponents and the concerned State/Union Territory bodies like the State Coastal Zone Management Authorities (SCZMAs) and Municipal/Town Planning agencies in tracking the status of their proposals.

**Coastal Regulation Zone (CRZ)**

- MoEF issued a notification in 1991, under the EPA, 1986 for regulation of activities in the coastal area. According to the notification, coastal land up to 500m from the high tide line and a stage of 100m along banks of creeks, estuaries, backwater and rivers subject to tidal fluctuations will be called CRZ.
- The CRZ was divided into four categories CRZ (1-4) as per permitted use of land.

**Classification of Coastal Regulation Zone**

- **CRZ I** – It refers to the ecologically sensitive areas, essential in maintaining ecosystem of the coast. These lie between the HTL and LTL. Only exploration of natural gas and extraction of salt is permitted
- **CRZ II** – These areas form up to the shoreline of the coast. Authorized structures are not allowed to be constructed in this zone
- **CRZ III** – This includes rural and urban localities. Only certain activities relating to agriculture and public utilities allowed here
- **CRZ IV** – This includes the aquatic area up to the territorial limit (12 nautical miles). Fishing and allied activities permitted in this zone. Solid waste can be let off in this zone.

**SHAILESH NAYAK COMMITTEE REPORT, 2015 on CRZ:** The Shailesh Nayak Committee was formed with an objective to review the issues relating to Coastal regulation zone 2011.

- The committee found that the 2011 regulations, especially with regard to construction, have affected the housing, slum redevelopment, redevelopment of dilapidated structures and other dangerous buildings.
- Since January 2015, several dilutions appear to be taken from this report, such as
  - ✓ Allowing construction of monuments/memorials (Sardar Patel statue in Gujarat) in CRZ VI zones;
  - ✓ Proposal to allow high-rise buildings (Chennai) in CRZ II zones within 500 metre of the high-tide line;
  - ✓ Proposal to allow reclamation of land from sea (Mumbai) for facilities such as ports, roads, quays, harbours and others.

- The report proposes the devolution of powers to state and union territory governments along with local authorities as sought by several states.
- The report even suggests that both CRZ II and III zones (500 metres from the high-tide line that are developed and relatively undisturbed, respectively) should not fall under the environment departments of the State or Central Ministry, and instead be guided by the rules of State town and planning departments.
- It further proposes to reduce the "**no development zone**" to just 50 metres from existing 200 metres for "densely populated" areas.

## 2.3.5. USE OF TECHNOLOGY IN BIODIVERSITY CONSERVATION

A new study published in the journal *SCIENCE* suggests that technology, contrary to popular concern, should play an increasingly important role in the campaign for species and habitat protection.

- **Collection of data:** lack of adequate data - especially data on species yet unknown to science, their locations, and their rates of extinction - prevents their study. Modern technology can be used to study them.
- **Preserving hotspots:** The protection of "hot-spot" regions may be the most effective strategy for species conservation. More comprehensive data is needed to more accurately identify these critical locations. More advanced technology can help in this.
- **Collaboration among scientists, public and government:** Online databases, smartphone apps, crowd-sourcing and new hardware devices are making it easier to collect data on species. When combined with data on land-use change and the species observations of millions of amateur citizen scientists, technology is increasingly allowing scientists and policymakers to more closely monitor the planet's biodiversity and threats to it.
- **International collaboration:** In order to develop more effective conservation policy in an age of complex and growing environmental threats, cross-country and inter-university data sharing is needed. Databases of the Red List of Threatened Species and of Protected Planet WWF report, Living Planet report are good examples.
- **Monitoring health of protected areas:** Hyperspectral imagery of landscapes can provide detailed information on a host of chemical and geological parameters and biological processes in both terrestrial and aquatic systems. Drones are increasingly being used to routinely monitor tracts of habitat and even individual animals. These types of remote sensing can help ensure that habitats remain healthy and protect the biota.
- **Restoration ecology** can play a significant role in augmenting the conservation value of marginal and degraded lands.
- **Robots or perhaps even cyborg animals** (remotely-controlled by humans using microchips linked to the animal's brain) could be used to enter areas that either cannot or should not be accessed by humans, and to limit unwanted contact between humans and a species targeted for protection.
- Monitoring reproductive status and other physiological parameters in the wild can be facilitated by broader deployment of **biotelemetry devices and the use of mobile communication networks**. Advances in brain mapping may eventually be applied to

**Recent development: Drones to be used for Monitoring Tigers**

- Conservation drones will soon hover over select tiger reserves of the country, marking the beginning of significant technological intervention in wildlife conservation.
- Drones would collect and transmit visual data on animal movements, poaching activities and instances of forest fire from inaccessible forest terrains on a real-time basis.

technologies that can determine how species perceive their environment. Such information could help identify and ameliorate stressors that could be impediments to reproduction or survival and considerably improve animal welfare.

- **Assisted Reproductive techniques:** The techniques that have been developed for captive populations in zoos, aquaria, and botanic gardens can be employed in the wild.
- **Promoting peaceful cohabitation:** Real-time data on animal movements can help with policing of the wildlife-human interface. Enhanced knowledge of animal behavior through advanced monitoring technologies can further improve management techniques.
- Technological advances in animal husbandry and plant propagation for highly marketable biological products could **reduce the incentives for illegal trade** (for example, crocodile farming has reduced poaching of wild populations for skins). It is even possible that future technology may bring about synthetic substitutes for some of the most sought after animal products, for example by 3D printing rhino horn tissue.

# 3. CLIMATE CHANGE

## 3.1. NEWS ON AGREEMENTS AND CONVENTIONS

### 3.1.1. KIGALI AGREEMENT

**Why in news?**

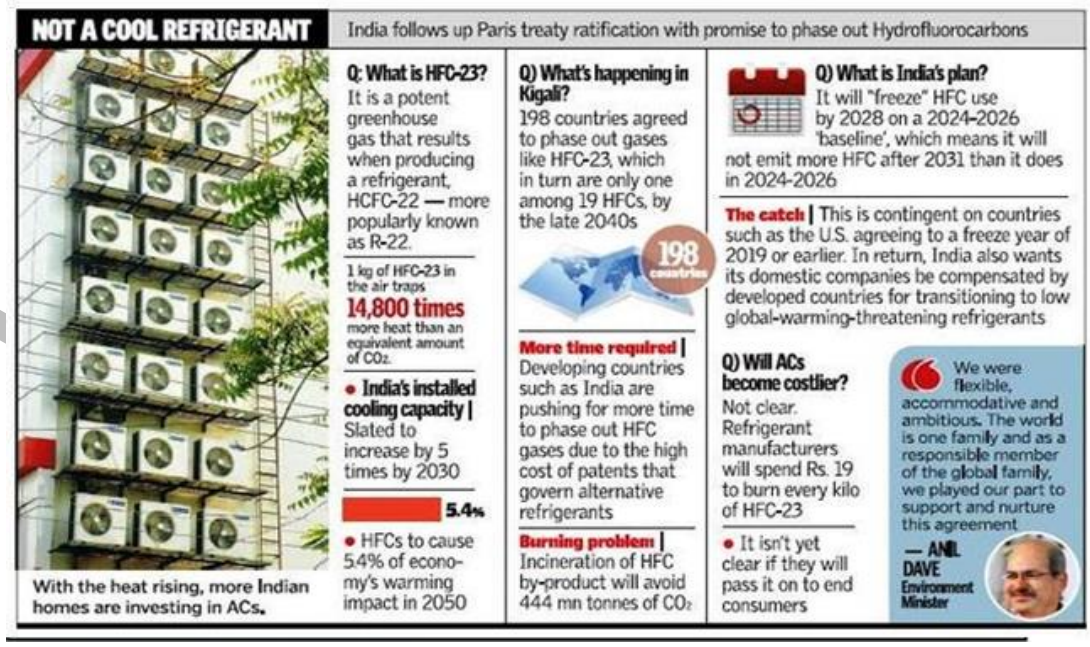
- 197 countries have struck a new landmark deal at Kigali in Rwanda to reduce the emissions of category of greenhouse gases (GHGs) which leads to hydro fluorocarbons (HFCs).
- Its reduction could prevent up to 0.5 degrees Celsius of global warming by year 2100.

**What is the Montreal Protocol on Substances?**

- The treaty was originally signed in 1987 and substantially amended in 1990 and 1992 is aimed at reducing the production and consumption of ozone depleting substances in order to protect the earth's fragile ozone layer.
- This agreement was one of the few successes of multilateral negotiations.

**Significance**

- The Kigali Amendment or amended Montreal Protocol for HFCs reduction amends the 1987 Montreal Protocol to now include gases responsible for global warming.
- It 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 also provide enhanced funding support estimated at billions of dollars globally. The exact amount of additional funding from developed countries will be agreed at the next Meeting of the Parties in Montreal in 2017.




**Different timelines**

All signatory countries have been divided into three groups with different timelines to go about reductions of HFCs. This agreement shows a new form of grouping:

- **First group:** It includes richest countries like US and those in European Union (EU). They will freeze production and consumption of HFCs by 2018. They will reduce them to about 15% of 2012 levels by 2036.
- **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.

**Steps taken by India: Eliminating use of HFC-23**

- India announced domestic action on HFC-23 (trifluoro-methane), a super greenhouse gas with a GWP of 14,800, which is produced as a byproduct of HCFC-22 (chloro-difluoro-methane). Currently, HCFC-22 is the most commonly used refrigerant in India.
- India has mandated five manufacturers — who fully control the domestic market — to capture and incinerate HFC-23 so that it is not released into the atmosphere. This action **will eliminate release of HFC-23 equivalent to about 100 million tonne of Carbon dioxide emissions over the next 15 years.**
- It also directed the companies to create and maintain sufficient storage capacity to ensure that all HFC-23 is stored
- Companies have been asked **to internalize the cost of this environmental externality** and create sufficient storage facility to take care of down time and run the incinerators to ensure that HFC-23 is not released in the atmosphere.

## 3.1.2. PARIS AGREEMENT: RECENT DEVELOPMENTS

**Background**

The Paris Agreement has set out the overarching goals and framework for international climate action, but left many details to be filled in later. The process of working out these details began in earnest at COP22, in Marrakesh last November. It continued in the "intersessional" talks in Bonn in May 2017.

- Meanwhile 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.

**MARRAKESH CoP**

- In the latest CoP22 of the UNFCCC held at Marrakesh (Morocco) countries negotiated to prepare the fine print for Paris deal. It sought to make the rules that would help in the implementation of the law i.e. Paris Agreement.
- The countries have agreed to complete the rule book by 2018 as the Agreement would come into force from 2020.

**Concerns**

Differences between the developed and developing countries persisted over crucial issues pertaining to climate finance, adaptation funds and scaling up reduction in emissions of greenhouse gases.

- The developed countries, led by USA, tried to use the rule-making process to subvert the Paris agreement.

- The developed countries were successful in getting their OECD report on climate finance acknowledged into the formal negotiations, despite developing countries claiming that it had used dubious accounting methods. This OECD report could now become one of the bases for defining climate finance.
- Principles of equity and differentiated responsibilities remain on table but no progress on operationalizing them in the Paris Agreement rulebook.
- The road map for rich countries to provide US $100 billion annually starting 2020 looks more dubious than before.
- No space for deeper emission reductions or increased climate finance by rich countries before 2020.
- The replenishment of funds for adapting to climate change though, was one of positive developments from the Marrakesh conference. There was a demand for replenishing the adaptation fund under the Paris agreement and that was done with $80 million. However, discussion over it will continue in the next CoP.
- The issue of providing loss and damage finance to vulnerable countries also will be taken up next year.
- India's call for 'Climate Justice' finds no place. India unable to find even a rhetorical entry for 'lifestyle issues' at Marrakech.

**Bonn Climate Meet**

The "intersessional" talks, which take place in Bonn each year midway between the annual conference of parties (COP), aim to move negotiations forward ahead of the larger meeting which take place towards the end of the year.

- The Bonn Climate Change Conference was organized by UNFCCC in May 2017 in Bonn, Germany to further implementation of Paris Agreement, deadline of which is agreed to be 2018.

**Outcomes on different agenda items:**

- **Global stocktake:** Under the Paris deal, parties agreed they would come together for a "global stocktake" in 2023 and every five years afterwards to measure their collective progress.
  The countries disagreed on the scope of the process and what progress will be assessed against.
- **Transparency:** the "enhanced transparency framework" aims to "build mutual trust and confidence and to promote effective implementation" by formalising the ways countries report and review their own progress, as well as the support they have provided to others. Negotiations on transparency are currently still centred on which different areas should be included, and what the procedures and guidelines should be.
- **Climate finance:** Developed countries pledged in 2009 to jointly "mobilise" $100bn per year by 2020 to help developing countries mitigate and adapt to climate change, and the Paris Agreement again recognised the importance of this climate finance.
  Negotiations on this section are focused on how to account for and track the climate finance that countries have given or received. One related area of contention is the future of the Adaptation Fund, a (relatively small) pot of money created in 2001 as part of the Kyoto Protocol. While EU announced funds for pacific region, US announced no further contributions.
- **Carbon markets:** No substantial progress was made.

**Paris Agreement (COP 21)**

The Paris Agreement sets a roadmap for all nations in the world to take actions against climate change in the post-2020 period. It seeks to enhance global action against climate change and limit global warming while reflecting the principles of equity and common but differentiated responsibilities and respective capabilities (CBDR-RC), in the light of different national circumstances.

**How is it different from Kyoto Protocol:**

**This universal agreement will succeed the Kyoto Protocol.**

- Unlike the Kyoto Protocol, it provides a framework for all countries to take action against climate change. Placing emphasis on concepts like climate justice and sustainable lifestyles, the Paris Agreement for the first time brings together all nations for a common cause under the UNFCCC.
- The Agreement's has taken bottom-up approach, allowing each nation to submit its own national plan for reducing greenhouse gas emissions, rather than trying to repeat a top-down approach advocated by the Kyoto Protocol, giving each country an emission reduction target.

**Salient features of the Paris Agreement**

- It aims to limit the increase in the global average temperature to well below 2°C above pre- industrial level and on driving efforts to limit it even further to 1.5°C.
- It covers all the crucial areas identified as essential for a comprehensive and balanced agreement, including mitigation, adaptation, loss and damage, finance, technology development and transfer, capacity building and transparency of action and support. The Paris Agreement acknowledges the development imperatives of developing countries by recognizing their right to development and their efforts to harmonize it with the environment, while protecting the interests of the most vulnerable.
- The Agreement seeks to enhance the 'implementation of the Convention' while reflecting the principles of equity and CBDR-RC, in the light of different national circumstances.
- Countries are required to communicate to the UNFCCC climate action plans known as nationally determined contributions (NDCs) every five years. Each Party's successive NDC will represent a progression beyond the Party's then current NDC thereby steadily increasing global effort and ambition in the long term.
- The Agreement is not mitigation-centric and includes other important elements such as adaptation, loss and damage, finance, technology development and transfer, capacity building and transparency of action and support.
- Climate action will also be taken forward in the period before 2020. Developed countries are urged to scale up their level of financial support with a complete road map towards achieving the goal of jointly providing US$ 100 billion by 2020. The decision also sets a new collective quantified goal from a floor of US$ 100 billion per year prior to 2025.
- The Agreement mandates that developed countries provide financial resources to developing countries. Other Parties may also contribute, but on a purely voluntary basis.
- The Agreement includes a robust transparency framework for both action and support.
- Starting in 2023, a global stocktake covering all elements will take place every five years to assess the collective progress towards achieving the purpose of the Paris Agreement and its long term goals.
- The Paris Agreement establishes a compliance mechanism, overseen by a committee of experts that operates in a non-punitive way, and is facilitative in nature.

**Present status:** The Paris Agreement entered into force on 4 November 2016. The first session of the Conference of the Parties serving as the Meeting of the Parties to the Paris Agreement (CMA 1) took place in Marrakech, Morocco from 15-18 November 2016. India has also ratified the agreement on Oct 2, 2016.

**Analysis of Paris Agreement:**

**Win- Win Situation for all**

- **Developed Nation-** The developed countries have ensured that henceforth climate actions would be taken by every nation and not just them.

- **Developing Nation-** The developing countries were able to take heart from the fact that the all-important principle of 'differentiation' viz CBDR – has been retained, even though in a diluted form
- **The island nations and least developed countries —** Most vulnerable to climate change were happy to have forced the rest of the world to acknowledge the need to take a 1.5 degree path instead of the 2 degree it is more comfortable with**.**

**Few of the issues with Paris Agreement**

- The INDC commitments are voluntary, and there is no penalty for failing to meet them. Even if they are met, they will not put the world on a path to less than 2 C of warming.
- No clarity on finance and technology transfer issues.
- No mechanism for updated targets for countries based on stocktaking of carbon dioxide or equitable distribution of the remaining carbon budget for the world.
- Ignoring the CBDR-RC principle; putting developing and developed countries at same level. Though INDCs still allows the space for equitable targets for reduction, it is not guaranteed and it is thus believed that developing countries would be at a disadvantage.
- **Binding targets:** Countries have pledged their emission reduction targets. But these are only pledges. Even though China and USA have recently ratified Paris Agreement, the implication for violation of the pledges is not clear.

**Conflict between developed and developing countries**

- **On 'transparency':** Developed countries want a 'common and unified' system to compare the climate actions undertaken under INDCs. Developing countries, however, want the CBDR-RC principle to be reflected in the transparency provision.
- **'Stocktale' provision** for estimating the progress in the implementation of INDCs in 5 years. However, the developed countries want to put mitigation aspect specific and hold everyone accountable for that but not the finance and technology transfer provision.
- **The principle of 'historical responsibility'** is conveniently ignored now; only current emissions are the basis of comparing mitigation strategies. So even if China uses more coal than India, it is ignored because there is an incremental decline even though from a very large base. This is not equity.
- **No clarity on finance and technology transfer;** IPR issues.

## 3.1.3. INDIA: AGREEMENTS ON CLIMATE CHANGE

### A. INDIA RATIFIES PARIS CLIMATE DEAL AT U.N.

- India is the 62nd country to ratify the agreement and accounts for 4.1 per cent of the emissions.
- Ratified on 147th birth anniversary of Mahatma Gandhi, also observed as the International Day of Nonviolence by UN.

### B. SECOND COMMITMENT PERIOD (2013-2020) OF THE KYOTO PROTOCOL

Recently the Union Cabinet had approved the ratification of **the second commitment period (2013-2020)** of the Kyoto Protocol on containing the emission of greenhouse gases.

**Importance of this ratification:**

- In view of the critical role played by India in securing international consensus on climate change issues, this decision further underlines India's leadership in the comity of nations committed to global cause of environmental protection and climate justice.
- Ratification of the Kyoto Protocol by India will encourage other developing countries also to undertake this exercise.
- Implementation of Clean Development Mechanism (CDM) projects under this commitment period in accordance with Sustainable Development priorities will attract some investments in India as well.

Student Notes:

**What is Second Commitment Period**

- Kyoto Protocol was adopted in 1997 and the 1st commitment period was from 2008-2012. At Doha in 2012, the amendments to Kyoto Protocol for the 2nd commitment period (the Doha Amendment) were successfully adopted for the period 2013- 2020.
- This period bridges the gap between the end of the 1st Kyoto period and the start of the new global agreement in 2020. In this period, the **EU, some other European countries and Australia** have agreed to make further emissions cuts.

