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PHYSICAL GEOGRAPHY

1 Wandering of the Geo-Magnetic Poles

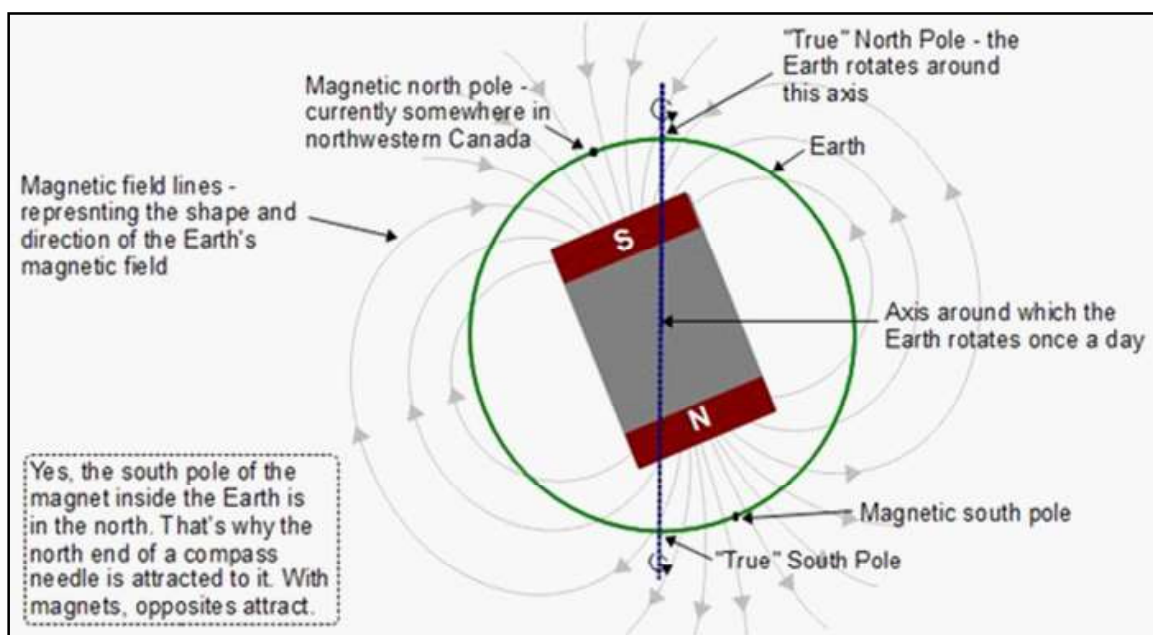
Context: Magnetic north and true north (Geographical North Pole) are going to synch for the first time in 360 years.

Background:

- **What is the difference between magnetic and geographic poles?**

The Earth has two pairs of north and south poles.

- ▶ **The geographic poles:** They are defined by the axis around which the planet rotates, and are fixed.
- ▶ **Magnetic poles:** The Earth behaves like a giant bar magnet and this behaviour defines its magnetic north and south poles, which are not static.



- **Why magnetic poles often change their position?**

- ▶ The magnetic poles shift according to the magnetic field of the earth. **The presence of the molten iron in the earth's core and the constant rotation of the earth around its axis are the reasons behind the ever-changing magnetic field of the earth.**

- ▶ The changing position of the North Pole is also referred to as the **Wandering North Pole hypothesis**.
 - ▶ So generally there is the gap between the true North Pole and the magnetic north pole of the earth.
 - ▶ Its north poles and south poles move around sometimes erratically. Over large periods, they change their locations significantly, sometimes even interchanging their positions.
- **How Magnetic poles interchange their positions?**
 - ▶ The geologic record shows that hundreds of pole reversals have occurred throughout Earth's history; they happen when patches of iron atoms in Earth's liquid outer core become reverse-aligned, like tiny magnets oriented in the opposite direction from those around them.
 - ▶ Earth's magnetic field takes between 1,000 and 10,000 years to reverse, and in the process, it greatly diminishes before it re-aligns. It's not a sudden flip, but a slow process, during which the field strength becomes weak. The field becomes more complex and might show more than two poles for a while, and then builds up in strength and align in the opposite direction.
 - ▶ When the reversed patches grow to the point that they dominate the rest of the core, Earth's overall magnetic field flips. The last reversal happened 780,000 years ago during the Stone Age, and indeed there's evidence to suggest the planet may be in the early stages of a pole reversal right now.
 - **What happens if Earth's Magnetic Poles Flip?**
 - ▶ **Formation of more ozone holes:** A strong magnetic field helps protect Earth from blasts of radiation from the sun. Due to the weak magnetic field, the charged particles bombarding Earth's atmosphere during solar storms would punch holes in Earth's atmosphere, and this could hurt humans. These 'holes' would not be permanent but might be present on one- to 10-year timescales and could be the cause of skin cancer.
 - ▶ **Impact on Fauna:** Animals that use Earth's magnetic field for navigation—including birds, salmon, and sea turtles could get lost during their routine journeys.
 - ▶ **Impact on technology:** Due to the weakened magnetic field, the impacts of solar disturbances will increase which can damage satellites, cause power outages and interrupt radio transmissions.
 - ▶ Some scientist believes that there is a **relation between reversal of magnetic field and species extinction** but some believe that there is no such relation.
 - **What is the current position of magnetic poles?**
 - ▶ Currently, the magnetic north pole is located somewhere over **northern Canada as discovered in 1831 by Sir James Clark Ross**.
 - ▶ The **magnetic South Pole is near McMurdo Sound, at the sea edge of the Antarctic continent**.
 - ▶ Since then the magnetic north pole has been moving across the Canadian Arctic towards Russia and has moved hundreds of miles over the last several decades.

2

Anthropocene recognised as an epoch

Context: The pervasive and persistent signatures of modern human activity on the earth have been so striking that officially, it is being recognised and named as a new geologic epoch (Anthropocene).

More on News:

- Recently, the Anthropocene Working Group (AWG) overwhelmingly voted to recognise Anthropocene as an epoch. The vote gives form to the efforts of scientists, notably the Nobel **Laureate Paul Crutzen and Eugene F. Stoermer, who coined the term in 2000** to highlight how human activity had changed many facets of the earth.

Geochronology:

- Eon (largest)
- Era
- Period
- Epoch
- Age
- Chron (smallest)

Geological epoch:

- In geochronology, **an epoch is a subdivision of the geologic timescale that is longer than age but shorter than a period.** The current epoch is the **Holocene Epoch of the Quaternary Period.**
- Cenozoic (current era)
 - Quaternary (current period)
 - Holocene (current epoch: The start of the Holocene epoch 11,700 years ago marks the end of the transition from the last glacial phase to a period of warming and a rise in sea level.)

Anthropocene:

- It is a proposed epoch dating from the commencement of significant human impact on Earth's geology and ecosystems.
- Unlike the others, it will be the **first time that the beginning of an epoch would be based on human activity** and not the consequences of changes brought about by nature.

Marker for this new epoch:

- Anthropocene Working group voted to look for unique signatures around the 1950s to define the start of the Anthropocene.
- To be chosen as a geologic marker, **the golden spike must be present globally across most environments and must be a part of deposits for a geologically significant length of time.**
- A decrease in deuterium excess, a proxy for climate change, owing to the reorganisation of North Atlantic Ocean-atmosphere circulation was a definitive geologic marker (or golden spike) to signify the base of Holocene.
- Now, **radionuclides from atomic bomb tests from the early 1950s** are emerging as a favourite golden spike candidate to define the base of the Anthropocene.

3**Annular Solar Eclipse**

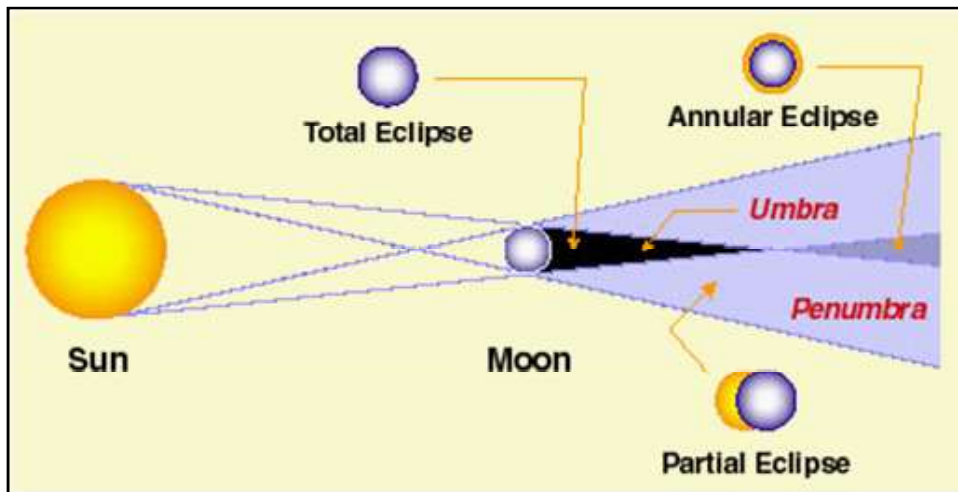
Context: The last solar eclipse of 2019 took place in December, which fell over the eastern hemisphere of the Earth and be visible from India, Saudi Arabia, Qatar, Malaysia, Oman, Singapore, Sri Lanka, Mariana Islands, and Borneo among a few other places.

Solar Eclipse:

- A solar eclipse happens when the moon while orbiting the Earth, comes in between the sun and the Earth, due to which the moon blocks the sun's light from reaching the Earth.

Types of Solar Eclipse:

- There are three types of eclipses:



- Total solar eclipse**, which is visible **only from a small area** on Earth.
 - People who can view the total solar eclipse are in the centre of the moon's shadow as and when it hits the Earth.
 - A total solar eclipse happens when the sun, moon, and Earth are in a direct line.**
- The second type of solar eclipse is a **partial solar**, in which the **shadow of the moon appears on a small part of the sun.**
- The third kind is an **annular solar eclipse**, which happens **when the moon is farthest from the Earth, which is why it seems smaller.**
- In this type of an eclipse, the moon does not block the sun completely, but looks like a "**dark disk on top of a larger sun-colored disk**" forming a "**ring of fire**".

4 Polar Vortex

Context

- Weather experts are predicting an extremely cold January and February for the Northeastern United States **due to low polar vortex**. Extreme cold has become the cause of concern as low polar vortex has been alleged earlier for the drop in temperatures along the mid-latitudes, in the United States and Europe.
- Similar cold outbreaks had occurred in the past, including notable outbreaks in 1977, 1982, 1985, 1989 and 2014

What is Polar Vortex?

- The stratospheric polar vortex is a large-scale region of air that is contained by a **strong west-to-east jet stream that circles the polar region**. This jet stream is usually referred to as the polar night jet.
- The polar vortex extends from the tropopause through the stratosphere and into the mesosphere (above 50 km). Low values of ozone and cold temperatures are associated with the air inside the vortex.
- It is described as a **whirling cone of low pressure over the poles** that is strongest in the winter months due to the increased temperature contrast between the Polar Regions and the mid-latitudes, such as the US.

- Often when the **polar vortex is strong**, **temperatures** are mild in the mid-latitudes across the Eastern US and Northern Eurasia; **and when the vortex is weak**, **temperatures** tend to be cold across the Eastern US and northern Europe and Asia.

What is Strong Polar Vortex?

- A strong polar vortex is the more common state of the vortex which creates strong **low pressure in the Arctic region**.
- Because of the pressure difference between the Arctic and mid-latitudes, air flows into low pressure and this confines the cold air to high latitudes closer to the Arctic. Therefore it is often mild across the Eastern US, Europe, and East Asia during winters when the polar vortex is strong. During strong polar vortex, the airflow is fast and in a direction from west to east.
- Low pressure in the Arctic region is referred to as the positive phase of the **Arctic Oscillation (AO)**, which is also known as the **North Atlantic Oscillation (NAO)**.

