



# IAS PARLIAMENT

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## MAINSTORMING 2020

### ENVIRONMENT & AGRICULTURE I



## SHANKAR IAS ACADEMY

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## ENVIRONMENT, AGRICULTURE & GEOGRAPHY I (JANUARY 2020 TO AUGUST 2020)

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## MAINSTORMING 2020

### ENVIRONMENT, AGRICULTURE & GEOGRAPHY I (JANUARY 2020 TO AUGUST 2020)

#### ENVIRONMENT

#### 1. POLLUTION

##### 1.1 Need for Amending 1981 Air Act

###### What is the issue?

- As Delhi's Air Quality Index crosses 500, the national capital has officially entered the public health emergency category.
- This highlights the dire need for amending the 1981 Air Act and making it more compatible with contemporary India.

###### What are the drawbacks with the 1981 Act?

- Under the 1981 Air Act, the Pollution Control Boards are presently unable to fulfill their mandate as watchdogs against polluting industries.
- In its present form, India's Air Act does not mention or prioritise the importance of reducing the health impact of rising pollution.
- It is therefore essential to make a rework on the 1981 Air Act that governs the country's pollution control system.

###### What should the new law bring in?

- A new bill will plug many loopholes in the 1981 Act.
- It could align the functions and priorities of the Pollution Boards towards reducing the adverse impact of pollution on human health in India.
- Primarily, a new law should make 'protecting health needs' to become the central mission that the pollution boards work towards.
- When the air quality goes from normal to toxic and hazardous, the boards must be empowered to declare public health emergencies.
- They should have the power to temporarily shut down all polluting activities.
- Accountability and deterrence are essential in ensuring that industries comply with emission standards.
- While the boards cannot levy penalties, they should be empowered to encash environmental compensations from polluting industries.
- This would be a strong reinforcement for industries to adopt cleaner technologies and comply with standards.
- The industries and their respective state boards must be ranked in order of their efficiency and programme delivery.
- This would incentivise the industries to better themselves through environmental compensations.
- Finally, in a federal set-up, the Centre and states must work in synergy to ensure that targets set for the country and states are fulfilled.

- The new law must thus push Central and state boards to convene joint sittings with a multi-sectoral participation from concerned ministries.
- Multi-sectoral participation is crucial as air pollution is not, and has never been, a problem with a single solution.
- With this need in place, ensuring appropriate political leadership is essential in giving shape to public commitment.
- Therefore, the new law must give an additional mandate to a senior minister or else the prime minister's office needs to be involved directly.
- The pollution targets must be made public every year to have greater public transparency and control.

## 1.2 UPPCB Order on Kanpur Tanneries

### Why in news?

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

### What is the order?

- In August 2019, UPPCB had permitted 126 tanneries to run at 50% capacity, provided they fulfilled the pollution norms.
- But, a report of the Ganga monitoring wing of the National Green Tribunal found the shortcomings in this.
- It said that effluents from tanneries, located in Kanpur's Jajmau industrial area, were being released into the river.
- As a result, tanneries have now been ordered to remain closed.

### What are the concerns with the order?

- The estimated size of Kanpur's leather industry is Rs 12,000 crore, 50% of which is exported.
- It provides direct and indirect employment to about a million people.
- Notably, it is the state agency Jal Nigam, which is mandated to run the effluent treatment plant, not the tanneries.
- The Jal Nigam has not fulfilled its commitment and has asked for more time to set things right.
- But, it is the tanneries that are left to suffer.

### What are the larger issues to be addressed?

- The issue highlights the several economic and governance challenges in India's attempt to deal with rapidly increasing urbanisation.
- However, the issue of externality is not new and, in the Kanpur tanneries case, pollution of the Ganga has wider consequences.
- Despite all the efforts made by the government, a large amount of sewage water is still being released into the Ganga in Uttar Pradesh.

### What should be done?

- India needs to tackle negative externalities of industrial development and rapid urbanisation at various levels.
- Imposing taxes may not always work in containing pollution and damage to the environment.
- India needs to build the state capacity to deal with such issues.
- Notably, tanneries in Kanpur have been closed because a state agency could not handle the project properly.



- Engagement of local institutions is necessary, as the one-size-fits-all solutions may not work in a country like India.
- Dealing with pollution thus requires empowering the institutions of local governance.
- Besides this, it increasingly requires better coordination among different agencies.
- Essentially, the state should be in a position to make the necessary investment. It should also monitor the adherence to environment regulations at the local level.
- Attracting private investment in waste management in a big way will help bring innovation and minimise costs over time.
- In all, the government will have to work at multiple levels to ensure that growth and development are sustainable.

### 1.3 Plastic Pollution in the Atlantic Ocean

#### Why in news?

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

#### What are microplastics?

- Microplastics are plastic debris smaller than 5mm in length.
- They come from a variety of sources.
- One of the sources is when larger pieces of plastic degrade into smaller pieces, which are difficult to detect.

#### Why is plastic pollution especially harmful?

- The durability of plastic makes it difficult to decompose depending on the type of plastic and where it has been dumped.
- In the oceans, plastic pollution impacts marine life, ocean health, coastal tourism and even human health.
- Over the past few years, all sorts of marine animals such as whales, seabirds and turtles unknowingly ingest plastic and often suffocate.
- But bigger marine species tend to get more attention because of the amounts of debris they can hold up.
- For humans, marine plastic pollution is harmful if it reaches the food chain.
- A 2019 study found that an average person eats at least 50,000 particles of microplastic each year.
- Consumption of plastic by humans is harmful since several chemicals that are used to produce plastics can be carcinogenic.
- Even so, exact risks of the microplastics on the environment and human health are not clearly known.

#### What does the study say?

- **Study** - In the study, scientists studied pollution of the Atlantic Ocean caused by three types of plastics: polyethylene, polypropylene, and polystyrene.
- These plastics, most commonly used for packaging, were suspended in the top 200 metres of the ocean.
- **Smaller plastic particles** - They are a hazard as it is easier for them to sink to greater ocean depths.
- Some marine species such as zooplanktons show preferential ingestion of smaller particles.
- This makes them easier to enter the food chain and their conversion to fast-sinking faecal pellets.
- **Underestimated** - Scientists say that pollution caused by microplastics has been “severely” underestimated in previous assessments.



- They said that a considerable amount of small microplastics are lost from the surface and are stored in ocean interiors.
- **Amount** - The study have estimated that the Atlantic waters could hold 17-47 million tonnes of plastic waste.
- This estimation is based on the trends of plastic waste generation from 1950-2015.
- This is also based on the fact that the Atlantic Ocean has received 0.3-0.8% of the global plastic waste for 65 years.

#### 1.4 Legacy Waste

*Recently, the National Green Tribunal (NGT) has directed a committee to assess the amount of damage caused to the environment due to the dump sites (legacy waste) in Delhi.*

- The committee comprises representatives from the Central Pollution Control Board, National Environmental Engineering Research Institute (NEERI) and IIT Delhi.
- Legacy wastes are the wastes that have been collected and kept for years at some barren land or a place dedicated for Landfill (an area to dump solid waste).
- Legacy wastes not only occupy large space, but also become a breeding ground for pathogens, flies, malodours and generation of leachate, which may lead to water contamination.
- They also contribute to generation of greenhouse gases and pose risk of uncontrollable fire.
- This waste can be roughly grouped into four categories:
  1. Contained and/or stored waste (contained or stored waste are wastes in tanks, canisters, and stainless steel bins).
  2. Buried waste.
  3. Contaminated soil and groundwater
  4. Contaminated building materials and structures.
- Bio-mining method has been proposed by the Central Pollution Control Board (CPCB) for the effective disposal of legacy wastes.

#### 1.5 Smog Towers

*First ever smog tower has been installed in New Delhi.*

- Smog towers are structures designed to work as large-scale air purifiers.
- They are usually fitted with multiple layers of air filters, which clean the air of pollutants as it passes through them.
- The smog tower installed in Delhi is capable of treating 6,00,000 cubic meters of air per day and can collect more than 75 per cent of particulate matters (PM) 2.5 and 10.
- After the cleaning, the tower releases clean air, it will focus on reducing particulate matter load.
- The filters installed in the tower will use carbon nanofibers as a major component and will be fitted along its peripheries.
- The project is a collaboration between the Indian Institute of Technology (IIT) Bombay, IIT-Delhi and the University of Minnesota.
- The Central Pollution Control Board (CPCB) will also be involved with the project.
- Similar to this china, has two smog towers in its capital Beijing and in the northern city of Xi'an.



## 1.6 E-Waste

According to a recent United Nations University (UNU) report, global e-waste will increase by 38% in the decade between 2020 and 2030.

- E-Waste is short for Electronic-Waste and the term used to describe old, end-of-life or discarded electronic appliances.
- It is categorized into 21 types under two broad categories:
  1. Information technology and communication equipment.
  2. Consumer electrical and electronics.
  3. E-waste includes their components, consumables, parts and spares.
- It consists of toxic elements such as Lead, Mercury, Cadmium, Chromium, Polybrominated biphenyls and Polybrominated diphenyl.
- E-waste consisting of gold, silver, copper, platinum and other high-value, recoverable materials was mostly dumped or burned rather than being collected for treatment and reuse.
- It can cause some of the major health effects including serious illnesses such as lung cancer, respiratory problems, bronchitis, brain damages, etc. due to inhalation of toxic fumes, exposure to heavy metals and alike.
- It is an environmental hazard causing groundwater pollution, acidification of soil and contamination of groundwater and air pollution due to the burning of plastic and other remnants.
- Asia generated the greatest volume (around 24.9 MT) followed by the Americas (13.1 MT) and Europe (12 MT). Africa and Oceania generated 2.9 MT and 0.7 MT respectively.
- UNU is a global think tank and postgraduate teaching organization headquartered in Japan.
- UNU's mission is to resolve the pressing global problems of human survival, development and welfare that are the concern of the United Nations, its peoples and the member states.

## 2. GLOBAL WARMING & CLIMATE CHANGE

### 2.1 State of Climate of India in 2019

#### Why in news?

The State of Climate of India Report was released by the India Meteorological Department (IMD) recently.

#### What does the report say?

- The Statement on Climate of India in 2019 confirms that the **extreme weather events** have become par for the course in the country.
- This is what climate scientists have been claiming for more than half a decade.
- It notes that excessive heat, cold and rainfall killed 1,562 people in 2019.
- In 2019, the mean **temperature was 0.36 above normal** while the country also recorded **excess rainfall** during both the southwest and northeast monsoons.
- Intense dry spells were interspersed with floods in several parts of the country.
- This is a phenomenon that policymakers will increasingly be called to factor while drawing up projects in areas as diverse as agriculture, urban planning, water resources and disaster management.

#### How the report should be seen?

- The IMD report should be seen in conjunction with **long-term meteorological trends**.



- The World Meteorological Organisation, for example, reckons that the decade starting 2011 remains on track to be the warmest on record.
- At the same time, data from the European Centre for Medium Range Forecast shows that the relative humidity in the mid-troposphere in the Subcontinent has increased by about 2% in the past four decades.
- Such warming has increased the capacity of oceans to form intense cyclonic disturbances.

### What are the observed vagaries?

- In 2019, as the IMD report notes, the Indian Ocean witnessed **eight cyclones**.
- By that very fact, cyclones don't kill but buildings can turn hazardous during such extreme weather events.
- The Ministry of Housing and Urban Affairs does have guidelines for climate-friendly construction.
- But planners in coastal cities and towns rarely pay heed to its provisions.
- Kerala, southern Karnataka and Gujarat were **heavily deficient** till July 2019.
- But in the last week of July, these states recorded **surplus rainfall**.
- For farmers, such vagaries mean **disruptions in the entire cropping cycle**.

## 2.2 NYU Study on Antarctic Glacier

### Why in News?

The New York University (NYU) study has pinned the cause of the melting of the Thwaites Glacier of Antarctica.

### Why is the glacier important?

- Thwaites or Doomsday Glacier is 120 km wide glacier at its broadest, fast-moving and melting fast over the years.
- Because of its size (1.9 lakh sq.km.), it contains enough water to raise the world sea level by more than half a metre.
- The amount of ice flowing out of this glacier has nearly doubled over the past three decades.
- Its melting contributes 4% to global sea level rise each year, which has been a cause of alarm for scientists.
- It is estimated that it would collapse into the sea in 200-900 years.
- Thwaites is important for Antarctica as it slows the ice behind it from freely flowing into the ocean.
- A 2019 study had discovered a fast-growing cavity in the glacier.

### What has the new study found?

- In 2020, researchers from NYU conducted a study that detected warm water at a vital point below the glacier.
- Warm waters in this part of the world, as remote as they may seem, should serve as a warning about the potential dire changes to the planet brought about by climate change.
- The study reported water at just two degrees above freezing point at Thwaites's "grounding zone" or "grounding line".
- This NYU study was funded by the International Thwaites Glacier Collaboration which has been studying the glacier since 2018.

### Why is that significant?

- **Grounding line** is the place below a glacier at which the ice transitions between resting fully on bedrock and floating on ocean as an ice shelf.
- The location of the line is a pointer to the rate of retreat of a glacier.



- When glaciers melt and lose weight, they float off the land where they used to be situated.
- When this happens, the grounding line retreats.
- That exposes more of a glacier's underside to seawater, increasing the likelihood it will melt faster.
- This results in the glacier speeding up, stretching out, and thinning, causing the grounding line to retreat ever further.

### 2.3 IUCN's Gender-Based Study

#### Why in News?

The International Union for Conservation of Nature (IUCN) has studied the effects of climate change and environmental degradation on gender-based violence.

#### What does the study reveal?

- This study shows that the damage humanity is inflicting on nature can fuel violence against women around the world.
- This study adds to the urgency of halting environmental degradation alongside action to stop gender-based violence in all its forms.
- It demonstrates that these two issues need to be addressed together.

#### What is the survival strategy followed?

- According to the study, girls in Ethiopia and South Sudan are being sold off in marriage during extreme droughts, in exchange for cattle.
- It is a survival strategy to get rid of a daughter to relieve the pressure on the family, or it's a way to generate income.
- The rate of **child and forced marriages** increases in crisis situations.
- Growing resource scarcity also increases the risk that women and girls will be victims of violence.

#### What problems do women face due to water scarcity?

- With increasing drought and desertification in the global south, more and more water sources and wells are drying up.
- Women who go to fetch water are forced to walk farther for that water.
- Because of this, the risk of sexual assault also increases.
- The same risk applies to gathering firewood.
- So wells are being built in the villages directly, or nearby, and try through reforestation efforts to plant trees near settlements.
- In addition to practical measures, aid organizations have also called for changes to traditional gender roles.
- It's also important that girls and women know who they can contact after an assault, and that they're encouraged to do so.

#### What problems do women face due to scarcity of fish?

- Women living on many of Africa's coasts and lakes have also suffered as fish have become scarcer.
- Fishermen peddling their wares are now not only expecting money as payment - they're also demanding sex.
- According to the IUCN study, this practice is now so common in western Kenya that it has a name: the Jaboya system.



- To counteract this form of sexual exploitation, women have been given the opportunity to breed fish in ponds around Lake Victoria, Africa.
- This way, they can now set up their own business and sell fish without getting into violent situations.

#### **What is the situation of the women farmers?**

- In places where women are responsible for agriculture, a sudden natural disaster or extreme weather event can have a dramatic effect on their social and family standing.
- If harvests are threatened or wiped out altogether, it can lead to violence - often from within their own families.
- Diversifying their sources of income is the most important way to protect women.

#### **How do traditional societal roles lead to death?**

- When societies dictate certain behaviours and prohibit others to women, they can suffer terribly in extreme weather situations and during natural disasters.
- Women are also more likely to die as a result of flooding, because they rarely seek refuge in emergency shelters.
- Most women prefer to barricade themselves in their huts, where they're often simply washed away by the floods. Eg: Bangladesh shelters.
- But men also die because of these traditional societal roles, as men receive significantly less help than women in crisis situations.
- This is primarily related to the traditional view of masculinity.

#### **How do environmental crimes lead to violence?**

- Environmental crimes, such as poaching and illegal resource extraction, can also lead to gender-based violence.
- According to the IUCN study, threats and sexual violence such as rape are often used to target women environmental activists to undermine their status within the community.
- It is also done to prevent other women from working to preserve the environment.
- Similar strategies are also used in industrialized nations, as women who work on environmental issues are threatened with rape on social media in order to intimidate and silence them.

### **2.4 Smallest Annual Ozone Hole**

#### **Why in news?**

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

#### **Why is ozone important?**

- Ozone is, chemically, a molecule of three oxygen atoms.
- It is found mainly in the upper atmosphere, an area called stratosphere, between 10 and 50 km from the earth's surface.
- Though it is talked of as a layer, ozone is present in the atmosphere in rather low concentrations.
- Even at places where this layer is thickest, there are not more than a few molecules of ozone for every million air molecules.
- Nevertheless, they perform a very important function.

- By absorbing the harmful ultraviolet radiations from the sun, the ozone molecules eliminate a big threat to life forms on earth.
- Notably, UV rays can cause skin cancer and other diseases and deformities, in plants and animals.

### **What is the concern with depletion?**

- During experiments in Antarctica in the early 1980s, it was noticed that during September-November, the concentration of ozone fell considerably lower to what was recorded in the 1950s.
- Studies and satellite measurements confirmed the depletion.
- Given its significance, the ozone layer's depletion was considered as grave a threat to the planet in the 1980s and 1990s as climate change is now.
- By mid-1980s, scientists narrowed down on a class of industrial chemicals like chlorofluorocarbons, or CFCs, as the likely culprits.
- So, over the years, the threat has largely dissipated.
- This is largely because the world has banned the production and consumption of most of the "ozone-depleting substances".
- However, it will take another 15-45 years for the ozone layer to be fully restored.

### **What causes the ozone hole?**

- It is to be understood that the 'ozone hole' is not really a hole.
- It is a region in the stratosphere, directly above Antarctica, where the ozone concentration is measured to become extremely low in certain months.
- Notably, depletion has happened in other regions of the stratosphere as well but the problem is more acute in Antarctica.
- This is due to a set of special meteorological and chemical conditions that arise there in the months of September, October and November.

### **What is the recent discovery?**

- NASA recently reported that the ozone hole, which usually grows to about 20 million sq km in September, was less than half that size in this year (2019).
- This is the smallest it has ever been during this time of the year, after being discovered.

### **What are the possible reasons for this?**

- There was an extraordinarily high temperature in the stratosphere this year.
- The NASA said that the less depletion could have happened because of this rather than the ongoing human efforts to contain the ozone depletion.
- Temperatures in some areas of the stratosphere, which is usually over 100 degrees below zero, were 30° to 40°C higher than normal in September.
- At least two such extraordinary warming of the stratosphere has been observed in the past.
- On both such occasions, the ozone hole was also measured to be smaller than usual.
- However, the reason why this warming happens is uncertain.
- The warming has no observed connection with the warming in lower atmosphere that leads to climate change.
- Given all, it should be noted that this gain is temporary, and persistent human efforts are essential.

## 2.5 Report on the Ocean & Cryosphere

### What is the issue?

- The annual conference of United Nations Framework Convention on Climate Change (UNFCCC) took place in Madrid, Spain.
- In this backdrop, one of the Intergovernmental Panel on Climate Change's (IPCC's) recent reports gains significance.