**Difference between first commitment period and second commitment period**:

- During the first commitment period, 37 industrialized countries and the European Community committed to reduce GHG emissions to an average of five percent against 1990 levels.
- During the second commitment period, Parties committed to reduce GHG emissions by at least 18 percent below 1990 levels in the eight-year period from 2013 to 2020; however, the composition of Parties in the second commitment period is different from the first.

**Importance of second commitment period**

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.

**What is Emissions Gap?**

- Emissions gap is the difference between the emissions levels in 2020 necessary to meet climate targets, and the levels expected **that year if countri**es fulfill their promises to cut greenhouse gases.
- So, the emissions gap reveals how much more needs to be done by countries in order to meet the target of keeping global warming levels below the 2°C safe limit as agreed in the Paris climate accord last year.

**Significance of the Finding**

- The Report shows that the INDCs, even if fully implemented, would only help the world in staying below an increase in temperature of 3.2°C by 2100, and this would have disastrous consequences for the climate.
- The report has therefore **emphasised on pre-2020 action by countries**. According to it, raising ambition before 2020 is likely the last chance to keep the option of limiting global warming to 1.5°C.

**About Kyoto Protocol**

- 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).

**Classification of Parties to the Kyoto protocol**

- **Annex I**: Parties to the UNFCCC listed in Annex I of the Convention. These are the **industrialized (developed) countries** and "economies in transition" (EITs). EITs are the former centrally-planned

(Soviet) economies of Russia and Eastern Europe. The European Union-15 (EU-15) is also an Annex I Party.

- **Annex II**: Parties to the UNFCCC listed in Annex II of the Convention. Annex II Parties are made up of **members of the Organization for Economic Cooperation and Development (OECD)**. Annex II Parties are required to provide financial resources to enable developing countries in reducing their greenhouse gas emissions (climate change mitigation) and manage the impacts of climate change (climate change adaptation).
- **Annex B**: Parties listed in Annex B of the Kyoto Protocol are Annex I Parties with first or second round Kyoto greenhouse gas emissions targets.
- **Non-Annex I**: Parties to the UNFCCC not listed in Annex I of the Convention are **mostly low-income developing countries**. Developing countries may volunteer to become Annex I countries when they are sufficiently developed.
- **Least-developed countries (LDCs)**: 49 Parties are LDCs, and are given special status under the treaty in view of their limited capacity to adapt to the effects of climate change.

**Mechanisms to stimulate green investment**

- **Emission Trading**: Emissions Trading-mechanism allows parties to the Kyoto Protocol to buy 'Kyoto units' (emission permits for greenhouse gas) from other countries to help meet their domestic emission reduction targets.
- **Clean Development Mechanism (CDM):** Countries can meet their domestic emission reduction targets by buying greenhouse gas reduction units from (projects in) non Annex I countries to the Kyoto protocol.
- **Joint Implementation**: Any Annex I country can invest in emission reduction projects (referred to as "Joint Implementation Projects") in any other Annex I country as an alternative to reducing emissions domestically.

## C. INTERNATIONAL SOLAR ALLIANCE (ISA)

- The International Solar Alliance is a common platform for cooperation among sun-rich countries lying fully or partially between the Tropics of Cancer and Capricorn who are seeking to massively ramp up solar energy.

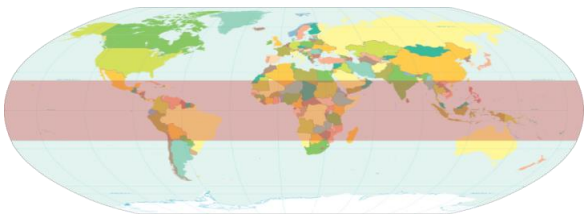


**Fig: ISA members**

- India and France had launched an International Solar Alliance (ISA) at the CoP21 Climate Conference Paris in Dec, 2015. The foundation stone for an interim secretariat of the International Solar Alliance (ISA) in Gurgaon was laid last year by India and France. Indian government will provide land and $30 million to form a secretariat for the Alliance, and will support it for five years.

**Objectives**

- Promote solar technologies and investment in the solar sector to enhance income generation for the poor and global environment.
- Formulate projects and programme to promote solar applications.
- Develop innovative Financial Mechanisms to reduce cost of capital.
- Build a common Knowledge e-Portal.
- Facilitate capacity building for promotion and absorption of solar technologies and R&D among member countries.

**Present status:** At present 121 countries have joined the agreement.

**Significance of ISA**

**For world:** More than 120 countries are geographically located in the tropics. These places get ample sunlight throughout the year, making solar energy an easily available resource. These countries also happen to be ones where maximum growth in energy demand is expected in the coming years. The ISA is an effort to ensure that as these countries rapidly ramp up their electricity production, they should predominantly use solar energy and avoid fossil fuels.

**Benefits to India**

- Launching of ISA has set up the stage for India's proactive and forward-looking leadership on climate change and the transition to a less carbon-intensive growth trajectory. The ISA launch establishes India as a voice of authority in the developing world on clean energy
- This will help India in meeting its solar energy target which is to generate the 100GW of solar energy by 2022.
- It will also help in bringing down the price of solar technology which will further help in accelerating the development of the country.
- It signaled that India would employ ISA as a foreign policy tool to cement its leadership among developing countries—vastly eroded by countries like China in the past decades.

**Challenges Ahead**

- **Funding:** Although alliance talks about developing "innovative financial mechanisms", it does not address how the capital would be provided.
- **Technology Sharing:** There is need to create a comprehensive framework to share the modern solar technologies at low cost.

# 3.2. CLIMATE CHANGE & ENVIRONMENT

## 3.2.1. SLOW PROGRESS IN ACHIEVING GREEN GROWTH

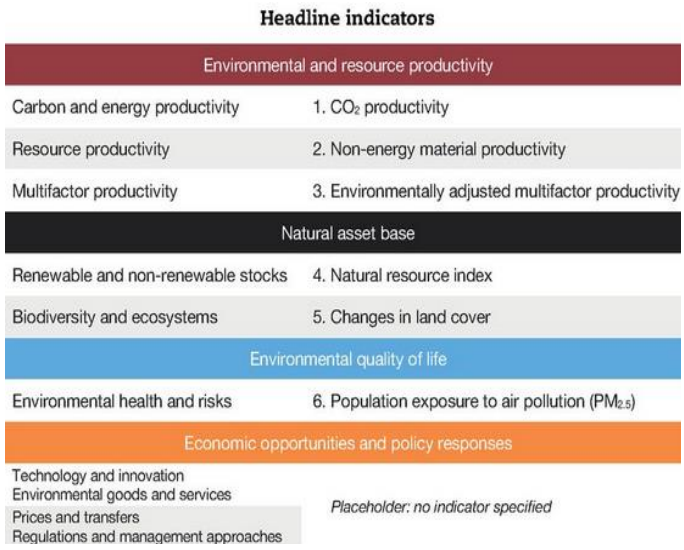
**Why in News?**

- In June 2017, OECD released a report titled ***"Green Growth Indicators 2017"*** highlighting the slow progress in achieving the Green Growth.

**What is Green Growth?**

- It is fostering economic growth and development while ensuring the natural assets continue to provide the resource and environment services on which our well-being relies.
- Green Growth is measured by **Green Growth Indicators** covering everything from land use to CO2 productivity and innovation.

**Green Growth Indicators 2017**




**Highlights of report**

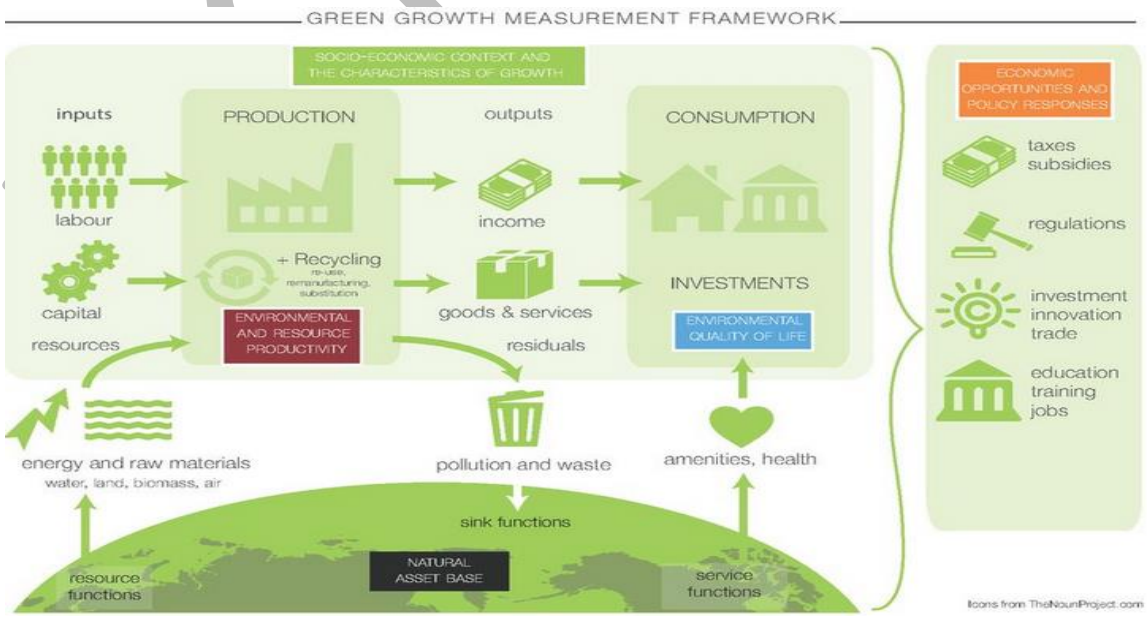
- The BRICS have a higher

average share of renewables at 14.8% than OECD countries at 9.6%, but the share has dropped in the BRIICS since 1990.

- China and the US extract the most non-energy raw materials followed by India and Brazil (mostly biomass), and South Africa and Canada (mostly metals).
- Urban areas are growing rapidly, even in some already highly urbanised countries, and across the OECD built-up areas are growing faster than populations.
- Air pollution remains dangerously high. Less than one in three OECD countries meet WHO air quality guidelines for fine particulate matter and pollution levels are high and rising in China and India.
- About 90% of green technologies originate in OECD countries, but the contributions of China and India are rising fast.
- Countries are making more use of environment-related taxes, but their contribution to total tax revenue has declined since 1995.

**Steps taken by India for Green Growth**

- **Research**
  - ✓ An **Initiative on Green Growth and Development** in India is a collaborative project Global Green Growth Institute (GGGI) and The Energy and Resources Institute (TERI).
- **Mission**
  - ✓ The **National Mission for Green India** is one of the eight Missions outlined under the National Action Plan on Climate Change (NAPCC).
- **Infrastructure**
  - ✓ Green Highways (Plantation, Transplantation, Beautification & Maintenance) Policy.
  - ✓ Emphasis on green infrastructure in **Smart Cities Mission**.
- **Tax and other measures**
  - ✓ Excise taxes on petrol and diesel have escalated by over 150 percent since 2014 this is considered as a **de facto carbon tax.**
  - ✓ **The coal cess which is, one-fifth the cost of mining coal.**
  - ✓ **Renewable purchase obligations on all electricity distribution companies and producers.**



## 3.2.2. EVIDENCES OF IMPACT OF CLIMATE CHANGE

**A. RISING TEMPERATURES CAUSES SOIL TO RELEASE MORE CO2**

Rising global temperatures is triggering carbon release from the soil, according to a study published in the journal **Nature**. More carbon dioxide in the air would accelerate planetary warming.

- Soils have accumulated vast amounts of organic matter especially in Tundra and Boreal forests. As the soil warms, microbial activity picks up and carbon or methane is released. Both of which are active greenhouse gases which contribute to global warming.
- The study says that temperature rise of 1degree Celsius will result in the release of 30 pentagrams of carbon which is double the amount emitted due to human activities annually.
- The massive jump in emissions can prove to be a serious setback to the efforts being made to keep the global temperatures from rising above 2 degree Celsius.

**B. CLIMATE CHANGE REDIRECTS CANADIAN RIVER: STUDY**

- The retreat of one of Canada's largest glaciers has changed the flow of a northern river almost overnight in an extreme case of what researchers call climate change "river piracy."
- For hundreds of years, the Slims carried meltwater northwards from the vast Kaskawulsh glacier towards the Bering Sea. But in spring 2016, a period of intense melting of the glacier meant the drainage gradient was tipped in favour of a second river (River Alsek), redirecting the meltwater to the Gulf of Alaska,
- It was found that a glacial barrier that once routed its flow northward into the Bering Sea had been breached in the spring.

**C. CORAL BLEACHING**

- A study report that 2,300-kilometre long Great Barrier Reef in Australia has suffered its most severe bleaching in recorded history.
- The Bleaching is due to warming sea temperatures during March and April of this year, with the maximum damage on its northern, pristine part.
- Scientists estimate that the northern region, region with most damage, will take at least 10-15 years to regain lost corals. However, the issue could be the possibility of a major bleaching event occurring before that, hampering the recovery.
- The southern two-thirds of the reef has escaped with minor damage.

## 3.2.3. INITIATIVES BY INDIA TO COUNTER CLIMATE CHANGE

India is taking many measures to deal with climate change, and specifically mitigation. The government also launched an outreach program in 2015 to inform people and other countries about all the efforts that are being made.

**Following steps have been taken:**

| | |
|---|---|
| **Policy development** | • **National action plan on climate change (NAPCC):** Government of India has launched **eight Missions** as part of NAPCC in specific areas which include assessment of the impact of climate change and actions needed to address climate change. National Action plan on climate change is being revised in view of new knowledge and some new missions are being added viz Health, waste to energy, coastal areas etc.<br>• **National Action Programme to Combat Desertification:** It is proposed to |

| | |
|---|---|
| | initiate activities such as assessment and mapping of land degradation, drought monitoring and early warning system, drought preparedness plans, and on-farm research activities for development of indigenous technology etc.<br>• **National Policy on Bio-fuels** approved by Cabinet to promote cultivation, production and use of Bio-fuels for transport and in other applications |
| **Funding** | • National Adaptation Fund for Climate Change<br>• Implementation of coal cess of Rs 200 per ton, and the increased taxes on petrol and diesel that should be seen as carbon tax being imposed on its citizens.<br>• The National Clean Energy Fund (NCEF) which is supported by the cess on coal was created for the purposes of financing and promoting clean energy initiatives, funding research in the area of clean energy and for any other related activities |
| **International Cooperation** | • India is party to major International agreements to combat global warming and climate change<br>• India has ratified Paris agreement, signed Kigali agreement<br>• Launch of International Solar Alliance |
| **Forestry** | • Launch of CAMPA<br>• National Green Highway Mission<br>• Promotion of agro-forestry, community participation in forest management |
| **Progress on renewable energy front** | India is currently undertaking the largest renewable capacity expansion programme in the world. The total renewable energy capacity target has been increased to 175GW by the year 2022, out of which 100GW is to be from solar, 60 GW from wind, 10 GW from biomass and 5 GW from small hydro power projects |
| **Alignment of development projects with climate objectives** | In its INDC, India has also linked several of government's flagship programmes like the Smart Cities Mission, Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Swachh Bharat Mission, National Heritage City Development and Augmentation Yojana (HRIDAY), National Mission for Clean Ganga, Make in India policy, Soil Health Card scheme, PradhanMantriKrishiSinchayeeYojana and many others to climate objectives. |

**Achievement:** In its INDC, India said its emission intensity in 2010 had already been cut by 12 per cent as compared to 2005.

**Challenges before India in tackling climate change:**

**a)** India houses 30 per cent of the global poor, 24 per cent of global population without access to electricity, and 92 million people without access to safe drinking water. Coupled with its vulnerability in terms of the impact of climate change, this entails that India faces formidable and complex challenges in terms of balancing the sustainable development agenda.
**b)** Task of achieving renewable energy targets is enormous considering the present status of achievement.
**c)** Finance mobilization is critical to achieve the targets.
**d)** India lacks in cutting edge technology needed to combat climate change.
**e)** Lack of skilled manpower to take forward many of its missions. For eg there is acute shortage of skilled persons dealing with solar technology, wind power generation etc.

## 3.2.4. CLIMATE ENGINEERING

**What is it?**

Climate engineering, also known as **geoengineering**, describes a diverse and largely hypothetical array of technologies and techniques for intentionally manipulating the global

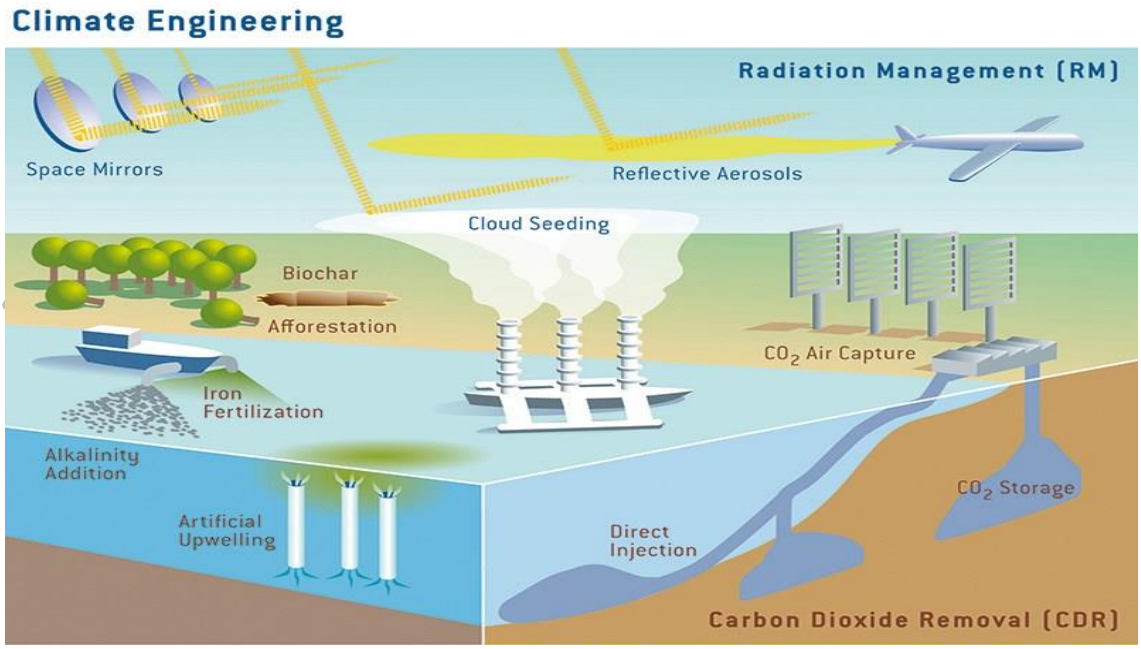
climate, in order to moderate or forestall the (most severe) effects of climate change.

They are sometimes viewed as additional potential options for limiting climate change alongside mitigation and adaptation.