Weak polar vortex

- Occasionally, the polar vortex is disrupted and weakens, due to wave energy propagating upward from the lower atmosphere.
- When this happens, **the stratosphere warms sharply in an event known as sudden stratospheric warming**, in just a few days, miles above the Earth's surface.
- The warming weakens the polar vortex, shifting its location somewhat south of the pole or, in some instances, **'splitting' the vortex up into 'sister vortices'**.
- The split higher up in the atmosphere can give rise to both, sudden and delayed effects, much of which involves declining temperatures and extreme winter weather in the eastern US along with northern and western Europe.
- Sudden stratospheric warming also leads to the warm Arctic not only in the stratosphere but also in the troposphere as well.
- A warmer Arctic, in turn, **favours more severe winter weather in the Northern hemisphere mid-latitudes including the eastern US**.

5 Auroras

Context: Geostorm offers Northern USA a rare chance to see aurora borealis.

More on News:

- A solar flare that erupted on March 20, 2019 prompting the National Oceanic and Atmospheric Administration issue a G2 watch, or moderate geostorm watch.
- The flare bends around the Earth's natural magnetic field and slammed into the poles at either end of the planet, which supercharged the northern lights and pushed it deeper.
- **What is an Aurora?**
 - Polar lights (auroras) are a natural phenomenon. In the **North Pole**, it is called an **aurora borealis** or northern lights. In the **South Pole**, it is called **aurora australis** or the southern lights.

What makes this happen?

- Even though auroras are best seen at night, they are **caused by the sun**.
- The protective magnetic field around Earth shields us from most of the energy and particles, and we don't even notice them.

- During coronal mass ejection (kind of solar storm) the sun burps out a huge bubble of electrified gas that can travel through space at high speeds.
- When a solar storm comes toward earth, some of the energy and small particles can travel down the magnetic field lines at the north and south poles into the upper Earth's atmosphere.

Do other Planets get auroras?

- They sure do! If a planet has an atmosphere and magnetic field, they probably have auroras.
- The gas giants in our solar system (Jupiter, Saturn, Uranus, and Neptune) each have thick atmospheres and strong magnetic fields, and each has auroras — although these auroras are a little different from Earth's, given they are formed under different conditions.

What are Pulsating Auroras sometimes seen in the news?

- Sometimes on a night near the poles, the sky pulses a diffuse glow of green, purple and red. Unlike the long, shimmering veils of typical auroral displays, these pulsating auroras are much dimmer and less common.
- According to **NASA's THEMIS Mission and Japan's Arase satellite mission, it is the chirping waves that rhythmically pulse the particles that create the auroras.**
- The magnetosphere is home to a type of plasma wave known as the **whistler mode chorus**.
- These waves have characteristic rising tones reminiscent of the sounds of chirping birds and can efficiently disturb the electrons.
- When these waves make their appearance within the magnetosphere, some of the electrons scattered by the wave careen down into Earth's atmosphere, causing the pulsating auroras.

Magnetosphere

- It is that area of space, around a planet, that is controlled by the planet's magnetic field.
- The shape of the Earth's magnetosphere is the direct result of being blasted by the solar wind. The solar wind compresses its sunward side to a distance of only 6 to 10 times the radius of the Earth.
- A supersonic shock wave is created sunward of Earth called the **Bow Shock**.
- Most of the solar wind particles are heated and slowed at the bow shock and detour around the Earth in the **Magnetosheath**.
- The solar wind drags out the night-side magnetosphere to possibly 1000 times Earth's radius; its exact length is not known.
- This extension of the magnetosphere is known as the **Magnetotail**. The outer boundary of Earth's confined geomagnetic field is called the **Magnetopause**.
- The Earth's magnetosphere is a highly dynamic structure that responds dramatically to solar variations.

6 Heat Waves

Context: In early June 2019, an intense heatwave scorched many parts of India which led to the death of 36 people in the country, mostly from Andhra Pradesh.

More on News:

- In 2019, sparse rainfall during the pre-monsoon season, along with a delayed monsoon, has made the heat more unbearable.
- The NDMA official added that Churu (Rajasthan), where temperature crossed the 50 degrees Celsius mark, has not registered a single death whereas parts of Andhra Pradesh have witnessed most deaths, where the temperature was relatively lower.

Reason behind this Anomaly

- The **Comfortable Index** of a region increases with the increase in humidity. **Comfortable Index** measures the human discomfort due to the **combined effects of heat and humidity**.
- Since humidity in Andhra Pradesh would be 80-90 percent, it makes the overall comfortable index much more than a person in the state is used to experiencing. This will make people feel that they are experiencing temperatures above 70°Celsius.
- This is true about most coastal states like Odisha, Andhra Pradesh, and Telangana whereas Churu has humidity around 10 to 15 percent.
 - ▶ This happens because it is not just temperature, but **humidity** also plays an important role.
 - ▶ Weak El Niño conditions may also play their part in ensuring higher than normal temperature.

Heat Waves

Heat Wave is simply, a continuous spell of abnormally hot weather. Heatwave need not be considered till the maximum temperature of a station reaches at least **40° C for Plains and at least 30° C for Hilly regions**.

Criteria for declaring Heat Wave followed by IMD

- **Situation 1** - When the normal maximum temperature of a station is less than or equal to 40° C. Declare Heat Wave if:
 - ▶ Heat Wave Departure from normal is 5° C to 6° C
 - ▶ Severe Heat Wave Departure from normal is 7° C or more
- **Situation 2** - When the normal maximum temperature of a station is more than 40° C. Declare Heat Wave if:
 - ▶ Heat Wave Departure from normal is 4° C to 5° C
 - ▶ Severe Heat Wave Departure from normal is 6° C or more
- **Situation 3** - When the actual maximum temperature remains 45°C or more irrespective of normal maximum temperature, heatwave should be declared.

7 Australia Bushfires

Context: Wild bushfires have been ravaging Australia for several weeks now. These fires have been especially severe in the New South Wales and Victoria.

More on News:

- The State declared a week-long state of emergency in response to the escalating disaster.
- 916 homes have been destroyed this season, 363 more have been damaged.
- Both New South Wales and Victoria have given fire fighting authorities the power to forcibly relocate people.
- Bushfires in Australia impact extensive areas and cause property damage and loss of human life.
- Some of **Australia's native flora has evolved to rely on bushfires as a means of reproduction**, and fire events are an interwoven and an essential part of the ecology of the continent.
- For thousands of years, Indigenous Australians have used fire to foster grasslands for hunting and to clear tracks through dense vegetation.

- Major firestorms that result in severe loss of life are often named based on the day on which they occur, such as **Ash Wednesday and Black Saturday**.
- Some of the most intense, extensive and deadly bushfires commonly occur during droughts and heatwaves.

What Is a Bushfire?

- One type of wildfire is known as a bushfire**, an uncontrolled fire that burns through scrubland, which is common to Australia.
- Many factors lead to a bushfire or influence its spread. This includes the type of fuel. Some grasses, as well as twigs, can burn very quickly. On the other hand, large tree trunks don't burn as easily.
- The moisture of fuel is another critical factor. Wet fuel is unlikely to burn. Similarly, increased humidity decreases the chances that a bushfire will start.
- On the flipside, lower humidity, higher temperature, and drier conditions all help ignite and spread a fire.
- Wind plays a key part in the spread of bushfires too. Wind provides much-needed oxygen for a fire.
- A bushfire will spread up a hill much faster than it will down a hill **due to the processes of convection and radiation**.

These Fires are triggering Thunderstorms

- It's an explosive storm called pyro cumulonimbus and it can inject particles as high as 10 miles into the air.
- During a fire, heat and moisture from the plants are released, even when the fuel is relatively dry.
- Warm air is less dense than cold air so it rises, releasing the moisture and forming a cloud that lifts and ends up a thunderstorm started by fire.
- It happens from time to time in Australia and other parts of the world, including Canada.

Major causes of Bush fires

- Australia's deadly fires have been fuelled by a combination of extreme heat, prolonged drought, and strong winds.
- The country is in the grip of a heatwave, with record-breaking temperatures.
- Major parts of the country are experiencing rainfall shortfalls.
- Trees, shrubs, and grasslands have turned into the perfect tinder for flames.
- Global warming is intensifying the fires.
- Indian Ocean Dipole is also among one of the reason as it brings drought-like conditions and decline in precipitation plays a major role in intensifying fires.

8 Melting of Himalayan Glaciers

Context: Researchers from Columbia University claimed that the Himalayan glaciers have lost more than a quarter of their ice in the last four decades.

Background:

- The Hindu Kush-Himalayan (HKH) region extends over 2,000 km from east to west across the Asian continent-spanning several countries: Afghanistan, Bangladesh, Bhutan, China, India, Nepal, and Pakistan.

- **Hind Kush Himalayan region is also known as Third Pole** due to its **largest permanent snow covers** after the North and South Poles — sustains the livelihoods of 240 million people living in the mountains and hills.
- This region is the source of numerous large Asian river systems, including the Indus, Ganges, and Brahmaputra, which provide water for over a billion people. The surface water of these rivers and associated groundwater constitute a significant strategic resource for all of Asia.
- Many of the countries in this region are already experiencing physical water scarcity. Existing water stress and projections of population growth have led to concern over possibilities of negative impacts from changes in the availability of water supplies in the coming decades.
- Climate change and global warming have emerged as a threat to the Himalayan Ecosystem. Many researches in the recent past have claimed that the glaciers are melting at an accelerated pace.

Analysis:

- **Himalayan Assessment report of International Centre for Integrated Mountain Development (ICIMOD)** says the HKH region is warming faster than the global average. It would continue to warm through this century even if the world can limit global warming at the agreed 1.5 degrees Celsius.
- The **per capita fossil fuel carbon dioxide emission** from the HKH countries is **one-sixth of the global average** though it is disproportionately impacted.
- In the last 60 years, extreme cold events have become lesser while extreme warm weather events have become more pronounced. Both minimum and maximum temperatures are also changing: they are moving north, indicating overall warming.
- Every decade HKH loses one cold night and half a cold day. While warm nights have increased by 1.7 per decade, the region gets 1.2 warm days every decade.
- Alarming, changes in surface temperature (relative to 1976-2005) in this Himalayan region are higher than the global average, and even the South Asian region.
- The projected changes in the surface mean temperature over the HKH region is larger compared to the global mean change by the end of the 21st century.
- Although the climate of the region has changed significantly in the past, it is projected to change more dramatically in the near future.
- **The number of glaciers in the Himalayan area has increased** in the last five decades and this is an indicator of how severe glacier melting has been due to global warming.
- The increase in the number of glaciers is primarily due to glacier fragmentation — that big ones are splitting into smaller ones. And this is happening due to consistent loss in areas the glaciers occupy.
- Smaller glaciers are shrinking faster than larger ones, although the smaller glaciers of Ladakh show a lower rate of a retreat than other Himalayan glaciers. However, the assessment makes clear that despite the surety of glaciers in the Hindu Kush Mountains losing length since 1973, no studies have been done to examine area change in this region.

9

Sea Level Increase

Context: According to the Ministry of Earth Sciences, **Diamond Harbour, which is one of the major ports in West Bengal** located at the mouth of river Hooghly, has recorded the maximum sea-level increase.

More on News:

- While recent studies reveal that sea-level rise in the country has been estimated to be 1.3 mm/year along India's coasts during the last 40-50 years.