### What is the report on?

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

### What are the key highlights?

- Over the 21st century, the ocean is projected to make transition to unprecedented conditions.
- Increased temperatures, further ocean acidification, marine heatwaves and more frequent extreme El Nino and La Nina events are the key threats.
- It is virtually certain that the global ocean has warmed unabated since 1970.
- It has taken up more than 90% of the excess heat in the climate system.
- Since 1993, the rate of ocean warming has more than doubled.
- Marine heatwaves have very likely doubled in frequency since 1982 and are further increasing in intensity.
- The Southern Ocean accounted for 35%–43% of the total heat gain in the upper 2,000 m global ocean between 1970 and 2017.
- Its share increased to 45%–62% between 2005 and 2017.
- **Threats** - Even under the most optimistic scenarios, human health, livelihoods, biodiversity and food systems face a serious threat from climate change.
- Accelerated rates of loss of ice, particularly in Greenland, the Arctic and the Antarctic, will produce a destructive rise in sea levels.
- Increases in tropical cyclone winds, rainfall and extreme waves, combined with relative sea level rise, will exacerbate catastrophic sea level events.
- All this will deal a blow also to the health of fish stocks.
- What is particularly significant for countries with a long coastline, including India, is the local sea level anomalies.

- Such events that occurred once in a century may become annual events, due to the projected global mean sea level rise over the 21st century.
- This is an alarming scenario for the 680 million residents of low-lying coastal areas and for those living in small islands.
- Notably, population of low-lying coastal areas may go up to one billion by 2050.
- A major impact is in the Hindu Kush Himalayan Regions.
- Floods will become more frequent and severe in the mountainous and downstream areas of the Indus, Ganges and Brahmaputra river basins.
- This would be because of an increase in extreme precipitation events.
- The severity of flood events is expected to more than double towards the end of the century.

#### **What does the report call for?**

- There is a yawning gap between planned emissions cuts, and what needs to be done by 2030 to contain global temperature rise at 1.5°C.
- The IPCC report thus lends further urgency to the task before countries at the UN conference.
- The member-nations of the UNFCCC are tasked to finalise measures under Article 6 of the Paris Agreement.
- The objective is to commodify carbon emissions cuts, and to make it financially attractive to reduce emissions.
- The IPCC assessment underscores the need for unprecedented and urgent action in all countries that have significant greenhouse gas emissions.
- It strengthens the case for industrialised nations to provide liberal, transparent funding to developing countries under the Paris Agreement.
- This would reinforce the principle of Common But Differentiated Responsibilities and Respective Capabilities.
- It would also recognise that rich countries reduced the carbon space available to the poor.

#### **2.6 Phasing out HCFC-141 b**

*India had proactively and successfully taken the challenge of complete phase out of Hydro chlorofluorocarbon (HCFC)-141 b, by 1.1.2020.*

- Hydro chlorofluorocarbon (HCFC)-141 b, which is a chemical used by foam manufacturing enterprises and one of the most potent ozone depleting chemical after Chlorofluorocarbons (CFCs) .
- (HCFC)-141 b is used mainly as a blowing agent in the production of rigid polyurethane (PU) foams.
- In 2019 December, Ministry of Environment, Forest and Climate Change (MoEFCC) brought out a notification in the Gazette of India through which the issuance of import license for HCFC-141b is prohibited from 1st January, 2020 under Ozone Depleting Substances (Regulation and Control) Amendment Rules, 2019 issued under the Environment (Protection) Act, 1986.
- HCFC-141b is not produced in the country and all the domestic requirements are met through imports.
- With this notification, prohibiting the import of HCFC-141 b, the country has completely phased out the important ozone-depleting chemical.
- Nearly, 50 % of the consumption of ozone depleting chemicals in the country was attributable to HCFC-141 b in the foam sector.
- The phase out of HCFC-141b from the country has twin environmental benefits viz.
  - (i) Assisting the healing of the stratospheric ozone layer, and

- (ii) Towards the climate change mitigation due to transitioning of foam manufacturing enterprises at this scale under HPMP to low global warming potential alternative technologies

### **3. RENEWABLE ENERGY**

#### **3.1 Balancing between Coal-fired Power & Renewables**

##### **Why in news?**

The Ministry of New and Renewable Energy recently proposed 'reverse bundling' scheme for balancing between coal-fired power and renewables.

##### **What is the bundling scheme?**

- In 2015, the government had come up with a plan to 'bundle' solar energy with the then cheaper coal generation.
- The idea was to push sales of renewable power through a market-driven approach.
- The 'bundling' mechanism soon became obsolete as renewable energy cost started falling dramatically.
- The cost of electricity using solar photovoltaic fell to \$38 per megawatt hour which is 14% lower than cost of coal-fired power in 2019.

##### **What is the recent proposal?**

- A new proposal now seeks to flip the 'bundling' scheme by using cheap renewable energy to subsidise costlier coal-fired power.
- It aims to ensure uninterrupted round-the-clock electricity.
- Under 'reverse bundling', "high cost thermal power" is bundled with cheaper renewable energy to overcome the 'intermittent-ness' of green power.
- The draft policy stipulates supply of 51% renewable energy with or without energy storage bundled with 49% thermal power component.

##### **What is the concern with the cost?**

- The tariff for this bundled electricity could work out to be much higher instead of a simple average of cheap renewables and costlier coal supply.
- This is because renewable energy can only be supplied for 6-8 hours.
- On the other hand, battery storage plus thermal plants will cover power supply for the remaining 18-14 hours in a day.
- The cost of battery storage, although falling rapidly, could raise power tariff when supplying for several hours together.
- The high charge for a fixed amount of standby thermal power capacity needed for bundling will further add to the combined tariff.

##### **What are the other concerns?**

- Coal power generators in the country are evading deadlines year after year to retrofit their plants with emission controlling systems.
- Given this, using renewable energy to lower tariff of polluting power counters the climate objectives.
- Also, if thermal power is bundled with renewable energy without storage, the coal-fired capacity will have to be ramped up and down throughout the day.



- Otherwise, it has to be shut for a part of the day depending on renewable generation.
- This may not benefit the coal-fired projects due to inefficient operation.
- The capacity utilisation factor (CUF) of a solar project is only 20%.
- If 80% power is supplied from thermal capacity, the mechanism is still workable because the coal-fired plants will be utilised to a larger extent.
- Instead, necessitating renewables to form a 51% share of supply will make bundled power tariff expensive.
- The inability of power distribution companies (discoms) to buy enough electricity due to their poor financial health is at the centre of the tussle between renewables and coal-fired power.
- Simultaneously, coal thermal capacity utilisation has constantly been falling throughout the year.
- Reverse bundled power will thus have to face the test of being attractive to discoms, which cannot be forced to buy it.

### 3.2 Ethanol Production

#### Why in news?

The Ministry of Environment and Forests announced that mills would not require separate environmental clearance to produce additional ethanol from B-heavy molasses.

#### Why was this decision taken?

- The decision comes at a time when the country is looking at heavy oversupply of sugar, and a host of measures have been launched by the central government to address the systemic issue.
- The ministry clarified that the proposals to undertake additional ethanol production from B-heavy molasses/sugarcane juice/sugar syrup/sugar would be considered.
- It will be considered under the provisions of the EIA (Environmental Impact Assessment) notification, 2006, by an expert appraisal committee for granting environmental clearance.

#### What are ethanol and molasses?

- Ethanol, or ethyl alcohol, is a liquid that has several uses.
- At 95% purity, it is called rectified spirit and is used as the intoxicating ingredient in alcoholic beverages.
- At 99%-plus purity, ethanol is used for blending with petrol.
- Both products are made from molasses, a by-product of sugar manufacturing.
- For making sugar, mills crush sugarcane which typically has a total fermentable sugars (TFS) content of 14%.
- The TFS component consists of sucrose along with the reducing sugars glucose and fructose.
- Most of this TFS component gets crystallised into sugar, and the remaining part is called molasses.

#### What are the Molasses stages?

- The molasses go through three stages - **A, B, and C**, the last one being where the molasses are most un-crystallised and non-recoverable.
- The 'C' molasses roughly constitute 4.5% of the cane, and have a remaining TFS of 40%.
- After C-molasses are sent to the distillery, ethanol is extracted from them. Every 100 kg of TFS yields 60 litres of ethanol.
- Thus, from one tonne of cane, mills can produce 115 kg of sugar (at 11.5% recovery) and 45 kg of molasses (18 kg TFS) that gives 10.8 litres of ethanol.



### **How more ethanol can be produced?**

- Mills can also produce only ethanol from sugarcane, without producing sugar at all.
- In this case, the entire 14% TFS in the cane is fermented. Here, a mill can make 84 litres of ethanol and zero kg of sugar.
- In between the two extreme cases, there are intermediate options as well, where the cane juice does not have to be crystallised right till the final 'C' molasses stage.
- The molasses can, instead, be diverted after the earlier 'A' and 'B' stages of sugar crystal formation.
- Mills, then, would produce some sugar, as opposed to fermenting the whole sugarcane juice into ethanol.
- If ethanol is manufactured using 'B' heavy molasses (7.25% of cane with TFS of 50%), around 21.75 litres will get produced along with 95 kg of sugar from every 1 tonne of cane.
- The latest move by the government is to waive the environmental clearance required to produce ethanol at this stage.
- In the press release, it has been explained that this was done since this process does not contribute to the pollution load.

### **Why focus more on ethanol?**

- Mills currently have all-time-high stocks of sugar, and they have been at loggerheads with farmers over non-payment of dues.
- Mill owners insist that the reason behind their woes is excess production of sugar and fall in its price.
- Under the circumstances, ethanol is the only real saviour - both for mills and cane growers.
- In September 2019, the government approved an increase in the price of ethanol to be procured by public sector oil marketing companies from sugar mills for blending with petrol for the 2019-20 supply year.
- The Cabinet Committee on Economic Affairs also allowed conversion of old sugar into ethanol.
- This again is expected to help mills deal with the current overproduction in the sweetener and make timely payments to farmers for the cane delivered by them.
- Ethanol production has been additionally facilitated with the government mandating 10% blending of petrol with ethanol.

## **3.3 New Zealand's Zero-Carbon Act**

### **Why in news?**

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

### **What is the Act on?**

- The Act comes as part of the country's attempts to meet its Paris climate accord commitments.
- The Act is not a separate legislation but is an amendment to the existing Climate Change Responses Act, 2002.
- The Act is titled Climate Change Response (Zero Carbon) Amendment Act.
- It provides a framework by which New Zealand will be able to develop and implement climate change policies in line with the Paris Agreement.
- The objective is to limit the temperature increase to 1.5 degree Celsius.
- According to the New Zealand government, this is the first legislation in the world to make a legally binding commitment to living within 1.5°C of global warming.

## What are the key targets?

- The Bill presents the country's plan on how to act over the next 30 years, to safeguard its future and that of its children.
- The key aims of the Act include:
  - i. reducing all greenhouse gases (except methane) to net zero by 2050
  - ii. reducing emissions of biogenic methane (produced from biological sources) up to 10% below 2017 levels by 2030 and to 24-47% below 2017 levels by 2050
  - iii. establishing an independent Climate Change Commission
  - iv. establishing a system of emissions budget
- The Act proposes separate targets for biogenic methane.
- [Biogenic methane is emitted by livestock, waste treatment and wetlands.]
- This is because methane is a short-lived climate pollutant with an atmospheric lifetime of around 12 years.
- While its lifetime in the atmosphere is much shorter than carbon dioxide (CO<sub>2</sub>), it is much more efficient at trapping radiation.
- In other words, it is a more potent greenhouse gas than CO<sub>2</sub>.

## 4. GOVERNMENT INTERVENTIONS

### 4.1 India State of Forest Report

#### Why in news?

The Union Minister for Environment, Forest and Climate Change recently released the biennial "India State of Forest Report (ISFR)" for 2019.

#### What is the ISFR?

- The report is published by the Forest Survey of India (FSI).
- FSI has been mandated to assess the forest and tree resources of the country including wall-to-wall forest cover mapping in a biennial cycle.
- Starting 1987, 16 assessment have been completed so far. ISFR 2019 is the 16th report in the series.

#### What are the key findings?

- **Rankings** - Area-wise, Madhya Pradesh has the largest forest cover in the country.
- This is followed by Arunachal Pradesh, Chhattisgarh, Odisha and Maharashtra.
- In terms of forest cover as percentage of total geographical area, the top 5 States are:
  1. Mizoram (85.41%)
  2. Arunachal Pradesh (79.63%)
  3. Meghalaya (76.33%)
  4. Manipur (75.46%)
  5. Nagaland (75.31%)



- **Share** - India's forest cover has increased by 3,976 sq km or 0.56% since 2017.
- For the second successive time since 2007, the SFR recorded a gain (an impressive 1,275 sq km) in dense forest.
- This includes Very Dense Forest with a canopy density of over 70%, and Moderately Dense Forest with a canopy density of 40-70%.
- Around 2,140 sq km of dense forests became non-forests since 2017.
- [A dense forest can deteriorate into an open forest (10-40% canopy density) but conversion to non-forest signifies total destruction.]
- Since 2017, plantations with high canopy density have added 2,441 sq km to the dense forest category.
- On the other hand, 1,858 sq km of non-forests have become dense forests.
- These are plantations of fast-growing species since natural forests rarely grow so fast.
- Since 2003, close to 18,000 sq km of dense forests have become non-forests in the country.
- Nearly half of this (8,552 sq km) were in the last 4 years alone.
- While hill forests have gained in quality, large tracts of tropical forests have fallen off the "dense" category since 2017.
- The biggest loss is under the tropical semi-evergreen head in SFR 2019 - close to 23,500 sq km.
- [In India, tropical semi-evergreen forests are found along the western coast, lower slopes of the eastern Himalayas, Odisha and Andamans.]
- Of India's 7.12 lakh sq km forest cover, 52,000 sq km is plantations.
- This means that it cannot substitute natural forests in biodiversity or ecological services.
- Of the nearly 7,28,500 sq km recorded forest area, around 2,15,000 sq km (nearly 30%) recorded no forest cover in SFR 2019.
- In other words, forestland roughly the combined area of Tamil Nadu and West Bengal holds no forests.
- The total mangrove cover in the country is 4,975 sq km.
- An increase of 54 sq Km in mangrove cover has been observed as compared to the previous assessment of 2017.
- Top three states showing mangrove cover increase are Gujarat (37 sq km) followed by Maharashtra (16 sq km) and Odisha (8 sq km).
- The extent of bamboo bearing area of the country has been estimated 16 million hectare.
- There is an increase of 0.32 million hectare in bamboo bearing area as compared to ISFR 2017.
- Under the current assessment, the total carbon stock in the country's forest is estimated at around 7,100 million tonnes.
- There is an increase of 42.6 million tonnes in the carbon stock of the country as compared to 2017.
- The annual increase in the carbon stock is 21.3 million tonnes, which is 78.2 million tonnes CO<sub>2</sub> equivalent.

### AINS & LOSSES (in sq km)

	2003	2015	Total
	-15	-19	(2003-19)
<b>FORESTLAND LOST</b>			
VDF to NF	545	575	1,120
MDF to NF	8,968	7,977	16,945
<b>Total lost</b>	<b>9,513</b>	<b>8,552</b>	<b>18,065</b>
<b>FORESTLAND GAINED</b>			
NF to VDF	200	233	433
NF to MDF	4,569	5,225	9,794
<b>Total gained</b>	<b>4,769</b>	<b>5,458</b>	<b>10,227</b>

VDF: very dense forest; MDF: mid-dense forest;  
NF: non-forest Source: Forest Survey of India

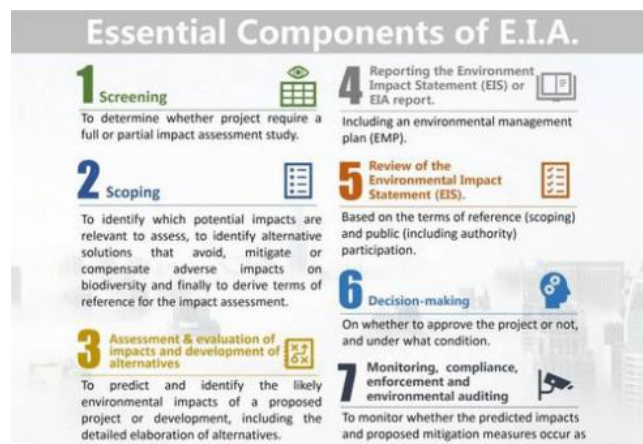
## 4.2 Draft EIA Notification, 2020

### What is the issue?

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

### What is EIA?

- The EIA process scrutinises the potential environmental impact of a project.
- It looks into the negative externalities of a proposed project i.e. before commencement.
- It then determines whether it can be carried out in the form proposed, or whether it is to be abandoned or modified.



### How does it work?

- The assessment is carried out by an Expert Appraisal Committee (EAC).
- The EAC consists of scientists and project management experts.
- The EAC frames the scope of the EIA study and a preliminary report is prepared.
- The report is published, and a public consultation process takes place.
- During consultation, objections can be heard including from project-affected people.
- The EAC can then make a final appraisal of the project.
- It is then forwarded to the regulatory authority, which is the Ministry of Environment and Forests (MoEF).
- The regulatory authority is ordinarily obliged to accept the decision of the EAC.

### What is the idea behind?

- The basis in global environmental law for the EIA is the “precautionary principle”.
- Environmental harm is often irreparable.
- It is thus cheaper to avoid damage to the environment than to remedy it.
- Various international environmental treaties and obligations as well as Supreme Court judgments are based on this principle.
- Environmental regulation must balance damage to the environment with sustainable development and possible benefits of a project.
- In this line, any project that involves environmental factors needs an unbiased assessment made on a precautionary basis.
- It is with this idea that the Environmental Impact Assessment is carried out.
- However, industries and business interests have long regarded EIA as a constraint to them.

### What are the concerns with the recent notification?

- The stated reason is to streamline the EIA process and bring it in line with recent judgments.
- If put into force, the EIA Notification, 2020 will replace the EIA Notification, 2006 for all future projects.

- But the Draft EIA Notification dilutes the effectiveness of the process, and shrinks its scope.
- The most devastating blow to the EIA regime is the creation of an ex-post-facto clearance route.
- Under this, the project proponent can enter an assessment procedure, with some minor fines for the violations.
- In other words, it offers a route when an EIA clearance is not sought or granted, and the construction of the project had taken place.
- Where such ex-post-facto clearances were being granted previously, the courts cracked down on them as illegal.
- Therefore, what could not be ratified will now find itself notified.
- The legality of sidestepping the courts is questionable and will have to be tested.
- In essence, the EIA would become a business decision as to whether the law needs to be followed or the violation can be “managed”.
- The argument that this route will be an “exception” is difficult, given the long history of expanding the exception into the rule.
- The draft notification also shortens the time for the public to furnish responses on the project.
- The project-affected people are frequently forest dwellers.
- For these and others who do not have access to information and technology, this will make it harder to put forth representations.
- Monitoring requirements have also been relaxed.
- The draft EIA notification halves the frequency of reporting requirements from every 6 months to once a year.
- It also extends the validity period for approvals in critical sectors such as mining.
- The scope of the EIA regime is also set to shrink.
- Industries that previously fell under the categories that required a full assessment have been downgraded.
- The construction industry will be one such beneficiary, where only the largest projects will be scrutinised fully.
- Defence and national security installations were always understandably exempt.
- But, a vague new category of projects “involving other strategic considerations” will also now be free from public consultation requirements.

### 4.3 Clause 22 of EIA Draft

#### Why in news?

The Clause 22 of the Environmental Impact Assessment (EIA) 2020 draft notification is one of its central issues.