Climate engineering efforts can be divided into two categories:

1. **Removal of Greenhouse gases from the atmosphere:** This basically involves management of carbon. It includes:
   - **carbon capture and storage (CCS)**, where some of the carbon dioxide (CO) being emitted by coal-fired power stations is recaptured by physically sucking it in and transporting it elsewhere to be sequestered underground.
   - **Increasing forest cover** as plants will absorb some of the unwanted CO. Increased forestation is part of India's strategy for reducing CO.
   - **Ocean fertilization**
   - **Biochar**

   However, it is not clear whether CCS, reforestation and other carbon removal methods can make sufficient impact at the global level to significantly slow down global warming.
2. **Solar Radiation Management or Sunlight Reflection Methods (SRM):** This method aims to reduce the amount of heat trapped by greenhouse gases by reflecting sunlight back into space, either by increasing the reflectivity of the earth's surfaces, or by deploying a layer of reflective particles in the atmosphere.
   Among the techniques being considered under SRM are marine cloud brightening, cirrus cloud manipulation and stratospheric aerosol injection (SAI).
   Stratospheric aerosol injection (SAI): SAI, involves spraying into the stratosphere fine, light-coloured particles designed to reflect back part of the solar radiation before it reaches and warms the earth. SAI proponents claim that this could bring down the global temperature by as much as 1°C.




**Concerns:**

- No technologies have been deployed at the scale that impacts global climate.

- Complexity and uncertainity of its potential effects upon climate governance and human society raises profound questions.
- Imperfect knowledge of both the technology and the climate system: there are worries about the unintended environmental and ecosystem side effects. It may alter natural surroundings and weather patterns as well as the lives and livelihoods depended upon them.
- This may siphon resources and momentum away from already flagging efforts to reduce carbon emissions.

**Way Ahead:**

Continuation of responsible research in climate engineering should be done under proper regulatory oversight. International governance mechanisms need to be evolved for overseeing the research and development.

Also, we should not be overly dependent on climate engineering solutions to tackle climate change rather focus on traditional solutions in the form of energy conservation, reducing emissions and afforestation.

# 3.3. CLEAN ENERGY

## 3.3.1. REDUCING CARBON FOOTPRINT

**INTERNAL CARBON PRICE**

**Why in news?**

Mahindra & Mahindra became first Indian firm to announce an internal Carbon Price of $10 per ton of carbon emitted.

**What is internal carbon price?**

It is an internationally recognised business tool that enables companies to create resources which are invested in low carbon technologies, which help reduce future emissions and lower operating costs.

A carbon price is a cost applied to carbon pollution to encourage polluters to reduce the amount of greenhouse gas they emit into the atmosphere.

There are two main types of carbon pricing:

- emissions trading systems (ETS)
- carbon taxes.

An **ETS:** sometimes referred to as a cap-and-trade system – caps the total level of greenhouse gas emissions and allows those industries with low emissions to sell their extra allowances to larger emitters.

**Significance**

- Help accelerate innovation and drive our investments in energy efficient and renewable technologies.
- Taking advantage of low-carbon investment opportunities while managing carbon risk.
- Some of the global companies that have announced carbon pricing are Unilever, Microsoft, Google.
- Mahindra partnered with the World Bank and IFC led Carbon Pricing Leadership Coalition along with the World Resources Institute, India to enhance its understanding of the Carbon price mechanism.

**Carbon Tax and Feasibility of Carbon Tax in India**

**Carbon Tax**

- Burning of hydrocarbon fuels release CO2 which affect the environment and society adversely. Thus it has a social cost that it higher than the private cost. Carbon tax is

imposed on these hydrocarbon fuels so that these negative externalities are taken into account for. The purpose is to dissuade people from using products that require burning of hydrocarbon fuels and also use the revenue thereby collected for production of alternate products.

- It has been regularly suggested by international organisations like IMF

**Indian Position**

- In 2010 India introduced a nationwide carbon tax of 50 rupees per metric tonne of coal both produced and imported into India. In 2014, govt. has increased the Price to 100 rupees per metric tonne. It has been further increased from 100 Rs per tonne to 200 Rs per tonne now.
- A carbon tax will help India to meet their voluntary target to reduce the amount of carbon dioxide

**Pros**

- Using revenue for developing green technologies
- shifting the people from hydrocarbons to renewable methods; habits like cycling, car pooling etc which are healthy would be inculcated
- leads to socially efficient income

**Cons**

- Revenue might not come efficiently- implementation might be difficult, cost of administration would be high,
- Covert operations by tax evasion
- Production shift; to 'pollution havens'
- developing countries cannot manage increase in cost of essential fuels
- the increase in cost might be too less to lead a substantial influence

## 3.3.2. BIOFUELS

**Why in News?**

1st second generation ethanol bio-refinery will be set up in Bathinda in Punjab by HPCL.

**Generations of Biofuels**

**First Generation Biofuel**

- They **are produced directly from food crops**.
- Crops such as wheat and sugar are the most widely used feedstock

**Second Generation Biofuel**

- They are produced from **marginal croplands unsuitable for food production or non-food crops** such as wood, organic waste, food crop waste and specific biomass crops. For example- Jatropha
- Thus, it overcomes over food vs fuel debate in first generation biofuel.


- It is also aimed at being cost competitive in relation to existing fossil fuels and increasing Net energy gains.

**Third Generation Biofuels**

- It is based on improvements on the production of biomass by taking advantage of **specially engineered energy crops** such as algae as its energy source.
- The algae are cultured to act as a low-cost, high-energy and entirely renewable feedstock.
- Algae will have the potential to produce more energy per acre than conventional crops.

**Fourth Generation Biofuels**

- Fourth Generation Bio-fuels are aimed at producing sustainable energy and also capturing and storing carbon dioxide.
- This process differs from second and third generation production as at all stages of production the carbon dioxide is captured which can be then geo-sequestered.
- This carbon capture makes fourth generation biofuel production carbon negative rather than simply carbon neutral, as it is 'locks' away more carbon than it produces.

**Benefits of Bio-ethanol Plants**

- Provide additional sources of remuneration to farmers
- Reduction in CO2 emissions from the paddy straw which currently is burnt after harvesting
- It will produce about 30,000 tonnes of bio-fertiliser per annum that can be used as soil nutrient.
- It will produce more than 1 lakh kilograms of Bio-CNG per annum which can cater to transport and clean cooking requirements.
- These Bio-refineries shall produce around 35-40 crorelitres of ethanol annually, thus contributing significantly towards the EBP programme

**Issues**

- **Issues with first generation**
  - ✓ One of the major drawbacks is that they come from biomass that is also a food source. This has led to increase in the volumes of crops being diverted away from the global food market and is blamed for the global increase in food prices over the last couple of years
  - ✓ Some biofuels have negative Net energy gain meaning that the energy expended to produce the biofuel is more than the energy gained from that harvest
- 2nd generation biofuels come from non-food biomass, but still compete with food production for land use.
- Finally, 3rd generation biofuels present the best possibility for alternative fuel because they don't compete with food. However, there are still some challenges in making them economically feasible.

**Way Forward**

- It needs to be ensured that the production of biofuels does not lead to food shortages, water shortages, high food prices, deforestation and other ecological damages.
- Biofuels are alternative sources to fossil fuels which can help India not only lower its import bill on oil but also help conserve environment.

## 3.3.3. HYDROGEN FUEL VEHICLES

**Why in news?**

Recently Toyota Motor North America, Inc. unveiled "Project Portal", a hydrogen fuel cell system designed for heavy-duty truck use.

**Advantages of hydrogen as a fuel**

- Hydrogen is the lightest element but it has the highest energy content per unit weight of all fuels.
- Its energy density is three times greater than that of petrol.
- Hydrogen can be extracted from virtually any hydrogen-containing compound, including both renewable and non-renewable resources
- Waste products from hydrogen in vehicles are only water vapour and warm air.

**Challenges**

- Hydrogen, seldom found on its own in nature, typically combines with oxygen and carbon.
- Storing hydrogen a challenge because it requires high pressures, low temperatures, or chemical processes to be stored compactly.
- Production cost of hydrogen fuel based vehicles is high at present.

## 3.3.4. ENERGY CONSERVATION IN BUILDINGS

**Background**

Commercial as well as residential buildings in cities are more and more energy for their different needs viz. cooling, lighting etc. this high energy intensity is causing a burden on financial health on one side and is also leading to GHG emissions and global warming on other.

In view of this various organizations are working to make buildings more and more energy efficient.

**Three primary Green building rating agencies in India**

- **Green Rating for Integrated Habitat Assessment (GRIHA):** Developed by TERI (The Energy and Resources Institute) and the Ministry of New and Renewable Energy.
- **Indian Green Building Council (IGBC):** The vision of the council is, "To enable a sustainable built environment for all and facilitate India to be one of the global leaders in the sustainable built environment by 2025".
- **Bureau of Energy Efficiency (BEE): Statutory body under Ministry of Power.** Buildings rating based on a 1 to 5 star scale.

**Why energy conservation in buildings is important:**

Energy saved is energy generated. India is dependent on imports for fulfilling its energy needs. It also faces challenges to provide clean energy to all its population. It has set a target of Power to all by 2019. Energy conservation measures will help it in achieving various objectives:

- Reducing financial burden
- Reducing GHG emissions
- Biodiversity conservation and environmental conservation as less forest will be cleared and less coal will be mined

**Challenges**

Energy-efficient buildings require a higher investment. Also the technologies are not available to all. Moreover, the awareness level is also very low.

**Recent developments**

**A. GREEN BUILDING RATING SYSTEM:**

To promote construction of environment-friendly buildings, Rajasthan government has adopted the green building rating system developed by the Indian Green Building Council (IGBC).

**Significance**

- Lays emphasis on checking exploitation of natural resources in the construction of buildings.
- Ensure environment-friendly construction
- It comprises a predefined set of criteria relating to the design, construction, and operations of green buildings.

**B. ENERGY CONSERVATION BUILDING CODE-2017:**

Recently, Minister of Power launched the revised Energy Conservation Building Code 2017 (ECBC 2017). ECBC was initially developed by the Govt. of India for new commercial buildings on 27th May 2007.

- ECBC sets minimum energy standards for commercial buildings. They are voluntary in nature and have been accepted by 22 states with their own modifications to the codes.

**More about the Codes**

- It was developed by BEE with technical support from United States Agency for International Development (USAID) under US-India bilateral Partnership to Advance Clean Energy-Deployment Technical Assistance (PACE-DTA) Program.
- ECBC 2017 sets parameters for builders, designers and architects to integrate renewable energy sources in building design with the inclusion of passive design strategies.
- The code aims to optimise energy savings with the comfort levels for occupants, and prefers life-cycle cost effectiveness to achieve energy neutrality in commercial buildings.
- In order for a building to be considered ECBC-compliant, it would need to demonstrate minimum energy savings of 25%.
- Additional improvements in energy efficiency performance would achieve higher grades like ECBC Plus or Super ECBC status leading to further energy savings of 35% and 50%, respectively.

# 3.4. RENEWABLE ENERGY: RECENT DEVELOPMENTS

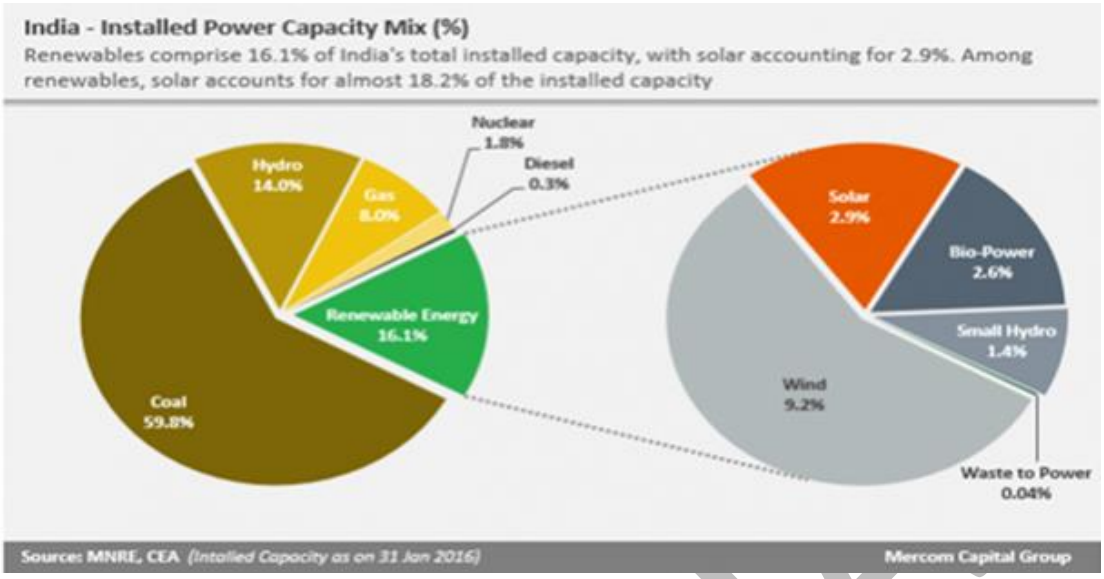
## 3.4.1. RENEWABLE ENERGY: BACKGROUND

**Targets**

- At the Paris Climate Summit, India promised to achieve 175 GW of renewable energy capacity by 2022. This includes 60GW from wind power, 100GW from solar power, 10 GW from biomass and 5GW from small hydro projects.
- The target set for the various renewable energy sources for the next three years are(in MW):

| Source | 2016-17 | 2017-18 | 2018-19 |
|---|---|---|---|
| **Solar Power** | **12,000** | **15,000** | **16,000** |
| **Wind** | 4000 | 4600 | 5200 |
| **Biomass** | 500 | 750 | 850 |
| **SHP** | 225 | 100 | 100 |
| **Grand Total** | **16725*** | **20450*** | **22150*** |

**Present Status**




**WIND RESOURCES**

**Observations**

- **Wind resources** are concentrated mainly in the western states (Gujarat, Maharashtra and Rajasthan) and southern states (Andhra Pradesh, Karnataka, Tamil Nadu and Telangana).

**Constraints**

**Location related**

- **Constraint in accessing high voltage transmission infrastructure:** 47% wind zones and two-thirds solar PV zones are more than 25 km away from existing substations with transmission voltage of 220 kV and above.
- About 84% of all wind zones are on agricultural land. It provides opportunities for multiple uses of land, but may also impose constraints on land availability.

**Other: Wind sector's woes**

- The grid usually is unavailable when the wind power plants generate electricity and therefore, remains unutilised. Wind energy developers get paid only when the generated power is fed into the grid.
- Distribution companies, have been deferring payments for electricity generators. Part of the reason for delayed payments is the lowering solar tariffs. Discoms do not want to pay Rs 5 for one unit of electricity when solar costs close to Rs 3 per unit.

**Steps taken**

**(a) Scope for developing co-location for wind and solar generation:** Latest research points out that about a quarter (28 per cent) of all solar PV zones overlap with wind zones, which means it is an opportunity for developing co-location for both. It will also be economical and easy to develop transmission extensions which can be used for both.

**(b) Wind Power Reform:** The new guidelines released by Ministry of New and Renewable Energy address payment and evacuation issues in the wind power sector.

- Introduced a payment security mechanism that guarantees a partial compensation to wind

power developers in case of back-downs or grid unavailability.
- Tariff paid by the state DisComs should be competitive, not just compared to the feed-in tariff being paid and solar tariff that is close to Rs 3.15 per unit.

**OTHER RECENT DEVELOPMENTS**

**Record 5,400mw Wind Power in 2016-17**

- India added a record 5,400 megawatts (MW) of wind power in 2016-17, exceeding its 4,000MW target.
- The leading states were Andhra Pradesh at 2,190MW, followed by Gujarat and Karnataka.

Now, in terms of wind power installed capacity India is globally placed at 4th position after China, USA and Germany.

**SOLAR POWER IN INDIA**

**Location**

**Solar PV resources** are distributed across several states, but Rajasthan, Gujarat, Maharashtra and Madhya Pradesh have the most resource potential.

**Constraints**

- Only 29% of suitable solar PV sites and 15% of Concentrated Solar Power (CSP) sites are within 10 km of a surface water body, suggesting water availability as a significant sitting constraint for solar plants
- Constraints related to competing land use and access to transmission lines is common to both solar and wind energy.

**Rooftop Solar project**

**Need**

- India has set up an ambitious 100 GW solar power target by 2022. Of the 100 GW, 40 GW is planned from the solar PV (photovoltaic) rooftop system. However, rooftop solar capacity till 2016 was about 1GW only.
- India has given a huge thrust to the solar rooftop sector as it does not require pooling of land or separate transmission facilities and has minimal technical losses, unlike ground-mounted solar projects.
- Rooftop projects also enable power distribution companies to meet their renewable purchase obligations and also help them in managing daytime peak loads.
- Commercial benefits in avoiding investments in transmission system are huge.
- It reduces the dependence on grid power, diesel generators and is a long-term reliable power source for consumers.

**Progress till date:** Considerable efforts have been put in place to develop the rooftop solar photovoltaic sector in India by the government, regulatory commissions and concerned agencies. Basic framework now exists in the country and implementation of rooftop solar power plants has started in true sense.

- The Government has instituted multiple enablers such as a 30% capital subsidy on the system cost for systems being implemented on residential rooftops, benefits of accelerated depreciation of 40%, encouraging financing of systems under the priority sector and lower interest rates.

- Most of the state govt has issued net metering guidelines to promote solar rooftop projects.

**Status**

As of July, 2017, India had achieved a solar rooftop installed capacity of around 1 GW, as against the year 2022 targets of 40GW.

**Challenges**

- Although there are net metering guidelines in place but because of **lack of experience and maturity in the market**, many states are yet to announce the detailed procedures to grant connectivity to rooftop solar plants.
- **Delay in getting final approval:** Further, across the states, it may take 3-4 months from the date of application to receiving grant of connectivity even for a residential rooftop solar system. There are further shared approvals and clearances between multiple departments such as the regulatory commission, state nodal agencies, DISCOMs, urban local bodies, etc. which may cause delays.
- **From a consumer perspective**, there are complexities involved in procedures of various departments, because of which they have to take out significant time from their day to day activities to get the project installed, avail CFA, apply for grid connection and follow up on bill settlement by the distribution licensee.
- Another major challenge is the **non-availability of skilled and trained manpower**. This couples with loosely drafted rooftop leasing agreement and sharing of roles and responsibilities between the developer and the rooftop owner.
- Distribution Related: there are limits on the total amount of electricity that can be injected in the grid at one point owing to the transformer capacity at that location. Other grid related issues such as effect on voltage control, quality of power, grid protection issues, forecasting and scheduling issues are other factors that have to be taken care of.

**Recent developments**

**(a) Solar Energy Corporation of India (SECI)** called for bids to install 1 GW rooftop solar power projects on central government buildings.

**(b) NO Duty on Solar Rooftops:** To encourage the use of rooftop solar power, Ministry of New and Renewable Energy (MNRE) has exempted customs and excise duties on materials used in solar rooftop projects of more than 100-KW capacity.

**Implications of the move**

- The move is expected to cut down the overall cost of power from rooftop projects. It will therefore promote rooftop solar installations across the country.
- It will aide domestic solar module manufacturing. Developers mostly use imported modules for solar installations as they are 8-10% cheaper. The duty will bridge the gap between imported and domestic.