- At Diamond Harbour, the rise was almost five times higher at 5.16 mm per year. The mean sea-level rise for this port was based on recordings over the period from 1948 to 2005.

Sea level rise:

- It is said to be linked with global warming and as per the fifth assessment report of the **United Nations International Panel on Climate Change (UNIPCC)**, the global sea level was rising at an average rate of **8 mm per year** over the last century.
- Rising sea levels can exacerbate the impacts of coastal hazards such as storm surge, tsunami, coastal floods, high waves and coastal erosion in the low lying coastal areas in addition to causing gradual loss of coastal land to sea.
- According to the data from the **Ministry of Earth Sciences**, four ports namely **Diamond Harbour, Kandla, Haldia, and Port Blair** recorded a higher sea-level rise than the global average.
- Chennai and Mumbai recorded a sea-level rise far below the global and the national averages at 0.33 mm per year (1916-2005) and 0.74 mm (1878-2005) respectively.
- The sea-level rise is higher in West Bengal, particularly in the Sunderbans delta is because of the deltaic sediment deposition as a result of the mixing of freshwater and saline water, according to experts.

Concerns over rising sea level

- On the results of studies on the impact of global warming, the ministry said **heavy rainfall and temperature extremes like heat waves and shifts in semi-arid regions** were some of the recent findings which may have linkages with climate change and global warming.
- Studies over the Indian region have shown a warming trend of 0.6°C on all India average basis, mainly contributed by maximum temperatures.
- If global warming exceeds 2°C by 2100, about 80 % of global coastline could see a 6-ft rise in sea levels.
- An increase in temperatures due to human-induced global warming can cause the melting of ice caps and glaciers which primarily drive an increase in sea levels.
- Warming of oceans causes excessive flooding, destructive erosion and agricultural soil contamination in coastal regions. Even the US is facing the heat with Louisiana, the southeastern state, losing 75 sq km of coastal terrain every year.
- Talking about the reason for the nature influencing the rise in sea levels centuries ago, ENSO (El Niño / Southern Oscillation) played a big role.

10 Ocean Warming

Context:

- As per a research published in the journal 'Science', oceans are heating up **40 percent faster on average than Intergovernmental Panel on Climate Change (IPCC) estimated five years ago**.
- The researchers also concluded that ocean temperatures have broken records for several straight years. 2018 is going to be the warmest year on record for the Earth's oceans before that 2017 and 2016 were declared as the warmest year.
- **What is ocean warming?**
 - The ocean absorbs most of the excess heat from greenhouse gas emissions, leading to rising ocean temperatures. The Fifth Assessment Report revealed that the ocean had absorbed more than 93% of the excess heat from greenhouse gas emissions since the 1970s. This is causing ocean temperatures to rise.

- As the oceans heat up, sea levels rise because warmer water takes up more space than colder water. As per this report, most of the sea level rise observed to date is because of this warming effect, not melting ice caps. The warming alone would cause sea levels to rise by about a foot by 2100, and the ice caps would contribute more. That could exacerbate damages from severe coastal flooding and storm surge.

- **How it affects?**

- Ocean warming leads to **deoxygenation** – a reduction in the amount of oxygen dissolved in the ocean – and sea-level rise – resulting from the thermal expansion of seawater and continental ice melting. The rising temperatures, coupled with ocean acidification (the decrease in pH of the ocean due to its uptake of CO₂), affect marine species and ecosystems and, consequently, the fundamental benefits humans derive from the ocean.

11 Impact of Weak El Nino conditions

Context:

- The Indian Meteorological Department (IMD) from the Ministry of Earth Sciences has declared that weak El Nino conditions are prevalent in the equatorial Pacific Ocean.
- These conditions are likely to persist in the early part of the summer season and weaken thereafter.
- The preliminary impact of a weak El Nino can already be seen with the rising temperatures and heatwaves across the country. In early March, the heatwave season began in many areas of Tamil Nadu, coastal Andhra Pradesh and Rayalaseema.

El Nino

- El Nino (Spanish for Christ Child) is the occasional development of **warm ocean surface waters along the coast of Ecuador and Peru. Recently** this development has been used for forecasting climatic conditions in different parts of the world.
- The El Nino normally occurs around Christmas, roughly every 2 to 7 years and lasts usually for a few weeks to a few months.
- El Nino event is related to two important atmospheric circulation systems:
 - **Hadley Circulation:** It features air rising near the Equator, flowing poleward at a height of 10 to 15 kilometres above the earth's surface, descending in the subtropics, and then returning equatorward near the surface.
 - **Walker Circulation:** There is a stable low-pressure system above the western Pacific near South East Asia and a high-pressure system in the central Pacific. This results in a constant westward flow of the air masses from the area of high pressure to the area of low pressure. At higher altitudes, this air then flows directly eastward, oblique to the Hadley Circulation.
- Due to the combined components of Walker Circulation and Hadley Circulation, there is a strong prevailing wind toward the west in the lower layers of the atmosphere, which maintains the stable coastal upwelling system off the coast in western South America.
- La Nina is the condition opposite of an El Nino. In a La Nina, the tropical Pacific trade winds become very strong and an abnormal accumulation of cold water occurs in the central and eastern Pacific Ocean.

Impact of El Nino around the world:

- It causes flooding in **Peru and Ecuador**. The earlier cool water off the coast was rich in nutrients and fish, providing rich pickings for the Peruvian fishing industry. During El Nino, the warm water sloshes back towards South America, which hides the nutrient-rich cold waters and ensures fish are in short supply.

- The lack of fish is the reason that El Nino was first discovered by the Peruvian fishermen. They noticed that every three to seven years, there would be virtually no fish in the seas. The reduction in fish caused by El Nino can be dramatic; an event in 1972-1973 almost brought the complete collapse of the Peruvian fishing industry.
- The severe El Nino had also caused massive coral bleaching in the Great Barrier Reef and droughts in parts of Africa, South East Asia, and South America.
- Last year, Australia underwent its worst drought in living memory — in regions like the New South Wales the drought was the worst in 400 years.
- It also brings drought in Indonesia and Australia.

Impact of El Nino in India:

- **El Nino and the Indian Monsoon rains are inversely related:**

- ▶ Trade winds coming from South America normally blow westward towards Asia during Southwest Monsoon. Warming of the Pacific Ocean results in the weakening of these winds.
- ▶ Therefore, moisture and heat content gets limited and results in the reduction and uneven distribution of rainfall across the Indian sub-continent.
- ▶ In the 135 years between 1880 and 2014, around 90 percent of all evolving El Nino years have seen below normal rainfall.

- **It leads to drought conditions:**

- ▶ The most prominent droughts in India, six of them, since 1871 have been El Nino triggered droughts, including the recent ones that occurred in 2002 and 2009.
- ▶ Drought has a negative bearing on crop production leading to very serious consequences on the livelihood of farmers, especially the poor and marginal ones.
- ▶ Also, the drop in agricultural production destabilises the food security framework of our country, leading to increased prices for the food products and push the lower economic class to hunger and starvation.

Hotter than usual summers:

- Whenever there is an El Nino during summer, temperatures tend to rise, with increased chances of stronger or more severe heat waves.
- The last El Nino event that ended in 2016 had lasted for two years and caused heatwaves in India. The heatwaves in 2015 and 2016 killed more than 2,500 people in India.

12

Local Indian Ocean phenomenon may bring better rainfall despite El Nino

Context: The dreaded El Nino is likely to be neutralised by a local phenomenon in the Indian Ocean, which can lead to good rainfall in the June-September season.

El Nino:

- El Nino refers to the **warming of the equatorial Pacific**, which weakens the flow of wind and consequently the monsoon system. In some other parts of the world, it leads to heavy rainfall but in India, it weakens rain.
- In this phenomenon, sea-surface temperatures rise over a threshold of +0.5 degrees Celsius (and cools by the same margin during La Nina).

- There are a few other key atmospheric indices that one comes across while tracking El Nino. For instance, the **Southern Oscillation Index (SOI)** that indicates the development and intensity of El Nino or La Nina. **The SOI is calculated based on the atmospheric pressure differences between Tahiti (South Pacific Ocean) and Darwin (Australia).** Sustained positive SOI values are indicative of La Nina conditions while negative values suggest El Nino conditions.
- Another atmospheric index is the **ENSO (El Nino Southern Oscillation)** which **refers to the oscillation between the El Nino and the La Nina.** ENSO shifts irregularly back and forth between El Nino and La Nina **every two to seven years.**
- Each phase led to disruptions of temperature, precipitation, and winds.
- The warmer area of the ocean is also a source for convection and is associated with cloudiness and rainfall.

What lies ahead?

- El Nino has been generally known to suppress monsoon rainfall in India while La Nina increases it. El Nino years tend to be drier than average, but one of the strongest El Nino of the century (1997-98) produced a monsoon season with above-average rainfall for India.
- Anomalous warming in the Central and East Pacific could have a more profound adverse impact on the monsoon than when the warming shifts to the adjoining Far East Pacific.
- The 'dipole' effect**, wherein the Indian Ocean mimics El Nino-La Nina in which the western and eastern basins warm up relative to each other every few years with the associated impact on the monsoon. **Warming up of the West Indian Ocean boosts a prevailing monsoon, and vice-versa.** International and domestic weather agencies expect that this year, the Indian Ocean dipole could be either 'neutral' or weakly positive.

13 Atlantic Meridional Overturning Circulation (AMOC)

Context: According to scientists weakening of AMOC could have drastic consequences on the global climate.

- What is Atlantic Meridional Overturning Circulation (AMOC)?**
 - It is a large system of ocean currents **that carry warm water from the tropics northwards into the North Atlantic.**
 - AMOC ensures the oceans are continually mixed, and heat and energy are distributed around Earth.
- How does the AMOC work?**
 - The AMOC is a large system of ocean currents, **driven by differences in temperature, salt content and the water's density.**
 - As warm water flows northwards it cools and some evaporation occurs, which increases the amount of salt. Low temperature and high salt content make the water denser, and this dense water sinks deep into the ocean.
 - The cold, dense water slowly spreads southwards, several kilometres below the surface. Eventually, it gets pulled back to the surface and warms in a process called "upwelling" and the circulation is complete.

Has the AMOC been changing?

- For thousands of years, AMOC has remained stable, **but since the past 15 years, it has been weakening** which could have dramatic consequences for Europe and other parts of the Atlantic rim.

- Indirect evidence (for example from sediments on the seafloor) shows that there have been some large, rapid changes in the AMOC in the past (for example around the end of the last ice age).

What will be the effect of climate change on the AMOC?

- Climate models suggest that the **AMOC will weaken over the 21st Century as greenhouse gases increase**. This is because as the atmosphere warms, the surface ocean beneath it retains more of its heat.
- All these changes make the ocean water lighter and so reduce the sinking in the 'conveyor belt', leading to a weaker AMOC. So the AMOC is very likely to weaken, but it's considered very unlikely that large, rapid changes in the AMOC, as seen in past times, will happen in the 21st Century.
- **A weaker AMOC will bring less warm water northwards, and this will partly offset the warming effect of greenhouse gases over Western Europe.**

What is the role of the Indian Ocean?

- As the Indian Ocean warms faster and faster, it generates additional precipitation. This draws more air from other parts of the world to the Indian Ocean, including the Atlantic.
- With so much precipitation in the Indian Ocean, there will be less precipitation in the Atlantic Ocean. Less precipitation will lead to higher salinity in the waters of the tropical portion of the Atlantic because there won't be as much rainwater to dilute it.
- This saltier water in the Atlantic, as it comes north via AMOC, will get cold much quicker than usual and sink faster.

14 Delayed Withdrawal of Monsoon

Context: The Monsoon season of 2019 officially ended with September, but rainfall has continued in several parts of the country which indicates the delayed withdrawal of Monsoon.