#### What is EIA?

- EIA is the process or study which predicts the effect of a proposed industrial/infrastructural project on the environment.
- It prevents the proposed activity/project from being approved without proper oversight or taking adverse consequences into account
- EIA regulation is one of the few tools that we have to ensure that we are the true trustees of our natural environment.

#### What is the Clause 22?

- The Ministry of Environment, Forests, and Climate Change released this 2020 draft notification.

- Clause 22 of the draft sets out a process for **post-hoc legalisation** of projects that start construction and/or operation prior to receiving an environmental clearance.

#### What are the EIA regulatory violations?

- **History** - The EIA regulation was first introduced in 1994 through a notification under the Environmental Protection Act, 1986.
- It was significantly amended in 2006, superseding the 1994 notification.
- The draft EIA 2020 notification is an attempt to remake many provisions of the 2006 notification.
- **Violation** - Dealing with projects that fail to obtain prior clearance has been a difficult issue for the regulator.
- This because the project proponents could cite sunk investments if the penalty for violation involves shutting down the project.
- On the other hand, post-hoc legalisation of such violations could lead to perverse incentives for the industry.
- This proposal would render the entire regulation redundant.

#### What is the proposed legalisation process?

- The draft has laid out a process that violators should follow in order to continue their operations legally.
- The Appraisal Committee would assess whether the project can be run sustainably under compliance of environmental norms with adequate environmental safeguards.
- If the answer is no, it can recommend closure of the project.
- If the answer is yes, it will require the project proponent to assess the ecological damage and prepare a remediation plan.
- It will want the project proponent to prepare a 'natural and community resource augmentation plan', along with an EIA report.
- The project proponent is needed to submit a bank guarantee, equivalent to the cost of the remediation plan, prior to receiving an environmental clearance.
- In addition, there are monetary penalties specified for each day the violation occurs.

### 4.4 Genetically Modified Seeds

#### Why in news?

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

#### What are GM seeds?

- Conventional plant breeding involves crossing species of the same genus to provide the offspring with the desired traits of both parents.
- Genetic engineering aims to transcend the genus barrier by introducing an alien gene in the seeds to get the desired effects.
- The alien gene could be from a plant, an animal or even a soil bacterium.

#### What are the GM crops in India?

- **Bt cotton** - It is the only GM crop that is allowed in India.
- It has two alien genes from the soil bacterium *Bacillus thuringiensis* (Bt) that allows the crop to develop a protein toxic to the pest pink bollworm.
- **Ht Bt cotton** - It is derived with the insertion of an additional gene, from another soil bacterium.



- This allows the plant to resist the common herbicide glyphosate.
- **Bt brinjal** - In this, a gene allows the plant to resist attacks of fruit and shoot borer.
- **DMH-11 mustard** - It was developed in University of Delhi.
- In this, genetic modification allows cross-pollination in a crop that self-pollinates in nature.
- Globally, GM variants of maize, canola and soya bean are available.

#### What is the legal position of GM crops in India?

- In India, the Genetic Engineering Appraisal Committee (GEAC) is the apex body that allows for commercial release of GM crops.
- In 2002, the GEAC had allowed the commercial release of Bt cotton.
- More than 95% of the country's cotton area has since then come under Bt cotton.
- Use of the unapproved GM variant can attract a jail term of 5 years and fine of Rs 1 lakh under the Environmental Protection Act, 1989.

#### Why are farmers rooting for GM crops?

- **Cotton** - In the case of cotton, farmers cite the high cost of weeding.
- This cost goes down considerably if they grow Ht Bt cotton and use glyphosate against weeds.
- **Brinjal** - Brinjal growers in Haryana have rooted for Bt brinjal.
- This is because it reduces the cost of production by cutting down on the use of pesticides.

#### What is the problem?

- **Unauthorised crops** are widely used.
- Of the 4-4.5 crore packets (each weighing 400 g) of cotton sold in the country, 50 lakh are of the unapproved Ht Bt cotton.
- Haryana has reported farmers growing Bt brinjal in pockets which had caused a major agitation there.
- Environmentalists argue that the **long-lasting effect of GM crops** is yet to be studied and thus they should not be released commercially.
- Genetic modification brings about changes that can be harmful to humans in the long run.

### 4.5 BIS' Draft Standard

#### Why in news?

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

#### What is the draft?

- The draft is labelled as 'Drinking water supply quality management system - requirements for piped drinking water supply service'.
- It has been prepared by the BIS' Public Drinking Water Supply Services Sectional Committee.
- It has been developed keeping in view the Centre's Jal Jeevan Mission.
- [Jal Jeevan Mission wants to provide safe and adequate drinking water to all rural households by 2024 through tap connections.]

#### What is the focus of the draft?

- The draft **outlines the process of water supply**, from raw water sources to household taps.



- The standard is expected to make the process of piped water supply more uniform, especially in rural and underdeveloped areas of the country.
- At present, the standard is not expected to be made mandatory.
- After the draft is notified, states or water utilities planning to implement the standard can approach BIS for a license.

#### What does the draft say?

- It **outlines the requirements** for a water supplier or utility.
- These requirements are regarding how they should establish, operate, maintain and improve their piped drinking water supply service.
- The process begins with identification of a water source.
- The source can either be groundwater or surface water sources such as rivers, streams or reservoirs.
- It states that after treating, the drinking water should conform to the BIS' Indian Standard (IS) 10500.
- [IS 10500 outlines the acceptable limit of various substances in drinking water, like heavy metals such as arsenic.
- It also sets the limits on parameters like the pH value of water, its turbidity, the total dissolved solids in it, and the colour and odour.]
- The draft standard also contains **guidelines for top management** of the water utility.
- These guidelines are in terms of accountability and customer focus, establishing a quality policy for their service, monitoring the quality of water released to people, and conducting a water audit.

#### What does the draft say about the water supply process?

- **Source identification** - The supply system as outlined in the draft should begin with the identification of a raw water source.
- Water should then be pumped into the treatment plant and treated to achieve the acceptable drinking standards.
- After the water is released from the plant, there should be,
  1. Reservoirs in the distribution system for storage of this water, and
  2. Disinfection facilities to get rid of contamination at any stage of distribution.
- **Accessories** - The draft says that, if necessary, the pumping stations could be provided with accessories shall be installed throughout the distribution system.
- These accessories shall be used as control devices and for water audit.
- **Automation** - The draft reads that the emphasis should be given to operate the systems on automation mode.
- **DMA** - The document also states that the concept of district metering area (DMA) should be adopted where possible.
- DMA would control the leakages in the water network, which is divided into a number of sectors.
- Here, flow meters are installed to detect leaks.
- **Water audit** - The water supplier/utility may provide bulk water meters in the water distribution system to ensure water audit.
- However, the provisions should be made for domestic meters also.



- It shall ensure that the consumers do not have direct access to the meters to avoid possible tampering of the meters.
- It reads that the provision should be made to have automatic meters at household level which shall support in water audit.
- **Quality assurance** - The draft mentions that water should be sampled at the treatment plant every four hours against quality parameters.
- In the distribution system, the sampling should be done every 8 hours at the water reservoirs.
- Random sampling should also be done at household levels.

#### **What's there in the draft in addition to the water supply process?**

- It states that a water audit should be conducted on a quarterly basis.
- [Water audit is a calculation of the amount of water put into distribution against the amount that is consumed.]
- It says that effort should be made by the water agency to bring down the water loss up to 15% of the total water supplied in the system.
- The water utilities are required to conduct surveys among consumers and obtain feedback on their service as per the draft.

#### **4.6 Revamping Haryana's Johads**

##### **Why in news?**

- Haryana's Johads (community-owned water conservation structures) are all set for a revamp by the State government.
- The Pond and Waste Management Authority, governed by Haryana's Pond and Waste Management Authority Act is working on rehabilitation.

##### **What is the Pond and Waste Management Authority Act?**

- The objective of the Act is to establish an authority in the State -
  - i. for development, protection, rejuvenation, conservation, construction and management of pond
  - ii. for utilisation of pond water and treatment thereof
  - iii. to manage and utilise treated effluent of sewage effluent treatment plants for irrigation, thereby reducing over-exploitation of ground water
- The Authority's primary functions are:
  - i. to conduct survey and study the ponds, their boundaries and protected areas
  - ii. to analyze pond water for ascertaining its suitability for irrigation and other uses
  - iii. to take steps for regulation, control, protection, cleaning, beautification, conservation, reclamation, regeneration, restoration and construction of ponds
  - iv. to make environmental impact assessment of the ponds
  - v. to develop infrastructure (pumping machinery, channels and pipe systems for pond water utilization, sewage effluent treatment plants)

##### **What is the plan?**

- Haryana's Johads are community-owned rainwater storage wetland mainly used for harnessing water resources.



- The state government has come out with a plan of rehabilitating over 16,400 ponds in rural areas across the state.
- The objective is to analyze pond water to ascertain its suitability for irrigation and other uses.
- The basic idea is to analyse water resources, other than canal water, for irrigation purposes.
- It is done in coordination with the departments of animal husbandry and dairying, irrigation and urban local bodies.
- The Authority has started surveying the ponds.
- **Model ponds** - The Authority shall be developing 18 model ponds on a pilot project basis.
- Based on this, a future action plan will be prepared for renovation of other ponds.
- The main focus of the model ponds will be -
  - i. beautification
  - ii. demarcation of area for fishing and animals
  - iii. conservation of water to be used for irrigation purposes
- To begin with, each district of the state shall have a model pond each.

#### 4.7 Community Forest Resources Guidelines

##### Why in news?

A study was commissioned by the Ministry of Tribal Affairs (MoTA) in 2019 to create state level guidance for sustainable resource usage in Community Forest Resource (CFR) submitted its report.

##### What is Community forestry?

- Community forestry is an evolving branch of forestry whereby the local community plays a significant role in forest management and land use decision making by themselves in the facilitating support of government as well as change agents.
- It involves the participation and collaboration of various stakeholders including community, government and non-governmental organisations (NGOs).
- The level of involvement of each of these groups is dependent on the specific community forest project, the management system in use and the region.
- It gained prominence in the mid-1970s and examples of community forestry can now be seen in many countries including Nepal, Indonesia, Korea, Brazil, India and North America.

##### What is the report?

- The report of the study highlighted Community forest resource (CFR) rights are given under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (FRA), the Energy and Resource Institute (TERI).
- According to the report
  1. MoTA must issue broad guidelines and principles for implementation of CFRs, mentioning specific role of the state forest department, state tribal/social welfare department, revenue department and gram sabhas
  2. State governments should prepare state-specific guidelines on the basis of MoTA's guidelines
  3. MoTa should focus on capacity-building of gram sabha members, assessment of the biomass stock and biodiversity conservation
  4. Focus on capacity building programmes to educate various stakeholder government departments about the acts/schemes/policies



5. The micro-plans prepared by gram sabha for their respective CFR should be a part of the working plans of forest division concerned, so that forest staff could facilitate the implementation of sustainable forest management.

### **Forest Rights Act**

- The 73rd Amendment to the Constitution of India empowered the third tier of democratic government (gram panchayats/ gram sabhas) for local self-governance.
- FRA and the Provisions of Panchayats (Extension to Scheduled Areas) Act, 1996 further empowered gram sabhas.
- Now the gram sabhas are supreme instead of the forest department.
- But this doesn't mean that the provisions of the national forest policy or the various court orders regarding resource usage from forest will not apply to them.
- It means that now they'll have to manage these areas themselves.
- Under FRA, a village can get its traditionally held forest land, legally recognized as CFR.
- The FRA gives gram sabhas "right to protect, regenerate or conserve or manage any community forest resource which they have been traditionally protecting and conserving for sustainable use."

### **4.8 Strict Liability Vs Absolute Liability**

*National Green Tribunal's order on Visakhapatnam gas tragedy, found LG Polymers prima facie liable under the law principle of "strict liability", which was made redundant in India by the Supreme Court in 1986.*

- Under the "strict liability principle", a party is not liable and need not pay compensation if a hazardous substance escapes his premises by accident or by an "act of God" among other circumstances.
- The Supreme Court, while deciding the Oleum gas leak case of Delhi, 1986, found strict liability woefully inadequate to protect citizens' rights in an industrialized economy like India and replaced it with the 'absolute liability principle'.
- The principle of absolute liability is part of Article 21 (right to life).
- The country was then reeling under the shock of the 1984 Bhopal gas tragedy.
- The court under then Chief Justice P.N. Bhagwati wanted corporations to be made fully liable for future "undeserved suffering of thousands of innocent citizens".
- So, under the absolute liability principle, the apex court held that a company in a hazardous industry cannot claim any exemption.
- It has to mandatorily pay compensation, whether or not the disaster was caused by its negligence.
- The court said a hazardous enterprise has an "absolute non-delegable duty to the community".
- If any harm results on account of such activity, the enterprise must be absolutely liable to compensate for such harm irrespective of the fact that the enterprise had taken all reasonable care and that the harm occurred without any negligence on its part.
- The court found that strict liability, evolved in an 1868 English case called Rylands versus Fletcher, provided companies with several exemptions from assuming liability.
- Absolute liability, on the other hand, provided them with no defence or exemptions.
- The National Green Tribunal Act of 2010 has wholeheartedly adopted 'absolute liability'. Section 17 mandates that the Tribunal should apply the 'no fault principle' even if the disaster caused is an accident.
- The NGT statute recognizes only absolute or non-fault liability.



- That is, a hazardous enterprise is liable even if the disaster is an accident and not caused by the negligence of the company.

#### 4.9 EIA Notification 2020

- Union government has recently released Environment Impact Assessment notification 2020, it set to replace the EIA notification 2006.
- It is released by the Ministry of Environment, Forest and Climate Change (MoEFCC), it requires the public to respond within 60 days of being issued.
- It is being criticized for absurdly released during a nationwide lockdown, it has several dangerous loopholes such as
  1. Public hearings are no longer mandatory for several projects,
  2. Project expansion rules have been eased,
  3. Public consultation process is weaker,
  4. It legitimizes the wrongdoings by industries.
- For instance in March 2017, the MoEFCC issued a notification to appraise projects which have started work on-site without taking prior environmental clearance in terms of the provisions of the 2006 EIA notification.
- It was supposed to be an exception, but has since become a norm.
- Taking it a step further, the 2020 notification states that 'Such violations being recurring in nature may come to the notice in future during the process of appraisal or monitoring or inspection by Regulatory Authorities.
- Therefore, the Ministry deems it necessary to lay down the procedure to bring such violation projects under the regulations in the interest of the environment, rather than leaving them unregulated and unchecked, which will be more damaging to the environment'.

#### 4.10 Wetlands Conservation Rules

- Definition - Wetlands are defined as an area of marsh, fen, peatland or water. It could be natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt.
- It includes areas of marine water the depth of which at low tide does not exceed 6 metres.
- National Wetland Inventory and Assessment (NWIA) – 2007. It added High altitude wetlands (present only in the Himalayas – J&K, Himachal, UK, Sikkim, Arunachal Pradesh)
- The rules apply to:
  - Wetlands categorised as – wetlands of international importance under the Ramsar Convention.
  - Wetlands as notified by the central and state governments and UT administration.
- Management - The new Rules farm out **wetland management to states and union territories**.
- The State or UT Wetlands Authority will have to prepare a list of all wetlands and a list of wetlands to be notified, within specified time.
- However, it is up to the states to decide which wetlands are to be notified.
- A comprehensive digital inventory of all wetlands is to be prepared within a year.
- CWRA - The new rules have done away with the earlier Central Wetlands Regulatory Authority entirely.
- CWRA has been replaced by the **National Wetland Committee** headed by **MOEFCC Secretary**, which has a merely **advisory role**. These include –

- advising the central government on proposals received from states/UTs for –omission of the prohibited activities.
- prescribing norms and guidelines for integrated management of wetlands based on wise-use principle.
- recommending trans-boundary wetlands for notification.
- reviewing the progress of integrated management of Ramsar Convention sites.
- **Restrictions** - As per the new rules, encroachments on wetlands have been banned.
- It also prohibits solid waste dumping, discharge of untreated waste and effluents from industries and human settlements.
- It says that conservation and management would be based on the principle of 'wise use', which is to be determined by the Wetlands Authority.

### Shortfalls in the rules

- Definition - The 2010 Rules included in the definition of wetlands all inland waters such as lakes, reservoir, tanks, backwaters, lagoon, creeks, estuaries, etc.
- It also included man-made wetland and the zone of direct influence on wetlands.
- However, the 2017 Rules are not as comprehensive as this. Recognised only natural and not man made and also did not recognise forest and coastal regulation zones.
- It does not apply to the wetlands falling in areas covered under the Indian Forest Act, 1927, the Wild Life (Protection) Act, 1972, the Forest (Conservation) Act, 1980, the State Forest Acts, and CRZ notification, 2011 as amended from time to time.
- It does not include river channels, paddy fields, human-made water bodies/tanks specifically for drinking water purposes, aquaculture, salt production, recreation and irrigation purposes.
- **Management** - There were lethargic response from states and UTs, in the past, on wetlands protection.
- So devolving management to states and UTs could be ineffective
- Restrictions - The term 'wise use' is subjective and could dilute the earlier restrictions.
- There is also no timeline specified for phasing out solid waste and untreated waste from being dumped into wetlands.
- The restrictions on –any other activity likely to have an adverse impact on the ecosystem of the wetland, are not specified clearly in the Rules.
- **Appeal** – The older provision of appealing to the National Green Tribunal does not exist in the 2017 Rules.

### 4.11 Environment Performance Index

- Environment Performance Index is a biennial index released by Yale University.
- The global index considered 32 indicators of environmental performance, giving a snapshot of the 10-year trends in environmental performance at the national and global levels.
- India secured 168 rank in the 12th edition of the biennial (EPI Index 2020) out of 180 countries, the country scored 27.6 out of 100 in the 2020 index.
- India's rank was 177 (with a score of 30.57 out of 100) in 2018. Its overall score under climate change has dipped 2.9 points.
- India needs to re-double national sustainability efforts on all fronts, according to the index.
- The country needs to focus on a wide spectrum of sustainability issues, with a high-priority to critical issues such as air and water quality, biodiversity and climate change.

- All South Asian countries, except Afghanistan, were ahead of India in the ranking.
- India's rank on Sustainable Development Goals (SDGs) among the South Asian countries was low, according to State of India's Environment 2020.
- India scored below the regional average score on all five key parameters on environmental health, including air quality, sanitation and drinking water, heavy metals and waste management.
- Among South Asian countries, India was at second position (rank 106) after Pakistan on 'climate change'.
- A ten-year comparison progress report in the index showed that India slipped on climate-related parameters.
- The performance on climate change was assessed based on eight indicators, adjusted emission growth rates; composed of growth rates of four greenhouse gases and one pollutant; growth rate in carbon dioxide emissions from land cover; greenhouse gas intensity growth rate; and greenhouse gas emissions per capita.
- The report indicated that black carbon, carbon dioxide emissions and greenhouse emissions per capita increased in 10 years.

## 5. BIODIVERSITY

### 5.1 Importing African Cheetahs

#### Why in news?

SC has recently given a green signal to introduction of African Cheetahs in a suitable area in India.

#### What is the story behind?

- This signal has revived a decade-long debate over the controversial plan first floated in 2009 and shot down by the SC in 2013.
- Cheetahs are the only large carnivore to have gone extinct in India.
- In 2009, the then Environment Minister Jairam Ramesh cleared a proposal to import a few cheetahs back in the Indian wild.
- At a 2009 meeting, the Namibia-based Cheetah Conservation Fund offered to help bring in African cheetahs in stages over the next decade, possibly starting in early 2012.
- By 2010, India's cheetah plan was ready and the Centre approved Rs 50 crore for the programme in 2011.