# 4. AGRICULTURE AND ENVIRONMENT

## 4.1. CLIMATE CHANGE AND AGRICULTURE

### 4.1.1. CLIMATE SMART AGRICULTURE

**About CSA**

- Climate smart agriculture (CSA) is an integrative approach to address these interlinked challenges of food security and climate change. It basically **aims at three main objectives**:
  - ✓ sustainably increasing agricultural productivity, to support equitable increases in farm incomes, food security and development;
  - ✓ Adapting and building resilience to climate change at multiple levels; and
  - ✓ Reducing and/or removing greenhouse gas emissions, where possible.
- It is **supported by Food and Agricultural Organisation (FAO).**

**Elements of CSA**

- CSA is not a set of practices that can be universally applied, but rather an approach that involves different elements embedded in local contexts. It relates to actions both on-farm and beyond the farm, and incorporates technologies, policies, institutions and investment.
- CSA approaches include four major types of actions:
  - ✓ Expanding the evidence base and assessment tools to identify agricultural growth strategies for food security that integrate necessary adaptation and potential mitigation
  - ✓ Building policy frameworks and consensus to support implementation at scale
  - ✓ Strengthening national and local institutions to enable farmer management of climate risks and adoption of context-suitable agricultural practices, technologies and systems
  - ✓ Enhancing financing options to support implementation, linking climate and agricultural finance

**Need for climate smartness in agriculture**

- **Rising challenges of food security**: The UN Food and Agriculture Organisation (FAO) estimates that feeding the world population will require a 60 percent increase in total agricultural production.
- **Negative impact of Climate change on agriculture**: Climate change is already negatively impacting agricultural production globally and locally, particularly in low-income countries where adaptive capacity is weaker. Impacts on agriculture threaten both food security and agriculture's pivotal role in rural livelihoods and broad-based development.
- **Impact of agriculture on environment**: The agricultural sector, if emissions from land use change are also included, generates about one-quarter of global greenhouse gas emissions.

### 4.1.2. CLIMATE CHANGE VULNERABILITY OF INDIAN AGRICULTURE

The vulnerability factor of Indian agriculture to climate change is very high. It is listed in the top 20 most vulnerable countries to climate change.

**Reasons**

- Uneven spatial and temporal distribution of water resources
- high presence of marginal farming and rain-fed agriculture

- less investment in irrigation, soil health etc- dependent on government support; in the event of floods, drought, soil pattern change etc individual farmers would not be able to do required amendments in cropping
- lack of use of tech and skill in farming to predict climate and adapt sowing accordingly

**Possible Impact on Indian agriculture**

- **Impact on soil health:** with increasing surface temperatures leading to higher CO2 emissions and reducing natural nitrogen availability. Mitigating this by increasing chemical fertilizer usage could impact long-term soil fertility, leaving the soil open to greater erosion and desertification.
- **Change in weather pattern:** Our regional crop patterns assume a specific range of weather variability, failing to cope with the recent high periods of heavy rainfall with long dry intervals. In 2013, large crops of wheat, gram, lentils and mustard, weeks away from harvesting, were destroyed in untimely rains.
- **Decrease in yield:** Limited temperature rises could lead to a 22 per cent decline in wheat yield in the *rabi* season, while rice yield could decline by 15 per cent. Other staple crops — sorghum, groundnut, chickpea - could see a sharp decline. It is estimated that without rising temperatures and rain variability, India's rice production over the past four decades could have been 8 per cent higher.
- **Livestock production** would face reduced fodder supplies given a decline in crop area or production.

**Policy measures needed**

- Increase agricultural productivity (as suggested by MS Swaminathan Committee report): A Rural spending plan focused on agriculture infrastructure particularly on irrigation, soil testing labs, water harvesting techniques needs to be promoted (National Commission on Farmers)
- Simple water harvesting and conservation measures (micro-irrigation, watershed management and insurance coverage) can reduce the majority of the potential loss due to drought (Intergovernmental Panel on Climate Change, 2013).
- Drought strategies at community level in rural areas-e.g. pond construction under MNREGA
- Each village should be provided timely rainfall forecasts along with weather-based forewarnings regarding crop pests and epidemics in various seasons.
- Assessment of real time availability of water resource. **National Hydrology Project** is a good initiative towards this
- **Afforestation, in a biodiverse manner,** should be encouraged to help modify regional climates and prevent soil erosion.
- **Agro-climatic cropping pattern** need to be incorporated; need to promote conservation farming and dryland farming. Zero tillage and laser-based levelling can also help conserve water and land resources.
- **Changing planting dates** could have a significant impact; research highlights that planting wheat earlier than usual can help reduce climate change-induced damage.
- **Focus on expanding our formal credit system** to reach all marginal farmers. **Insurance coverage** should be expanded to all crops while reducing the rate of interest to nominal levels: Effective implementation of PM Fasal Bima Yojana is needed.
- The Centre and States should launch an integrated crop, livestock and family health insurance package while instituting an Agriculture Credit Risk Fund to provide relief in the aftermath of successive natural disasters.

## 4.1.3. ORGANIC FARMING

**Background:** Citing the **successful example of Sikkim**, Prime Minister had called for expansion of organic farming across the country as part of efforts to transform the agriculture sector, entailing better remuneration for the farmers.

**Organic Farming**

- Organic farming is a system which limits (not eliminates completely the use of synthetic inputs (such as fertilizers, pesticides, hormones, feed additives etc.).
- It relies upon crop rotations, crop residues, animal manures, off-farm organic waste, and biological system of nutrient mobilization and plant protection
- Thus it is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity.

**Principles of Organic Agriculture**

- **Principle of Health**: It should sustain and enhance the health of soil, plant, animal and human as one and indivisible.
- **Ecological Principle:** It should be based on and work with living ecological systems and cycles, emulate them and help sustain them.
- **Principle of Fairness:** It should be built upon relationships that ensure fairness with regard to the common environment and life opportunities.
- **Principle of Care:** It should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.

**Need of organic farming**

- With the increase in population there is a need to stabilize agricultural production and increase it further in sustainable manner.
- 'Green Revolution' with high input use has reached a plateau and is now sustained with diminishing return of falling dividends
- A natural balance needs to be maintained at all cost for existence of life and property
- Agrochemicals which are produced from fossil fuel and are not renewable and are diminishing in availability may also cost heavily on our foreign exchange in future.
- With the cost of chemical fertilisers and pesticides, going up without any corresponding increase in productivity, farmers either quit the profession or are forced to end their lives unable to cope with mounting debts.
- Organic farming can significantly cut down the cost of production
- Organic agriculture in India will continue to grow and play a larger part in safely feeding 1.5 billion Indian mouths in 2030. New studies indicate that using the best management practices in organic systems over a long period of time can produce equal yields, or even outdo those of conventional systems.
- Organic farming is healthier and safe than non-organic farming. Organic farms have higher levels of soil biological activity and biodiversity;

**Challenges and Concerns**

- To start organic farming, the existing field has to be left fallow for minimum of 5-6 years to cleanse it of chemical fertilizers. This poses a burden on poor farmers.
- Availability of organic compost is a challenge.
- Due to relatively small volumes, the costs of organic food products are relatively high.

- The cost of cultivation increases as it takes more time and energy to produce than its chemical-intensive counterpart
- Specialised farmer training costs, higher processing and inventory holding costs, and increased packaging, logistics and distribution costs add to the price of end products.
- There is low awareness at the producer level on the difference between conventional farming and organic farming. At the consumer level there is confusion between natural and organic products and limited understanding of the health benefits of organic food products.

**Scope:** About 1-2% of the world's food is produced with organic methods. The market however is growing very quickly - by about 20% a year. In Europe, Austria (11%), Italy (9%) and the Czech Republic (7%) are the countries in which organic food production as it its highest.

**Government's Efforts**

- Government is promoting organic farming through various schemes under National Mission for Sustainable Agriculture (NMSA)/ ParamapragatKrishiVikasYojana (PKVY). National Horticulture Mission (NHM) and Horticulture Mission for North East & Himalayan States (HMNEH), financial assistance is provided for adoption of organic farming
- Organic Value Added Mode Development Mission for North-Eastern regions keeping in view the potentiality of farming in North-Eastern region
- The Centre's announcement for allocation of ₹1 billion for organic market development and ₹3 billion for the participatory guarantee scheme is commendable.
- Sikkim is an organic state with 75,000 ha of land under organic cultivation based on an initiative that started in 2003. Meghalaya aims to convert 200,000 ha under organic farming by 2020
- Government has come up with stringent punishment for selling counterfeit organic produce.
- Indian Council of Agricultural Research (ICAR) has developed technologies to prepare various types of organic manures.

## 4.2. NEWS RELATED TO AGRICULTURE

### 4.2.1. DRAFT ORDER ON BAN ON PESTICIDES

**Why in News?**

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

**More on the Ban**

- 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 was pending with the Supreme Court at that time.

**Significance of the Ban**

- The pesticides proposed to be banned are harmful not just to humans and animals but also leech into the soil and water bodies and harm the aquatic ecosystem.
- Therefore, the ban comes as a welcome step.
- India is likely to improve its reputation in countries (where the concerned pesticides are banned) which imports food related products (both manufactured and raw) from India.

## 4.2.2. FOOD LEGUMES RESEARCH PLATFORM (FLRP)

**Why in News?**

- Union Cabined has recently approved the setting up of Food Legume and Research Platform in Madhya Pradesh (Amlaha, Sehore).

**Why Legumes Research Platform is needed?**

- Food security is the mammoth task in front of Government. Research in Legumes (Pulses Crop) would play a pivotal role in this aspect.
- Global Climatic pattern is changing which in turn affecting the agriculture output. Thus, research in food Legume is need of the hour.
- India accounts 25% of world food legumes production. Thereby, making it a good destination for accelerating the production of more varieties and nutritious food legume using genomics techniques.
- This platform will contribute significantly towards reducing poverty, improving food security, improving nutrition and health, and sustaining the natural resource base.

**Four Dimensional benefits of Pulses (Legume Crop)**

- **Reducing poverty**
  - ✓ Pulses give 2-3 times higher market price than other cereal products.
  - ✓ These are locally produced by community action, especially by women.
  - ✓ Crop residue provide high protein value to livestock feed thereby cutting the cost of raising
- **Food Security**
  - ✓ It provides affordable source of protein.
  - ✓ Give more food by using less land.
  - ✓ Involves less risk due to its ability to withstand drought.
  - ✓ Often grown in rotation as it fulfils the soil nutrients requirement (nitrogen)
- **Improving nutrients and health**
  - ✓ Contains 3-4 time higher protein content than cereals crops.
  - ✓ Rich in nutrients like Calcium, Iron, Zinc and vitamin A.
  - ✓ Beneficial to women and child who are the risk of anaemia.
- **Sustainability for Environment**
  - ✓ Pulses leads to nitrogen fixation, thereby reducing the cost and environmental impact of chemical fertiliser.
  - ✓ Leafy cover of pulses prevent to soil erosion.

## 4.2.3. AMMONIA HOTSPOTS OVER AGRICULTURAL AREAS

**Why in news?**

- Researchers have discovered increased ammonia concentrations from 2002 to 2016 over agricultural centres in the US, Europe, China and India.

**Issues**

- Increased ammonia is linked to excessive use of fertilizers, livestock animal wastes, changes in atmospheric chemistry and warming soils that retain less ammonia.
- Gaseous ammonia is a natural part of the Earth's nitrogen cycle, but excessive ammonia is harmful to plants.
- The harm caused by ammonia in water bodies is more serious, because it is toxic to aquatic organisms.
- It can also lead to algal blooms and "dead zones" with dangerously low oxygen levels in oceans.
- Ammonia plays a role in the transportation and enhanced deposition of acidic pollutants - resulting in acidification of ground and water bodies

# 5. DISASTER MANAGEMENT

## 5.1. DISASTER PLANNING AND MANAGEMENT

### 5.1.1. NATIONAL DISASTER MANAGEMENT PLAN (NDMP)

- NDMP was unveiled last year. It is the **first major national plan for disaster management**. It aims to make India disaster resilient and reduces loss of lives.
- It is made keeping in mind the **Sendai Framework and Sustainable Development Goals (SDGs)**.

**Major highlights of the plan**

- **Comprehensive definition** of disaster
  - ✓ The plan is based on the four priority themes of the "Sendai Framework," namely:
    - understanding disaster risk,
    - improving disaster risk governance,
    - investing in disaster risk reduction (through structural and non-structural measures);
    - disaster preparedness- early warning and building back better in the aftermath of a disaster.
  - ✓ It covers all phases of disaster management: Prevention, Mitigation, Response and Recovery.
  - ✓ It covers human induced disasters like chemical, nuclear etc.;
- Planning : Planning for short medium and long run respectively 5, 10, and 15 years to deal with disasters.
- Integrating approach with role clarity
  - ✓ It provides for horizontal and vertical integration among all the agencies and departments of the Government.
  - ✓ The plan also spells out the roles and responsibilities of all levels of Government right up to Panchayat and Urban local body level in a matrix format.
  - ✓ Ministries are given role for specific disasters e.g. Ministry of Earth Sciences is responsible for Cyclones
  - ✓ The plan has a regional approach, which will be beneficial not only for disaster management but also for development planning.
  - ✓ It is designed in such a way that it can be implemented in a scalable manner in all phases of disaster management.
- Major activities
  - ✓ It also identifies major activities such as early warning, information dissemination, medical care, fuel, transportation, search and rescue, evacuation, etc. to serve as a checklist for agencies responding to a disaster.
  - ✓ It also provides a generalised framework for recovery and offers flexibility to assess a situation and build back better.
- Information & media regulation
  - ✓ To prepare communities to cope with disasters, it emphasises on a greater need for Information, Education and Communication activities.
  - ✓ It calls for ethical guidelines for the media for coverage of disasters as well as self-regulation. The plan wants the media to respect the dignity and privacy of affected people.

- ✓ Also, in a move aimed to stop rumours and spread of panic, the plan directed the authorities to schedule regular media briefing (depending on the severity of the disaster) and designate a nodal officer for interacting with the media on behalf of the government
- Focus on training, capacity building and incorporating best international practices

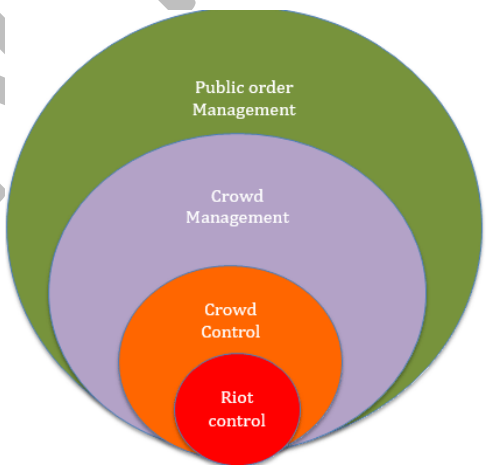
**Significance of the plan:** It closes a critical gap in our disaster management system- while most states and districts have prepared their plans, the national plan that was supposed to guide this process at the sub-national level was missing.

**Missing points**

- Unlike Sendai Framework or SDGs it does not set any goals or targets or a definite time frame.
- Further, a framework for funding is missing
- Apart from these some other improvements can be done. For example:
  - ✓ Role of corporate bodies need to be institutionalized
  - ✓ Inclusion of innovative methodologies- a judicious mix of new technology with traditional practices
  - ✓ Need to give space to disaster insurance provisions.

## 5.1.2. NDMA'S GUIDELINES ON CROWD MANAGEMENT

NDMA has released crowd management guidelines to **'Reduce stampede risks during festive season'.**




**Necessity for guidelines**

- An undercurrent of uncertainty prevails at huge gatherings.
- A crowd can become a stampede - a man-made disaster - in a moment and can result in casualties.
- A crowd can give in to baseless rumours or may just follow a herd-like mentality.
- Also the risk of fire is high especially during Ram leela celebrations of Dussehra.
- Once triggered, it is very difficult to contain this fluid mass of people. It is, therefore, important that the organisers of these pandals and Dussehra celebrations take simple precautions to ensure safety.

**Guidelines**

- Free movement: The first step is to regulate traffic in areas surrounding the pandals and Dussehra grounds.
  - ✓ For pedestrians, route maps for reaching the venue and emergency exit route should be put up at strategic points.
  - ✓ Barricading to ensure the movement of people in a queue is key to control a burgeoning crowd.
  - ✓ Unauthorised parking and makeshift stalls eating into pedestrian space also need to be taken care of.
- **Monitoring:** CCTV cameras to monitor movement and police presence to reduce the risk of snatching and other petty crimes should also be on the organisers' agenda.

- Medical emergencies can occur in claustrophobic spaces. An ambulance and health care professionals on stand-by can save lives in exigencies.
- **For participants**:
  - ✓ Familiarising with exit routes, staying calm and following instructions will help prevent stampede-like situations.
  - ✓ In case a stampede breaks out, protect chest by placing your hands like a boxer and keep moving in the direction of the crowd.
  - ✓ Stay alert to open spaces and move sideways wherever the crowd gets thinner. Stay away from walls, barricades or bottlenecks such as doorways.
  - ✓ Stay on your feet and get up quickly if you fall. If you can't get up, use your arms to cover your head and curl up like a foetus so that your exposure area is reduced.
- **Fire related**: Unplanned and unauthorised electrical wiring at pandals, LPG cylinders at food stalls and crackers hidden in the Ravana effigies pose the danger of a fire breaking out.
  - ✓ Organisers should ensure authorised use of electricity, fire safety extinguishers and other arrangements meeting safety guidelines. A list of neighbourhood hospitals would come in handy.

## 5.1.3. SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION

**Why in news?**

The Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR), 2016 was concluded at New Delhi. The Conference sought to pave the way towards **implementation of the Sendai Framework** in the Asian region.

**The Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR)**

**The** SFDRR, agreed in 2015 in Sendai Japan, is the successor instrument to the Hyogo Framework for Action (HFA) 2005-2015.

**Difference with earlier framework**

- The most significant shift is a **strong emphasis on disaster risk management as opposed to disaster management.**
- In addition, **the scope of disaster risk reduction has been broadened** significantly to focus on both natural and man-made hazards and related environmental, technological and biological hazards and risks.

**Present Status**

Representatives from 187 countries have adopted the 'Sendai Framework for Disaster Risk Reduction 2015-2030'. The Framework includes s**even targets and four priorities** for action.

The **seven targets** include:

1. a substantial reduction in global disaster mortality;
2. a substantial reduction in numbers of affected people;
3. a reduction in economic losses in relation to global gross domestic product (GDP);
4. a substantial reduction in disaster damage to critical infrastructure and disruption of basic services, including health and education facilities;
5. an increase in the number of countries with national and local disaster risk reduction (DRR) strategies by 2020;
6. enhanced international cooperation; and
7. increased access to multi-hazard early warning systems and disaster risk information and assessments.

The **four priorities for action** focus on:

1. a better understanding of risk;
2. strengthened disaster risk governance;
3. increased investment in DRR; and
4. more effective disaster preparedness and embedding the **'build back better'** principle into recovery, rehabilitation and reconstruction.