Monsoon trends this year:

- After an extremely dry June, which saw a rain deficiency of 33 percent, the monsoon brought generous rainfall in July, August, and September, each subsequent month exceeding the normal by a higher deviation.
- September produced rainfall that was 152 percent of normal, and this was the second-highest rainfall ever recorded in this month. The only higher deviation during September was way back in 1917 when the rainfall was 165 percent of the then normal for the month.
- August and September together produced 130 percent of normal rainfall, and this was the highest since 1983. And this was the first time since 1931 that the monsoon ended up producing more than 100 percent rainfall after having a 30 percent or more deficiency at the end of the first month.

Monsoon prediction terminology:

- **Long Period Average (LPA):** It is the average rainfall received by the country as a whole during the south-west monsoon, for 50 years. The current LPA is 89 cm, based on the average rainfall over the years 1951 and 2000. This acts as a benchmark against which the rainfall in any monsoon season is measured.
- **Deficient rainfall:** The country is said to have received deficient rainfall if the actual rainfall falls below 90 percent of LPA.
- **Excess rainfall:** The country is said to have received excess rainfall if the rainfall is greater than 110 percent of LPA.

Why there is a late withdrawal of monsoon?

- September marks the beginning of the withdrawal of the monsoon. This year, however, withdrawal has seen a record delay. So far, the longest delay happened in 1961 when the withdrawal started on October 1. According to IMD this year the withdrawal is likely to begin only after October 10.

- **Normal rainfall:** The country is said to have received normal rainfall when the actual rainfall received falls between 96 and 104 percent of LPA.

Reasons:

- Last time September produced so much rain, 1917 which happened to be a La Niña year. This year is not a La Nina year but instead of that, the rainfall is higher in September. Though there was no La Niña, a similar phenomenon called the **Indian Ocean Dipole** could have contributed to the enhanced rainfall.
- During the monsoon season, the Intertropical Convergence Zone (ITCZ) is located over the Indian subcontinent. By September, as the temperature begins to go down, the ITCZ starts moving southwards of the Indian landmass, towards the equator, and further into the southern hemisphere. This year, this process has not yet started.

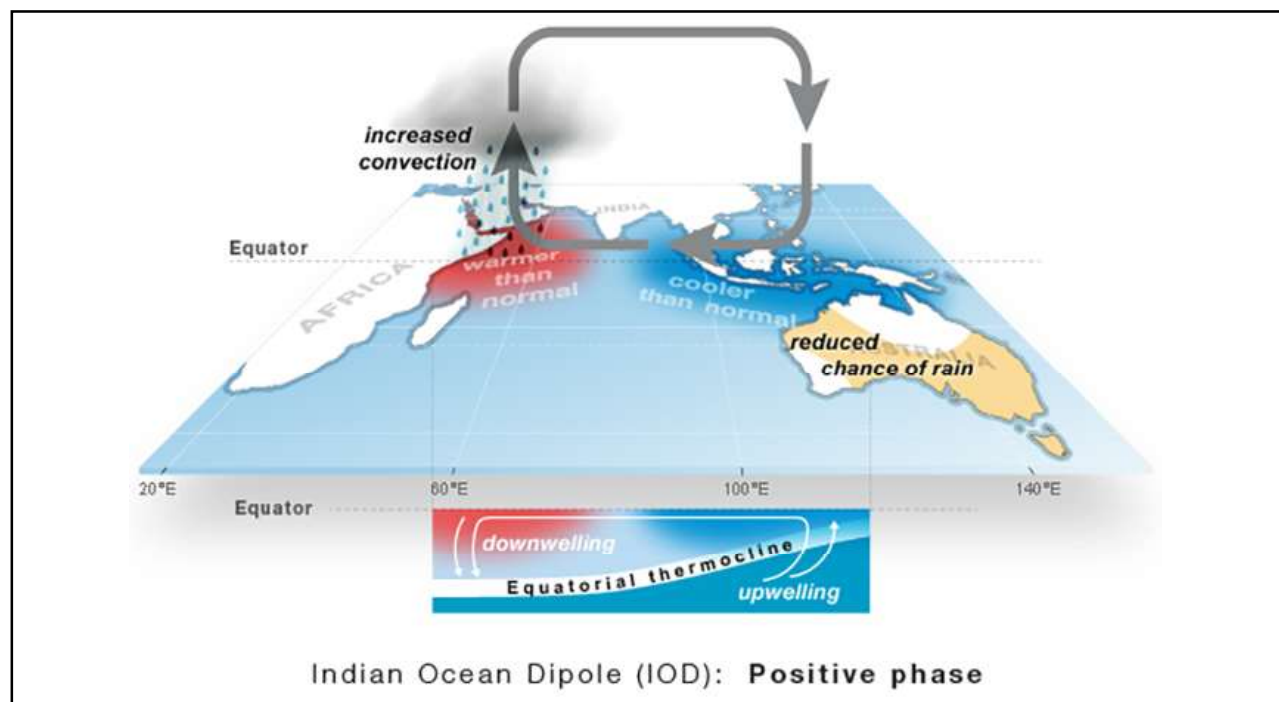
Inter-Tropical Convergence Zone (ITCZ):

- It is a belt of low pressure which circles the Earth generally near the equator where the trade winds of the Northern and Southern Hemispheres come together.
- It is characterised by convective activity which generates often vigorous thunderstorms over large areas.
- It is most active over continental landmasses by day and relatively less active over the oceans.

- **In September this year, the northern hemisphere was much warmer than the southern hemisphere, and that could be one reason why the ITCZ has remained longer than usual over the northern hemisphere which resulted in the longer stay of monsoon.**
- There was a cooling of the eastern equatorial Indian Ocean, below Sumatra, and that could be one of the reasons for this year's extended withdrawal of Monsoon.

What is the Indian Ocean Dipole?

- It is a phenomenon similar to the ENSO condition observed in the Pacific Ocean which creates the El Niño and La Niña events.
- **The sea surface temperatures in the Indian Ocean get warmer and cooler than normal, and this deviation influences regional atmospheric and weather patterns i.e. The Indian monsoon.**
- While the Pacific Ocean only has an El Niño or a La Niña condition at a time, the Indian Ocean experiences both warm and cold conditions at the same time – that's why known as a dipole.
- One of these poles is located in the Arabian Sea while the other is in the Indian Ocean, south of Indonesia.
- **The Indian Ocean Dipole is said to be positive when the western pole is warmer than the eastern one and negative when it is cooler.**
- The Indian Ocean Dipole and ENSO are not unrelated. **Positive Indian Ocean Dipole events are often associated with El Niño and negative Indian Ocean Dipole with La Niña.**
- When the Indian Ocean Dipole and ENSO happen at the same time, the Dipole is known to strengthen the impacts of the ENSO condition.



15 Ground Frost reported from many states of South India

Context: As several states across the country reel under cold wave conditions, the ground frosting has been reported in Jharkhand, Odisha, Uttar Pradesh, Punjab, Kerala, and Tamil Nadu.

More on News:

- In India frost is most prevalent during **December and January** when minimum temperatures across the Indo-Gangetic Plains as well as parts of Rajasthan and Madhya Pradesh drop to 4°C or less.
- **What is unusual this time?**
 - Frost has caught attention due to the increase in density of ground frosting in southern Indian states.
 - Recent reports highlighted a blanket of ground frost covering the hills of Kerala's Munnar, Kannimala, Chenduvvara, Chittuvvara, Sevenvalley and Nallathanni over the weekend, with temperatures falling as low as -3 degrees Celsius. The report also flagged the losses caused to tea plantation owners as tea leaves wilt away due to heavy frosting.
- **What is Frost and how is it formed?**
 - **Frost is water vapour or water in gas form, which becomes solid.** Frost usually forms on objects like cars, windows, and plants that are outside in air that is saturated, or filled, with moisture. Areas that have a lot of fog often have heavy frosts.
 - Frost is normally formed on **still, clear and cold nights**. The cool air causes water vapour in the air to condense and form droplets on the ground. When the temperature of the ground or surface is below 0 °C the moisture freezes into ice crystals - **known as the frost point**.
 - Frost usually forms at night, when the air temperature is cooler. Once the sun rises and warms the air around the frosted object, the frost melts quickly.

- **Where does it occur more often?**

- ▶ Frost is most common in **low-lying areas**, where warm air rises, and cool air sinks—cool air is denser than warm air.
- ▶ That means there are usually more water molecules in cool air than in warm air. As cool air collects in valleys, frost forms.

Types of Frost

- **Ground frost:** A ground frost refers to the formation of ice on the ground, objects or trees, whose surface has a temperature below the freezing point of water. During situations when the ground cools quicker than the air, a ground frost can occur without an air frost.
- **Air frost:** It occurs when the air temperature falls to or below the freezing point of water. An air frost is usually defined as the air temperature is below the freezing point of water at a height of at least one metre above the ground.
- **Hoar frost:** It is composed of tiny ice crystals and is formed by the same process as the dew, but when the temperature of the surface is below freezing point. The 'feathery' variety of hoar frost forms when the surface temperature reaches freezing point before dew begins to form on it
- **Rime:** It is a rough white ice deposit that forms on vertical surfaces exposed to the wind. It is formed by supercooled water droplets of fog freezing on contact with a surface it drifts past.
- **Glaze:** It forms when supercooled rain or drizzle comes into contact with the ground, or non-supercooled liquid may produce glaze if the ground is well below 0 °C. The glaze is a clear ice deposit that can be mistaken for a wet surface and can be highly dangerous

16 Ice Stupa Stamp

Context: The Chief Postmaster General, Jammu & Kashmir Circle released a 'Special Stamp Cover on Ice Stupa' during a function organised at the Ice Stupa site at Gangles in Leh.

More on News:

- Over 12 villages in Ladakh have built ice Stupas this year to create awareness about depleting glaciers and effect on the ecology around the Himalayas.
- **Ramon Magsaysay and Rolex award winner Sonam Wangchuk conceptualised this technique of water conservation.**

Why Ice Stupas?

- Ladakh is a trans-Himalayan mountain desert in the extreme north of India with villages located at 2,700m to 4,000m altitudes.
- It is a cold desert with winter temperatures touching -30° C, and an average annual rain/snowfall of only 100 mm.
- Human settlements are almost always located around glacial streams that feed into the Indus and other rivers as tributaries.
- The key to human settlement in this cold desert is the art of diverting water from the streams through meticulously built canals toward deserts to grow crops like barley, wheat, vegetables and trees like apricots, apples, willow, and poplar.

- Most villages face acute water shortage, particularly during the two crucial months of April and May when there is little water in the streams and all the villagers compete to water for their newly planted crops.
- By mid-June, there is an excess of water and even flash flooding due to the fast melting of the snow and glaciers in the mountains.
- By mid-September, all farming activities end, and yet a smaller stream flows throughout the winter steadily but wastefully going into the Indus River without being of use to anybody.
- The problem is getting worse with time as Himalayan glaciers are disappearing due to global warming and local pollution.

Ice Stupa Project

- The Students' Educational and Cultural Movement of Ladakh (SECMOL) Alternative Institute is making the ice stupa from **artificial glaciers which store the wasting winter water in the form of Ice Mountains that melt and feed the farms when water is most needed by the farmers.**
- This project has been initiated by **His Holiness Drikung Skyabgon Chetsang Rinpoche and executed in partnership with SECMOL.**
- To provide a platform for further innovations, the Himalayan Institute of Alternatives, (HIAL) has been established which has the mandate to create Ice Stupas across the Ladakh region.