#### What were the obstacles?

- The matter of import came up before the SC during a hearing on shifting few lions from Gujarat to Kuno-Palpur wildlife sanctuary, Madhya Pradesh.
- It was also one of the sites identified for releasing Cheetahs.
- In 2012, the SC stayed the cheetah plan and in 2013, it ordered translocation of lions while quashing the plan to introduce African cheetahs to Kuno-Palpur.
- The cheetah plan was revived in 2017 when the government sought the SC permission to explore possibilities to reintroduce cheetahs from Africa to suitable sites other than Kuno-Palpur.

#### Which place will be the first host?

- In April 2013, the SC had set a 6-month deadline for trans-locating lions from Gujarat to Madhya Pradesh.
- Instead, the 3<sup>rd</sup> National Wildlife Action Plan (2017-2031) released in 2017 said that the identification of an alternative home for the Asiatic lion will be completed during 2018-2021.
- Then, **Kuno** resurfaced as a potential cheetah site in the court.



- But, much of its grasslands have naturally progressed to woodlands, they are not suitable for the African import.
- In the sanctuary, there is barely any presence of the four-horned antelope, chinkara or blackbuck - potential prey for the cheetah.
- **Nauradehi** in Madhya Pradesh will be the host to the first batch of imported animals, as other sites were not feasible.

#### **What is the argument against this host place?**

- Wolves are the keystone species in Nauradehi and would have to compete with cheetahs.
- The majestic GIB is a potential prey for the cheetah.
- Putting the cheetah in with the bustard cannot be contemplated, because of the threat to this most gravely endangered bird.
- The project excluded Jaisalmer's Desert National Park, a potential host.
- Yet, it recommended erstwhile GIB habitats for the cheetah, in effect denying the bird any chance of habitat recovery.
- There is a lopsided focus on flying in an exotic species as a replacement for what was long gone, at the cost of undermining the future of an indigenous species that is still around.
- This is one of the reasons why the SC scrapped this plan in 2013.

### **5.2 India's Proposals at CMS**

#### **Why in News?**

India has proposed inclusion of some species on Appendix-I of the UN Convention on the Conservation of Migratory Species of Wild Animals (CMS).

#### **What were India's proposals?**

- Those species that India wants to include are the Great Indian bustard, Asian elephant and Bengal florican.
- It was accepted by a committee at the 13th Conference of the Parties to CMS (CMS COP13) held in India for the first time.
- [Appendix-I lists species threatened with extinction.
- Appendix-II lists those species in need of global cooperation for favourable conservation status.]
- If listed on Appendix-I, it would facilitate trans-boundary conservation efforts of these species.

#### **What does the Convention seek to do?**

- CMS is a treaty functioning under the UN Environment Programme.
- It works for protection and conservation of species that migrate across frontiers and are facing threats of extinction or require urgent attention.
- It aims to bring together different countries that are part of range of a given species.
- It will also facilitate coherent conservation and protection regimes in a group of countries.

#### **Why do migratory species need special attention for conservation?**

- With a change in season, many species move from one country to another in search of food and shelter, and for breeding.
- However, wildlife laws and protection regimes for these species can be different in each country.
- This makes them vulnerable to taking, hunting, poisoning etc.

- Many migratory species are threatened with extinction due to habitat degradation, barriers in their migration routes, and other pressures.
- Therefore, these species need special attention by all countries that are part of their range.

#### How does listing on a CMS Appendix help a species?

- Listing generally leads to concerted actions in different national jurisdictions in which a species ranges.
- Actions may include cooperation among range countries, harmonization in policies etc through regional agreements.
- CMS has **workinggroups** specializing in various fauna families.
- It also has a **ScientificCouncil** that advises research-based solutions for conservation.
- Many countries started shifting towards renewable energy by building infrastructure like wind turbines, solar parks; these pose risks to wildlife.
- CMS set up in 2014 an **Energy Task Force** that advises contracting parties on how to keep their energy projects wildlife-friendly.

#### So, what changes for the species in India's proposals?

- If the plenary eventually adopts these proposals and the listing goes through, a formal regional cooperation among range countries would become possible.
- Once the listing is done, contracting parties within the range of a species are obliged to cooperate in trans-border conservation efforts.
- Bangladesh welcomed the proposals on the elephant and the florican.
- However, Pakistan did not express any views on the proposal on the great Indian bustard.
- Conservation efforts would also gain from the international expertise of the CMS family.
- It could increase pressure on Pakistan for preventing alleged hunting of the great Indian bustard.

#### What else is on the agenda of the conference?

- Besides the threespecies, proposals have been moved for including **sevenotherspecies** for listing on CMS Appendices.
- COP13 also discussed marine noise pollution, plastic pollution, light pollution, insect decline etc.
- India has invited the COP13 to adopt the '**Gandhinagar Declaration**'.
- This declaration will urge the world community to strive for ensuring ecological connectivity, especially for sustainable management and conservation of migratory species.
- India has proposed that once adopted, CMS forward this declaration to the 15th meeting of UN Convention on Biological Diversity conference in China in October this year.
- This will prepare post-2020 global bio-diversity framework.

### 5.3 The State of India's Birds 2020

#### Why in News?

The State of India's Birds 2020 (SoIB), a new scientific report on bird species was released recently.

#### What is the significance of this report?

- It is the **first such assessment** of long-term trend, current trend, distribution range size and overall conservation status of 867 birds.



- a) Adequate data on how birds fared over a period of over 25 years (long-term trend) are available only for 261 species.
- b) Current annual trends are calculated over a five-year period.
- This report jointly released by **100 organisations** is based on the observations contributed by the birdwatchers on eBird platform.

#### What are some findings?

- This assessment raises the alarm that several birds face a growing threat from loss of habitat due to human activity, widespread presence of toxins, hunting and trapping for the pet trade.
- It warned that diminishing population sizes of many birds because of one factor brings them closer to extinction because of the accelerated effects of others.
- For every bird species that was found to be increasing in numbers over the long term, 11 have suffered losses, some catastrophically.
- Of 101 species categorised as being of **High Conservation Concern**, endemics such as the Rufous-fronted Prinia, Nilgiri Pipit and Indian vulture were confirmed as suffering current decline.
- All these species except 13 had a restricted or highly restricted range, indicating greater vulnerability to man-made threats.

#### On what basis, the health of the avifauna is looked on?

- The health of avifauna is looked at based on scientific groupings such as raptors (birds of prey), habitat, diet, migratory status and endemism (exclusively found in an area).
- The analysis concludes that **raptors overall are in decline**, with some 'open country' species such as the eagle suffering the most.
- Migratory shorebirds, along with gulls and terns, seem to have declined the most among water birds.
- Within India, the losses suffered by resident water birds, particularly in the past five years, calls for detailed investigation, it adds.
- From a **dietary viewpoint**,
  1. Meat-eater birds' populations have fallen by half,
  2. Birds dependent on insects exclusively have also suffered over the long term.
  3. There has been some stabilisation for omnivores, seed and fruit eaters in recent years.
- **Habitat impacts** have decimated 'specialist' birds, which need specific environmental conditions to survive, particularly those dependent on forests.
- This is followed by declines in numbers of grassland, scrubland and wetland species calling for urgent investigation into the causes.

#### What are some suggestions in the report?

- Forward-looking actions suggested by the report include an **update to the IUCN Red List** of endangered species using the SoIB.
- There should be a **collaborative research** by scientists and citizens aided by policy with special emphasis on removing gaps in data.
- An urgent **emphasis on habitats** of species of high concern, notably grasslands, scrublands, wetlands and the Western Ghats.

## 5.4 Study on Eastern Ghats

### Why in News?

University of Hyderabad has studied historical maps and satellite images of Eastern Ghats from 1920 to 2015 to understand the changes in land use and land cover.

### Why Eastern Ghats is important?

- The Eastern Ghats is spread across Odisha, Andhra Pradesh, Karnataka and Tamil Nadu.
- It plays important role in modulating climate, fostering biodiversity, providing sustenance and storing energy in trees.
- They play a significant role in the monsoon break of both North-East and South-West Monsoon.
- Many animals, including tigers and elephants, 2600 plant species and some 400 bird species are found in these discontinuous forests.
- New research findings arguing that the Ghats face a serious threat from climate change, and temperature variations are a cause for worry.
- Another study shows that it has lost almost 16% of its forest area over a span of 100 years.

### What does the study reveal?

- **Forest cover** - The forest cover was 43.4% of the total geographical area in 1920 and has reduced drastically to 27.5% in 2015.
- **Forest area** - Over the years, 8% forest area was converted into agricultural fields, while 4% converted into scrub or grassland.
- They also found that the number of patches of land had increased indicating fragmentation.
- Eastern Ghats being home to many plant species, this fragmentation and destruction can pose a serious threat to the endemic plants.

### What does the study reveal about the threats to species?

- The sampling points are found across the four States where the plants are monitored regularly.
- The study has found that there is fragmentation in areas where several rare, endangered, threatened and endemic species are found.
- It has also found that the best suitable habitats for the plant species have decreased in the Eastern Ghats.
- While agriculture was the main reason for deforestation during the early years, post 1975, mining and other developmental activities such as the construction of dams, roads were the culprits.

### What is the international commitment?

- India is committed to the Paris Agreement on Climate Change.
- Under this agreement, it should create an additional carbon sink of 2.5 to 3 billion tonnes through enhanced forest and tree cover.
- Yet, forest protection policies have often failed dismally.
- Schemes for restoration of forest peripheries through indigenous plant and tree species that match the national commitments could be done.
- These schemes could qualify for international climate finance and must be pursued.



## 6. DISASTER MANAGEMENT

### 6.1 Bushfire

#### Why in news?

Australia is witnessing an unprecedented catastrophic fire season that began in August 2019, with large-scale destruction, mainly in New South Wales (NSW) and Queensland.

#### What is the impact?

- Fire is no stranger to the dry continent's woodlands.
- But, the fires this time has devastated over 10 million hectares of land, killing at least 25 people and tens of millions of animals.
- Besides this, it has forced the evacuation of entire communities.
- Kangaroos were burnt in their tracks as they tried to flee, and koalas desperately escaped the fire.

#### What is the government's response?

- The government of Prime Minister Scott Morrison is struggling to pacify the angry citizens.
- Citizens are calling for a reconsideration of the country's relationship with fossil fuels.
- The government has, however, sought to downplay the impact of changing climate.

#### What is the significance with the current fires?

- Bushfires are routine in Australia, but authorities are calling this season the worst on record.
- Australia is hot, dry, prone to droughts, and, in some parts of the country, to bushfires.
- Such fires happen when grass, branches, and trees start to burn in an uncontrolled manner.
- In New South Wales and Queensland, the risk of bushfires peaks during the spring and early summer.
- This year, the fires started in August 2019, much before the Southern Hemisphere summer (December to February).
- These have been aggravated by an impending drought and record high temperatures.
- This summer, Australia has witnessed its worst drought in more than 5 decades, and temperatures went above 41°C.
- Scientists have said that the conditions demonstrate the effects of climate change.

#### Bushfires in New South Wales and Victoria



#### What is the impending threat?

- Warnings have been sounded by scientists that even with a global average temperature rise of 1°C, the raging fires have engulfed an area the size of Switzerland.
- The world is set to warm at least half a degree more in the coming decades.

- Given this, Australia's encounters with devastating fires could become more frequent.
- It could happen perhaps even once in 8 years, making large parts of the continent uninhabitable.
- The situation is bound to worsen without policy change, as temperatures are predicted to soar to 50°C.
- Over the past half century, the number of hot days and very hot days each year has steadily increased.
- It would be tragic if this scientific insight is ignored.



### What are the contributory factors?

- The coal industry has a sway over politics in Australia that is disproportionate to its share of economic production.
- One-third of global coal exports come from Australia, accounting for 7% of global carbon emissions.
- The country is the largest exporter of coal and liquefied natural gas in the world.
- The energy sector is an important employer there.
- Prime Minister Morrison's conservative government has defended the country's coal industry despite criticisms.
- Australia has also invited scorn for counting carbon credits under the Kyoto Protocol instead of making new reductions to meet its emissions targets.
- The mining industry has caused worries about greenhouse gas emissions increasing in Australia, and in countries to which it exports the fuel.
- The official Climate Commission too was shut down by the government 6 years ago.
- Credentialed specialists at the country's Climate Council have thus had to crowd-source funds to continue their work.
- Today, they are raising the alarm over the lowest ever rainfall recorded in parts of NSW and Queensland.
- These and high peak temperatures are producing challenging situations across the large Murray-Darling Basin.

## 6.2 Heatwave in North India

### Why in news?

Recently, many North Indian States have been experiencing severe to very severe heatwave conditions.

### What is a heatwave?

- Heatwaves occur over India between March and June.
- Meteorologists declare a heatwave event when the maximum (day) temperature for a location in the plains crosses 40 degrees Celsius.
- Over the hills, the threshold temperature is 30 degrees Celsius.
- When the day temperature jumps by 4 to 5 degrees above the normal maximum temperature of a location, it is declared as a heatwave.

### How long can a heatwave spell last?

- A heatwave spell generally lasts for a minimum of four days.
- On some occasions, it can extend up to seven or ten days.



- The longest recorded heatwave spell, in recent years, was between 18 and 31 May 2015.
- This spell had severely affected parts of West Bengal along with Odisha, Andhra Pradesh, and Telangana.
- The current heatwave spell commenced on May 22, 2020 and may continue till May 29.
- Heatwave conditions occurring in May have been observed to last longer, as the season reaches its peak this month.
- Whereas those reported in June die down sooner, often due to the onset of Southwest monsoon over the location or in its neighbourhood.

#### **Does all of India experience heatwave conditions?**

- No. Heatwaves are common over the Core Heatwave Zone (CHZ).
- CHZ includes Rajasthan, Punjab, Haryana, Chandigarh, Delhi, Madhya Pradesh, Uttar Pradesh, Chhattisgarh, Orissa, Vidarbha in Maharashtra, parts of Gangetic West Bengal, Coastal Andhra Pradesh and Telangana.
- This is categorised by India Meteorological Department (IMD).
- CHZ experiences more than six heatwave days per year during these four months.
- Many places in the northwest and cities along southeast coast report 8 heatwave days per season.
- However, the regions in the extreme north, northeast and southwest India are lesser prone to heatwaves.

#### **Why did the country experience an unusual summer?**

- Summer season reaches its peak by May 15 in India, when the day temperatures across north, west, and central India is between 40-45 degrees.
- This year, north India has experienced an unusual summer without heatwaves until May 21.
- It was mainly because of the **continuous inflow of Western Disturbances** that influenced the weather in the north until April.
- Between January & March, there were about 20 Western Disturbances over the north, appearing after every five to seven days.
- Originating in the Mediterranean Sea, Western Disturbances are eastward-moving winds that blow in lower atmospheric levels.
- They affect the local weather of a region during its onward journey.
- When they interact with weather systems heading from the two southern seas, they cause snowfall or rainfall over the north.
- [Here, Southern Seas = The Bay of Bengal or the Arabian Sea]
- A significant influence of Western Disturbances is experienced during December to February.
- However, this year, its influence persisted until early May.
- The recent Western Disturbances resulted in rainfall over Rajasthan, Punjab, Uttar Pradesh, north Madhya Pradesh and Delhi until mid-May.
- This has kept the atmospheric conditions cooler than normal for summer standards.

#### **Has cyclone Amphan influenced the current heatwave?**

- The event of severe heat has emerged immediately after the passing of Cyclone Amphan, a massive Super Storm covering 700 kms.
- Therefore, the experts confirm Cyclone Amphan's role in leading to the present heatwave spell.
- It managed to drag maximum moisture from over the Bay of Bengal, entire South Peninsula, parts of Central India and to some extent, even from the Arabian Sea.

- All the moisture got gradually depleted from over vast areas as the storm advanced towards West Bengal and Bangladesh between May 16 and 20.
- It has now triggered dry north-westerly winds to blow over Rajasthan, Madhya Pradesh, Uttar Pradesh and Maharashtra causing heatwave.

### 6.3 Delhi Earthquakes

#### What is the issue?

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

#### What are the discussions?

- These recent earthquakes have triggered discussions on the possibility of increased seismicity around Delhi.
- They have also triggered fears of an impending big earthquake soon.
- None of these apprehensions has any scientific basis.

#### Is it unusual for Delhi to experience so many earthquakes?

- **Nothing unusual** - Scientists assert that no unusual seismic activity is taking place around Delhi in the last few months.
- Delhi and its surrounding areas usually experience between two and three earthquakes of magnitude 2.5 and above every month.
- But there are monthly and annual variations as well.
- Geological and seismological processes are not very smooth.
- So nothing special has happened in Delhi in the last couple of months.
- **Detection** - Detection of earthquakes, especially those of smaller magnitude, being recorded in an area also depends on the number of seismic recorders installed in that area.
- The area around Delhi has the densest concentration of seismometers in the country, even more than the seismically active Himalayan region.
- Out of the 115 detectors installed in India, 16 are in or around Delhi.
- As a result, even the earthquakes of smaller magnitude are recorded, and this information is publicly accessible.

#### Do these small earthquakes foretell a bigger one?

- **Scientifically** - Earthquakes of magnitude 4 or below hardly cause any damage anywhere and are mostly inconsequential for practical purposes.
- Thousands of such earthquakes are recorded around the world every year, and most of them are uneventful.
- They certainly do not signal any big upcoming event.
- **Foreshocks** - Foreshocks are post-event definitions, which is something that is largely applied in hindsight.
- When a big event happens, all the smaller earthquakes that have occurred in that region in the near past are classified as foreshocks.
- The description does not exist before any big earthquake has happened.
- So, the talk of these being foreshocks of a big earthquake in Delhi have no basis at all.
- **Reality** - A big earthquake might still occur, which no can rule out. But they cannot be predicted.
- So to say that these small earthquakes are precursors to the big one is totally unscientific.



### What is a signal to an upcoming earthquake?

- Scientists have been working for years to identify “precursors” to an earthquake, but have so far met with no success.
- Some special earthquakes, triggered by volcanic activity, can be predicted to some extent but nothing else.
- Predicting earthquakes in a region like Delhi is all the more difficult because the place does not lie on any fault lines.
- We know a little bit about the tectonics in the Himalayan region, where two tectonic plates are meeting each other.
- But Delhi is located on a single plate, and the seismic activity is generated by internal deformities.
- Therefore, predicting earthquakes in advance is out of the question.

### 6.4 Vizag Gas Leak

#### Why in news?

A gas leak from the electronics giant LG's styrene plant has claimed lives in Vizag, Andhra Pradesh.

#### What is styrene?

- Styrene is a flammable liquid.
- It is used in the manufacturing of polystyrene plastics, fibreglass, rubber, and latex.
- It is also found in vehicle exhaust, cigarette smoke, and in natural foods like fruits and vegetables.

#### What happens when exposed to styrene?

- **Short-term exposure** to the substance can result in respiratory problems, and irritation in the eyes and mucous membrane.
- It will also cause gastrointestinal issues.
- **Long-term exposure** could drastically affect the central nervous system and lead to related problems like peripheral neuropathy.
- It could also lead to cancer and depression in some cases.

#### What are the symptoms?

- Symptoms include headache, hearing loss, fatigue, weakness, difficulty in concentrating etc.
- Animal studies have reported effects on the CNS, liver, kidney, and eye and nasal irritation from inhalation exposure to styrene.