The Sendai Framework's clear targets and priorities for action will lead to a substantial reduction of disaster risk and losses in lives, livelihoods and health.

## 5.1.4. FOREST FIRE

**Why in news?** Parliamentary Standing Committee on Science and Technology submitted its report on forest fires.

**Details of report**

- It said that 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.
- The committee observed that Chir pine needles, which are highly inflammable due to its high resin content, are a prominent factor in occurring and spreading of forest fires. In comparison, incidents of fire in broad leaves forests were found to be minimal.

**Major Recommendations**

- The Committee suggested that a national policy on managing forest fires should be prepared.
- Planting of broad tree leaves in forests, and after a period of five years, systematic replacement of chir pine trees in forests by broad leaves.
- Procurement of sweeping machines to clear roadsides of chir pine needles and dry leaves in vulnerable areas.
- Advocated large-scale incentives and programmes (including under the MGNREGA) to collect pines for use as fuel, and other incineration.
- A dedicated toll-free number for reporting incidents of forest fire in each state.
- Use of corporate social responsibility funds for creating awareness campaigns on forest fires.
- Environment ministry should train fire brigade officers of all states and equip them with forest fire equipment so that in the event of forest fires they do not have to depend on outside agencies like NDRF.
- Creation of ponds and other water harvesting structures within the forest area to not only reduce river bank erosion but also as a handy tool for supply of water to douse forest fires.

**Forest Fires: A Brief**

In India, states where forest cover is thick, like Himachal Pradesh, Uttrakhand, and the North-East, are often prone to forest fires. During the summer, forest fires become quite rampant because the forests become littered with dry senescent leaves and twigs, which could burst into flames ignited by the slightest spark.

**Types of forest fires**

**Forest fires are normally of two types:**

- A surface fire may burn primarily by spreading along the surface litter (senescent leaves and twigs

and dry grasses etc.) on the forest floor.

- The other type is a crown fire, in which a crown of trees and shrubs burn, and is often sustained by a surface fire. A crown fire is particularly very dangerous in a coniferous forest because resinous material given off burning logs burn furiously.

**Why Indian forests are prone to forest fires?**

- A report titled Forest Fire Disaster Management, prepared by the National Institute of Disaster Management, in 2012, said about half of India's forests were prone to fires. 43% were prone to occasional fires and 5% to frequent fires, and 1% were at high or very high risk.
- Forest fires can be caused by both natural and man-made reasons. In most of the cases in India, due to heavy population, human habitations have often gone closer to thick forest, resulting in forest fires.
- The bulk of forest fires in India occur in the tropical dry forests of our country, an umbrella category encompassing scrub, savanna grassland, dry and moist-deciduous forests. Almost 70% of forests in India are composed of these types.
- The roots of our current fire crisis lie squarely in the blanket implementation of a no-fire forest policy. This 'one-size-fits-all' approach of fire protection is perhaps incompatible with the ecology of India's tropical dry forests.
- Supply of fuel by ample invasive species present in the forests also aids the spread of forest fires. Authorities have failed in preventing the spread of such species.

**Benefits of forest fires**

- Wildfires are sometimes a natural process, and help forests by promoting flowering, branching and seedling establishment. Fires that are limited to the surface may help in the natural regeneration of forests. The heating of the soil may result in helpful microbial activity, and hasten decaying processes that are useful for the vegetation.
- Recent research on the ecology and bio-geographical origin of these forests indicates that fire occurrence and light availability are important factors that maintain the ecosystem.
- Also, frequent, low-intensity forest fires possibly prevent the proliferation of many invasive species which act as fuel for the spread of forest fires.

**Way ahead:** Instead of viewing forest fires as being purely destructive in nature, forest managers should perhaps expand their world view and be more inclusive to information from ecological and local knowledge systems that view fires as being both rejuvenating and revitalising.

## 5.1.5. SAFETY MEASURES IN COAL MINES

**Why in news?**

An open cast coal mine collapsed in Lalmatia in Jharkhand killing at least 13 miners. It is the worst such disaster in over a decade.

**Occupational Hazards**

Occupational hazard is a danger to a worker that is the result of the occupation he/she is involved in. The danger can range from diseases to even death. Examples:

- Silicosis in stone crushing industry due to fine silica getting deposited in lungs.
- Frostbites to soldiers posted on high mountains.

**Background**

- Digging up more coal has become a national priority for India to meet its electricity needs.
- Alongside ship-breaking, mining is the most dangerous profession in India.
- NHRC in its 2014 report titled 'Views on Mine Safety in India' says:
  - The frequency of incidents has increased in recent years.
  - There has been a fatality every seven days in 2016.

**Reasons of such accidents**

- Poor safety conditions for workers.

- Not following Standard Operating Procedures (SOPs).
- PSUs outsource work to private companies that do not follow rules and regulations. eg.
  - To prevent flying of coal dust water is not sprayed on open cast mines.
  - Trucks are not covered with tarpaulin sheets.
- This is despite the Coal Mines (Nationalisation) Act 1973, which nationalized private sector, accused of neglecting safety Standard Operating Procedures.
- Careless use of explosives.

**Government initiatives on mining safety**

- Mines Act 1952 covers protection of health and safety of workers in mines.
- Major incidents are investigated by the **Oil Industry Safety Directorate** and a committee set-up by the Ministry of Petroleum and Natural Gas.
- Root Cause Analysis (RCA) and lessons learnt report is shared with oil companies to prevent similar incidents.
- Ministry of Mines has recently started **Anti-collision system for dumpers, electronic telemonitoring system, slope stability system and gas monitoring system** in some areas.

**What needs to be done?**

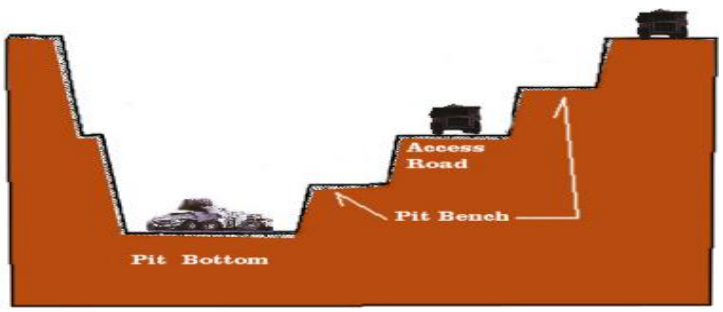
- NHRC in its 2014 report mentioned the need for the mining sector to adopt best practices including-
  - ✓ Using **scientific 'training need assessment'** for officers and workers
  - ✓ Developing **effective training delivery mechanisms**
  - ✓ Working on comprehensive **specialised training on accident investigation**.
- **Occupational health is not integrated with primary healthcare**. It is the mandate of the Labour Ministry. This has to be shifted to Health Ministry for better synergy and finance allocation.
- A regulator on occupational health safety is needed.

**Way forward**

The mining industry is a labour intensive industry. Therefore the government and the companies involved needs to devise a multi-pronged strategy that encompasses occupational safety along with protection of the rights of local residents and the environment.

- Safety standards as prescribed by ILO and national standards related to safety should be strictly adhered to.
- Any lapse or negligence on the part of those entrusted with safety requirements must be thoroughly investigated and punished.

**Open Cast Coal Mines**




- This is mining of minerals at the surface by excavating large strips of land as shown in the adjoined figure, without making subsurface tunnels as is done in underground mines.
- Retaining walls are made along steeper slopes to prevent collapse of pit benches.
- Its **benefits** include lower cost and higher safety level.
- It causes **ground water contamination** and high chances of exposure to radioactive substances.

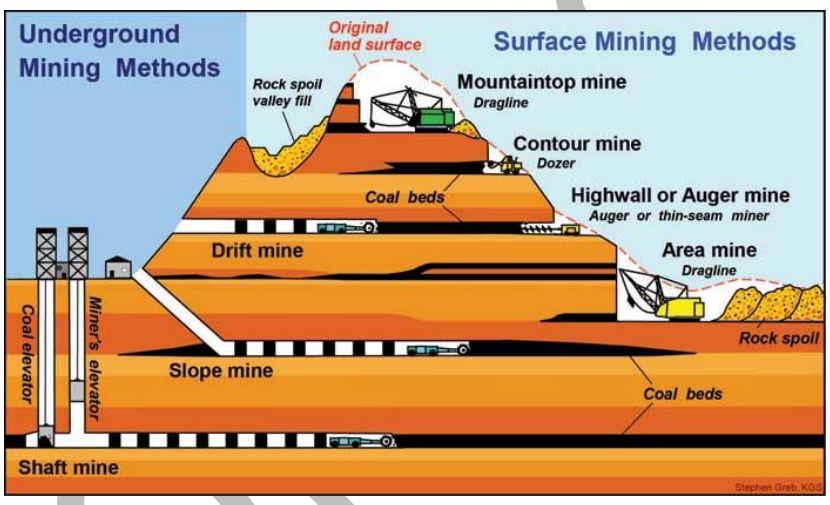
## 5.1.6. COAL FIRE

**Why in News?**

- **Unsafe and illegal mining** has led to fires in coal deposits under the surface of the Jharia coalfields in Jharkhand's Dhanbad district.

**Background**

- Most of the mines affected by coal fires date back before Independence and nationalization (private owners ran collieries earlier) when the thrust was on production and profit, with little regard for safety. This problem has later spread to other areas as well.
- There are different types of coal mining techniques which are all probable to fire incidents (see image).




**Consequences**

- Coal fires are a **risk to the population living on the surface** which could lead to cave-ins and gas spills.
- It is also harmful for the employees as they can get occupational diseases like black lung etc.
- They are also a threat to rail transport. Shutting of rail lines used for the evacuation of coal from production centres to market can lead to loss of revenue for the exchequer.

**Government steps**

- **Fire Mitigation - CIMFR (Central Institute of Mining and Fuel Research)** have started putting down fires with the help of the state government.
  - It is pushing nitrogen foam mixed with water through boreholes in the affected mines.
  - It is filling up cavities with sand and mud to cut-off oxygen supply and sprinkling water to lower temperatures.
- Government has shifted the arterial rail lines away from the areas where coal fires are dominant. Eg. Dhanbad-Chandpura line is being diverted from areas like Sijua which are vulnerable to coal fires.
- The **Rehabilitation and Development Authority (RDA),** formed by the Centre, in places like Jharia has now been asked for the **possibility of prefabricated structures** to increase the number of resettlement houses as quickly as possible.

## 5.1.6. HEAT WAVE

**Why in News?**

- **National Disaster Management Authority (NDMA)** and Government of Telengana organised a workshop on Preparation of Heat Wave Action Plan in order to mitigate the impact of the impending heat wave in 2017.

**What are Heat Waves?**

- Heat wave is a period of abnormally high temperatures (more than the normal maximum temperature) during summer months.
- It is predominantly prevalent in North-western parts of India during March-June. In some parts, it extends up to July.
- As per **Indian Meteorological Department (IMD)** Heat-wave is a condition of atmospheric temperature that leads to physiological stress, which sometimes can claim human life. Heat-wave is defined as the condition where maximum temperature at a grid point is 3˚C or more than the normal temperature, consecutively for 3 days or more. World Meteorological Organization defines a heat wave as five or more consecutive days during which the daily maximum temperature exceeds the average maximum temperature by five degrees Celsius. If the maximum temperature of any place continues to be more than **45° C** consecutively for two days, it is called a heat wave condition.

**Recent developments:** According to India Meteorological Department (IMD), temperatures in India are on an average 0.6 degree Celsius hotter than a century ago. 2016 was the warmest year since 1901. Until 2015, 13 of India's 15 warmest years ever were after 2000.

**Reasons for These Unusual Heat Waves**

- Apart from Global warming, heat waves have been linked to increase in El Nino events which are marked by an anomalous heating in the Central Pacific Ocean, linked to a weakening of Indian monsoon.
- Particularly, years succeeding an El Nino event are said to be linked to heat waves and mortality. The Indian Ocean temperatures are also rising faster than the other oceans. This leads to reduction of moisture over the Indian mainland and resultant heat waves.
- Other reasons include deforestation, the heat-island effect, and industrial pollution.

**Geographical Spread**

- **Traditional Areas:** North and northwest of India, coastal Andhra Pradesh, north Odisha and parts of West Bengal.
- **New Areas:** Parts of the Himalayan plains, regions north of Andhra Pradesh and Central India. In 2017, the maximum spikes in temperatures, in March, were recorded in unconventional places such as Shimla, Kullu and tourist spots in Uttarakhand.

**Impact:** Heat waves often lead to dehydration, stress, heat exhaustion and sometimes a fatal heat stroke as well.

- **NDMA** released the **Guidelines for Preparation of Action Plan – Prevention and Management of Heat Wave** in **2016.**
- With better preparedness and mitigation measures under place, casualties due to heat wave can be minimized if not eliminated.

**Odisha model to deal with heat wave:** Odisha State Disaster Management Authority is taking steps proactively such as:

- Early warning systems: Temperature and humidity levels, considered together, will determine the threshold for heat wave alerts. Bhubaneswar experiences up to 85 percent humidity in the summer, with Odisha's coastal regions facing even higher humidity.
- Public outreach: Temperature forecasts and heat alerts will be sent as bulk messages on mobile phones, including to the media for wider broadcast and Electronic screens at busy traffic intersections and market places will also display the information. It is also developing a website and a mobile phone app that would not only provide heat alerts but also help users identify, via maps,

heat shelters and drinking water availability alonghighways through the state.

- Medical upgradation and administrative measures- Heat treatment wings also are planned in hospitals, and heat alerts would trigger early morning shifts for schools and offices.

## 5.1.7. CLIMATE REFUGEE

**Who are they?**

- **Climate refugees** are people who must leave their homes and communities because of the effects of climate change and global warming.
- Climate refugees belong to a larger group of immigrants known as environmental refugees. Environmental refugees include immigrants forced to flee because of environmental disasters (either natural or man-made) are called **environmental refugees**. Eg. The 2010 eruptions of Mount Merapi in Java, Indonesia, created more than 250,000 refugees.

**Present status:** The International Red Cross estimates that there are more environmental refugees than political refugees fleeing from wars and other conflicts. The United Nations High Commissioner for Refugees (UNHCR) says 36 million people were displaced by natural disasters in 2009, the last year such a report was taken. Scientists predict this number will rise to at least 50 million by 2050. Some say it could be as high as 200 million.

**Factors that give rise to climate refugees**

The main reason is global warming and resultant climate change leading to natural disasters. Most important of them are

- **Sea Level Rise:** The Intergovernmental Panel on Climate Change (IPCC) predicts that sea levels will rise a total of 0.18 to 0.6 meters (7 inches to 2 feet) between 1990 and 2100. Rising sea levels will cause loss to agriculture, tourism, fisheries in coastal and low lying areas forcing people living here to migrate to inner areas.
- **Drought: D**rought can create climate refugees inland. When people cannot grow crops on the land where they live, they have to move somewhere else in order to survive. For example, the Gobi Desert in China expands more than 3,600 square kilometers every year. People in the area surrounding the Gobi migrate to China's crowded urban areas as grasslands are overtaken by desert.

**Refugee Status**

- Environmental refugees are not protected by international laws. They face greater political risks than refugees who flee their homes due to conflict or political oppression. Unlike traditional refugees, climate refugees may be sent back to their devastated homeland or forced into a refugee camp.
- Most climate refugees are internal migrants.

**Problems faced by Climate refugees**

Often, climate refugees are rural and coastal residents who are forced to migrate to urban areas. These climate refugees face numerous problems.

- Skills such as herding and farming are not relevant in urban areas. Rural farmers are often more self-sufficient than many urban dwellers; they may not be familiar with depending on a corporation or other people for employment.
- Climate refugees who migrate outside their home countries face other difficulties. They must adjust to different laws, languages, and cultures.

- Climate refugees may encounter conflict with indigenous residents. Educational and health care systems must adjust to a sudden, new population. This population may speak a different language or have different customs than the native population. “Climate change can enhance the competition for resources- water, food, grazing lands- and that competition can trigger conflict.”

**Impact on countries**

- A rapid increase in climate refugees will put an economic and social strain on the regions that offer them asylum.
- Climate change can enhance the competition for resourceswater, food, grazing landsand that competition can trigger conflict.

## 5.1.8. GLACIER LAKE OUTBURST FLOODS (GLOF)

**Why in news?**

- A new study has found that about 66 per cent of the constructed and the potential projects in the Himalayan regions spanning across India, Pakistan, Nepal and China, are on possible Glacier Lake Outburst Floods (GLOF) tracks.

**What is GLOF?**

- The acronym GLOF is used for **glacier floods** caused by the drainage of naturally dammed lakes in the glacier, on or at the margin of glaciers.
- Glacial lakes form when a glacier retreats, leaving the debris mass at the end of the glacier – the end moraine – exposed.
- The moraine wall can act as a natural dam, trapping the meltwater from the glacier and leading to the formation of a lake. The moraine dams are composed of unconsolidated boulders, gravel, sand, and silt. As with landslide dams, they can eventually break catastrophically, leading to a glacial lake outburst flood or GLOF.

**Issue**

- The Himalayan region has about 15,000 glaciers. However, in the face of accelerated global warming, the glaciers in the Himalayan region are retreating/ melting at as high a rate as 30-60 metres per decade leading to accumulation of increasing amounts of water in mountain top lakes.
- Satellite observation of the mountain top lakes in the region has revealed a steady increase in the size and volume of many of the glacial lakes behind moraine or ice ‘dams’ at high altitudes.

**Concerns**

- Due to the inherent instability of such ‘dams’, the potential of sudden outbursts/breaches is extremely high. The breach or outburst can be triggered by various factors such as an earthquake, landslide, avalanche, over-topping, rock-fall, slope failure etc.
- Such outbursts can lead to discharge of millions of cubic metres of water and debris in a few hours and can cause catastrophic devastation and flooding up to hundreds of kilometres downstream.
- The sudden flooding can lead to serious damage to life, property, agriculture, livestock, forests, ecosystems, the livelihoods of mountain communities heavily dependent on mountain ecosystems for sustenance, as well as precious socio-economic infrastructure/ assets like hydro-power, electricity, communications, roads and bridges.

- They can also bring permanent changes in topography and stream hydrology.
- All of these can induce forced migration and undermine the already meager sources of livelihood of mountain people and downstream communities.

**Mitigation Strategies**

- There is a need to improve cross boundary scientific collaboration and monitoring of glaciers to bridge the knowledge gap and allow policy options to be based on appropriate scientific evidence.
- Develop activities and initiatives which can be implemented in a feasible manner and can be sustained by communities and local administrations easily to mitigate the impact of GLOF events in the long run.
- Develop an inventory of glacial lakes and Early warning systems across the Himalayan region. Studies have been conducted by International Centre for Integrated Mountain Development (ICIMOD), United Nations Environment Programme (UNEP), Asia Pacific Network etc. at country and regional level along with identification of potentially dangerous glacial lakes.

# 5.2. NEWS RELATED TO DISASTERS

## 5.2.1. CYCLONES

Cyclone Vardah made a landfall on Chennai on December 10, 2016 uprooting trees, causing heavy rainfall and bringing the metropolitan to a standstill.