Technique

- The concept of artificial glaciers is not new to Ladakh. In earlier times people in the region used to have a process of **'grafting glaciers'** in the very high reaches of mountains.
- The idea behind artificial glaciers is to freeze and hold the water that keeps flowing and wasting away down the streams and into the rivers throughout the winter.
- However, since these are based on horizontal ice formation, they need very high altitude locations (above 4,000m), constant maintenance and a north-facing valley to shade the ice from the spring sun.
- **New approach:** The glaciers would be free of location, frequent maintenance and shading requirement, etc.
- This is achieved by freezing the stream water vertically in the form of huge ice towers or cones of 30 to 50m height that looks very similar to the local sacred mud structures called Stupa or Chorten.
- These ice mountains can be built right next to the village itself where the water is needed. Very little effort or investment would be needed except for laying one underground pipeline from a higher point on the stream to the outskirts of the village.

17 Why this winter is extra cold in India?

Context: The unusually cold December (2019) could just be another instance of extreme climates becoming more and more frequent, a result of climate change. Across the world, the frequency and intensity of both heat waves and cold waves have increased in the last few years.

More on News:

- Extreme cold temperatures, rainfall and intense fog in December and January are witnessed by north and northwest India.
- Every year, in the second half of December and the first half of January, temperatures routinely drop to 2-4°C at some point of the day in many places in the north and northwest India.

- In December, the maximum daily temperature does not rise beyond 16-18°C in most of Punjab, Haryana, Himachal Pradesh, and western Uttar Pradesh.
- In Delhi and northern Rajasthan, daily maximum temperatures are usually not over 20-22°C for most of December.
- This has happened only four times in the last 118 years, and the IMD has said December, 2019 would most likely become the second coldest December for Delhi since 1901. This is already the longest such spell for December since 1997.
- A cold-day condition is said to prevail when the maximum temperature during the day is at least 4.5°C below normal.
- If the maximum temperature is at least 6.5°C below normal, it is classified as a severely cold day.

Causes for these conditions

- Scientists say there is nothing unusual in the climatic conditions that influence temperatures in this region at this time of the year.
- The cold wave usually arrives from the west, through the **Western Disturbance wind system**.
- The intensity of the cold also depends on the amount of snowfall that happens in Jammu and Kashmir, Ladakh, Himachal Pradesh, and nearby areas.
- They combine in different ways to produce different kinds of winter conditions.
- The flow of north-westerly winds over northwest India that too over much lower levels, further fuelled the chill factor, making the days much colder than normal during December.
- This extended cold spell has been triggered due to low stratus clouds that are blanketed over a large geographical area — between Pakistan, cutting across India and running up to Bangladesh.

Western Disturbance

- It can be defined as “a low-pressure area or a trough over the surface or the upper-air in the westerly winds regime, north of 20°N, causing changes in pressure, wind pattern and temperature fields. It is accompanied by cloudiness, with or without precipitation.”
- Western Disturbances originate in the Caspian Sea or the Mediterranean Sea as extra-tropical cyclones. They gradually travel across the middle-east from Iran, Afghanistan, and Pakistan to enter the Indian sub-continent.

18 Coral Reefs

Context: Lawmakers in the US Virgin Islands have passed a bill banning the retail use of sunscreens and 10 personal-care products that contain toxic chemicals harmful for marine environment and ecosystems. The ban becomes effective by January 1, 2021.

More on News:

- Humans use sunscreens as the first line of defence against skin cancer but concerns have been raised for their effect on endocrine and reproductive systems of fishes and increase coral bleaching and damage the polyps' DNA.
- The ban will help protect coral, marine life as well as human health.

Recent Cases:

- Popular beaches and critical coral reef areas throughout the Virgin Islands, including **Trunk Bay**, **Hawksnest Bay**, and **Buck Island** have all been detected with high levels of toxic chemicals.

- In addition to environmental and human harm, **tourism-based economies** will experience financial devastation if coral and marine life die off. This ripple effect would be huge.

Why this ban?

- Sunscreens are widely used to protect skin from the harsh rays of the sun. According to a 2015 study, published in journal **Archives of Environmental Contamination and Toxicology**, chemicals in a single drop of sunscreen are enough to damage fragile coral reef systems.
- However, those with toxic ingredients, **oxybenzone or octinoxate** (these are chemical ultraviolet (UV) filters that absorb harmful rays and help prevent skin cancer), cause death among developing corals and increase coral bleaching even at temperatures below 31 degrees Celsius.
- The presence of these chemicals in the waters can also cause **genetic damage to corals**, reduce their ability to cope with climate change as well as induce neurological behavioural changes in fish threatening their populations.
- According to various scientific studies, the chemicals also appear to cause disruptions in the corals' **endocrine system**, which can induce **feminisation in adult male fish** and increase reproductive diseases.

- The Caribbean has already lost more than 80 % of its coral due to a variety of issues. Studies have shown that these chemicals are at 40 plus times acceptable levels in some territory waters.
- Hawaii Island state became the first in the nation to prohibit sunscreens that contain oxybenzone and octinoxate, which are endangering coral reefs.
- In February 2019, Key West, Florida, banned the sale of sunscreens containing oxybenzone and octinoxate to protect coral reefs from bleaching and death.

19 The rising threat of coral bleaching

Context: A recent study conducted on coral reefs in the Indian and Pacific Oceans have found that heat was not the only driver of coral bleaching but it is also influenced by location and several other factors.

Background:

- The stunning colours in corals come from **marine algae called zooxanthellae**, which live inside their tissues. This algae provide the corals with an easy food supply thanks to photosynthesis, which gives the corals energy, allowing them to grow and reproduce.
- When corals get stressed, from things such as heat or pollution, they react by expelling this alga, leaving a ghostly, transparent skeleton behind. This is known as '**coral bleaching**'. Some corals can feed themselves, but without the zooxanthellae, most corals starve.

Significance of coral reefs:

- **A Coastal Protection** - They absorb wave's energy and contribute to environmental protection through the reduction of coastal erosion in the case of storms, hurricanes, etc.
- **Habitat** - It is one of the **most important biodiversity hotspots on earth**.
- **Food Resource** - Reef animals are an important source of protein, contributing about a quarter of the fish catch average in these countries.
- **Economic Importance** - Millions of people around the world depend on coral reefs for food, protection, and employment.

- **Tourism Wealth** - The reefs are often an essential element in the economy of tropical regions they inhabit. They attract divers in effect, freedivers, recreational fishermen and lovers of white sand beaches.
- **Medical Future** - Reef organisms are used in the treatment of diseases such as certain cancers including leukaemia, HIV, cardiovascular diseases, ulcers. Also, long coral skeleton, because of its very close similarity to our bones nature, served as material for bone grafts.

20 Stormquake

Context: Scientists have discovered an earthquake-like event “stormquake” that can happen during a hurricane or other powerful ocean storms.

What is stormquake?

- It is a new geophysical phenomenon entirely unknown to science - **a hybrid entity where powerful storms such as hurricanes trigger seismic episodes that can rumble for hours or even days.**
- Storms trigger giant waves in the sea, which cause another type of wave. These secondary waves then interact with the seafloor only in certain places and that causes the shaking.
- Stormquakes are limited to places along the edge of continental shelves or on ocean banks.
- Stormquakes frequently occur in the Maritimes and Labrador Sea in the North American margin.

- **“Earth’s hum”:** It is a phenomenon in which the constant sloshing of ocean waves produces seismic signals at frequencies of about once every few minutes.
- **Microseisms:** These are high-frequency signals created by ocean waves which occur every five seconds.
- **Seismic noise** is a band of signals generated in the ocean that occur once every 20 to 50 seconds or so or at a frequency of between 0.02 and 0.05 hertz.

When is a stormquake generated?

- To be a stormquake the source of the seismic data had to meet several criteria:
 - It had to occur during a stormy day.
 - It should not be a part of known earthquake event and belong to a swarm of similar quakes on the same day.
 - Stormquakes are confined to certain regions along the coast where seafloor topography has small raised regions called **ocean banks**.

21 Danakil Depression

Context: Nature Ecology & Evolution recently published a new study. It says that active and naturally occurring life cannot be sustained at Danakil Depression, a place having water.

Danakil Depression

- It is **located in Ethiopia**. It is the northern part of Afar Triangle there.
- It is a geological depression that has resulted from the divergence of **three tectonic plates in the Horn of Africa**.

- It is one of the **lowest place** in the surface of earth measuring 125m below sea level.
- It is the **hottest place** on Earth in terms of year-round average temperatures. It remains without rain for most of the year.
- At the northern end of Danakil Depression which is separated by live volcanoes from the Red Sea, this depression was formed by the evaporation of an inland water body.
- All the water entering Danakil evaporates, and no streams flow out from its extreme environment. It is covered with more than 10 lakh tonnes of salt.

Findings of the report:

- There are **extremophile microbes** that can adapt to environmental conditions that are too extreme for any living organism. This new research has pointed out that in Danakil Depression, **a place having bubbling pools of water and mounds of salt covering its landscape, even these microorganisms cannot live.**
- It identifies two barriers for this: **magnesium-dominated brines** that cause cells to break down; and **an environment having simultaneously very low pH and high salt** (toxic hyperacid-hypersaline water), a combination that makes adaptation highly difficult.
- The scientists have the opinion that the fact that this research has not revealed life form does not mean that organisms more complex than microfossils are not present there.
- They say that until more intricate studies are done, this Danakil Depression for now is the most inhospitable area not fit for living.

22 Naming of Cyclones

Context: The recent cyclone to emerge out of the Bay of Bengal has been named Fani.

More on News:

- It has made landfall in Odisha causing the most destruction in 2 cities- Puri and Bhubhneswar.
- Before this, there were cyclones Hudhud in 2014, Ockhi in 2017 and Titli and Gaja in 2018.
- The first cyclone after the list was adopted was given the name in the first row of the first column — Onil, proposed by Bangladesh. The next cyclone will have name- Vayu.

Naming of cyclones:

NORTHERN INDIAN OCEAN CYCLONE NAMES								
Contributors	List 1	List 2	List 3	List 4	List 5	List 6	List 7	List 8
Bangladesh	Onil	Ogni	Nisha	Giri	Helen	Chapala	Ockhi	Fani
India	Agni	Akash	Bijli	Jal	Lehar	Megh	Sagar	Vayu
Maldives	Hibaru	Gonu	Aila	Keila	Madi	Roanu	Mekunu	Hikaa
Myanmar	Pyarr	Yemyin	Phyan	Thane	Nanauk	Kyant	Daye	Kyarr
Oman	Baaz	Sidr	Ward	Murjan	Hudhud	Nada	Luban	Maha
Pakistan	Fanoos	Nargis	Laila	Nilam	Nilofar	Vardah	Titli	Bulbul
Sri Lanka	Mala	Rashmi	Bandu	Viyaru	Ashobaa	Maarutha	Gaja	Pawan
Thailand	Mukda	Khai Muk	Phet	Phailin	Komen	Mora	Phethai	Amphan

- Each Tropical Cyclone basin in the world has its own rotating list of names.
- For cyclones in the Bay of Bengal and Arabian Sea, the naming system was agreed by eight member countries of a group called **WMO/ESCAP** and took effect in 2004.
- These eight countries are – Bangladesh, India, Maldives, Myanmar, Oman, Pakistan, Sri Lanka and Thailand.
- The first cyclone after the list was adopted was given the — Onil, proposed by Bangladesh.
- Subsequent cyclones are being named sequentially, column-wise, with each cyclone given the name immediately below that of the previous cyclone.
- Once the bottom of the column is reached, the sequence moves to the top of the next column.
- So far, the first seven columns have been exhausted, and **Fani** (again proposed by Bangladesh) is the top name in the last column.
- The next cyclone will be named Vayu. When all the names in list are exhausted, the eight countries will propose fresh lists of names.
- The lists for storms in the Atlantic and Eastern Pacific basins are, however, rotated when the names in the list get exhausted. Exception are, however, made in certain cases — if a storm causes excessive death and destruction, its name is considered for retirement and is not repeated; it is replaced with another name.