#### How bad is the situation in Vizag?

- It is unclear whether the deaths are due to direct exposure to styrene gas or one of its by-products.
- Vizag Police has maintained that the gas is “non-poisonous” and is only fatal when exposed for longer durations.
- However, hundreds of people were admitted to hospitals.
- The cases are high as the gas leak was detected early in the morning.
- Several crucial hours have been lost till safety precautions were taken, and the gas was allowed to spread while people were fast asleep.
- Officials immediately began making announcements over speakers.
- But many have already become unconscious as police had to break open doors to shift people.



### What caused the leak?

- LG Polymers said that stagnation and changes in temperature inside the storage tank could have resulted in auto polymerization.
- This in turn resulted in vapourisation.
- There was 1,800 tonnes of styrene stored at the plant during the leak.

### Is the leak under control?

- The leak has been plugged.
- NDRF teams moved into the five affected villages and have started opening the houses to find out if anyone was stranded inside.
- Officials said that the Covid-19 preparedness helped a lot as dozens of ambulances with oxygen cylinders and ventilators were readily available.
- The spread of the gas depends on wind speeds.
- So far it is estimated that areas within a five-kilometre radius have been affected.

## 6.5 Assam Gas Leak

### Why in news?

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

### Where is the oil rig?

- The Baghjan 5 well is a purely gas-producing well in Tinsukia district.
- It is at an aerial distance of 900 metres from the Dibru-Saikhowa National Park.
- It was drilled by Oil India Limited (OIL) in 2006.
- It is one of the most prolific gas reservoirs owned by OIL.
- It produces around 80,000 standard cubic metres per day (SCMD) of gas from a depth of 3,870 metres.
- The current discharge is at 90,000 SCMD at a pressure of 4,200 PSI, far higher than the normal producing pressure of around 2,700 PSI.

### Why do blowouts happen?

- Sometimes, the pressure balance in a well may be disturbed leading to 'kicks' or changes in pressure.
- If these are not controlled in time, the 'kicks' can turn into a sudden, uncontrolled release of gas/oil or blowout.
- The possible **reasons** behind blowouts include simple lack of attention, poor workmanship, bad maintenance, old age, sabotage, morpho-tectonic factors, etc.
- A device called a **blowout preventer** is usually installed in wells.

### Why was there a blowout at Baghjan?

- The gas well at Baghjan was being **serviced**, and a new sand was being tested at another depth in the same well.
- The existing well-head (the exposed top portion) was also being repaired.
- For repairing the well-head, the well was temporarily killed or the producing zone was shut down.
- The **blowout preventer** was also **removed**.
- But suddenly, gas started to ooze out of the exposed well.



- Before anyone could do anything, it broke through our cement barrier.
- The inquiry is going on regarding how and why it happened, how the gas came out of the 'killed zone'.

#### **Why is it so difficult to control?**

- The control of a blowout depends on two things:
  1. The size of the reservoir and
  2. The pressure at which the gas/oil is flowing out.
- This reservoir was particularly difficult to control since it was a gas well and ran the risk of catching fire at any point.
- While many blowouts automatically collapse on their own, it can take up to months.
- To control a blowout, the first step is to pump in water, so that the gas does not catch fire.

#### **What is being done?**

- A crisis management team from OIL and ONGC intend to create a water umbrella to protect workers while they hook up the blowout preventer.
- For that, a temporary reservoir, channel cables or temporary pipelines have to be built from the Dangori river nearby.
- With very limited space and non-availability of open space above the well head, placement of the BOP is a huge challenge and entails a huge risk.
- It is planned to place the BOP on the well head through a hydraulically driven mechanical transporter.
- Drilling mud will have to be pumped in immediately after capping the well by the BOP.
- OIL has reached out to Singapore-based firm Alert Disaster Control.

### **6.6 Neyveli Boiler Blast - Safety Protocols**

#### **Why in news?**

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

#### **What happened?**

- The power station has seven units of 210 MW each, totalling 1,470 MW.
- On 7 May 2020, a boiler explosion occurred in Unit VI.
- This killed five persons, including two permanent staff members.
- In the recent incident (July 1, 2020), Unit V was shut down after it got tripped the previous night.
- The workers and engineering staff were attempting to revive it.
- It was then that a fire broke out in the boiler, resulting in the explosion.
- Six people were killed and a dozen workers suffered severe burns.
- Power generation in the unit was stalled after the accident.
- All other units in the station and other thermal power plants worked as usual.

#### **What are the other such incidents elsewhere?**

- A day before the boiler blast, 2 persons died and 4 were taken ill after a gas leak at Vizag pharma company.
- Those affected inhaled benzimidazole vapours.



- It happened at the Sainor Life Sciences Private Limited at JN Pharma City in Parawada, a suburb of Visakhapatnam.
- The gas leak at the LG Polymers factory in the Visakhapatnam area in May 2020 is well known.

#### **Why is the Neyveli incident so worrying?**

- The boiler blast is inexplicable, as the power producer had encountered a boiler explosion only on May 7, 2020.
- Following that, NLC had ordered a review of its infrastructure and processes.
- Without meticulous care, boilers are dangerous pieces of equipment.
- High-pressure and superheated steam make for a lethal combination at the event of an explosion.
- Keeping the release mechanism in good order is absolutely crucial.
- Also, occupational safety demands that boilers are operated by trained personnel.
- But some of those on the ground have been described as contract employees.

#### **What is the larger concern?**

- Given the safety threat, boilers are regulated strictly under the Indian Boilers Act, at least on paper.
- The terrible consequences of lax boiler safety were evident 3 years ago in Rae Bareilly.
- Back then, a blast at an NTPC power plant killed a few dozen people.
- But States have clearly not internalised a culture of zero tolerance to boiler accidents.
- In the Neyveli incident, it is said that the boiler was not in operation as it had tripped.
- Notably, the major operations of this equipment involve a furnace and production of steam.
- So, what led to an unexpected blowout should be inquired into.
- The gas leak at Vizag pharma company raises questions on maintenance and operational procedures.
- How vapours of a stable but acutely toxic chemical escaped should be looked into.
- It should be ensured that there is an upgrade to safety protocols.

#### **NLC India Limited (NLCIL)**

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

### **6.7 Integrated Flood Warning System**

#### **Why in news?**

Maharashtra's CM and Union Minister for Health and Family Welfare, Science and Technology recently launched an Integrated Flood Warning System called 'IFLOWS-Mumbai'.

#### **What is 'IFLOWS-Mumbai'?**

- IFLOWS is a joint initiative between the Ministry of Earth Sciences (MoES) and Brihanmumbai Municipal Corporation (BMC).
- It is a monitoring and flood warning system.

- It will be able to relay alerts of possible flood-prone areas anywhere between 6 to 72 hours in advance.
- The system can provide all information regarding possible flood-prone areas including -
  - i. the height the floodwater could attain
  - ii. location-wise problem areas across all 24 wards
  - iii. calculation on the vulnerability and risk of elements exposed to flood
- The early warning forecast would include alerts on -
  - i. rainfall information
  - ii. tide levels
  - iii. storm surge for low-lying areas anticipated to be affected
- The system is designed to generate flood warnings for specific geographical areas of the city.
- All this information will then be routed to authorities.
- It thereby will minimize the damage from cyclones and heavy rain events in Mumbai by evacuating people to safe areas.

#### How does it work?

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



## 6.8 Disaster Management Funds

### PM-CARES Fund

- PM-CARES was set up as a public charitable trust with the trust deed registered on March 27, 2020.
- It is meant for supporting relief or assistance of any kind relating to a public health emergency or any other kind of emergency, calamity or distress, either man-made or natural.

- It includes the creation or upgradation of healthcare or pharmaceutical facilities, funding relevant research or any other type of support.
- Composition of PM-CARES:
  1. Prime Minister as chairperson
  2. Defence Minister, Home Minister, Finance Minister
  3. Three trustees nominated by the Prime Minister “who shall be eminent persons in the field of research, health, science, social work, law, public administration and philanthropy”.
- Donations to fund can avail 100% tax exemption.
- PM-CARES is different from the Prime Minister’s National Relief Fund (PMNRF).

#### ***Foreign contribution to PM-CARES Fund***

- Recently, the Central Government has decided to accept contributions from abroad, irrespective of the nationalities, to the Prime Minister’s Citizen Assistance and Relief in Emergency Situations (PM-CARES) Fund.
- Now the foreign governments, NGOs, and nationals can contribute to the Fund.
- The move is a major policy change as in the past 16 years India has not accepted any foreign aid.
- In 2018, the government refused to accept foreign aid to flood-ravaged Kerala since it was following the disaster aid policy set in December 2004.
- After a tsunami hit India in December 2004, the government felt that it could cope up on its own. Since then, India has followed the policy of not accepting aid from foreign governments.
- It has been said that the contribution to PM-CARES is not “aid” and the foreign contribution is “only” applicable to the PM-CARES fund and not any other fund like the Prime Minister’s National Relief Fund.

#### ***Prime Minister’s National Relief Fund (PMNRF)***

- PMNRF was instituted in 1948 by then Prime Minister Jawaharlal Nehru, to assist displaced persons from Pakistan.
- The fund is currently used primarily to tackle natural calamities like floods, cyclones and earthquakes.
- The fund is also used to help with medical treatment like kidney transplantation, cancer treatment and acid attack.
- The fund consists entirely of public contributions and does not get any budgetary support.
- It accepts voluntary contributions from Individuals, Organizations, Trusts, Companies and Institutions etc.
- The corpus of the fund is also invested in various forms with scheduled commercial banks and other agencies.
- Disbursements are made with the approval of the Prime Minister.
- The fund is recognized as a Trust under the Income Tax Act and the same is managed by the Prime Minister or multiple delegates for national causes.
- Contributions towards PMNRF are notified for 100% deduction from taxable income under section 80(G) of the Income Tax Act, 1961.

#### ***Chief Minister Relief Fund***

- The Ministry of Commerce and Industry has clarified that the contributions to the Chief Minister’s Relief Fund or the State relief fund will not qualify as Corporate Social Responsibility (CSR) expenditure, while any donation to the PM CARES Fund will.



- The Chief Minister's Relief Fund or State Relief Fund for Covid-19 is not included in Schedule VII of the Companies Act, 2013, and therefore any contribution to such funds shall not qualify as admissible CSR expenditure.
- Schedule VII of the Companies Act, 2013 provides the list of activities that can be included in CSR.
- Some political parties criticized this saying it is discriminatory and goes against the constitutional principle of federalism.
- However, donations to the State Disaster Management Authority to combat Covid-19 can be counted as admissible CSR expenditure.

## AGRICULTURE

### 7. AGRICULTURAL PRACTICES

#### 7.1 Punjab and Pulses Cultivation

##### Why in news?

Punjab Agriculture Department is distributing moong dal seed kits to farmers during the ongoing sowing season to push pulses cultivation in the state.

##### What is the total area under pulses in Punjab?

- While Punjab is the highest contributor of wheat and paddy to the national pool, it lags behind in cultivation of pulses.
- In Punjab, mainly green gram (moong), black gram (mash) and pigeon pea (arhar) pulses are grown.
- In 2019, there was 11,700 hectares (0.74%) area under pulses in the state, out of around 39.69 lakh hectares under agricultural crops.
- This is a further decrease of 27% from the previous decade.

##### Why Punjab wants to increase its area under pulses?

- Farmers are already reeling under an agrarian crisis and this can boost their income.
- Punjab is a leading state in wheat and paddy production but it is totally lagging behind in pulses and dependent on the other states.
- So, there is a want to **increase their self-dependence** in the pulses cultivation and to **increase the farmers' income**.
- Sources in the Agriculture Department said that Punjab is not even growing 3% of pulses against the total requirement of the state.

##### How pulses cultivation can help Punjab farmers?

- Moong cultivation provides farmers with an opportunity to have a third crop in a year.
- Moreover, moong being a leguminous crop, it helps in nitrogen fixation and contributes to improving the soil fertility.
- In Punjab, the most suitable time for cultivating pulses is during spring/summer months (March to May).
- This is the same time when hectares of land in Punjab remain vacant after wheat and potato harvesting for over two months.
- Farmers will be able to take advantage of this period.

### How much a farmer can earn from growing moong dal?

- Farmers can get 5-6 quintals moong per acre which translates to Rs 35,000 to Rs 42,000 per acre if he gets the Rs 7000 per quintal MSP of moong decided by the Centre.
- While the input cost would be around Rs 8000-9000 per acre including seed, labour, and other expenditure.
- This can maximize the farmers' profits even from small landholdings.
- But farmers feel that the state government must make a system for local procurement, so that the produce can be consumed in Punjab.

### What is government doing on the ground?

- The government is distributing 4-kg kits to the farmers free-of-cost to multiply the seed.
- It is also holding awareness and training camps for farmers to demonstrate the use of the latest techniques for sowing pulses.
- These kits will help farmers cover two-fifth of an acre and will give a yield that can be used as seeds that can be sown in around 20 acres.

## 7.2 Early Locusts

### Why in news?

Last month, the Locust Warning Organisation (LWO) observed desert locusts in western part of India.

### What is LWO?

- It is a part of the Union Agriculture Ministry's directorate of plant protection, quarantine & storage.
- It has a field headquarters at Jodhpur in Rajasthan.

### Why these locusts are a concern?

- These desert locusts are the destructive migratory pests currently devouring acres of crops in East Africa.
- While locusts are seen in India as well, that is normally only during July-October and mostly as solitary insects or in small isolated groups.
- This year, their being spotted along the India-Pakistan border before mid-April has raised the alarm bells.
- They have damaged the growing rabi crops along western Rajasthan and parts of northern Gujarat during December-January.

### What exactly are locusts?

- The desert locust (*Schistocerca gregaria*) is a short-horned grasshopper.
- **Solitary phase** - In "solitary phase", these winged insects are safe.
- They become dangerous only when their populations build up rapidly.
- Close contact in crowded conditions trigger behavioural changes.
- **Gregarious phase** - They enter the "gregarious phase", by grouping themselves into bands and forming swarms.
- They travel great distances (up to 150 km daily), while eating up every bit of vegetation on the way.
- If not controlled at the right time, these insect swarms can threaten the food security of countries.

### How the LWO's first sighting of the locusts should be viewed?

- **No worries, for now** - The rabi crops has already been harvested and kharif crops are yet to be planted.
- The LWO has detected "gregarious" hopper groups, including in Punjab adjoining the Pakistan border.



- But no breeding or swarm movement has also been seen so far.
- **Timing, a concern** - Their normal breeding season in India is July-October. But this year, they have been sighted by mid-April.
- Last year, too, they were seen towards end-May as isolated grasshoppers.
- But, they could breed to high enough populations for forming swarming and wreaking havoc during the rabi season in Rajasthan and Gujarat.
- The longer time to breed is more conducive for build-up of gregarious insect swarms, as opposed to solitary hoppers.

#### What kind of damage can they cause?

- Locusts are **polyphagous** i.e., they can feed on a wide variety of crops.
- Locusts can **multiply rapidly**, a single female desert locust lays 60-80 eggs thrice during its roughly 90-day life cycle.
- The damage potential of locusts has been limited in India, as India hosts only one breeding season.
- [In Pakistan, Iran and East Africa, they also multiply during January-June.]

#### What is the genesis of the present locust upsurge?

- It lies in the **Mekunu and Luban cyclonic storms** of May and October 2018 that struck Oman and Yemen, respectively.
- These turned large desert areas in remote parts of the southern Arabian Peninsula into lakes.
- This allowed the insects to breed undetected across multiple generations.
- The swarms attacking crops in East Africa reached peak populations from November onwards.
- They build up since the start of this year in southern Iran and Pakistan.
- Widespread rains in East Africa in late March and April have enabled further breeding.

### 7.3 Direct Seeding of Rice

#### Why in news?

Farmers could adopt 'direct seeding of rice' (DSR) in place of conventional transplanting.

#### Why is DSR encouraged now?

- Punjab and Haryana (granary states) could face a shortage of labourers to undertake transplantation of paddy in the upcoming kharif season.
- This is mainly because the seasonal migrants from Bihar and Uttar Pradesh who usually arrive by early June, may not come in time.

#### How is DSR different from normal transplanting of paddy?

- **Conventional transplantation** - Farmers prepare nursery seedbed in the 5-10% of the area to be transplanted.
- Here, the paddy seeds are sown and raised into young plants.
- These seedlings are then uprooted and transplanted 25-35 days later in the main field.
- **DSR** - There is no nursery preparation or transplantation. The seeds are directly drilled into the field by a tractor-powered machine.
- 'Lucky Seed Drill' developed by the Punjab Agricultural University (PAU) can both sow seeds and simultaneously spray herbicides.



- This machine is different from the 'Happy Seeder', which directly sow wheat on combine-harvested paddy fields.

#### Why spray herbicides along with sowing seeds?

- **Wateracts as a herbicide for paddy** - The threat from weeds recedes once tillering (stem development) stage is over.
- The need to flood the fields will also be over.
- For the first three weeks or so after transplanting, the seedlings have to be irrigated daily to maintain a water depth of 4-5 cm.
- Farmers continue irrigating every 2-3 days even for the next 4-5 weeks, when the crop is in the tillering stage.
- The underlying principle here is simple: Paddy growth is compromised by weeds that compete for nutrition, sunlight and water.
- Water prevents growth of weeds by denying them oxygen in the submerged stage.
- Aerenchyma tissues in paddy allow air to penetrate through their roots.
- **In DSR, water is replaced by real chemical herbicides.**
- Farmers have to only level their land and give one pre-sowing irrigation.
- Once the field has good soil moisture, they need to do two rounds of ploughing and planking (smoothing of soil surface).
- This is followed by sowing of the seeds and spraying of herbicides.

#### What are these herbicides?

- There are two kinds, called pre-emergent (applied before germination) and post-emergent (sprayed 20-25 days after sowing).
- **Pre-emergent** -In this case, the herbicide used is Pendimethalin.
- The Lucky Seed Drill that sows paddy can also spray the chemical, which costs Rs 450-500 at one litre per acre.
- Alternatively, farmers can use an ordinary seed drill and apply the herbicide immediately after sowing.
- **Post-emergent** - They include Bispyribac-sodium (Rs 600-700 at 100 ml/acre) and Fenoxaprop-p-ethyl (Rs 700-800 at 400 ml/acre).

#### What is the main advantage with DSR?

- **Watersavings** - The first irrigation (apart from the pre-sowing) under DSR is necessary only 21 days after sowing.
- This is unlike in transplanted paddy, where watering has to be done daily to ensure submerged/flooded conditions in the first three weeks.
- **Labour** - About three labourers are required to transplant one acre of paddy in a single day.
- In 2019, transplanting labour costs were around Rs 2,400 per acre, which may double this time.
- The cost of herbicides under DSR will not exceed Rs 2,000 per acre.

#### What are the drawbacks?

- As DSR demands more of herbicides, the **availability of herbicides** may become a problem.
- The **seed requirement** for DSR is also higher, at 8-10 kg/acre, compared to 4-5 kg in transplanting.
- **Laser land levelling**, which costs Rs 1,000/acre, is compulsory in DSR. This is not so in transplanting.



## 7.4 GM Cotton Controversy

### What is the issue?

- India's cotton growers are keen to buy illegal herbicide-tolerant Bt (HTBT) cottonseed varieties at black market rates.
- The organised seed industry and the anti-GM groups are dismayed by it.

### What is the reality?

- The moratorium imposed in 2009 on approval of all GM crops remains.
- But, the ground realities with respect to cotton cultivation have undergone a significant change.