**About tropical cyclones**

- Tropical cyclone**,** also called typhoon or hurricane, an **intense circular** storm that originates over warm tropical oceans and is characterized by low atmospheric pressure, high winds, and heavy rain.
- **Tropical cyclones are known by various names in different parts of the world**. In the North Atlantic Ocean and the eastern North Pacific they are called hurricanes, and in the western North Pacific around the Philippines, Japan, and China the storms are referred to as **typhoons**. In the western South Pacific and Indian Ocean they are variously referred to as severe tropical cyclones.
- There are some conditions favourable for this process to take place. The conditions are :
  - ✓ The temperature of the surface layer of ocean water must be **26.5 °C (80 °F) or warmer**.
  - ✓ A **preexisting** atmospheric circulation must be located near the surface warm layer.
  - ✓ The atmosphere must cool quickly enough with height to support the **formation of deep convective clouds.**
  - ✓ The middle atmosphere must be **relatively humid** at a height of about 5,000 metres (16,000 feet) above the surface.
  - ✓ The developing system must be at least 500 km (300 miles) **away from the** Equator etc.

**What is a Landfall?**

- A landfall is the intersection of the center of tropical cyclone with a coastline.
- A landfall is often accompanied by strong winds, lashing rain and rising sea waves.

**Tropical Storms/ Cyclones in India**

- India is exposed to nearly 10% of the world's tropical cyclone owing to its long coastline.
- Majority of cyclones originate in the Bay of Bengal and therefore mostly hit the east coast of the Indian sub-continent.
- The Indian coast line was hit by other cyclones in 2016 such as Roanu and Nada.

**Early Warning system for cyclones in India**

Forecasts / Warnings relating to cyclones are being provided by the India Meteorological Department.

**Types of Warnings**

- Maritime interests
- Port warnings
- Four Stage warnings for disaster managers
  - ✓ Pre-Cyclone watch
  - ✓ Cyclone Alert
  - ✓ Cyclone Warning
  - ✓ Post Landfall outlook
- Warnings for designated officials
- Warnings for Aviation

The cyclone warnings are issued to state government officials in four stages.

- The **First Stage** warning known as **"PRE CYCLONE WATCH"** issued 72 hours in advance contains early warning about the development of a cyclonic disturbance in the north Indian Ocean, its likely intensification into a tropical cyclone and the coastal belt likely to experience adverse weather. This early warning bulletin is addressed to the Cabinet Secretary and other senior officers of the Government of India including the Chief Secretaries of concerned maritime states.
- The **Second Stage** warning known as **"CYCLONE ALERT"** is issued at least 48 hrs. in advance of the expected commencement of adverse weather over the coastal areas. It contains information on the location and intensity of the storm likely direction of its movement, intensification, coastal districts likely to experience adverse weather and advice to fishermen, general public, media and disaster managers.
- The **Third Stage** warning known as **"CYCLONE WARNING"** issued at least 24 hours in advance of the expected commencement of adverse weather over the coastal areas. Landfall point is forecast at this stage. These warnings are issued at 3 hourly interval giving the latest position of cyclone and its intensity, likely point and time of landfall, associated heavy rainfall, strong wind and storm surge alongwith their impact and advice to general public, media, fishermen and disaster managers.
- The **Fourth Stage** of warning known as **"POST LANDFALL OUTLOOK"** is issued at least 12 hours in advance of expected time of landfall. It gives likely direction of movement of the cyclone after its landfall and adverse weather likely to be experienced in the interior areas.

**Recent Developments:** The Indian Meteorological Department (IMD) in 2014 launched a SMS-based alert system for general public for disseminating of weather and disaster-related information.

Under round-the-clock web-based operational system, the IMD would send SMS to individuals who register themselves.

**Benefits:** The improvement in cyclone warning systems has resulted in significant reduction in loss of life and property. To mention a few are very severe cyclonic storms, Phailin and Hudhud which crossed Odisha coast near Gopalpur and Andhra Pradesh coast near Visakhapatnam on October 12, 2013 and 2014 respectively wherein loss of life and resources was minimized.

## 5.2.2. CHENNAI OIL SPILL

**Why in news?**

- Two vessels collided off the Kamarajar Port at Ennore near Chennai resulting in oil spill in the sea.

**Ecological Footprint of Oil Spill**

- Damage to fish, turtles, crabs among other marine animals.
- Loss of livelihood to fisherman as venturing out into the sea was not safe.
- Consumers' reluctance to buy sea food adds to woes of fisherman.
- Environmental damage to coastal areas.
- Heavy metals released along with oil will poison marine life all the way up the food chain.

**Why Oil Spills are difficult to contain?**

- When oil hits the sea, its surface is quickly dispersed by the wind, while sea currents spread the lower layers in contact with the water.
- This **twin action** creates a large, ever-expanding film of oil called a "**slick**".
- Along the shore, the oil mixes with sand and debris to form a thick viscous sludge that gradually oxidizes into a toxic brown mass that experts like to call "**chocolate mousse**".

**Measures at National and International Levels to Contain Harmful Impacts of Oil Spills**

- **The National Oil Spill-Disaster Contingency Plan (NOS-DCP),** which was adopted in 1996, has routinely been updated and revised to reflect the latest in international safety and regulatory standards. But, **it completely failed in taking action on the ground.**
- A **state contingency plan has not been prepared** even after Coast Guard demanding states to formulate a local plan to fight such disasters for over 20 years now.
- The **International Convention on Civil Liability for Oil Pollution**, 1969, of which India is a signatory, provides for adequate compensation for the damages involving oil tankers and has strict liability for ship owners.
- But, the **domestic liability regime** for environmental damage has been weak and underdeveloped.
  - ✓ There's an **absence of clear definitions of environmental damage**. Several jurisdictions in Europe include ecological and economic losses in environmental damages while most others limit to compensate only economic harm.
  - ✓ Such an **exclusion** of ecological damage leads to **most long-term damage** to marine environment, bio-diversity and natural resources**go uncompensated**.

**A HISTORY OF OIL SPILLS IN INDIA**

- August 2010: Merchant ships MSC Chitra and MV Khalija 3 collided off Mumbai's coast, spilling more than 800 tonnes of oil. All fishing activities were suspended for 15 days near the area after the catastrophic spill.
- January 2011: ONGC's Mumbai-Uran Trunk pipeline burst 80 km away off Mumbai's coast. The spill had reportedly spread to around 4 square km from the site of the leak.
- October 2013: Another oil spill was reported from the Mumbai-Uran Trunk after a rupture in the pipeline. ONGC said a few days later the leak was fixed.
- August 2013: Officials had reported an oil spill in the coastal areas of Gulf of Khambhat in Gujarat. The leak was from an ONGC pipeline near Bhadbhut village of the district.

**Bioremediation techniques:**

**Oilzapper**

- It is essentially a cocktail of five different bacterial strains that are immobilized and mixed with a carrier material (powdered orncob).
- It feeds on hydrocarbon compounds present in crude oil and oily sludge and converts them into harmless $CO_2$ and water.

**Oilivorous-S**

- It is a tad different from Oilzapper is an additional bacterial strain that makes the former more effective against sludge and crude oil with high-sulphur content.
- Both Oilzapper and Oilivorous-S can be used in situ, thereby eliminating the need to transfer large quantities of contaminated waste from the site, a process that poses more threats to the environment.

**Way Forward**

- There is a need for **a comprehensive legal mechanism** to address issues of fault and no-fault based liability for environmental harms and introduce civil penalties for the same.
- **Responsibility for any negligence** on the part of any actor **should be fixed**.

- A detailed report should be prepared **to learn from the mistakes or lapses and rectify them.**

## 5.2.3. DROUGHT IN SOUTH INDIA

**Why in news?**

Kerala and Tamil Nadu are facing an unprecedented drought – the worst ever in over a century, according to experts; Karnataka's northern districts are without water for the third consecutive year.

Droughts are not attributed to only scarcity of rainfall but more to inefficient management of water resources.

**E.g.** region with less rainfall but growing less water intensive crops like bajra is not said to have drought like condition.

**Reasons for the Drought**

- **Rainfed agriculture**-Failure of Northeast monsoon and lack of irrigation facilities being the major reason for the drought.
- **Urbanization** has converted the wetlands and other areas into concrete surfaces that does not allow the conservation of water.
- **Inter-state river water disputes**: southern states are not ready to sit together and solve the problem of sharing of river waters.
- **Water has lost the cultural connect**- historically large number of ponds were connected to each other so that overflow of water in one reaches other, there used to be celebration of festivals for conservation of water has gone, etc.
- **Faulty cropping pattern-** water intensive crops such as paddy, sugarcane are given preference by farmers because of high Minimum Support Price(MSP) given by government

**What can be done?**

- Focus should be on developing large number of small reservoirs at local levels may or may not linked to irrigation canals. Eg Gujarat has developed large number of check dams in Saurashtra region.
- Agroclimatic cropping pattern- should be followed
- Increase investment in irrigation especially micro irrigation practices like drip irrigation. Pradhan Mantri Krishi Sinchayi Yojna would help in this.

**Drought Crisis Management Plan, 2015**

The manual sets out four important measures that a State government should take at the time of a drought, with the Union government's help.

- MGNREGA to provide immediate employment to drought-affected people.
- The public distribution mechanism should be strengthened to provide food and fodder
- initiate actions to recharge the groundwater table by building check dams and providing pipeline water and other irrigation facilities
- The government should either waive off or defer farmer loans and arrange for crop loss compensation.

**National Disaster Management Guidelines on Management of Drought**

The NDMA guidelines on management of drought are issued in 2010. The recommendations are as follows:

1. Creation of *Drought Monitoring Cells* (DMCs) cells at state level with requisite staff.
2. Preparation of *vulnerability maps* for each state by the State DMCs.
3. *Development of real-time drought related information* by using information and communication technology.
4. The *watershed development approach* would be taken up for drought management.

5. Integration of ground-based information with the space-based information for *comprehensive reporting*.
6. Assessment of damage would include agricultural production, depletion of water resources, livestock population, land degradation and deforestation as well as human health.
7. Revamping of *Drought Management Information System* of Department of Agriculture.
8. To enable micro level analysis and forecasting, automatic weather station and rain-gauges to be put in place.
9. Development of drought resistant crop varieties through large scale research.
10. The mitigation measures to be taken would include cloud-seeding and conduct of pilot studies in all categories of drought prone areas for suggesting long term mitigation measures.
11. Formulation of a cloud seeding policy.
12. Promoting crop diversification through sprinklers/Drip irrigation systems (micro irrigation techniques).
13. Prompt provision of credit in the drought affected areas; and extension of marketing and price support.
14. Afforestation with subabul, seemaruba, casurina, eucalyptus and bio diesel plantation like Jatropha and pongomia.
15. Development of insurance products for different agro-climatic zones providing coverage against drought. Crop insurance to be extended to post-harvest losses. Promotion of price linked insurance products to avoid distress sales of farm produce. Use of satellite derived crop condition images as surrogates to crop yield estimates for settling insurance claims.
16. Framing a realistic national training and capacity building programme for drought management. Officers at PRIs and ULBs to be provided with required training.
17. Encouraging NGOs, PRIs and ULBs for generating awareness among farmers.
18. Updating the syllabi of graduate and under-graduate courses in agriculture to include drought management.
19. Fodder, Cattle feed and mineral mixture to be supplied to all productive animals to prevent distress sales of cattle.
20. Wherever necessary and feasible, the corporate sector should also be involved in supporting drought risk management efforts as part of CSR.

# 6. GEOGRAPHY

## 6.1. MONSOON FORECASTING

**Background: IMD has adopted new** methodology to forecast monsoon in India. The new methodology, called **dynamical forecasting**, breaks away from the century-old tradition of using the British-developed statistical system for forecasting. The dynamic modelling used by India has been sourced from the US and is being tweaked according to the Indian monsoon.

**Ministry of Earth Sciences (MoES), Government of India** had launched **'National Monsoon Mission' (NMM) in 2012** with a vision to develop a state-of-the-art dynamical prediction system for monsoon rainfall on different time scales.

**The Major Objectives of Monsoon Mission are:**

- To setup a state of the art dynamical modeling frame work for improving prediction skill of Seasonal and extended range prediction system; and Short and medium range prediction system
- To setup the infrastructure and manpower required to improve the prediction skill at all time scales (long, seasonal, extended, medium and short range) over Indian region
- To build a working partnership between the Academic / Research & Development Organizations and the Operational Agency to improve the monsoon forecast skill.

**Dynamic Weather Prediction Model**

A dynamic weather prediction model involves 3D mathematical simulation of the atmosphere on computer. Dynamic models are especially useful for predicting rainfall over smaller spatial and temporal scale, which is not possible in the statistical forecasting system. With dynamic models, we will be able to provide monthly forecasts for every state.

Dynamic models have **several advantages**.

- The dynamic model, also known as the Coupled Forecast System, is based on faster computing to improve short-range forecasts. It provides the flexibility to upgrade forecasts for specific regions and enables collation of data on local as well as global weather patterns to simulate a forecast for a specific duration.
- They can be used along with agriculture and hydrological models. They can be used for many more purposes than rainfall prediction. One can get real-time information on wind, temperature and humidity in digitised format.

**Earlier system and its limitations**

India earlier used statistical forecasting system. Statistical models require lengthy calculations to track the southwest monsoon. The model uses historical relationships between rainfall and six to eight predictors such as sea-surface temperatures and southeasterly winds over the Indian ocean.

- **Failure in prediction:** For instance, IMD couldn't predict the oncoming droughts in the years 2002, 2004 and 2009. Also, from 1988 to 2010, the IMD has been able to successfully predict the monsoon only nine times which translates to a success rate of a mere 40 percent.
- It gives forecasts for the country as a whole and five regions, though does not give separate ones for the country's 29 states. Because of India's size, one national forecast is of little help to farmers spread across diverse climatic zones.

**Benefits**

- Weather forecast systems under the National Monsoon Mission (NMM) will be extended up to the block level across the country by 2019. It would help the farmers, policy makers, administrators and all concerned alike.
- It will be possible to predict droughts. Fallout of droughts like those of 2004 and 2009 could be prevented if we're able to warn farmers in advance.
- better forecasting could help India raise its farm output by nearly 15 percent, by helping farmers tweak the best time to sow, irrigate or apply fertilizer to crops and if rains fail plan state-wide measures.
- Also, better forecasts resulting in better farm outputs can stabilise the inflation level and thereby provide for effectual transmission of monetary policies in the economy.

**Challenges for future**

Predicting monsoons in India is a tricky job. Since India falls in the tropical region, the fluctuations in the weather conditions are more frequent than anywhere else in the world. With changing weather predictions, the parameters also frequently change, thereby having an effect on the forecast. After factoring in the wild weather patterns in the region and the use of a novice forecasting model, India would have to wait and see to fully analyse the accuracy of the predictions.

## 6.2. THUNDERSTORM

**Background**

Recent research from Florida Institute of Technology in the US, have confirmed that lightning can be much more powerful over the ocean than land.

**Importance**

- These findings suggest that people living on or near the ocean may be at greater risk for lightning damage if storms develop over oceans and move on-shore.
- It could inform how off-shore infrastructure and vessels are to be built to minimise the risk of super-powerful lightning bolts from thunderstorms formed over the sea.

**Thunderstorm**

A thunderstorm is a storm with lightning and thunder. Its produced by a cumulonimbus cloud, usually producing gusty winds, heavy rain and sometimes hail.

**How does a thunderstorm form?**

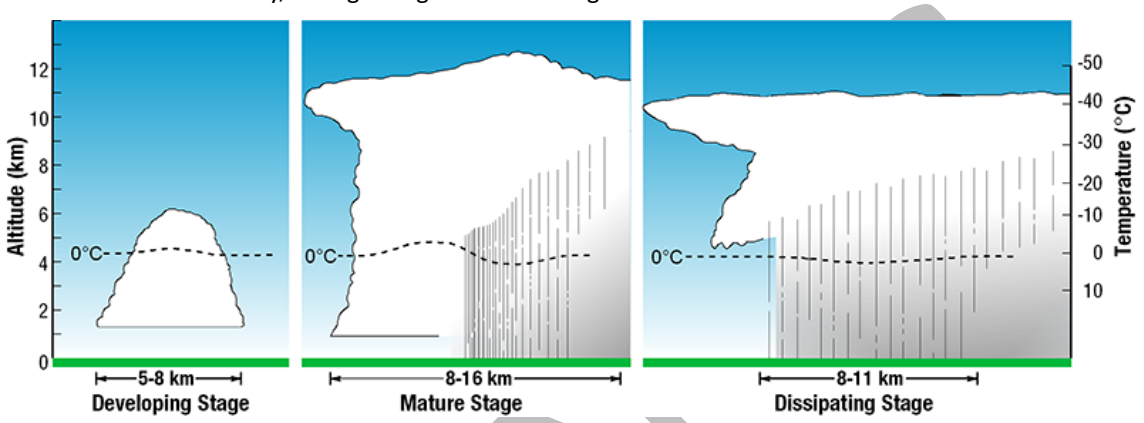
Three basic ingredients are required for a thunderstorm to form: moisture, rising unstable air, and a lifting mechanism to lift the air.

The sun heats the surface of the earth, which warms the air above it. As the air rises, it transfers heat from the surface of the earth to the upper levels of the atmosphere (the process of convection). The water vapor it contains begins to cool, releases the heat, condenses and forms a cloud. The cloud eventually grows upward into areas where the temperature is below freezing. As a storm rises into freezing air, different types of ice particles can be created from freezing liquid drops. When two ice particles collide, they grab some electric charge. Lots of these collisions build up big regions of electric charges to cause a bolt of lightning, which creates the sound waves we hear as thunder.

**The Thunderstorm Life Cycle**

Thunderstorms have three stages in their life cycle: The developing stage, the mature stage, and the dissipating stage.

- The developing stage of a thunderstorm is marked by a cumulus cloud that is being pushed upward by a rising column of air (updraft). There is little to no rain during this stage but occasional lightning.
- The thunderstorm enters the mature stage when the updraft continues to feed the storm, but precipitation begins to fall out of the storm, creating a downdraft (a column of air pushing downward). When the downdraft and rain-cooled air spreads out along the ground it forms a gust front, or a line of gusty winds. The mature stage is the most likely time for hail, heavy rain, frequent lightning, strong winds, and tornadoes.
- Eventually, a large amount of precipitation is produced and the updraft is overcome by the downdraft beginning the dissipating stage. At the ground, the gust front moves out a long distance from the storm and cuts off the warm moist air that was feeding the thunderstorm. Rainfall decreases in intensity, but lightning remains a danger.




## 6.3. INTERLINKING OF RIVERS AND ITS IMPACT

**Background**

The average rainfall in India is about 4,000 billion cubic meters, but most of India's rainfall comes over a 4-month period – June through September. Also, the rain across the nation is not uniform. India also sees years of excess monsoons and floods, followed by below average or late monsoons with droughts. This geographical and time variance in availability of natural water versus the year round demand for irrigation, drinking, and industrial water creates a demand-supply gap.