23 Cyclone Herold

Context: A tropical depression has formed in the North-east of Madagascar. According to current forecasts, this depression, named 'Herold', has a strong potential for development in tropical cyclones in the region.

More on News:

- **Tropical Cyclone Herold** has developed close to **Madagascar** and is expected to strengthen further in the coming days as it **heads into the southern India Ocean**.
 - Parts of Madagascar have already been hit by **heavy rain**.
 - **Reunion Island**, and especially **Mauritius** (towards **Rodrigues Island**) are **threatened**.
- **Location:** Herold depression is currently located some 800 kilometres to the north-west of Port Louis in Mauritius.
- **Intensity:** It has **sustained winds** or about **110kmph (68mph)** and gusts nearer 140kmph (87mph).
 - The system is now **intensifying explosively**, with the winds forecast to reach **195kmph (120mph)** gusting up to **240kmph (150mph)**.
 - It is equivalent to a **Category 3 Atlantic hurricane** on the **Saffir-Simpson scale**.
 - Impact: Widespread disruption, including the prospect of **floods and mudslides**, is likely.
- **Movement:** Strength of the storm and movement depends on favourable conditions in the **warm waters**. Conditions are extremely favourable as **sea surface temperatures** are about **28-29 degrees Celsius** (82-84 degrees Fahrenheit).
 - There is also **very little vertical wind shear**, which will allow Herold to remain upright and standing.

Tropical Cyclones

- **Definition:** A tropical cyclone is a **rapidly rotating storm** system characterized by a **low-pressure centre**, a **closed low-level atmospheric circulation**, **strong winds**, and a spiral arrangement of thunderstorms that produce **heavy rain or squalls**.

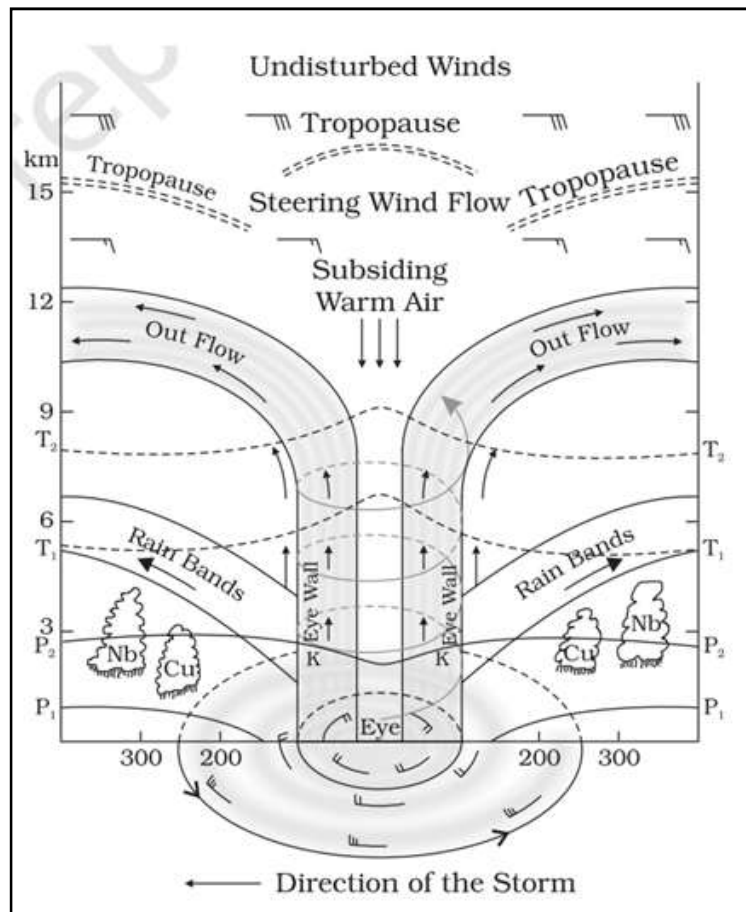
- **Different names:** Depending on its location and strength, a tropical cyclone is referred to by different names, including:
 - **Hurricane:** Atlantic Ocean
 - **Typhoon:** North-western Pacific Ocean
 - **Tropical cyclones:** South Pacific or the Indian Ocean

Mechanism of Tropical cyclones

- **Movement:** “**Tropical**” refers to the geographical origin of these systems, which form almost exclusively **over tropical seas**. “**Cyclone**” refers to their winds moving in a circle, whirling round their central clear eye, with their winds blowing **counterclockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere**.
 - The opposite direction of circulation is due to the **Coriolis effect**.
- **Formation:** Tropical cyclones typically form over **large bodies of relatively warm water**. They derive their energy through the **evaporation of water** from the ocean surface, which ultimately **re-condenses into clouds and rain** when moist air rises and cools to saturation.
 - Tropical cyclones are typically between **100 and 2,000 km** (62 and 1,243 mi) in diameter.
 - **Once the maximum wind speed exceeds 119 km** (74 miles) per hour, the storm is classified as a tropical cyclone.
 - The **strong rotating winds** of a tropical cyclone are a result of the **conservation of angular momentum** imparted by the Earth’s rotation as air flows inwards toward the axis of rotation.
 - **Low surface:** As a result, they **rarely form within 5° of the equator**.

The physical structure of Tropical cyclones

- **Eye-wall:** At the centre of a mature tropical cyclone, **air sinks rather than rises**, thereby creating a clear “**eye**”.
 - Weather in the **eye is normally calm and free of clouds**, although the sea may be extremely violent.
- **Rain-bands:** In addition to **deep convective cells** (compact regions of vertical air movement) surrounding the eye, there are often **secondary cells** arranged in bands around the centre.
 - These bands, commonly called rain-bands, spiral into the centre of the storm.
- **Outflow:** The **upper levels** of a tropical cyclone feature winds headed away from the centre of the storm



with **anticyclonic rotation**. **Winds at the surface are strongly cyclonic, weaken with height, and eventually reverse** themselves.

- ▶ Tropical cyclones owe this unique characteristic to the **warm core** at the centre of the storm.
- **Area of influence:** Tropical cyclones are almost **unknown in South Atlantic** due to **consistently strong wind shear** and a **weak Inter-tropical Convergence Zone**.
- ▶ The **near-surface wind field** of a tropical cyclone is characterized by air rotating rapidly around a centre of circulation.
- ▶ Once aloft, air flows away from the storm's centre, producing a **shield of cirrus clouds**. Typically, these are the **highest and coldest clouds** in the cyclone.
- ▶ **They intensify very rapidly.**

24 Cyclone Bulbul

Context: Bulbul damages crops, houses, electricity and water connections in Odisha and West Bengal.

More on News:

- Very Severe Cyclonic Storm Bulbul is an active tropical cyclone which struck the Indian state of West Bengal.
- At Category 2 hurricane-equivalent intensity and is currently a flood and storm surge threat to Bangladesh.
- Originating from the remnants of Severe Tropical Storm Matmo over the southern Bay of Bengal.
- It is only the fourth tropical cyclone ever recorded to regenerate over the Andaman Sea, having crossed Southeast Asia overland.
- The cyclone has been named by Pakistan.

25 Fani - Country's strongest April cyclone in 43 years

Context: Cyclonic storm Fani, which was lying about 600 km east of Vishakapatnam and 800 km south of Puri, was the first severe, cyclonic storm to have formed in April in India's oceanic neighbourhood since 1976, according to records from the India Meteorological Department (IMD).

More on News:

- Cyclone Fani is an '**extremely severe cyclonic storm**' and made landfall in Odisha (as a very severe cyclonic storm) by May 4, according to a forecast by the IMD.
- Heavy rains in north Andhra Pradesh and Odisha and light rains in West Bengal under the influence of the cyclone.
- Strong winds in Kerala, Tamil Nadu, Puducherry and south Andhra.
- It is equivalent in intensity to a Category 4 hurricane in the Atlantic, or a super typhoon in the Pacific.
- With winds expected to be 240 kilometers per hour (150 mph) at landfall, Tropical Cyclone Fani would be the strongest storm to hit the region since a similar system struck Odisha in 1999, resulting in at least 10,000 deaths.

India Meteorological Department (IMD)

- It is the principal agency under the Ministry of Earth Sciences (MoES), Government of India responsible for meteorological observations, weather forecasting and seismology.
- It is headquartered in Delhi and operates hundreds of observation stations across India and Antarctica.
- Regional offices of IMD are located at Mumbai, Chennai, Delhi, Kolkata, Nagpur and Guwahati.
- IMD is also one of the six Regional Specialised Meteorological Centres of the World Meteorological Organization. It has the responsibility for forecasting, naming and distribution of warnings for tropical cyclones in the Northern Indian Ocean region, including the Malacca Straits, the Bay of Bengal, the Arabian Sea and the Persian Gulf.

26 Disaster preparedness with reference to Odisha

Context:

- Extremely severe cyclonic storm **Fani** affected 1.5 crore people in nine districts of Odisha since making landfall near Puri on May 3, 2019 morning.
- It was the strongest tropical cyclone to strike the Indian state of Odisha since Phailin in 2013.

Disaster Management: Structure at National Level

- The NDMA is the central policy making body for disaster management. Under the Disaster Management Act, 2005, it has an **Advisory Committee** comprising experts in the field of disaster management.
- The National Plan for disaster management is meant to include measures for **disaster prevention, mitigation, preparedness, responsibilities of different Ministries, etc.**
- It is to be prepared by the **National Executive Committee (NEC)** and approved by the National Disaster Management Authority (NDMA).
- Under the Act, the NEC is responsible for coordinating response in case of a disaster, preparing the National Plan for disaster management, monitoring implementation of disaster management guidelines, etc.

Disaster Management: A system that works in Odisha

- In 2013, when cyclone Phailin rattled the Indian coasts, the government of Odisha undertook the largest ever evacuation, shifting 11 lakh people into safety.
- The state stood strong as rains lashed the landscape, and death toll was contained to 21. Next year when cyclone Hudhud hit Odisha, the death toll was contained to just two.

Actions taken by the state government

- The Odisha State Disaster Management Authority (OSDMA) was established in 1999, much before the Disaster Management Act was passed in 2005.
- **OSDMA was the first disaster management authority centre established in India**, or perhaps the world, given its scale of operations.
- Odisha, along with Assam, Gujarat, and Bihar are the only states with active State Disaster Management Authorities (SDMAs).
- These states have their own offices, management, and staff. In most states, SDMAs are still being run out of the State Revenue Department Office, which is a temporary arrangement.

27 Cyclone 'IDAI'

Context: The Indian Navy was the first to respond cyclone Idai, a category 4 tropical storm, which hit southern Africa, is the worst weather-related disaster to hit the southern hemisphere.

More on News:

- Cyclone '**IDAI**' made landfall at Beira, Mozambique in early hours of 15 March 2019 causing widespread damage and loss of human life in the Central and Northern provinces of the country.
- The situation is being monitored closely and the Indian Navy is prepared to render all necessary assistance to the local population in Mozambique.
- Ships of First Training squadron of Indian Navy, **Sujata, Sarathi and Shardul**, operating in Southern Indian Ocean were diverted to Port Beira in Mozambique based on the request of the Government of Mozambique.
- The Indian Navy has made HADR (**Humanitarian Assistance and Disaster Relief**) assistance a major tool of its **foreign cooperation initiative** in the Indian Ocean Region (IOR) which has a high incidence of natural disasters.