### What is there a demand for HTBT seeds?

- The demand for the unapproved HTBT cottonseeds has arisen.
- This rise is because India's dominant BT strain (BG-II) is falling prey to pink bollworm pest attacks in recent years.
- [BG-II - Accounts for most of India's cotton acreage.]
- Cotton farmers have been faced with falling yields, while dealing with constant or rising costs.
- The HTBT cotton plant is resistant to the usage of glyphosate-based weedicides, a popular labour-saving product.
- This weedicide has been allowed for use in very restricted conditions in India for its alleged carcinogenic effects.

### What is the fear?

- According to the organised seed industry, illegal trade in HTBT seeds is of ₹300 crore, with 50 lakh packets of 450g each in circulation.
- They fear it has been used over 15-20% of cotton area.
- This is a straightforward case of market forces rising to meet a genuine demand.

### What are the implications?

- The implications of unregulated seed trade are indeed serious.
- This is because the **farmers** in search of high yields may suffer a dead loss if the expensive seeds (selling at over the maximum rates fixed by the Centre) are spurious.
- Bonafide **seed distributors** and **producers** suffer as well.
- The **farmers' groups** have stepped up protests seeking HTBT approval, allowing for reduced costs and quality control.

### What are the actions of the Centre?

- The Centre has said that glyphosate-based weedicides must be applied in the presence of a pest control operator.
- This is an effort taken to curb the use of HTBT seeds.
- However, the sowing season is close to completion.
- Meanwhile, the use of glyphosate in India has increased since 2016-17.
- The Centre must take a clear position on the HTBT issue (GM-based seed technology).

### What could be done?

- India should have a credible regulator to assess these issues on a case-by-case basis, involving all stakeholders.



- India's initiatives on this count should be driven by public-funded research.
- The development of indigenous varieties and strains must be given more emphasis, given our gene pool in seeds.
- A pragmatic response to GM is long overdue, with a distinction being made between food and non-food crops.

## 7.5 Punjab's Groundwater Crisis

### Why in news?

The Punjab Agricultural University (PAU), Ludhiana, recently decided to strengthen maize, the most important alternative to rice, to address the water crisis.

### What is Punjab's water crisis?

- Over 70% of blocks in Punjab are in the dark zone on underground water stocks.
- At current rates of depletion, Punjab's entire subsurface water resource could be exhausted in a little over two decades.
- To conserve the resource, the Punjab government brought a law in 2009 to mandatorily delay transplantation of paddy beyond June 10.
- This is when the most severe phase of evapo-transpiration gets over.
- This has delayed harvesting to end-October and early November.
- This is when atmospheric and wind conditions cause particulate matter and gases from burning paddy stubble to hang close to the surface.
- So, the law has been blamed for creating the bad air crisis of North India, especially Delhi.
- There is serious discussion on finding a sustainable solution to address Punjab's massive groundwater crisis.

### What is the move thus?

- In the above context, there is a strong demand for diversification of crops, and a move away from water-guzzling paddy.
- The PAU has emphasized on moving from paddy to maize.
- It has suggested working towards narrowing the gap in economic returns between the two crops - Paddy and Maize.
- The idea is to persuade farmers towards increasing the area under maize.

### How is maize cultivation across the country?

- Of the 42-odd lakh hectares under cultivation in Punjab, maize was grown on just 3.8% in 2019.
- The area under maize in Punjab is only 1.6% of the total area under maize in India (98 lakh hectares).
- Nearly 46% of India's maize area is in the pensinsular states of Karnataka, Telangana, and Andhra Pradesh.
- Madhya Pradesh and Maharashtra too, have large areas under maize.

### What is the scope in Punjab?

- In Punjab, maize can be grown in three seasons - spring (March-June), rabi (December-April) and kharif (June-October).
- Kharif is the state's main maize season.
- There is need to increase the area under kharif maize, which is also the paddy season.
- Spring maize is grown on around 25,000 hectares.



- But the crop is not promoted due to its long duration, and because it consumes water during the hot summer days.

#### **What are the limitations?**

- Unlike paddy and wheat, which are procured by the government, maize is sold in the open market and is subject to the actions of private players.
- Maize is one of 24 crops for which the government fixes a minimum support price, but procurement is not its responsibility.
- This is because maize is primarily a “feed” crop.
- Notably, of the 28 million tonnes produced in India, only 13% is consumed as food.
- Fluctuating prices of maize has also been a disincentive for farmers.

#### **What is needed for Punjab to effectively diversify from paddy?**

- The area under non-basmati paddy must be cut by at least 12 lakh hectares.
- [Non-basmati paddy is currently grown on 23-26 lakh hectares.]
- Instead, maize, basmati, and cotton must be grown on this land.
- Also, areas under agro-forestry and vegetables should be increased.

#### **What should the government do?**

- Developing more high-yield and good varieties of maize for which there is a demand in the market should be taken up.
- But alongside this, the government must stop free power for paddy.
- This is necessary to disincentivise its cultivation and check overexploitation of underground aquifers.
- [A very large number of tubewells (more than 14 lakh in 2015-16) running on free power extract virtually endless amounts of water across the state.]
- The government could also earmark a portion of the Minimum Support Price budget for maize.
- By doing so, farmers could be compensated in case the price of maize falls below what has been fixed by the government.
- Besides government measure, conditions should be created for farmers to move voluntarily away from paddy.
- Farmers will themselves go for such crops without the government’s efforts if there is a market for low water-consuming crops, and a good price for such crops.

### **7.6 Organic Matter in Soil**

#### **What is the issue?**

- Punjab soils are degraded and depleted because organic matter is quite below (.5-.2%).
- There is a serious need to increase the organic matter of the soil.

#### **Why is there low organic matter in the Punjab’s soil?**

- Punjab is the highest consumer of chemical fertilisers per hectare in the country.
- It is also the third highest pesticide consumer while accounting for just 1.53% of the total area of the country.
- In Punjab, farmers usually plant three crops a year.
- This means that the land gets disturbed every time they till, leading to a decrease in organic matter in the soil.



### **What is Organic Matter?**

- Organic matter (OM) consists of plants, animal material which gets converted into humus after decomposing.
- It improves soil quality and fertility.
- It supplies nutrients, increases water-holding capacity and prevents soil erosion.
- This in turn needs lesser irrigation and helps arrest floods by allowing increased infiltration into the soil.
- Good OM also leads to proper utilisation of fertilisers put in the fields.

### **What is the ideal OM content in soil?**

- Punjab Agricultural University (PAU) said that .75% organic matter in the soil is sufficient.
- Punjab agriculture department said it should be at least 1%.
- International standards suggest having around 2-3% in the soil.

### **How much OM is present in the Punjab soil?**

- OM in the soil was .33% during the Green Revolution in 1966-67, which has increased to .51% at present.
- In the past over 50 years that have elapsed between the Green Revolution, the state registered a .18% increase of organic matter (OM) in its soil.
- Punjab's soil falls in the 'medium' category as far as availability of OM is concerned.

### **How much time does it take to increase OM in the Punjab soil?**

- It can be increased by up to .50-1% in a decade's time, even though the increase was between .3 and .11% in the past five decades.
- This requires the collective efforts of Punjab government, experts and farmers.
- PAU had done experiments in their fields where they had added crop residues in the fields and had also done green manuring.
- As a result, the OM has increased from .42% a decade back to .67% now in their fields.
- The same can be replicated across Punjab.

### **What steps can be taken to increase OM in soil in Punjab?**

- By tilling the land again and again, organic matter gets disturbed and decreases.
- Farmers can opt for two crops a year and grow green manure as a third crop.
- The green manure can be ploughed into the field to improve soil fertility.
- The best time to grow it is after wheat harvesting in April, and then ploughing it in the fields before paddy sowing in June.
- Putting cow dung in the fields, incorporating paddy and wheat stubble in soil, growing pulses are methods to enhance it.

### **Why is increasing OM important for Punjab?**

- Punjab has already witnessed high productivity in several crops.
- But, enhancing this further with existing land holdings is possible when soil is enriched.
- If OM in the Punjab soil is enhanced, the fertility of the soil of low production areas can be enhanced to bring it at par with soil giving the highest production.
- Fertility of soil with high productivity can also be enhanced further by increasing organic matter to around 1%.



## 8. GOVERNMENT INTERVENTIONS

### 8.1 Wheat procurement in Punjab

#### Why in news?

Wheat procurement in Punjab is taking place despite the challenging circumstances during Covid-19.

#### Why this procurement is important?

- It is important because Punjab is the country's highest contributor of wheat at over 46% of the central pool.
- Punjab has already procured three-quarters of its procurement target of 13.5 million tonnes for the national pool.

#### What is the challenge?

- Punjab needs a **labour force** of 3.5 lakh to 4 lakh.
- 90% of its usual labour force comes from Bihar and Uttar Pradesh.
- They were meant to have reached Punjab during the first week of April, ahead of the procurement season starting April 15.
- This did not happen once the lockdown was announced.

#### How were the labour arranged?

- Punjab used the networking skills of its 27,000 registered commission agents.
- Each of them engaged 15 to 20 workers, mostly people working in urban sectors such as construction, catering or as taxi drivers.
- These agents have provided them with masks, soap and sanitisers.
- They also arranged for accommodation of those who want to stay in the mandis.
- Also, each agent is responsible for 20 to 200 farmers, whose crop he sells, and coupons for entry in the mandis.

#### What was the restriction imposed?

- The government **restricted the number of people in mandis** by setting a target of 27 lakh coupons for farmers.
- A farmer can come to the mandi only when his/her turn arrives.
- Every day, 70,000 to 1 lakh coupons are being issued.
- The government has **extended the procurement season** by a month (April 15 to June 15), to prevent a rush in mandis.
- The procurement has been staggered at the rate of less than 7 lakh tonnes daily, even during the peak phase (April 20-May 1).
- In previous years, the peak days would see 9 to 11 lakh tonnes daily.

#### How the number of mandis was increased?

- The Food and Civil Supply Department along with the Punjab Mandi Board (PMB) have set up 3,447 wheat purchase centres.
- This is up from the existing 1,849 grain markets.
- This increase is achieved by converting the rice sale centres into wheat purchase centres.

### What are the other measures?

- **Designated trucks** are doing transportation to godowns and storage units of the FCI (Food Corporation of India).
- Less than 5 lakh tonnes is being transported daily across the state.
- The government has loaded 25.77 lakh tonnes of wheat and rice on 1,031 special trains.
- PMB is preventing crowds in mandis by issuing the coupons in a staggered manner.
- It has set up a **control room** for enquiries and complaints.

## 8.2 Agri-Marketing Reforms

### Why in news?

- As part of the Atmanirbhar Bharat Abhiyan, the Centre announced a set of agricultural marketing reforms.
- Significantly, the Centre would deregulate the sale of six types of agricultural produce by amending the Essential Commodities Act, 1955.

### What is the reform proposal made?

- It was decided to remove restrictions and facilitate enhanced marketing freedom for agri-commodities.
- These include amendments to the Essential Commodities Act, 1955.
- The move would deregulate cereals, pulses, oilseeds, edible oils, onions and potato.
- Stock limits will not be imposed on these commodities.
- This is except in case of national calamity or famine or an extraordinary surge in prices.
- Even these stock limits would not apply to processors and exporters.

### What is the rationale?

- The Essential Commodities Act was enacted at a time of food scarcity.
- It now needs to reflect the different concerns of the present times.
- Now, farmers are producing, and there is an abundance of crops.
- Honest exporters would have paid a fair price to the farmer and stocked produce for shipment overseas.
- There are sometimes issues with this because they would want to export, and the Act does not permit it.
- At some other times, the consumers also suffer.
- The Economic Survey, in January 2020, had also recommended abandoning the “anachronistic” Act altogether.
- [The law has nonetheless remained a vital tool.
- It protected consumers from irrational volatility in the prices of essentials by constraining black marketers and hoarders.]

### What are the concerns though?

- Despite the said reasons, total deregulation for foodgrains is fraught with the risk of future inflationary food price spikes.
- Besides these, plans were underway to bring in a facilitative legal framework to oversee contract farming.
- This would provide farmers with assured sale prices and quantities even before the crop is sown.
- It would also allow private players to invest in inputs and technology in the agricultural sector.



- Another proposal aims at bypassing the APMC regime through a central law that would allow farmers the freedom to sell across State borders.
- [Mandi closures during the lockdown had highlighted the urgent need for multiple channels to sell produce.]
- Both these changes, once enacted, could privilege market forces but without necessarily safeguarding food security.
- This is also the time for relief, which should have been prioritised over reform.
- There is an urgent need to map farmers' current needs and provide relief.
- So, alongside the reforms, the government could consider increasing income support to Rs. 10,000 from the current Rs. 6000 per year under the PM-KISAN scheme, at least for this year.

#### What are the other decisions made?

- **Infrastructure** - There is currently a noticeable lack of adequate cold-storage facilities.
- This continues to extract a high price on farmers and the agrarian economy.
- Post-harvest losses, especially in perishables, are a major concern.
- Given this, Rs. 1-lakh crore fund to finance agriculture infrastructure projects at the farm gate and produce aggregation points was announced.
- The decision to channel the funds to agricultural cooperatives, farmer producer organisations, rural entrepreneurs and start-ups is encouraging.
- It lays the onus of creating the appropriate infrastructure or logistics solution largely on the principal beneficiaries, the farmers themselves.
- The move addressed the needs of fishworkers, livestock farmers, vegetable growers, beekeepers and related activities.
- **Enterprises** - A Rs. 10,000 crore scheme to promote the formalisation of micro food enterprises was also unveiled.
- A cluster approach focused in different regions on signature produce was suggested.
- The goal is to assist unorganised enterprises in scaling up food safety standards to earn the products certification and build brand value.
- **Inter-State trade** - The Centre has been attempting to reform agricultural marketing through a model Act, for the States to adopt.
- However, it now intends to enact a central law to allow farmers to sell produce at attractive prices beyond the current mandi system.
- This is intended at facilitating barrier-free inter-State trade and e-trading.
- While agricultural marketing remains on the State list, inter-State trade falls in the central list. And so, the Centre enacting a law on the latter was justified.
- Overall, the reform package may be more beneficial in the longer term.
- However, it may not provide any immediate relief from the lockdown-driven distress in the rural hinterland.

### 8.3 Ban on Agro-Chemical Products

#### Why in news?

Agriculture ministry made a proposal to ban 27 commonly used plant protection chemicals, due to disputable environmental and health concerns.

### What is the proposal?

- The government plans to ban 27 widely used pesticides.
- The government has shortlisted these 27 from the 66 contentious pesticides being reviewed.
- Out of these 66 under review, the government has already banned 18 pesticides in 2018.
- The 27 pesticides now include popular molecules such as monocrotophos, acephate, carbofuran, 2,4-D and carbendazim.
- These have been found to contaminate water bodies and underground water.
- They are said to cause health hazards to humans, animals and honey bees that help in plant pollination.
- These are pesticides, which were banned, restricted or withdrawn in one or more countries but continued in India.
- However, now, companies may give their objections and representations within 45 days from May 14, 2020.
- After review of their objections, the final notification on the ban will be issued.

### How significant are these 27 products?

- These 27 products account for some 20% of the country's agro-chemicals output.
- These include many broad-spectrum molecules that are used extensively to control a variety of pests, diseases, and weeds.
- Many of them have been in use for decades.
- They are in use without causing any visible harm to the environment, biodiversity, or human and animal health.
- They also constitute a sizeable part (70%) of the agro-chemicals exports, which are worth around Rs 21,000 crore a year.
- The domestic industry is likely to take a hit of Rs 8,000-9,000 crore, if the ban is implemented.

### What are the conflicting responses?

- The move has evoked sharp criticism from all stakeholders in the agro-chemicals sector, including the industry and farmers.
- Agricultural scientists have also decried the move.
- They fear it may gravely hurt the farm sector, which has stood out as a silver lining in the coronavirus-battered economy.
- The agro-chemical industry intends to register its strong objection with the government.
- Only environmental activists have welcomed it, though without offering credible reasons for that.

### What does it mean to farmers?

- Significantly, the farmers and their organisations are backing the industry in contesting this proposal.
- This is because most of the identified products are generic pesticides.
- They are, hence, far cheaper than their patented alternatives.
- The average cost of plant protection operations is now estimated at Rs 250-300 per acre.
- This might double with the use of expensive substitutes, thereby, further eroding the profitability of agriculture.



### Is the proposal wise?

- Technically, only a few of these 27 products are said to fall in the “red” (most bio-hazardous) category of chemicals.
- But others are also being planned to be abandoned.
- This is because either they have been junked in certain other countries or they lack adequate safety data.
- The move thus disregards the wide-ranging ramifications of their withdrawal.
- Lessons from past experience of discarding versatile and cheap pesticides just to imitate the other countries is ignored.
- E.g. discarding the highly useful and inexpensive pesticide, DDT
- The malaria-eradication programme had made considerable headway in controlling mosquitoes.
- But this had collapsed due to the above hasty and ill-judged step.
- [Mosquitoes exit or even avoid DDT-sprayed dwellings.]
- Its cost-effective replacement has been elusive to date.
- The net result is the resurgence of mosquitoes and malaria.
- Importantly, there was emergence of several other vector-borne diseases like dengue and chikungunya, which were almost unheard of earlier.

### What is a possible ramification now?

- The proposed phasing out of the versatile pesticide Malathion can potentially have a similar wide-ranging impact on the agricultural sector.
- Of particular concern in this case is the ongoing battle against the dreaded locusts.
- Malathion is the key chemical for its control.
- Ironically, the agriculture ministry itself is procuring large quantities of Malathion for the locust control programme even after deciding to ban it.

## 8.4 Livestock Census Data 2019

### Why in news?

The 20th livestock census (2019) data was released recently by the Ministry of Agriculture & Farmers Welfare.

### What does the data reveal?

- **Indigenous breeds** - The population of exotic and cross-bred cows has surged by nearly 27% since the last livestock census in 2012.
- However, the population of the indigenous and non-descript cattle has dipped by 6% per cent.
- The data thus makes it evident the futility of the government’s controversial cow protection policies.
- The government has set up the Gokul Mission for the preservation and promotion of indigenous cattle breeds.
- Also, curbs were made on the movement and trade of cows, besides the controversial vigilantism by self-appointed cow protectors.
- Despite all these, cattle-keepers continue to prefer cross-bred cows and buffaloes over desi (indigenous) cows.
- **Domesticated animals** - The census shows that the population of several useful but low milk- or non-milk-yielding domesticated animals is dwindling rapidly.
- These include equines and bovines like horses, ponies, mules, donkeys, camels, and yak.



- These animals cumulatively constitute only about 0.23% of the country's vast livestock wealth.
- Nevertheless, these are useful in their own respect, with each one having its own unique qualities.
- The most dramatic fall is in the number of donkeys (61%) and mules (57%).
- If not protected, these animals may vanish in near future.

#### **What is the case with the state of U.P.?**

- The above trend is evident in Uttar Pradesh that has recorded the largest number of cases of vigilantism and lynching.
- The state government is directly involved in the cow conservation campaign.
- All district authorities have been asked to build goshalas (cow shelters) to keep and feed cattle at government expense.
- A one-rupee cess has been imposed on every liquor bottle to raise funds for this purpose.
- Yet, the state's cattle population has declined by nearly 4%, while the buffalo count has risen by about 8%.
- The closing down of many old slaughter houses and preventing opening of new ones have resulted in a decline in the number of goats and sheep as well.
- This bodes ill for the export of mutton from the country's leading meat-exporting state.