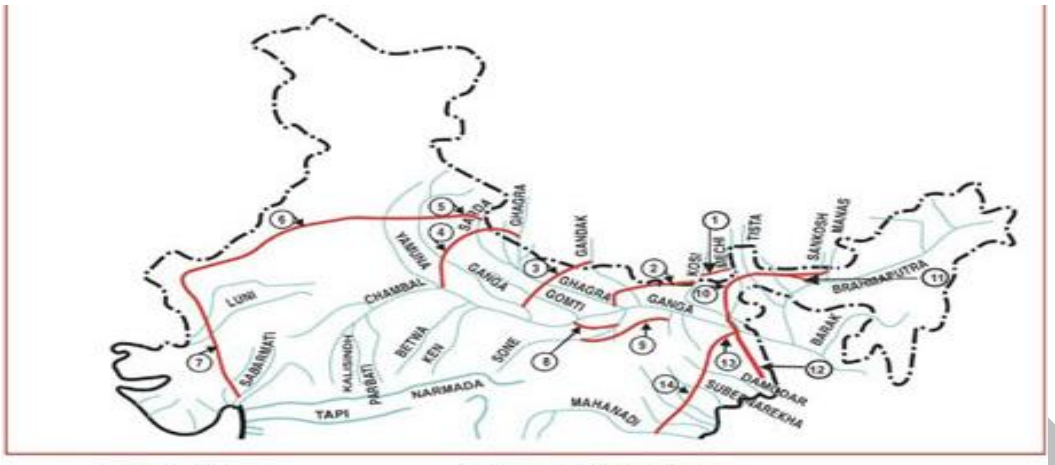
Hence, the **National River Linking Project (NRLP)** is claimed to be the answer to India's water problem through conservation of the abundant monsoon water, store it in reservoirs, and deliver this water using rivers inter-linking project to areas and over times when water becomes scarce. Beyond water security, the project is also seen to offer potential benefits to transport infrastructure through navigation, as well as to broadening income sources in rural areas through fish farming.

**Project detail**

The Inter-link project has been split into **three** parts: a **northern Himalayan** rivers inter-link component, a **southern Peninsular**component and starting 2005, an **intrastate** rivers linking component. The project is being managed by India's **National Water Development Agency (NWDA)**, under its **Ministry of Water Resources**.

**(a) Himalayan Rivers Development Component:** Under this 14 links have been identified. This component aims to construct storage reservoirs on the Ganga and Brahmaputra rivers, as well as their tributaries in India and Nepal. The aim is to conserve monsoon flows for irrigation and hydropower generation, along with flood control. The linkage will transfer surplus flows of the

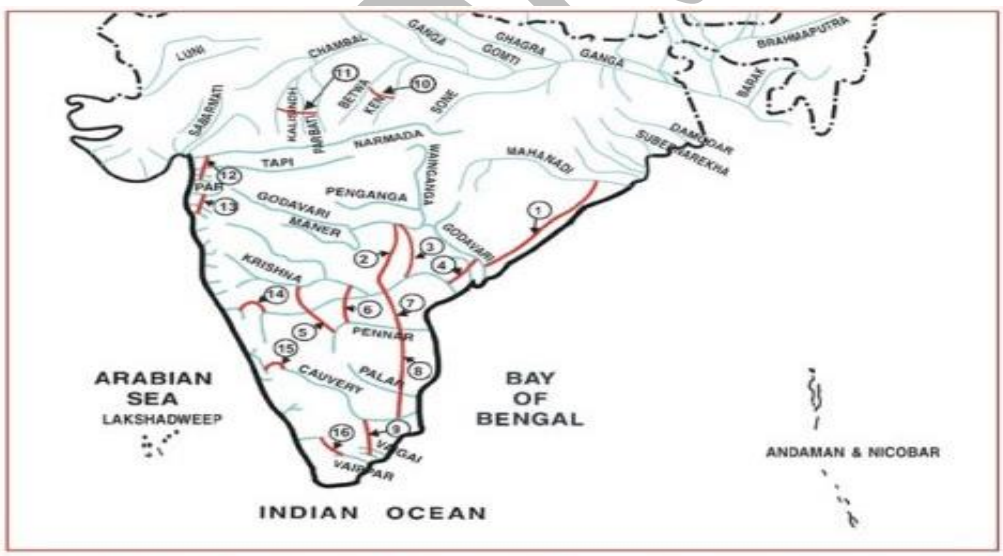
Kosi, Gandak and Ghagra to the west.




1. Kosi – Mechi
2. Kosi – Ghagra
3. Gandak – Ganga
4. Ghagra – Yamuna *
5. Sarda – Yamuna *
6. Yamuna – Rajasthan
7. Rajasthan – Sabarmati
8. Chunar- Sone Barrage
9. Sone Dam – Southern Tributaries of Ganga
10. Manas –Sankosh - Tista - Ganga
11. Jogighopa – Tista – Farakka (Alternate)
12. Farakka – Sunderbans
13. Ganga (Farakka) – Damodar – Subernarekha
14. Subernarekha – Mahanadi

* FR Completed

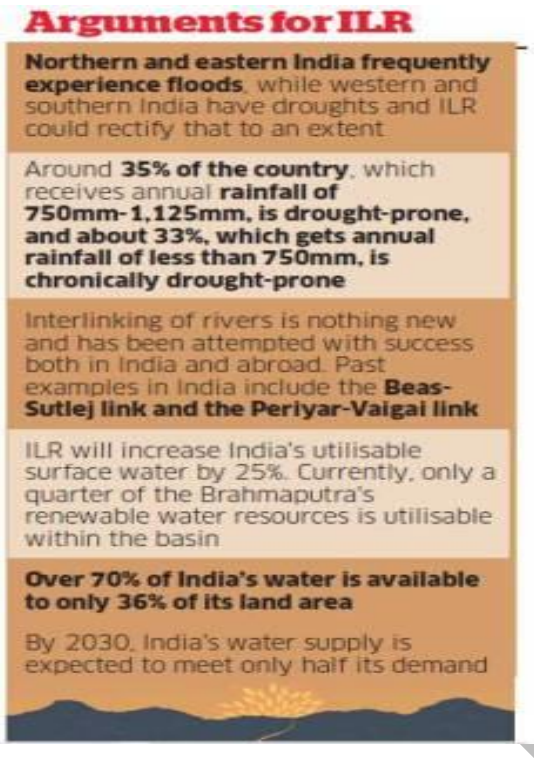
**(b) Peninsular Rivers Development Component or the Southern Water Grid:** It includes 16 links that propose to connect the rivers of South India. It envisages linking the Mahanadi and Godavari to feed the Krishna, Pennar, Cauvery, and Vaigai rivers. This linkage will require several large dams and major canals to be constructed. Besides this, the Ken river will also be linked to the Betwa, Parbati, Kalisindh, and Chambal rivers.

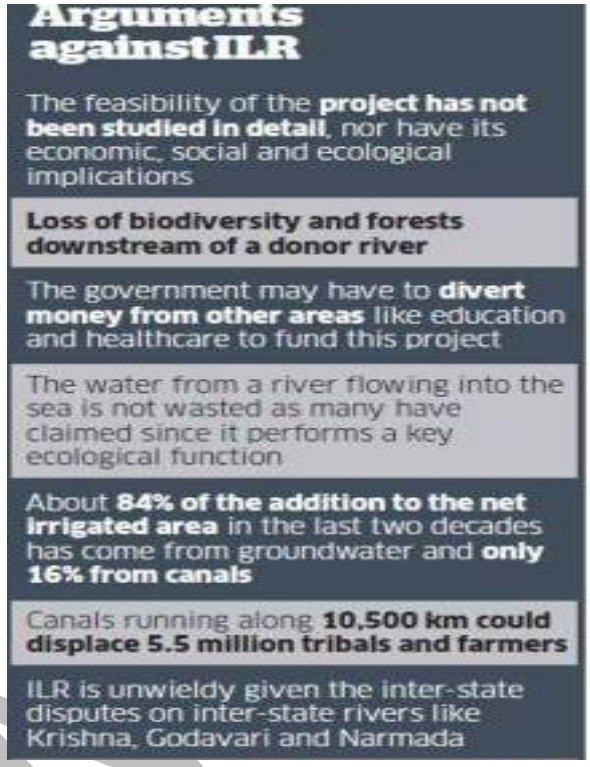



1. Mahanadi (Manibhadra) – Godavari (Dowlaiswaram) *
2. Godavari (Inchampalli) – Krishna (Nagarjunasagar) *
3. Godavari (Inchampalli) – Krishna (Pulichintala) *
4. Godavari (Polavaram) – Krishna (Vijayawada) *
5. Krishna (Almatti) – Pennar *
6. Krishna (Srisailam) – Pennar *
7. Krishna (Nagarjunasagar) – Pennar (Somasila) *
8. Pennar (Somasila)–Palar- Cauvery (Grand Anicut) *
9. Cauvery (Kattalai) – Vaigai – Gundar *
10. Ken – Betwa *
11. Parbati – Kalisindh – Chambal *
12. Par – Tapi – Narmada *
13. Damanganga – Pinjal *
14. Bedti – Varda
15. Netravati – Hemavati
16. Pamba – Achankovil – Vaippar *

* FR Completed

**The debate:**




| | |
|---|---|
| • **Hydropower generation:** It proposes to generate 34 GW of power, which is very huge in itself.<br>• **Irrigation benefits:** The project claims to provide additional irrigation to 35 million hectares (m ha) in the water-scarce western and peninsular regions<br>• India needs infrastructure for logistics and movement of freight. Using connected rivers as navigation is a cleaner, low carbon footprint form of transport infrastructure, particularly for ores and food grains. | • Possibility of displacing nearly 1.5 million people due to the submergence of 27.66 lakh hectares of land<br>• Ganga's topography is flat- so the dams would not substantially add to river flows. But the adverse effect on monsoon and Himalayan forests would continue to happen.<br>• The Himalyan component calls for building dams in **Bhutan**. In at least some inter-link projects, neighboring countries like **Bangladesh** may be affected. This will need international collaboration and thus huge potential for logjam.<br>• A major issue in India vis-a-vis river-linking is that **water is a state subject**. States that have surplus water are not ready to give it to other states and there is a huge logjam which is cropping up time and again because of this. Even though the government is thinking of **intra-state** river-linking processes the environmental issues relating to these projects are very huge. |

**The Ken-Betwa Link Issue**

It is the only project for which the detailed project report has been prepared.

- The Ken-Betwa river linking project aims to irrigate the drought-ravaged Bundelkhand region.
- It involves building a 288-metre **Daudhan dam**, and transfer of surplus water from the Ken river basin to the Betwa basin.
- This will submerge nearly 400 of the 4,300 hectares of the Panna tiger reserve.
- Experts suggest that the result could be drastic for the tiger population, as they have to adjust to the changes.

- Impact area will be far greater with associated activities related to construction, power houses etc.
- A team of **wildlife experts have submitted a report** on the environmental impact of the project.
- While not endorsing or disapproving the project, the Panel has advised the government to ensure two things:
  - ✓ The proposed canal should not hinder tiger movement; and
  - ✓ There should be enough habitable forest land developed to compensate for the loss of tiger reserve land.
- However, another set of experts believe that the benefits would outweigh the costs:
  - ✓ New water will draw herbivores and thus additional prey and carcass in the region, resulting in benefits for tigers and vultures
  - ✓ The area lost will be compensated; alternate forest land to the tune of double the area lost would be replenished with vegetation that had once existed in the region.
  - ✓ The benefits to mankind is huge- additional water to 6.35 lakh hectares of land helping nearly 70 lakh people of the region.

**Way ahead**

Hence, before implementing the proposal on a large scale, a sound scientific and technical assessment needs to be undertaken to make it techno-economically feasible. This is a Herculean task and would involve considerable amount of time. Meanwhile, policy-makers can propagate better water resource management and encourage whatever small initiatives the states undertake towards solving their water-related woes.

## 6.4. DEVELOPMENT PLAN FOR THE ANDAMANS

Centre has prepared a plan for the Andamans Titled 'An Approach Paper on 'Prospects of Island Development - Options for India. NITI Aayog recently approved the plan for the promotion of high-end tourism in four islands-Smith, Ross, Avis and Long.

**About The Plan**

- Plan focuses less on strategic and defence-related projects and more on economic activities such as rail construction, port and petrochemical complex development, special economic zones (SEZ) and the tourism industry.
- Plan articulates the need for economic, social, ecological and cultural sustainability in development strategy.

In 1965, the Ministry of Rehabilitation had prepared a similar proposal which was in fact a blueprint for the 'colonisation' of the islands.

**Concern Areas**

- However it ignores the historical, social, ecological and legal context of the unique island system.
- Of particular relevance here is the Andaman and Nicobar Protection of Aboriginal Tribes Regulation (ANPATR) that was promulgated in 1956.
- Significant areas of the islands have been protected under this regulation for indigenous communities like the Jarawa and the Onge.
- The Approach Paper does not mention of ANPATR even as it proposes a number of projects that will impinge directly on the lands and rights protected by the regulation.

**Limitations of the Plan**

- Latest plan completely ignores the changes that have taken place in the legal and policy framework of the country, apart from matters of geology and ecology.

- 520 sq. km. of Little Andaman is protected as the Onge Tribal Reserve and that Dugong Creek, where the harbour is proposed, is located deep inside the Reserve and has the most important settlement of Onge tribes.
- The plan does not account for realities such as the fact that drinking water is a big challenge in many of the islands.
- The islands are located in Seismic Zone V, part of the world's most active seismic regions, where earthquakes are regular occurrences.
- It also ignores that the 2004 tsunami was caused by an earthquake not far from the Nicobar Islands, and that tourism will be the first and the worst affected in case of calamities like earthquakes, tsunamis and cyclones.
- Since there will be a greater thrust on development plans, with tourism being given top priority it will have a negative impact on forests, biodiversity and the Onge community.

## 6.5. NEW URBAN AGENDA - HABITAT - III

**Why in news?**

- The New Urban Agenda was officially adopted at the UN Conference on Housing and Sustainable Urban Development (referred as "Habitat III") held recently in Quito, Ecuador.
- The UN's Habitat conferences are held in a bi-decennial cycle, with previous editions being held in Vancouver (1976) and Istanbul (1996).

**What is New Urban Agenda?**

- It is a set of 175 commitments that countries need to adhere to tackle the staggering challenges of urbanization.
- It sets the global vision of sustainable urbanization for the next 20 years.
- It is a roadmap for building cities that can serve as engines of prosperity and centres of cultural and social well-being while protecting the environment.
- It also provides guidance for achieving the Sustainable Development Goals and provides the underpinning for actions to address climate change.

**Constituents of the New Urban Agenda**

In the New Urban Agenda, leaders have committed to:

- **Provide basic services for all citizens:** These services include: access to housing, safe drinking water and sanitation, nutritious food, healthcare and family planning, education, culture and access to communication technologies.
- **Ensure that all citizens have access to equal opportunities and face no discrimination:** The New Urban Agenda calls on city authorities to take into account the needs of women, youth and children, people with disabilities, marginalized groups, older persons, indigenous people, among other groups.
- **Promote measures that support cleaner cities:** In the Agenda, leaders have committed to increase their use of renewable energy, provide better and greener public transport, and sustainably manage their natural resources.
- **Strengthen resilience in cities to reduce the risk and the impact of disasters:** Some of the measures include: better urban planning, quality infrastructure and improving local responses.
- **Take action to address climate change by reducing their greenhouse gas emissions:** Leaders have committed to involve not just the local government but all actors of society to

take climate action taking into account the Paris Agreement on climate change which seeks to limit the increase in global temperature to well below 2 degrees Celsius.

- **Fully respect the rights of refugees, migrants and internally displaced persons regardless of their migration status:** Leaders have recognized that migration poses challenges but it also brings significant contributions to urban life. Because of this, they have committed to establish measures that help migrants, refugees and IDPs make positive contributions to societies.
- **Improve connectivity and support innovative and green initiatives:** This includes establishing partnerships with businesses and civil society to find sustainable solutions to urban challenges
- **Promote safe, accessible and green public spaces**
  - ✓ Human interaction should be facilitated by urban planning, which is why the Agenda calls for an increase in public spaces such as sidewalks, cycling lanes, gardens, squares and parks.
  - ✓ Sustainable urban design plays a key role in ensuring the liveability and prosperity of a city.

**Significance of New Urban Agenda**

- More than half of the world's population now lives in cities. So it makes sense that the New Urban Agenda will significantly shape the UN 2030 Agenda for Sustainable Development.
- Sustainability is at the core of the "New Urban Agenda" with a substantial focus on various "transformative commitments for sustainable urban development", linking it further with themes like social inclusion, urban prosperity and resilience.
- It commits to a "vision of cities for all" where "all inhabitants" are able to "inhabit and produce just, safe, healthy, accessible, affordable, resilient, and sustainable cities and human settlements."

**Relevance for India**

India was also one of the signatories. For India, the New Urban Agenda is significant because of the following reasons:

- Though the pace of urbanization was slow until now, with only 31.16% of Indians living in cities, it is expected to accelerate.
- It took 40 years for 230 million Indians to become urban citizens. For the next 250 million, it is expected to take only 20 years.
- Presently, cities are anything but liveable, crumbling under congestion, pollution and lack of basic facilities for a huge segment of the population—65 million people—who live in slums.
- The Agenda provides a vision wherein government initiatives like Smart Cities, AMRUT and 'Housing For All' can be seamlessly integrated.

**Concerns**

- Since it is a **non-binding document** without concrete mechanisms for implementation, its ability to effect change is limited.
- The agenda is built around a series of Sustainable Development Goals (SDGs), particularly **SDG 11**, which aims to "make cities and human settlements inclusive, safe, resilient and sustainable". However, the New Urban Agenda has been criticised for lacking direct links to the targets set out within Goal 11.
- Under the umbrella of smart cities, using open data networks for better urban planning provided an optimistic, technology-based future for cities. However, questions about the

security, ethics, and oversight of large-scale information gathering remain largely unanswered.

**Way Forward**

- All countries will need to step up their commitments if the aspirations set out in Habitat III are to be achieved. Key concepts, such as integrated planning and models for local-national government cooperation, will need further work.
- With the New Urban Agenda as a road map, it is hoped that we can rise to the challenge of creating more liveable, resilient and sustainable cities. Because without global urban transformation, we cannot achieve sustainable development as a whole.
- As for India, UN Habitat plans to review country-level progress on its New Urban Agenda in Kuala Lumpur in 2018. India's performance on improving the quality of life in its cities will be watched.

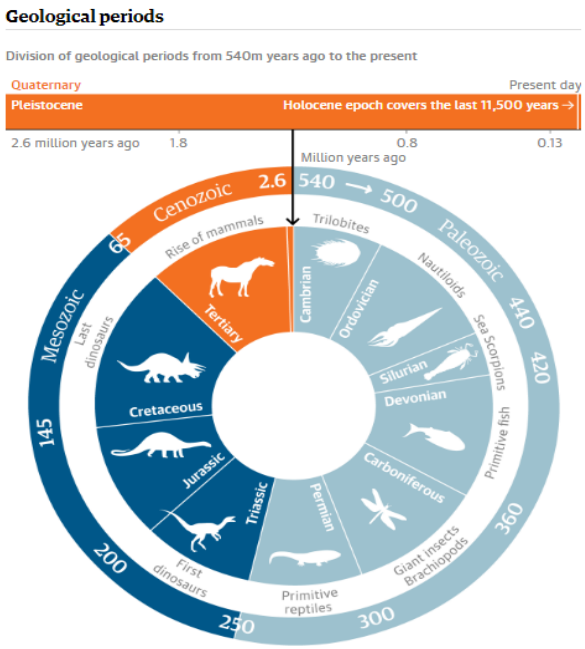
## 6.6. ANTHROPOCENE EPOCH

**Why in news?**

- An expert group at the World Geological Congress in Cape Town recommended that the new Anthropocene epoch, start from the mid-20th century, be officially declared.