Categories of tropical cyclone:

The severity of a tropical cyclone is described in terms of categories ranging from 1 to 5 related to the zone of maximum winds. Using this severity scale, communities will be able to assess the degree of cyclone threat and take appropriate action. A gale is a strong wind, typically used as a descriptor in nautical contexts.

- **Category 1:** Less than 125 km/h Gales - Minimal house damage. Damage to some crops, trees and caravans. Boats may drag moorings.
- **Category 2:** 125 - 164 km/h Destructive winds - Minor house damage. Significant damage to signs, trees and caravans. Heavy damage to some crops. Risk of power failure. Small boats may break moorings.
- **Category 3:** 165 - 224 km/h Very destructive winds - Some roof and structural damage.
- **Category 4:** 225 - 279 km/h Very destructive winds - Significant roofing and structural damage
- **Category 5:** More than 280 km/h extremely destructive winds - Extremely dangerous with widespread destruction.

28 Cyclone Vayu

Context: Cyclone Vayu hit Gujarat and ravaged port town.

More on News:

- Cyclone Vayu is the second deadliest cyclone to hit the state since 1998 that had ravaged port town. It is the strongest cyclone in past 20 years.

Six factors responsible for the formation of cyclone:

- Sufficient warm temperature at sea surface
- Atmospheric instability

- Impact area of **Coriolis force** so that low pressure can be develop
- High humidity in the lower to middle levels of the troposphere
- A pre-existing low-level focus or disturbance
- Low vertical wind shear.

Impact of Cyclone Vayu on India

- It may cause a significant delay in the arrival of monsoon in some parts of the country.
- Coastal areas in Karnataka, Kerala, Konkan, Goa and Lakshadweep recieved fairly widespread rainfall.

Cyclone Prone area in India

- According to the meteorological department, there are 13 coastal states and Union Territories in India are Cyclone prone region.
- Four states like West Bengal, Andhra Pradesh, Odisha, Tamil Nadu and one UT Puducherry on the east coast and Gujarat on the west coast are more vulnerable.

Cyclone Warning System in India

- The **India Meteorological Department** is the nodal agency, which is responsible for meteorological observations, weather forecasting, and seismology.
- A cyclone in the Bay of Bengal is predicted by the **Area Cyclone Warning Centres (ACWC)** and in the Arabian Sea, it is predicted by the **Cyclone Warning Centre (CWC)**.
- Both ACWC and CWC sent their report to the **National Cyclone Warning Centre (NCWC)**.

Difference between the Arabian Sea and Bay of Bengal Cyclones:

- **The Bay of Bengal** gets higher rainfall, and because the sluggish winds around it keep temperatures relatively high. Warm air currents enhance this surface temperature and aid the formation of cyclones.
- **Bay** receives a constant inflow of freshwater from the Ganga and Brahmaputra rivers. This means that its surface water keeps getting refreshed, making it impossible for the warm water to mix with the cooler water below, making it ideal for depression.
- On the other hand, the **Arabian Sea** receives stronger winds that help dissipate the heat, and the lack of constant freshwater supply helps the warm water mix with the cool water, reducing the temperature.

An exception to the rule

- Bay of Bengal witnesses cyclones both pre-monsoon and post-monsoon.
- The post-monsoon period sees a higher number of cyclones than the pre-monsoon period. This is because summers and pre-monsoons see dry and hot air moving from north-western India towards the Bay of Bengal.

29

Kyarr and Maha Mark First Case of Two Simultaneous Cyclones over Arabian Sea

Context: The Arabian Sea witnessed a peculiar occurrence with the formation of Cyclone Maha even as Kyarr prevailed over the region, first since since 1965.

Why the Arabian Sea is seeing one of the most active cyclone seasons?

- The oceanic basin to the west of the Indian sub-continent which usually sees low-intensity cyclonic activity has suddenly turned into a hotspot of sorts, churning out severe cyclonic storms one after the other.
- 2019 recorded one of the most active cyclone seasons in the North Indian Ocean. Four cyclones formed off the coast of India in the Arabian Sea – Vayu, Hikaa, Kyarr and Maha. While Vayu, Hikaa and Kyarr did not make landfall in India, the western coast from Kerala to Gujarat witnessed heavy rains and strong winds, affecting normal life in several areas.

- The excess heat energy in the Western Pacific Ocean was transferred to the South Indian Ocean via the Indonesian Throughflow (ITF), a low altitude, oceanic pathway for warm, fresh water to move between the two ocean basins.
- The ITF is the only open pathway between the Western Pacific and the south eastern tropical Indian Ocean and flows through the Indonesian Archipelago.
- This oceanic pathway has immense influence over the region's climate patterns. According to one study, done on ITF state, "The volume, heat and freshwater carried by the ITF are known to impact the state of the Pacific and Indian Oceans and modulate regional climate variability through altering the regional air-sea exchange and precipitation patterns."
- **It is this transfer of excess heat energy via the ITF, among other factors, that has led to a noticeable increase in the Indian Ocean's sea surface temperature or SST over the decades.**

Maha & Kyarr Cyclonic Storm

- Cyclone Maha, the fourth cyclone this year in the Arabian Sea, is set to intensify further into a '**Severe Cyclonic Storm**'. The depression that had developed in the Comorin Sea, gained strength and turned into a cyclonic storm.
- The most recent Cyclone Kyarr, was the first super cyclone with windspeed of 250 kmph to form in the Arabian Sea after a gap of 12 years. Kyarr, which is a category 4 hurricane was only preceded by Super Cyclone Gonu in 2007, which ravaged the coast of Oman.

Fujiwhara effect:

Two big cyclonic systems forming at the same time could also influence each other's wind systems and lead to pushing and pulling. This is usually known as the Fujiwhara effect - named after the Japanese Meteorologist Sakuhei Fujiwhara - when two nearby cyclone vortices orbit each other

30 Volcanic eruption in White Island

Context: Volcanic eruption in White Island of New Zealand.

More on News:

- Whakaari/White Island (also known as just White Island) is an **active andesite stratovolcano**, situated 48 km (30 mi) from the **east coast of the North Island of New Zealand**, in the **Bay of Plenty**.
- Whakaari/White Island is New Zealand's most active cone volcano which has been built up by continuous volcanic activity over the past 150,000 years. About **70 percent of the volcano is under the sea**, making this massive volcanic structure the largest in New Zealand.
- **Previous Eruptions: On 27 April, 2016** a short-lived eruption occurred in the evening. It deposited material all over the crater floor onto some of the crater walls.

31 Colour Coded Weather Warning

Context:

- Recently Indian Meteorological Department issued a yellow weather warning for rain in Himachal Pradesh.
- The weather department forecast thunderstorm with hail in isolated places of mid-hills, including Shimla, Mandi, Kullu, Chamba, Solan, and Sirmaur.

Colour coded weather warning:

- It is issued by the country's apex weather agency **Indian Meteorological Department (IMD) from the Ministry of Earth Sciences.**
- Its **objective is to alert people ahead of severe or hazardous weather** which has the potential to cause damage, widespread disruption or danger to life.
- As per the regular practice, warnings are uploaded on the website every day. District wise rainfall forecast along with warnings with colour coded alerts are also uploaded and updated thrice daily on the website.

Four colour codes:

The Four colour codes are issued to indicate various categories of warnings. The meaning of these codes are:

- **Red:**
 - Take action.
 - Extremely bad weather is expected.
 - People need to take action to keep themselves and others safe.
 - Widespread damage, travel and power disruption and risk to life are likely. People must avoid dangerous areas and follow the advice of the emergency services and local authorities.
- **Amber:**
 - Be prepared.
 - There is an increased likelihood of extremely bad weather, which could potentially cause travel delays, road and rail closures, and interruption of power supply.
 - Amber means people need to be prepared to change plans and protect themselves, their family and community from the impacts of the severe weather based on the forecast from the Met Office.
 - There could be a risk to life and property.
- **Yellow:**
 - Be updated.
 - Severely bad weather is possible over the next few days, plan thinking about possible travel delays and disruption of day-to-day activities possible.
 - It indicates the weather may change or worsen in the next few days.
- **Green:**
 - No action required.
 - No severe weather concerns.
 - No advisory is issued.

32

Kelp Forests

Context: Underwater Arctic Forests (Kelps) is expanding according to research by Canadian Marine Ecology, Universite Laval published in Global Change Biology.

More on News:

- The research uncovers the distribution of Arctic kelp forests and explores how these important ecosystems are changing with the climate.
- **Warming waters and retreating of sea ice will benefit marine plants. Researchers predict a northern shift of kelp forests as ice retreats.**

Kelp Forests

- These are underwater forests that thrive well **in cold, nutrient-rich waters.**
- Kelps are **large brown algae seaweeds** attached to the seafloor and eventually grow to the water's surface and rely on sunlight to generate food and energy.
- These forests are always coastal and require shallow, relatively clear water.
- These forests harbour a greater variety and higher diversity of plants and animals **than almost any other ocean community.**

Distribution

- Kelp forests have been observed throughout the Arctic by Inuit, researchers and polar explorers. The Canadian Arctic alone represents 10 percent of the world's coastlines.
- Kelps have adapted to the severe conditions. These cool water species have special strategies to survive freezing temperatures and long periods of darkness and even grow under sea ice.
- In regions with cold, nutrient-rich water, they can attain some of the **highest rates of primary production of any natural ecosystem on Earth.**
- In Hudson Bay and eastern Canada, kelp forests have been scientifically documented between **Ellesmere Island and Labrador**, and along coasts in **Lancaster Sound, Ungava Bay, Hudson Bay, Baffin Bay, and Resolute Bay.**

Threat:

- Thawing permafrost and crumbling Arctic coasts are dumping sediments into coastal waters at alarming rates, which blocks light and could limit plant growth.
- The run-off from melting glaciers will also lower salinity and increase turbidity, which impacts young kelp.
- Destructive fishing practices, coastal pollution, and accidental damage caused by boat entanglement are known to negatively affect kelp forests.
- **Sea urchins can destroy entire kelp forests** at a rate of 30 feet (9 m) per month by moving in herds. **Sea otters play a key role in stabilizing sea urchin populations** so that kelp forests may thrive

33 Mass Extinctions

Context: In the last 500 million years, 75 to more than 90 percent of all species on Earth have disappeared in mass extinctions.

What is mass extinction?

- Mass extinctions are defined as any substantial increase in the amount of extinction (lineage termination) suffered by more than one geographically wide-spread higher taxon during a relatively short interval of geologic time, resulting in an at least temporary decline in their standing diversity.

- **Major mass extinction events in the geological history of Earth:**

- ▶ Ordovician-Silurian extinction 485 to 444 million years ago
- ▶ Late Devonian extinction - 383-359 million years ago
- ▶ Permian-Triassic extinction - 252 million years ago
- ▶ Triassic-Jurassic extinction - 201 million years ago
- ▶ Cretaceous-Paleogene extinction - 66 million years ago

- **Extinction today**

- ▶ Recent estimates suggest that extinction threatens up to a million species of plants and animals, in large part because of human activities such as deforestation, hunting, and overfishing.
- ▶ Other serious threats include the spread of invasive species and diseases from human trade, as well as pollution and human-caused climate change.
- ▶ Today, extinctions are occurring hundreds of times faster than they would naturally. If all species currently designated as critically endangered, endangered, or vulnerable go extinct in the next century, and if that rate of extinction continues without slowing down, we could approach the level of mass extinction in as soon as 240 to 540 years.

34 Strange waves rippled around the world, and nobody knows why

Context: On the morning of November 11, 2019 a mysterious rumble rolled around the world. The seismic waves began roughly 15 miles off the shores of Mayotte, a French island sandwiched between Africa and the northern tip of Madagascar.