#### **What are the implications of cow protection measures?**

- Stray cattle are not enumerated in the livestock census.
- But anecdotal evidence suggests a sharp increase in their numbers as a result of the ban on the movement and trade of cows.
- Earlier the old and unproductive cows used to be disposed of in the cattle bazaars.
- These are now let loose to roam about in the countryside, damaging crop fields and forests and competing with other livestock for fodder and feed resources.
- Farm organisations from all over the country are demanding an urgent solution to this menace.

### **8.5 Nutrient Based Subsidy Scheme**

*Government provides fertilizers, Urea and 21 grades of P&K fertilizers to farmers at subsidized prices through fertilizer manufacturers/importers.*

- In accordance to its farmer friendly approach, the Govt is committed to ensure the availability of P&K fertilizers to farmers on affordable price.
- The subsidy on P&K fertilizers is being governed by NBS Scheme from 2010.
- Nutrient Based Subsidy (NBS) Scheme is being implemented , since 2010 by the Department of Fertilizers, Ministry of Chemicals & Fertilizers.
- Under NBS, a fixed amount of subsidy decided on an annual basis, is provided on each grade of subsidized Phosphatic & Potassic (P&K) fertilizers depending on its nutrient content.
- The NBS scheme, was sought to deregulate subsidy on non-urea fertilizers and expected to reduce the subsidy burden substantially.
- While the NBS certainly did not lead to any decline in subsidy on fertilizer, it did lead to worsening of soil nutrient quality, along with shortages and price increases in all three types of major nutrients, namely Nitrogenous, Phosphoric and Potassic.
- An undesirable outcome has been the change in fertilizer mix.

- As against the recommended Nitrogen (N): Phosphorous (P): Potassium (K) ratio of 4:2:1, the NPK ratio in 2013-14 was 8.2:3.2:1.
- The environmental damage caused by the inappropriate use of fertilizers is certainly a matter of serious concern in many states.
- Recently Union government has cut the subsidy for non-urea fertilizers this year to ₹22,186 crore.
- That is about 3% lower than the ₹22,875 crore which was the estimated expenditure on the nutrient based subsidies in 2019-20.
- The Cabinet Committee on Economic Affairs decided to reduce the subsidy for nitrogen-based fertilizers to ₹18.78 per kg, for phosphorous-based fertilizers to ₹14.88 per kg, and set the subsidy for potash-based fertilizers at ₹10.11 per kg.
- And while the subsidy for sulphur-based fertilizers had been raised last year to ₹ 3.56 per kg, from ₹2.72 per kg, this year it has been slashed to just ₹2.37 per kg.
- The CCEA also approved the inclusion of a complex fertilizer, ammonium phosphate, under the nutrient-based subsidy scheme.
- The subsidy component on retail price of fertilizers is announced at the beginning of the fiscal and subsequent changes in raw material cost, import price and currency fluctuations get reflected in the retail price.

## 8.6 Need for Land Leasing Legislation

### What is the issue?

- The government's recently announced set of agricultural marketing reforms as part of the Atmanirbhar Bharat Abhiyan is largely welcome.
- However, a critical big-ticket land sector reform, which is the legalisation on land leasing, is still pending.

### What is the present scenario?

- At present, leasing of agricultural land is either banned or severely restricted in most states.
- Only some states allow selected individuals to let out their lands.
- These include disabled people, widows or armed forces personnel.
- The landholders do not lease them out for fear of losing the ownership rights.
- As a result, many tiny land parcels and land holdings of migrant farmers remain unutilised.
- But cumulatively, they amount for a sizable part of the cultivable land.
- Besides, tenant farmers and share-croppers are denied the compensation for crop damages.
- They also find it hard to access cheap bank loans and other government subsidies and doles.
- E.g. the direct income support through annual cash transfer of Rs 6,000 per hectare

### What does this call for?

- The small farmers are now forced to either rent out their fields to quit farming or hire more land to make their holdings viable.
- A valid land lease market is, in fact, believed to have become an economic necessity for the small farmers.
- Legal validation of land leasing is imperative to undo the gross injustice done to farmers.
- Tenurial security, on the other hand, will incentivise tenant cultivators to invest in land improvement and crop yield-enhancing measures to raise their income.

### What are the proposals in place?

- Legalisation of land leasing has long been a part of the agricultural reforms agenda laid down by the NITI Aayog.
- This has subsequently been endorsed by the high-level committee on doubling farmers' income too.
- The committee (headed by an agriculture ministry official Ashok Dalwai) mentioned it in its report submitted in 2019.
- The NITI Aayog also appointed a committee headed by the former chairman of the Commission for Agricultural Costs and Prices, T Haque.
- This has already drafted a model land leasing Bill to serve as a guide for the states to amend their land laws.
- Several states are said to be favourably inclined to reform their land-related statutes.
- But, concrete action has not been forthcoming in this field by them.

### 8.7 Draft Seeds Bill 2019

#### Why in news?

The government has invited public feedback on the recently released draft Seeds Bill 2019.

#### What are the key provisions?

- The draft Seeds Bill aims to replace the Seeds Act, 1966 and regulate the quality of seeds sold.
- All varieties of seeds for sale have to be registered.
- The seeds are required to meet certain prescribed minimum standards.
- Transgenic varieties of seeds can be registered only after the applicant has obtained clearance under the Environment (Protection) Act, 1986.
- In addition, the label of a seed container has to indicate specified information.
- The Bill exempts farmers from the requirement of compulsory registration.
- Farmers are allowed to sow, exchange or sell their farm seeds and planting material.
- They do not have to conform to the prescribed minimum limits of germination, physical purity and genetic purity (as required by registered seeds).
- However, farmers cannot sell any seed under a brand name.

#### What is the key shortfall?

- The Bill contains provisions for the Centre and states to introduce capping of prices.
- It seems that the government is willfully ignoring the lessons of the recent Shetkari Sanghatana (SS) 'civil disobedience' protest.
- In consequence of this, Monsanto withdrew one of its most advanced GM offerings from approval.
- As the Shetkari Sanghatana protest shows, the fact is that the farmers are aware of the benefits of GM technology.
- They are even willing to pay a premium as long as the GM seeds deliver the promised increase in yields, which translates into profits.
- Moreover, companies such as Monsanto invest heavily in R&D to develop products.
- These not only drive up farm profits but also are fast emerging as a key need as climate change effects threaten agriculture.

- So, any move to discourage seed-tech will be anti-farmer.
- Disincentivising seed-tech companies will have the same effect that the price-caps in pharma and medical devices have had.
- In these sectors, companies have just kept their latest offerings out of the market.
- In many ways, losing access to advanced GM tech could seriously undermine Indian agriculture.

## 8.8 PMFBY Needs a Relook

### What is the issue?

Five years after its inception in 2016-17, the Pradhan Mantri Fasal Bima Yojana (PMFBY) has run into rough weather. PMFBY needs a relook, as many States are opting out of it.

### What is PMFBY?

- PMFBY is a flagship crop insurance scheme, launched in 2016.
- It is aimed at reducing agricultural distress at instances of monsoon fluctuations induced price risks.
- It fixes a uniform premium of just 2% to be paid by farmers for Kharif crops and 1.5% for Rabi crops.
- The premium for annual commercial and horticultural crops will be 5%.

### Why States are opting out?

- Farmers are dissatisfied with both the level of compensation and delays in settlement.
- Insurance companies have shown no interest in bidding for clusters that are prone to crop loss.
- States (Bihar, West Bengal and Andhra Pradesh, Telangana, Jharkhand and now Gujarat) are opting out of the scheme.
- These States are launching their own versions.
- They couldn't deal with a situation where these companies compensate farmers less than the premium they have collected from them and the Centre.

### What would be the impact, if not opted out?

- The sums can be serious for the States, given the current levels of fiscal stress.
- If this amount is not to benefit farmers directly, States run the risk of being accused of aiding insurance companies rather than farmers.

### What did the companies do?

- In Maharashtra's Beed cluster, farmers are up against the State government and insurance companies for not settling earlier claims.
- The insurance companies have decided to stay out of bids for this region for the current season.
- It is in the nature of the insurance business for entities to make money when crop failures are low and vice-versa.
- Over the last three years, insurance companies have collectively paid claims amounting to about 85% of the premium collected.
- There is a troublesome issue of 50% of farmers' insurance dues being funnelled into less than 50 districts.
- This raises questions on whether the scheme is being gamed by a few.

### What needs to be done?

- The task ahead is to sweeten the deal for farmers and insurance companies.



- **Clusters** - The States are struggling to find insurers for its clusters.
- Insurance companies should bid for a cluster for about 3 years.
- By this, they get a better chance to handle both good and bad years.
- **Bids** - The bids should be closed before the onset of the kharif/rabi season.
- At present, bids remain open even as the monsoon is in progress.
- As a result, farmers may feel persuaded to buy an insurance policy when the weather is adverse, even as the insurer wants to exit the cluster.
- **Change of product** - The farmer is not enthused by crop insurance despite the 95-98% subsidy on premium.
- So, it means that the product per se needs improvement.
- Farmers deserve a better choice of insurance products to meet the specifics of each crop or region.
- For this, insurance companies should be offered more freedom to operate.
- **Beed 'model'** – In this model, a company assumes liability only up to 110% of the premium collected or shares gains in a good year with the State government.
- For now, this model can emerge as a way out of the current mess.

## 8.9 Shifting Agriculture Policy

### Why in news?

The government is formulating a new policy that would lend legal recognition to shifting agriculture as a form of agro-forestry.

### What is Shifting Agriculture?

- It involves clearing of forests, burning the stubble and cultivating the land for a few years before moving to another plot, leaving the old patch for regeneration.
- It is also known as jhumming or slash-and-burn agriculture.
- This mode of farming has ill-effects on ecology, biodiversity, habitats and other natural features.
- It also causes loss or deterioration of forest cover leading to soil erosion and degradation of catchments of rivers and other water bodies.

### What was NITI Aayog's idea?

- The NITI Aayog which had mooted the idea of redefining jhumming land-use as agro-forestry in a 2018 report.
- It is based on the contention that shifting farming is essentially a method of putting land to two distinct uses alternately,
  1. **Agriculture**, when it is under cultivation, and
  2. **Fallowforestry**, when it is left untilled for revival of forest.
- This plea seems well founded, but it cannot be disregarded that the time given for renewal of forests (3 to 4 years) is insufficient for that purpose.
- This phase used to be as long as 10 to 40 years in the past.
- The green cover now rarely comes up to the level where it can be deemed as secondary forest.

### What do farmers need?

- The farmers engaged in jhumming (jhumias) are themselves fed up with this kind of nomadic life.

- As they feel jhumming is economically unviable, they want to move beyond subsistence farming to take up market-linked agriculture.
- They want opportunities for higher income from farming and non-farm employment, education and medical facilities and other civic amenities apart from access to government schemes.
- These are unduly denied to them in the absence of land titles (pattas) in their name.
- They don't get the benefits provided under the Forest Rights Act. At present, they are treated neither as farmers nor as forest dwellers.

### 8.10 Odisha's Samrudhi

#### Why in news?

Odisha government launched its new State Agricultural Policy (SAP) 2020-SAMRUDHI that focuses on profitability for farmers.

#### What is Samrudhi?

- Samrudhi is focused on the social and economic well-being of farmers, sharecroppers and landless agriculture households.
- It aims to actualise the untapped potential of agriculture, while ensuring growth process is environmentally, economically and technologically inclusive.
- It is based on an **8-pillar strategy** focused on simultaneous reforms.

#### What is the 8-pillar strategy?

- The policy lays emphasis on **diversification, marketlinkages** and use of **technology**.
- It suggests mechanisms to orient governance reforms towards **farmer-centricity**, which is in alignment with its flagship programmes.
- It recommends the creation of **agriculture production clusters**.
- It paves the way for the creation of an agro-ecological map, which will help in identify an ideal cropping pattern.
- The policy also suggests that these clusters should be linked to the market aggressively by removing all the existing barriers.
- **Innovative market reforms** like the eNAM portal, Gramin Agricultural Markets (GrAM), creation of market information system for disseminating current and forecasted prices have been laid down.
- Special focus has been given to the **adoption of model acts** like the Model Contract Farming Act, etc, with suitable changes necessary for its implementation in Odisha.
- The policy also emphasises development of **warehousing** and **quality testing infrastructure** for better marketing of the crops.
- The agriculture policy pushes for widespread usage of new-age technology to increase the quality of farming and farm products.

#### What sectors does Samrudhi want to develop?

- It provides recommendations for developing the livestock and fisheries, as they have contributed the most to the growth of farmer incomes.
- For livestock, it includes elements like protection of animals from diseases, artificial insemination, conservation of indigenous species and encouraging the private sector to create value chains.
- For fisheries, the focus is on the promotion of inland fisheries and digitisation of Odisha's assets like ponds and lakes.



## 8.11 Oil Price Impact on Sugar Prices

### Why in news?

The prices of raw sugar for May 2020 delivery at New York crashed to 9.75 cents per pound, the lowest closing for a nearest-month futures contract since June 2008.

### Why have global sugar prices collapsed?

- All commodities have taken a demand hit from subdued economic activity and lockdowns imposed to combat the COVID-19 pandemic.
- But sugar is one commodity that, until quite recently, was on growth phase.
- [Most estimates showed global production in 2019-20 (October-September) to fall short of consumption by 8-9 million tonnes (mt).]
- One reason for the collapse now is the closure of restaurants, weddings and other social functions not taking place.
- People are also avoiding ice-creams and sweetened cold beverages that might cause throat infections.
- The impact of coronavirus-induced lockdowns on out-of-home consumption and institutional demand for sugar is thus obvious.
- Sugar consumption in India alone is said to dip by 1.5-2 mt in 2019-20, from the normal 25.5-26 mt levels.

### Have oil prices played a role?

- The juice from crushing sugarcane can be crystallised into sugar or fermented into alcohol.
- When oil prices are high, mills (especially in Brazil) tend to divert cane for making ethanol (alcohol of 99%-plus purity) to be blended with petrol.
- In 2019-20 (April-March), only 34.32% of cane crushed by Brazilian mills went for manufacturing 26.73 mt of sugar.
- The rest was used to produce 31.62 billion litres of ethanol.
- But with oil prices falling, mills will not find it attractive to divert cane for ethanol.
- Brazil's mills are thus seen to produce up to 36 mt of sugar and hardly 26 billion litres of ethanol this year.

### Will this affect India?

- Before COVID-19 happened, the Indian industry was expecting to export 5.5-6 mt of raw sugar in 2019-20.
- Mills had already entered into contracts of some 3.8 mt, out of which 3.05 mt have been shipped out so far.
- The sugar industry's woes from excess stocks are thus slow to happen aided by both exports and lower production.
- However, dip in sugar consumption, together with higher Brazilian output, is unfavourable for both Indian sugar mills and cane farmers.
- Nevertheless, in Indonesia, there is an increased import requirement.
- Also, it decided recently to slash the duty on Indian raw sugar from 15% to 5%.
- Indonesian refiners are projected to import 3.3 mt of raw sugar this year, up from 2.6 mt in 2019.
- They buy mostly from Thailand but Thailand is experiencing a bad drought which could lead to its production falling.
- This offers an opportunity for India.

### What is the situation with respect to cane farmers?

- Decreasing exports and falling domestic use of sugar by institutional consumers has significantly undermined the mills' ability to make cane payments.
- E.g. Uttar Pradesh's factories have till now crushed cane worth roughly Rs 32,000 crore in the 2019-20 season.
- But they have managed to pay only around Rs 16,400 crore.
- The state government recently announced a scheme of mills giving "willing farmers" one quintal each of sugar for the next 3 months, instead of payments due.
- Moreover, the industry's problem is not from sugar alone.
- The lockdown has reduced off-take of alcohol, be it potable liquor or ethanol for blending with petrol.
- With cars and two-wheelers not running, oil market companies are not very keen to procure ethanol.

### What are the other implications of oil price fall?

- The oil price crash has affected other agri-commodities as well.
- Prices of corn, which is also used for making ethanol, fell to their lowest since 2009 at Chicago.
- Likewise, palm oil, again a feedstock for bio-diesel, ended 7.5% lower at the Bursa Malaysia futures exchange.
- Corn prices can, in turn, drag down other cereals, just as palm oil could do to soyabean and other oilseeds.
- All these are ultimately linked to oil, whose prices matter as much to farmers as petroleum companies.

## 9. IMPACTS OF COVID-19

### 9.1 Role of FCI at Pandemic Times

#### What is the issue?

- In the middle of the COVID-19 pandemic, the Food Corporation of India (FCI) holds the key to warding off a looming crisis of hunger and starvation.
- But there are few serious shortcomings to be overcome by the FCI to play an efficient and meaningful role at times of crisis.

#### How has the FCI's role evolved?

- FCI was set up under the Food Corporations Act 1964, in its first decade.
- From then on, the FCI is at the forefront of India's quest of self-sufficiency in rice and wheat following the Green Revolution.
- It has been managing procurement and stocking grain that supported a vast Public Distribution System (PDS).
- Over time, however, it has been felt that the FCI had long outlived its purpose, its operations regarded as expensive and inefficient.
- Even in the 1970s and 1980s, poor storage conditions meant a lot of grain was lost to pests, mainly rats.
- Before the lockdown, the FCI had 77 million tonnes of grains in its godowns.
- On the eve of a new round of procurement with a bumper harvest of wheat, it was observed that the FCI was facing a serious storage problem.
- There is not only shortage of modern storage facilities but the FCI also lacked a "pro-active liquidation policy" for excess stocks.

- But despite the shortcomings, the FCI has consistently maintained the PDS, a lifeline for vulnerable millions across the country.

#### How significant has FCI become now?

- The concern over the storage problems is temporarily not in place, given the demands to release food stocks to those affected by the lockdown.
- FCI has moved grain stocks to states where the demand outstripped within State procurement and/or stocks.
- It has also enabled purchases by States and non-governmental organisations directly from FCI depots.
- It did away with e-auctions typically conducted for the Open Market Sale Scheme (OMSS).
- Given the extended lockdown, the FCI is uniquely positioned to move grain across State borders (private sector players face restrictions).
- However, there is a widespread sense that the FCI was simply not moving fast enough and could do much more.

#### Where should the FCI work on now (COVID-19 emergency)?

- **Transport** - The FCI is overwhelmingly reliant on rail, which has several advantages over road transport.
- In 2019-2020 (until February), only 24% of the grain moved was by road.
- However, road movement is often better suited for emergencies and for remote areas.
- Containerised movement too, which is not the dominant way of transporting grain, is more cost-effective and efficient, to supply to areas where the need is the greatest now.
- **Positioning strategy** - The months following the lockdown will see predictable demand from food insecure hotspots.
- In such times, a strategy that has been adopted widely in international food aid is “pre-positioning” shipments. E.g. the United States
- Under this, grain is stored closer to demand hotspots.
- Given FCI's already decentralised godowns network, it is wise to maintain stocks at block headquarters or panchayats in food insecure or remote areas underserved by markets.
- **Distribution** - The central government can look beyond the PDS and the Pradhan Mantri Garib Kalyan Yojana.
- It can release stocks over and above existing allocations, but at its own expenses rather than by transferring the fiscal burden to States.
- The local governments would have the flexibility to access grains for contextually appropriate interventions at short notice.
- This would cover feeding programmes, free distribution to vulnerable and marginalised sections, those who are excluded from the PDS, etc.
- It also allows freedom to panchayats, for example, to sell grain locally at pre-specified prices until supply is restored.
- **Procurement** - The FCI's guidelines follow a first in, first out principle (FIFO).
- This mandates that grain that has been procured earlier needs to be distributed first to ensure that older stocks are liquidated.
- The FCI can rethink and suspend this strategy now, to enable grain movement that costs least time, money and effort.