**What is Anthropocene?**

- The Anthropocene, coined in 2000 by the Nobel prize-winning scientist Paul Crutzen, is a proposed epoch that begins when human activities started to have a significant global impact on Earth's geology and ecosystems.
- Neither the International Commission on Stratigraphy nor the International Union of Geological Sciences has yet officially approved the term as a recognized subdivision of geological time
- An epoch is a subdivision of the geologic timescale that is longer than an age and shorter than a period.
- Epochs are most commonly used for the younger Cenozoic Era, where a greater collection of fossils has been found and paleontologists have more detailed knowledge of the events that occurred during those times.




- We are currently living in the Holocene Epoch of the Quaternary Period
- The **Holocene epoch** began 12,000 years ago at the end of the last ice age. All human civilisations have developed during this climatically and geologically stable period.

**Evidences of the Anthropocene**

Since the 1950s, human beings have begun to alter the earth's surface and atmosphere in unalterable ways. Human activity has:

- **Pushed extinction rates**: The Earth is on course to see 75% of species become extinct in the next few centuries if current trends continue.
- Doubled the nitrogen and phosphorous in our soils in the past century with fertiliser use. This is likely to be the largest impact on the nitrogen cycle in 2.5bn years.
- Left a permanent layer of airborne particulates in sediment and glacial ice such as black carbon from fossil fuel burning.

**Need for recognition**

- It sends out the statement that humans have fundamentally changed the planet to the point it will preserve sediments for millions of years to come that record a world that is now fundamentally different to the one that preceded it.
- For the first time since the dawn of Darwinian theory — which showed human beings as just another character on the evolutionary stage — the world, literally, is of our own making.
- The significant geological changes, which usually take thousands of years, have occurred in less than a century and the long-term impact of an inhospitable planet may well be something we deal with sooner than expected.

**Concerns in declaring Anthropocene as a separate epoch**

- The Anthropocene is in many ways different to traditional geological units and so is harder to define using traditional techniques.
- Many would argue that it is too short a timescale and there is need to wait and make judgment once the planet has gone through this pulse of rapid change and has stabilised into a new state.

**Way forward**

- The Anthropocene marks a new period in which human's collective activities dominate the planetary machinery. This name change stresses the enormity of humanity's responsibility as stewards of the Earth.

## 6.7. UN OCEAN CONFERENCE

**Why in News?**

- Recently, first United Nations Ocean Conference was held in New York.

**Need**

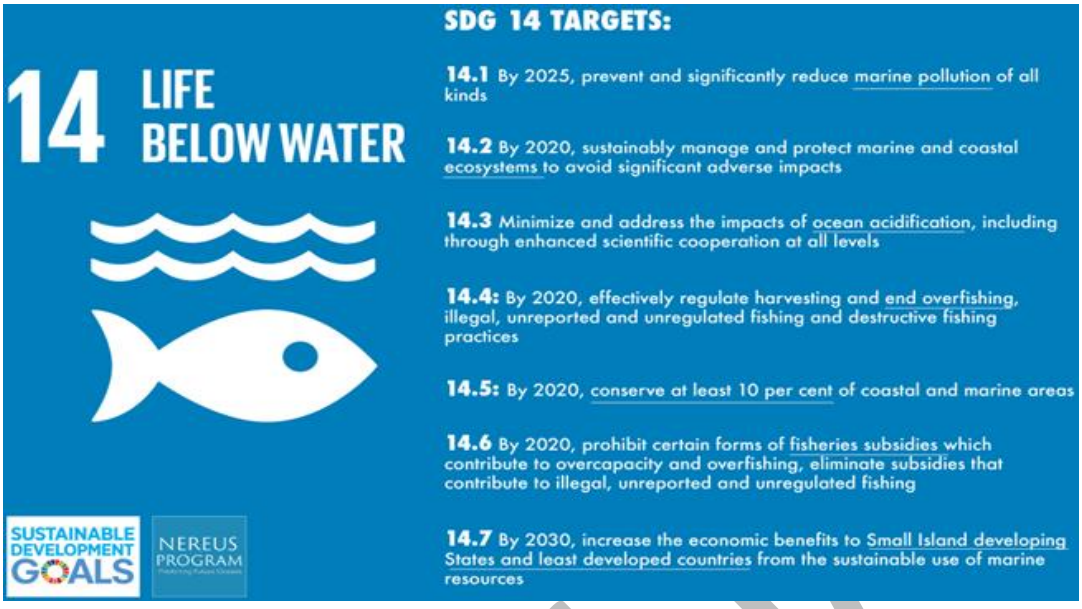
- With decades of unsustainable exploitation patterns, overcapacity, unsuccessful governance interventions, climate change and rising ocean temperatures, ocean and its resources are facing various problems like acidification, coral bleaching and changing wildlife patterns.
- Temperature pattern of oceans drives the climate and weather systems. Oceans have absorbed about half of the carbon emissions released due to human activities till now.

- India has a coastline of more than 7,500 kilometres. Marine fisheries wealth in India is estimated at an annual potential of 4.412 million metric tonnes and annual wealth of Rs 65,000 crores.
- About 4 million people depend on fisheries for their livelihoods in India.
- India contributes about 6.3 per cent to the global fish production (both marine and riverine), the sector contributes to 1.1 per cent of the GDP and 5.15 per cent of the agricultural GDP.

**Global Ocean Commission**

It is an international initiative that was launched in 2013. It raises awareness and promotes action to address the degradation of the ocean and help restore it to full health and productivity. Its focus is on the high seas, the vast ocean areas that lie beyond the Exclusive Economic Zones (EEZs) of individual states.

- SDG 14 specifies targets to manage and protect marine and coastal ecosystems
- Therefore there is a need to focus on conservation of underwater resources.




**Outcomes**

- It adopted a consensus of a **14-point Call for Action** where the participating Heads of State affirmed their strong commitment to conserve and sustainably use our oceans.
- Topics that were discussed ranged from **plastic pollution in the oceans and seas to ocean acidification and illegal fishing** – which tie in with topics of alleviating poverty, ending hunger, promoting health, ensuring access to water and sanitation etc.
- International Solid Waste Association also announced a task force on marine litter in concert with the conference.

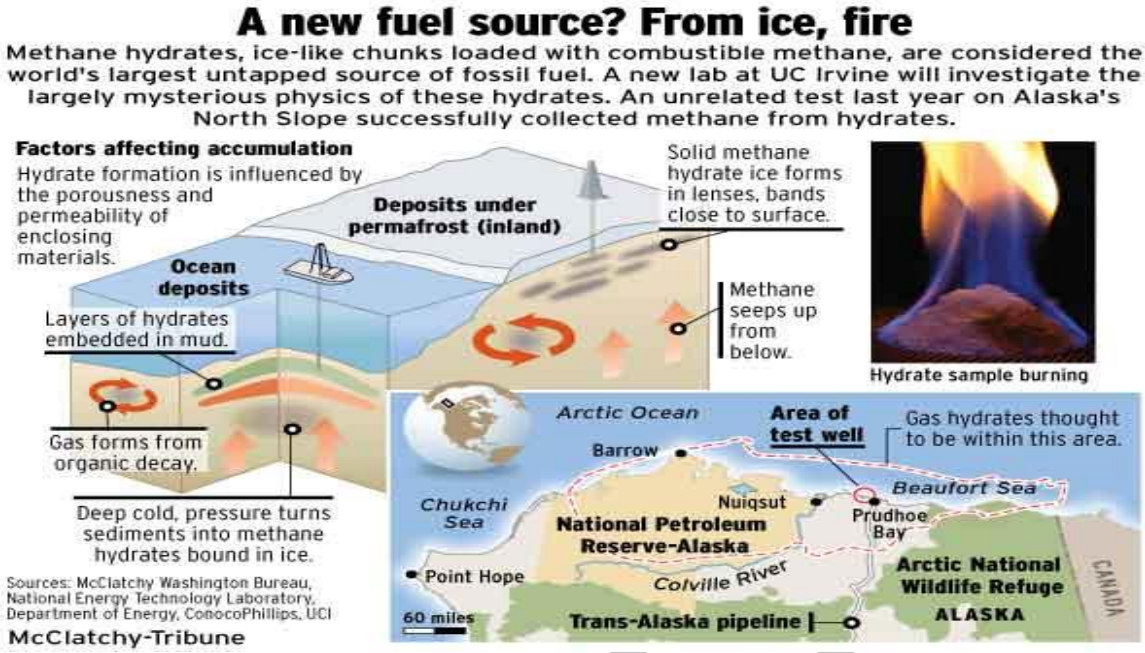
**Recommendation**

- Some of the recommendations to improve the oceanic ecosystem as decided by the Global Ocean Commission are:
  - Ending harmful subsidies in seas.
  - Checking illegal, unreported and unregulated fishing.
  - Establishing binding international safety standards and liability.

**Way forward**

- There is a need to address the existing gaps in regulation, policy areas, or implementation where governments so far have shown a deficit to deliver on sustainable fish stocks and healthy oceans.
- Some of the recommendations to improve the oceanic ecosystem as decided by the Global Ocean Commission are:
  - Ending harmful subsidies in seas.
  - Checking illegal, unreported and unregulated fishing.
  - Establishing binding international safety standards and liability.
- Meanwhile **The UN High Level Political Forum on Sustainable Development**, scheduled to meet in July 2017, will discuss the implementation of SDG 14 and evaluate outcomes of Ocean Conference.

## 6.8. COMBUSTIBLE ICE




**Why in news?**

Recently, Japan and China successfully extracted the combustible ice from the sea floor off their coastlines.

**About combustible ice**

- Combustible ice is **a frozen mixture of water and concentrated natural gas**.
- Technically known as **methane hydrate**, it can be lit on fire in its frozen state and is believed to comprise one of the world's most abundant fossil fuels.
- Methane hydrate has been **found beneath seafloors** and buried inside Arctic permafrost and beneath Antarctic ice.
- Estimates of worldwide reserves range from 280 trillion cubic metres up to 2,800 trillion cubic metres, according to the U.S. Energy Information Administration.
- Methane hydrate reserves could meet global gas demands for 80 to 800 years at current consumption rates.
- Yet efforts to successfully extract the fuel at a profit have eluded private and state-owned energy companies for decades.

**Environmental concerns**

- If methane hydrate leaks during the extraction process, it can increase greenhouse gas emissions.
- The fuel also could displace renewables such as solar and wind power.

## 6.9. WINTER FOG EXPERIMENT

**Why in news?**

- Ministry of Earth Sciences (MoES) has launched Winter Fog Experiment **(WIFEX 2016-17**) to achieve better understanding of fog life cycle at Indira Gandhi International Airport (IGIA), Delhi.

- The main scientific objective of this project is to study the characteristics and variability of fog events and associated dynamics, thermodynamics and fog microphysics.

**Significance of experiment**

- It will help to achieve better understanding of fog life cycle and ultimately improve capability in fog prediction.
- It will help reduce its adverse impact on aviation, transportation and economy, and loss of human life due to accidents.

**About Fog**

- Fog is a visible mass consisting of cloud water droplets suspended in the air or near the Earth's surface.
- Maximum fog occurrence over the Northwest India is about 48 days (visibility < 1000m) per year, and occurs mostly during the December-February time period.
- Land use changes and increasing pollution in the region are responsible for growing Fog occurrence.

# 7. MISCELLANEOUS

## 7.1. SUSTAINABLE TOURISM

**Why in news?**

Sustainable tourism was the theme of World Biodiversity Day 2017.

**About sustainable tourism**

- **It is defined as "tourism that respects both local people and the traveller, cultural heritage and the environment**".
- It seeks to provide people with an exciting and educational holiday that is also of benefit to the people of the host country.

**CONVENTIONAL TOURISM**
- Profit and Tourist oriented
- Conservation and local communities not a priority
- Much revenue goes to outside operators & investors

But in the longer run adopting sustainable tourism offers following benefits:

**SUSTAINABLE TOURISM**
- Planned with three goals: profit, environment, and community (triple bottom line)
- Usually planned in advance with involvement of all stakeholders
- Locally oriented
- Focus on educational experiences
- Conservation of natural resources a priority
- More revenue stays with local community

**Objectives**

- To appreciate the benefits and problems arising from various forms of tourism, especially in terms of **social equity and the environment**;
- To develop a **critical awareness** of the ways in which tourism can enhance the welfare of people and protect our natural and cultural heritage;
- To promote a **personal commitment** to forms of tourism that maximise rather than detract from sustainable human development and environmental quality; and
- To plan ways of teaching about sustainable tourism.

**India and sustainable tourism**

- Ministry of Tourism has launched the Implementation of the Sustainable Tourism Criteria for India (STCI) in association with Ecotourism Society of India (ESOI)
- The Sustainable Tourism Criteria for India (STCI) had been developed for the accommodation, tour operators and beaches, backwaters and lakes sectors of the tourism industry.
- The STCI follow the guidelines set by the Global Sustainable Tourism Criteria (GSTC) that has been evolved under the guidance of the United Nations' agencies viz. UNEP and UNWTO.

## 7.2. ENVIRONMENTAL IMPACT ASSESSMENT

**Why in news?**

The Ministry of Environment, Forest and Climate Change (MoEF&CC) has issued a notification, giving a six-month window period to project proponents, who have been operating without obtaining a prior environmental clearance.

**CAG's performance audit** on ECs
- It said that ministry has failed at every step in ensuring environment is protected
- It also said that ministry has not penalized even a single project for non-compliance.
- Only in 11% of the cases were the ECs granted within the prescribed time limit of 105 days.

**Background**

- The process of granting ECs by the ministry includes grant of terms of reference (ToRs), public consultations and environment impact assessment (EIA).
- Different sector-based Expert Appraisal Committees (EACs) in the environment ministry appraise projects as per the provisions of the EIA notification 2006 after which it recommends or rejects environment clearance to projects.

**New notification**

- There is a window for applying EC but the action will be taken in case an expert panel of the ministry finds it to be environmentally unsustainable.
- In cases where EAC finds that the project can run in an environmentally sustainable manner, the expert panel will prescribe assessment of ecological damage, a remediation plan and natural and community resource augmentation plan (NCRAP).
- The idea is to take away the economic benefit (if any) derived by the company due to violation and pay for the remediation of damage caused due to violation.

**Future Concerns**

- Environmentalists are not happy because it encourages violation and negates the purpose of detailed EIA
- The EC should not be granted once project activities have started, but if it is now allowed the implementation of remedial measures and compliance of clearance conditions must be strictly monitored.

**Environmental Impact Assessment (EIA): A Brief**

**What is it?**

It is the term used for the assessment of the environmental consequences (positive or negative) of a plan, policy, program or project prior to the decision to move forward with the proposed action. It is a management tool to minimize adverse impacts of the developmental projects on the environment and to ensure optimal use of natural resources for sustainable development. It has now been made mandatory under the Environmental Protection Act, 1986.

**Guidelines for EIA:** The Central government has issued EIA Notification, 2006 to facilitate collection of environmental data and preparation of management plans.

**Components of EIA:** The main steps in the EIA process are: **screening, scoping, prediction and mitigation, management and monitoring and audit.** EIA should contain all or some of the **following components:**

- Impact on air, water, soil, noise environment, biological environment viz flora and fauna
- Impact on socio economic and health environment of local people
- Risk assessment viz hazard identification and mitigation thereof
- Environment Management Plan: this includes delineation of mitigation measures including prevention and control for each environmental component and rehabilitation and resettlement plan.

**Critical evaluation of EIA in India:**

1. **Low Applicability:** there are several projects with significant environmental impacts that are exempted.
2. **Composition of expert committees and standards:**
   - Lack of expertise in various fields viz wild life experts, Anthropologists etc.
   - Lack of exhaustive ecological and socio- economic indicators for impact assessment.
3. **Public hearing:**
   - Public comments are not taken into account at early stage which often leads to conflict at later stage of project implementation.

- A number of projects have been excluded from mandatory public hearing.

4. **Quality of EIA:**
   - The reports are generally incomplete and provided with false data.
   - At present it is responsibility of project proponent to commission preparation of EIA. There are chances that final assessment may be biased

**Recommendations**

- All those projects where there is likely to be significant alteration of ecosystem, need to go through the process of environmental clearance.
- Public hearing should be made applicable to all hitherto exempt categories which have environmental impacts.
- Preparation of EIA should be completely independent of the project proponent. A central fund could be created which contains fees deposited by project proponents.
- All EIAs should clearly state what adverse impacts of the proposed projects are. This should be a separate chapter and not hidden within technical details.
- Capacity building of NGOs, civil society groups and local communities to use the EIA notification towards better decision making.

## 7.3. ACCESS AND BENEFIT SHARING

**Why in news?**

**Ministry of Environment, Forest and Climate Change (Moef)** launched the online filing of Access and Benefit Sharing (ABS) applications.

**What is Access and Benefit Sharing?**

- **Access and benefit-sharing (ABS)** refers to the way in which genetic resources may be accessed, and how benefits from that result from their use are shared between the people or countries using the resources (users) and the people or countries that provide them (providers).
- Users seek genetic resources to deliver a range of benefits; from basic scientific research, such as taxonomy, to developing commercial products which contribute to human well-being, such as pharmaceuticals.
- Providers of genetic resources grant access to these resources in return for a fair share of the benefits that result from their use. Ideally, these benefits will also be used to improve conservation and the sustainable use of biological diversity.
- The **Nagoya Protocol to the Convention on Biological Diversity** aims to ensure this.

**What is the Nagoya Protocol and what is its objective?**

- The *Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) to the Convention on Biological Diversity* is a supplementary agreement to the Convention on Biological Diversity. The Nagoya Protocol on ABS was adopted on 29 October 2010 in Nagoya, Japan and entered into force on 12 October 2014.
- Its objective is the fair and equitable sharing of benefits arising from the utilization of genetic resources, thereby contributing to the conservation and sustainable use of biodiversity.

**Importance**

- The Nagoya Protocol will create greater legal certainty and transparency for both providers and users of genetic resources. By helping to ensure benefit-sharing, the Nagoya Protocol creates incentives to conserve and sustainably use genetic resources, and therefore enhances the contribution of biodiversity to development and human well-being.
- The Nagoya Protocol also covers traditional knowledge (TK) associated with genetic resources that are covered by the CBD and the benefits arising from its utilization.

Student Notes:

**Related Policy and institutions in India**

- Access and Benefit Sharing falls under the ambit of Biodiversity Act, 2002.
- National Biodiversity Authority was established as a statutory body which advises government on conservation, sustainable use of biological resources and fair and equitable use of benefit arising out of use of biological resources.