- **Markets** - Farmers across the country growing for markets are now seeking to reach out to consumers directly.
- NAFED (National Agricultural Cooperative Marketing Federation of India Ltd.) and several State governments have already taken the initiative to procure and transport horticultural crops.
- The FCI should similarly consider expanding its role to support farmer producer organisations (FPOs) and farmer groups, in rebuilding the broken supply chains.

#### **What are the other larger concerns to be addressed?**

- **Food subsidy costs** - There is a long-term concern regarding the costs of food subsidy.
- However, an analysis of FCI costs spanning 2001-16 suggests that on average about 60% of the costs of acquisition, procurement, distribution and carrying stocks are in fact transfers to farmers.
- Not all of what is counted as subsidy therefore represents a waste of resources.
- There are, nevertheless, concerns with distributional consequences and inefficiencies, which need improvement.
- At the same time, the government needs to address the FCI's mounting debts.
- **Food prices** - Another concern is over the extended food distribution of subsidised grain.
- This is akin to dumping which might depress food prices locally, in turn, affecting farmers.

### **9.2 Exempting Farming Activities**

#### **Why in news?**

The government has exempted all agricultural, horticultural activities and those relating to harvesting, transportation, etc from the lockdown.

#### **What is the issued order?**

- The order has exempted the agencies engaged in procurement of agriculture products, including MSP operations and mandis.
- It also exempted the farmers and farm workers in the field.
- It exempted the custom hiring centres related to farm machinery.
- It also allowed the intra- state and inter-state movement of machines.
- The functioning of manufacturing and packaging units of fertilizers, pesticides, seeds, etc is allowed now.

#### **Why was this order made?**

- This order was made so that harvesting would continue uninterrupted.
- This decision has been taken to facilitate unhindered farming activities to ensure essential supplies.
- It was also taken so that the farmers and common people do not face any difficulty.

#### **What is AIKSCC's current concern?**

- All India Kisan Sangharsh Coordinating Committee's (AIKSCC) concern is about all farmers/workers being shut behind the doors.
- The AIKSCC is concerned about this because now is the peak time to harvest winter crops (wheat, barley, pulses).
- It is worried about the fate of vegetables/fruit growers, milk producers, the landless labourers and their families.
- Everything can wait but not farming as a season lost means a year lost.

- It will lead to a major crisis in food availability and may result in large numbers of hunger deaths.

#### What does the AIKSCC want?

- The AIKSCC, in a representation to the government, had asked the police not to stop peasants, farmers, vendors and transporters.
- It demanded that all harvested crops, milk, poultry, meat and eggs should be procured.
- It demanded that the regulated markets should operate at requisite strength.

#### What were the activities that stopped abruptly?

- The lockdown was introduced without ensuring the continuation of provisions mandated under the National Food Security Act, 2013.
- Consequently, the **anganwadis** were closed.
- Therefore, supplementary nutrition for children below age six, adolescent girls, pregnant women and lactating mothers came to a stop.
- **Mid-day meal**, which reaches millions of school-going students, discontinued abruptly.
- The provision of **Rs. 6,000 to every pregnant & lactating** woman, mandated under the Maternity Benefit Act, also virtually ended.
- Officials have hindered with the **collection of non-timber forest produce** by the forest dwellers (allowed by the Forest Rights Act).
- This has caused hunger and distress to many tribal people.

#### What could the judiciary do?

- There is a harshness, arbitrariness and lack of thought and preparation in the execution of the lockdown.
- Starvation deaths on account of hunger and merciless police beatings have been reported from across the country.
- With the crisis spreading to agriculture, the judiciary must abandon this hands-off approach.
- It must carefully review its approach of modestly following the executive.

## GEOGRAPHY

### 10.1 Monsoon: A Boon

#### Why in news?

India is having a good run with the monsoon, which is good news for farmers and the economy.

#### What would happen generally?

- June is the month during which the monsoon sets in.
- June is also when the monsoon begins its journey from two extremities of the country.
- One branch starts its journey northwards from Kerala and the other branch enters India from the southeast.
- Both branches eventually converge in the north.
- Usually, this merging of the monsoon currents over the mainland takes at least until July 15.

#### What happened this year?

- The India Meteorological Department (IMD) data reveals that rainfall during the season has been 14% more than what is usual for this period.



- The month of June only accounts for about 17% of the monsoon rainfall spanning June-September.

#### **What are the two significant factors?**

- The first factor was that the monsoon set in at a textbook date of June 1.
- Another factor was the record pace at which the monsoon covered the whole country.
- According to IMD, the monsoon would cover India's northern and western borders no later than July 8.
- This year, however, the monsoon broke even this speed limit and covered the country by June 25.

#### **What is the net result of all this?**

- The net result is that there were **more rainy days in June**.
- A **fairly even distribution** across the country was also observed.
- Rainfall in east, south and central India posted surpluses of 13%-20%
- Only in northwest India, the rainfall is staring at a 3% deficit.
- While good rains in June signal farmers to prepare the soil and sow kharif crop, the most important months are July and August.
- These two months account for two-thirds of the monsoon rain.
- This is also the time the monsoon goes into so-called 'break' conditions.
- Prolonged breaks, or an absence of rainfall, can even lead to drought.

### **10.2 Addressing Changing Trend in Monsoon**

#### **What is the issue?**

The drastic change in the monsoon pattern in recent years calls for a holistic and quick policy response.

#### **What is the change of trend in Indian monsoon?**

- The monsoon, which, since the Indian Meteorological Department started recording it, has been arriving in India by June 1 and departing by September 30 like clockwork, is no longer behaving.
- While the pattern itself has been changing for the past several years, this year perhaps saw the most severe deviations from "normal."
- After the hottest summer on record (each month of the Indian summer was the hottest ever recorded for that month), the monsoons were delayed.
- Although they hit the Kerala coast with a delay of just three days, the monsoon didn't progress much after that, leading rise to fears of drought.
- While the season total now is in excess of normal and monsoon it is set to retreat only by mid-October (the most delayed withdrawal on record).
- Large swathes of the country, particularly in the North, are in deficit, while there has been late and massively excessive rainfall in other areas, triggering floods.

#### **What are havocs caused by changing monsoons?**

- As late as the beginning of August, several parts of India were running a deficit of over 30 per cent from the long season average.
- Kerala wiped out its deficit in just one week (from August 1-8), triggering massive floods for the second year in succession and landslides killed dozens.
- Neighboring Karnataka was worse hit, in the same week (August 1-8), Karnataka as a whole received 128 per cent of normal rainfall but it was highly concentrated.

- On August 8, Mysuru received 3000 per cent of its long-term average rain for that day.
- Kodagu (Coorg) received 700 per cent excess, wiping out large chunks of its plantation economy.

### **How change in monsoon affects policy making holistically?**

- Official machinery is yet to wake up to the altered reality of Indian Monsoons, The IMD has been talking about changing the dates for the official monsoon for five years, but is yet to do it.
- This means the Agriculture Ministry's advisory (as well as those from its State counterparts) hasn't changed.
- Due to this farmers are not planting shorter duration crops, so delayed onset is killing early sowings, while late floods are destroying harvested or harvest-ready produce.
- Banks are still releasing (or not, depending on whom you ask) credit as per the timetable set in 1941.
- The Food Corporation of India's procurement machinery kicks into action when crops have either not arrived or long since been sold at distress prices to traders.
- Policy continues to focus on the kharif crop while the reality is that the rabi or the winter crop is now accounting for half the food grain output for the year and almost all of the oilseeds and pulses.

### **9.3 IMD's Prediction Role**

#### **What is the issue?**

- The monsoon has finally set in over Kerala on June 1, 2020 (keeping with the textbook date).
- With a change from its earlier report, here is a look at IMD's prediction and the associated concerns.

#### **What was the earlier prediction?**

- In earlier May 2020, the IMD had forecast a four-day delay in the monsoon onset over Kerala.
- This was premised on a relatively mild summer, in early May, in north India.
- Also, there were several spells of Western Disturbances, which are rains from the Mediterranean.
- The impact of super cyclone Amphan in the Bay of Bengal was also a factor behind the prediction.
- A private meteorological company had, however, forecast an early monsoon arrival on May 28.
- This was because its models seemed to suggest diminished impact of Amphan.
- However, in the last week of May 2020, the IMD updated its onset forecast.
- It said that 'favourable conditions' for the monsoon onset were likely on June 1.

#### **What are the criteria?**

- The IMD has clearly defined criteria for declaring the onset:
  - i. 8 of 14 designated meteorological stations in Kerala and Karnataka must register 2.5mm rain for two consecutive days
  - ii. there must be 30-40 kmph westerlies (winds from the equator reaching India) at a certain height and a certain value of radiation
- IMD has emphasized that the heavy rains over Kerala alone do not determine the onset of the monsoon.

#### **What are the discrepancies?**

- IMD is the only agency with the equipment to measure wind speeds and radiation at higher elevations, along with multiple weather stations.
- It therefore has a monopoly of declaring onset.

- However, the IMD faces competition from domestic and international companies in providing weather-related services.
- In crop insurance, power distribution and short-range forecasts, the IMD no longer has a monopoly on providing weather information.
- This has consequences for the IMD's other major role -
  - i. to give its outlook on how the monsoon might pan out over India
  - ii. how much rain is likely in July and August, the key months for the summer crop
- This year (2020), except India's northeast, the IMD has forecast 'above normal rains' in other areas, which is reassuring.
- However, it is also worth remembering that just last year the IMD failed to communicate that 2019 would turn out to be the wettest in two decades.
- On the other hand, every year of normal monsoon has brought with it both torrential floods and long dry spells.

### What is the way forward?

- The complexity of climate change is now such that excess rains in a year seem to have long-ranging impact.
- Reports suggest of a second consecutive year of a locust plague in India on the horizon.
- These can affect the kharif crop.
- It is therefore time that along with improved science and forecasting, the IMD works on disseminating more precise localised weather forecasts.
- IMD's public interface and technology adoption is improving, particularly in cyclone forecasts.
- On the other hand, the IMD has a long way to go in communicating these improvements to a wider population.

### 10.3 Monsoon Model

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

- The statistical models said that All India Monsoon Rainfall (June-September) would be 96% of the LPA.
- The CFS model said the monsoon would be 94% of the normal and updated to 99% in August.

### Long Period Average

- Recently IMD has officially redefined the definition of what constitutes 'normal' rainfall and reduced it by 1 cm to 88 cm from 89 cm.
- Long Period Average (LPA) is the averages of rainfall received over a 50-year period between 1951 and 2001, this average comes to 88 cm of rainfall (according to recent change).
- This is the average rainfall recorded during the months from June to September, calculated during the 50-year period, and is kept as a benchmark while forecasting the quantitative rainfall for the monsoon season every year.
- IMD maintains five rainfall distribution categories on an all-India scale which are
  1. **Normal or Near Normal:** When per cent departure of actual rainfall is +/-10% of LPA, that is, between 96-104% of LPA
  2. **Below normal:** When departure of actual rainfall is less than 10% of LPA, that is 90-96% of LPA
  3. **Above normal:** When actual rainfall is 104-110% of LPA
  4. **Deficient:** When departure of actual rainfall is less than 90% of LPA
  5. **Excess:** When departure of actual rainfall is more than 110% of LPA

### 10.4 Madden-Julian Oscillation

- The Madden–Julian Oscillation (MJO), is a moving band of rain clouds that travels around the globe spanning 12,000–20,000 km across the tropical oceans.
- The MJO can be characterized as an eastward moving 'pulse' of cloud and rainfall near the equator that typically recurs every 30 to 60 days.
- Because of this pattern, the Madden–Julian oscillation is also known as the 30- to 60-day oscillation, 30- to 60-day wave, or intra-seasonal oscillation.
- The Madden–Julian oscillation is characterized by an eastward progression of large regions of both enhanced and suppressed tropical rainfall, observed mainly over the Indian and Pacific Ocean.
- The anomalous rainfall is usually first evident over the western Indian Ocean, and remains evident as it propagates over the very warm ocean waters of the western and central tropical Pacific.
- This pattern of tropical rainfall generally becomes nondescript as it moves over the primarily cooler ocean waters of the eastern Pacific, but reappears when passing over the warmer waters over the Pacific Coast of Central America.
- The pattern may also occasionally reappear at low amplitude over the tropical Atlantic and higher amplitude over the Indian Ocean.
- The wet phase of enhanced convection and precipitation is followed by a dry phase where thunderstorm activity is suppressed.
- Global warming has been expanding the size of the warm pool which affects its normal interaction period.
- **Impact on India** - In its journey, it interacts with surface waters of the Indo-Pacific Ocean, the largest pool of warm water in the globe and the lifecycle of the MJO gets affected.
- The MJO clouds on average are spending only 15 days, instead of 19, over the Indian Ocean and increased by 5 days over the west Pacific.
- It is this change in the residence time of MJO clouds that has altered the weather patterns across the globe.

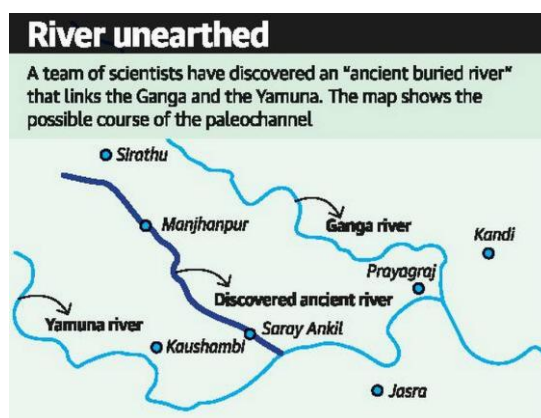
- When the MJO appears in the Indian Ocean during the monsoon months of June-September, it can increase rains over India.
- This year, India was poised to receive below normal monsoon rainfall in April but ended up with excessive rain partly due to the MJO.
- The change in the MJO could drift warmer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

#### 9.4 Indian Ocean Dipole

- The Indian Ocean Dipole (IOD), also known as the Indian Niño, is an irregular oscillation of sea-surface temperatures in which the western Indian Ocean becomes alternately warmer (positive phase) and then colder (negative phase) than the eastern part of the ocean.
- The IOD involves an aperiodic oscillation of sea-surface temperatures (SST), between "positive", "neutral" and "negative" phases.
- A positive phase sees greater-than-average sea-surface temperatures and greater precipitation in the western Indian Ocean region with a corresponding cooling of waters in the eastern Indian Ocean—which tends to cause droughts in adjacent land areas of Indonesia and Australia.
- The negative phase of the IOD brings about the opposite conditions, with warmer water and greater precipitation in the eastern Indian Ocean, and cooler and drier conditions in the west.
- The IOD also affects the strength of monsoons over the Indian subcontinent.
- The IOD is one aspect of the general cycle of global climate, interacting with similar phenomena like the El Niño-Southern Oscillation (ENSO) in the Pacific Ocean.

#### 9.5 Paleochannel

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



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

## 9.6 Artificial Neural Networks based Global Ionospheric Model

- Researchers from Indian Institute of Geomagnetism (IIG) have developed a global model to predict the Ionospheric electron density with larger data coverage, a crucial need for communication and navigation.
- Tracking the variability of the Ionosphere is important for communication and navigation.
- The Ionospheric variability is greatly influenced by both solar originated processes and the neutral atmosphere origin, therefore, difficult to model.
- IIG developed new Artificial Neural Networks based global Ionospheric Model (ANNIM) using long-term Ionospheric observations to predict the Ionospheric electron density and the peak parameters.
- ANNs replicate the processes in the human brain (or biological neurons) to solve problems such as pattern recognition, classification, clustering, generalization, linear and nonlinear data fitting, and time series prediction, and very few attempts have been made to model the global ionosphere variability using ANNs.
- The model developed by IIG researchers may be utilized as a reference model in the Ionospheric predictions and has potential applications in calculating the Global Navigation Satellite System (GNSS) positioning errors.

## 9.7 Swell Surge Forecast System

- Swell surge forecast system is an innovative system designed for the prediction of Kallakkadal/Swell Surge that occurs along the Indian coast, particularly the west coast.
- Kallakkadal/Swell surge are flash-flood events that take place without any noticeable advance change in local winds or any other apparent signature in the coastal environment.
- Hence the local population remains totally unaware of these flooding events until they actually occur.
- Such events are intermittent throughout the year. Kallakkadal is a colloquial term used by Kerala fishermen to refer to the freaky flooding episodes and in 2012 UNESCO formally accepted this term for scientific use.
- During Kallakkadal events, the sea surges into the land and inundates vast areas.
- These events have attracted attention especially after the 2004 Tsunami in the Indian Ocean, since most people mistake Kallakkadal to be Tsunamis.
- Tsunami and Kallakkadal/Swell surge are two different types of waves with entirely separate causes or mechanisms.
- Kallakkadal are caused by meteorological conditions in the Southern Ocean, south of 30°S.
- A study by INCOIS scientists has revealed that specific meteorological conditions in the Southern Indian Ocean support the generation of long period swells.
- These swells once generated, travel northward and reach the Indian coasts in 3-5 days time, creating havoc in the coastal areas.
- The system will now predict Kallakkadal and warnings will be given to concerned authorities at least 2-3 days in advance, which will help the local authorities for contingency plans and to reduce damage.

## 9.8 BoBBLE – Bay of Bengal Boundary Layer Experiment

- A team from Indian Institute of Science in Bengaluru and UK based University of East Anglia have created a blueprint for accurate prediction of monsoon, tropical cyclones and other weather related forecast.
- The Bay of Bengal Boundary Layer Experiment or BoBBLE in short is a project funded by Union Ministry of Earth Sciences and the Natural Environment Research Council of UK.
- The team carried out studies of oceanographic properties on board RV Sindhu Sadhana in the southern Bay of Bengal.
- Scientists from India and UK plans to release underwater robots in Bay of Bengal to monitor how ocean conditions influence monsoon, which can help in better predictions of the rainfall.
- Once out in the ocean, they will release seven underwater gliders to measure ocean properties such as temperature, salinity and current.

## 9.9 Tuting-Tidding Suture Zone

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

## 10.5 Fujiwhara Effect

- The Fujiwhara effect, is a phenomenon that occurs when two nearby cyclonic vortices move around each other and close the distance between the circulations of their corresponding low-pressure areas.
- When cyclones are in proximity of one another, their centers will circle each other cyclonically (counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere) about a point between the two systems due to their cyclonic wind circulations.
- The two vortices will be attracted to each other, and eventually spiral into the center point and merge.
- When the two vortices are of unequal size, the larger vortex will tend to dominate the interaction, and the smaller vortex will circle around it.
- Recently two tropical storms, formed in the western Atlantic Ocean at nearly the same time, are likely to impact the Gulf of Mexico, sparking concerns of the rare Fujiwhara effect that occurs when two hurricanes combine to form a mega hurricane.

- The last time two tropical storms formed at the same time and struck the region was in 1933.
- Marco is the 13th named storm of the Atlantic hurricane season which runs from June to November.
- It is likely to make landfall along the Louisiana state coastline August 24 evening.
- Tropical storm Laura is the 12th named storm of the season and is currently hovering over the Caribbean.
- This makes Marco and Laura the earliest 13th and 12th named storms respectively in the recorded history of Atlantic Hurricane season.
- Their simultaneous formation in the western Atlantic Ocean created a Fujiwhara effect scare.



### 10.6 Boreal Summer Intra-Seasonal Oscillation (BSISO)

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