More on News:

- The waves buzzed across Africa, ringing sensors in Zambia, Kenya, and Ethiopia. They traversed vast oceans, humming across Chile, New Zealand, Canada, and even Hawaii nearly 11,000 miles away.
- A unique feature of this earthquake wave was that it **rolled across the globe, without causing any disturbance**. This is the first instance when such a phenomenon has been observed.

35 Frigid planet detected orbiting nearby star

Context: Based on two decades of astronomical observation, astronomers have observed that a frozen and dimly lit planet, dubbed a "Super-Earth," may be orbiting the closest single star to our solar system.

More on News:

- The planet, estimated to be at least 3.2 times more massive than Earth, was spotted circling Barnard's Star. It is believed to orbit Barnard's Star every 233 days.
- **Barnard Star**
 - ▶ It is a type of relatively cool and low-mass star called a red dwarf, about 6 light-years away from our solar system, comparatively close in cosmic terms.

- It is located about 6 light-years away from Earth in the constellation of Ophiuchus.
- It is the fourth nearest known individual star to the Sun (after the three components of the Alpha Centauri system).

36 Increasing Reflection of Cirrus Cloud

Context: As cirrus clouds are not able to reflect ample sunlight into space, scientists have devised a noble method to inject ice dust nuclei into strata where they form to reduce their optic depth. This would allow more heat to escape into space. This will control global warming.

Cirrus clouds

- They are formed at high altitudes of 8,000 – 12,000m.
- They are detached thin clouds.
- They have a feathery appearance.
- They are always white in colour.

37 Cloud Brightening Project

Context: The Marine cloud brightening project has been initiated which will spray a fine mist of seawater into the cloud to brighten them so that they can reflect maximum sunlight into space. This will be done by spraying seawater through a nozzle that is being designed by the University of Washington.

More on News:

- **Marine Cloud Brightening (MCB) refers to manipulating cloud cover to reflect more sunlight back to space.** It is a proposed Solar Radiation Management (SRM) technique.
- MCB could reduce the temperature of the atmosphere and oceans because they would absorb less of the sun's energy, but it would not reduce levels of greenhouse gases.
- Proponents of MCB aim to **create whiter, more reflective clouds by shooting particulates (salt from seawater droplets or bacteria) into clouds and increasing cloud condensation nuclei** (the tiny particles around which clouds form).

38 Sinking Chain of Atolls of India

Context: Due to the constantly rising sea level, many small atolls of Indian archipelago are sinking.

More on news:

- **Parali I island of Lakshadweep has already sunk and Parali II has sunk almost 80% of its total area. Thinnkara(14.38%) and Parali III (11.42%) are eroding at a fast pace.**
- UN Intergovernmental Panel on Climate Change (UNIPCC) in its fifth report has already stated a rise in sea level and accelerating coastal erosion. It has stated that sea level in Lakshadweep has risen to 0.6 m in the last 20 years.

- This will not only cause a loss in livelihood to the native people but also loss of biodiversity as a large number of flora and fauna inhabit these Islands along with Particularly Vulnerable Tribal Groups (PVTGs).
- El-Nino event has also weakened coral colonies to a larger extent.

39 MOSAIC EXPEDITION

Context: India's Vishnu Nandan will be the only Indian aboard the multidisciplinary drifting observatory for the Study of Arctic Climate (MOSAIC) expedition.

About:

- The goal of the MOSAiC expedition is to take the **closest look ever at the Arctic as the epicenter of global warming and to gain fundamental insights that are key to better understand global climate change.**
- The Multidisciplinary drifting Observatory for the Study of Arctic Climate expedition is a one-year-long expedition into the Central Arctic, planned to take place from 2019 to 2020. For the first time a modern research icebreaker will operate in the direct vicinity of the North Pole year round, including the nearly half year long polar night during winter.
- During its one-year-long journey, the central expedition ship, the research icebreaker Polarstern from Germany's Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI), will be supported and resupplied by the icebreakers Akademik Fedorov and Admiral Makarov (Russia), Oden (Sweden) and Xue Long II (China).
- The results of MOSAiC mission will contribute to **enhance understanding of the regional and global consequences of Arctic climate change. It will be helpful in understanding the reasons behind the sea-ice loss and improve weather and climate predictions.**

40 11th Southern Ocean Expedition Of Indian Scientists In Antarctic

Context: The 18-member Indian scientific expedition team's 60-day mission onboard research vessel S.A. Agulhas was flagged off from Mauritius.

About:

- The Indian Scientific Expedition to the Southern Ocean (ISESO) 2020, which **aims to improving predictions of future climate changes, was flagged off from Mauritius**
- The two-month-long expedition will be carried onboard the **South-African oceanographic research vessel S.A. Agulhas by an 18-institution team.**
- The mission's objective is to understand **"the role and response of the Southern Ocean to the regional and global climate variability"**. It will investigate air-sea-ice interactions and aerosols over the Southern Ocean (also known as the Antarctic Ocean). The vessel will explore the waters between India and Antarctica.
- The scientific operations for observations pertaining to all disciplines — atmospheric, physical, chemical, biological, geological, air-sea-ice interaction and etc — will be carried out by the scientists and trained engineers during the expedition period.

ECONOMIC GEOGRAPHY

1 Global Carbon Project Report

Context: According to the Global Carbon Project Report, global carbon emissions are an all-time high of 37.1 billion tonnes of CO₂ in 2018. India, the third-highest contributor, saw emissions rise by about 6.3% from 2017 in 2018.

Global Carbon Project Report Highlights:

- Global carbon dioxide emissions rose 1.6% in 2017, and new data indicates emissions could have risen more than 2% in 2018 on the back of sustained increases in coal, oil, and gas use.
- CO₂ emissions have now risen for a second year, after three years of little to no growth from 2014 to 2016. The rise in 2017 was 1.6%.
- The 10 biggest emitters in 2018 are China, the U.S., India, Russia, Japan, Germany, Iran, Saudi Arabia, South Korea, and Canada. The EU as a region of countries ranks third.
- China's emissions accounted for 27% of the global total, having grown an estimated 4.7% in 2018 and reaching a new all-time high.
- Emissions in the U.S., which has withdrawn from its commitment to the **Paris Agreement**, account for 15% of the global total and look set to have grown about 2.5% in 2018 after several years of decline.
- Despite the rapid deployment in low carbon technologies in India, emissions are expected to grow a solid 6.3% in 2018, pushed by the strong economic growth of around 8% per year. Coal is still the mainstay of the Indian economy, and it will be a challenge for solar and wind to displace coal given the strong growth in energy use.
- Limiting global warming to the 2015 Paris Agreement goal of keeping the global temperature increase this century to well below 2°C would need carbon dioxide emissions to decline by 50% by 2030 and reach net zero by about 2050.
- Also, the IPCC Special Report reveals that at the current rate of emissions, the world is set to breach **the global warming limit of 1.5 degrees Celsius goal set in the Paris Agreement between 2030 and 2052**. At present, the world is 1.2°C warmer compared to pre-industrial levels.

2 India observer at Arctic Council

Context: Recently, at the Arctic Council ministerial meeting at Rovaniemi, Finland, India was re-elected as an Observer to the Arctic Council.

More on News:

- India was first granted the Observer status in 2013, along with five other nations.
- As an Observer, **India will not be allowed to take part in the active meetings** but will participate in side events.
- China, South Korea, Singapore, Italy, and Japan also have Observer status at the Council.
- At the meeting, the chairmanship of the Council was passed from Finland to Iceland.

Arctic Council:

- Established through the **Ottawa Declaration of 1996**, it is an informal intergovernmental forum to promote cooperation in regulating the activities in the Arctic region.
- It consists of:
 - Member nations: Eight nations that have territories in the Arctic, namely, Russia, the United States, Canada, Norway, Denmark, Sweden, Iceland, and Finland.
 - Permanent Participants: Six organisations representing the indigenous people of the Arctic region.
 - Observers: Observer status in the Arctic Council is open to non-arctic states, inter-governmental and inter-parliamentary organizations, global and regional, and non-governmental organizations

Article Circle

- It is at approximately 66°30' N.
- Due to the Earth's inclination of about 23 1/2° to the vertical, it marks the southern limit of the area within which, for one day or more each year, the Sun does not set (about June 21) or rise (about December 21).
- The length of continuous day or night increases northward from one day on the Arctic Circle to six months at the North Pole.
- The Antarctic Circle is the southern counterpart of the Arctic Circle, where on any given date conditions of daylight or darkness are exactly opposite.
- The region has become an arena of global power and competition" owing to vast reserves of oil, gas, minerals and fish stocks.

Arctic and India

- India is one of the very few countries to set up a permanent station in the Arctic for scientific research.
- The Himadri research station, located in Ny Alesund, Svalbard in Norway, about 1200 km south of the North Pole, was started in July 2008.
- The Goa-based National Centre for Antarctic and Ocean Research (NCOAR) is the nodal organisation coordinating the research activities at this station.

3 Japan resumes Commercial Whaling

Context: Japan recently has resumed commercial whaling after leaving International Whaling Commission last year.

More on News:

- **Reasons for withdrawal cited by Japan**
 - With a moratorium in effect for more than 30 years, populations of endangered whale species will have had plenty of time to regenerate.
 - 'Fundamental differences' among members have led the whaling commission to what it calls a dead end.
 - Pressure from local fishermen to restart commercial whaling.

- ▶ Whaling is deeply ingrained in Japanese culinary culture, dating back as far as the earliest historical era of the Jomon Period (10,000-200 B.C.). Whale meat also served as critical sources of protein in the post-war period as the nation grappled with poverty.
- ▶ The other two countries that still hunt whales commercially are Norway and Iceland.

• **International Whaling Commission (IWC)**

- ▶ IWC is the global body charged with the conservation of whales and the management of whaling. Currently, it has 89 members.
- ▶ All members are signatories to the International Convention for the Regulation of Whaling. This Convention is the legal framework that established the IWC in 1946.
- ▶ Uncertainty over whale numbers led to the introduction of a 'moratorium' on commercial whaling in 1986. This remains in place although the Commission continues to set catch limits for aboriginal subsistence whaling.
- ▶ Today, the Commission also works to understand and address a wide range of non-whaling threats to cetaceans including entanglement, ship strike, marine debris, climate change, and other environmental concerns.

4 **MECOS 3: Global Marine Ecosystem Meet in Kochi**

Context: Recently, the third international conference on Marine Ecosystems-Challenges and Opportunities (MECOS) was held in Kochi in January 2019.

More on News:

- The conference is aimed at reviewing the concerns involved in the marine ecosystem and formulating strategies for the better and sustainable utilisation of marine wealth by enhancing livelihood options.
- The symposium is organized by the **Marine Biological Association of India**.
- It will also serve as a platform for discussions on a range of topics, including the impact of the climate crisis on marine ecosystems and unusual warming of the Arabian Sea.
- The conference would focus on the **Sustainable Development Goal of the United Nations, SDG-14** which says '**conserve and sustainably use the oceans and its resources for sustainable development**'.
- **It also aims to create an active interest among its members in the field of marine biology and allied marine sciences.**

Marine Biological Association of India

- The Marine Biological Association of India was established in the year **1958**.
- It serves the cause of the **promotion of research on marine sciences in the Asia-Pacific region**.

5 **Disaster resilience in risk-prone Asia needs realistic policy and financial planning**

Context: As per the new Asian Development Bank (ADB) report, four in five people affected by natural disasters are in Asia, putting the region's prosperity at risk.

More on News:

- The report is published under ADB's flagship Asian Development Outlook (ADO) 2019. It released ahead of the biennial global platform for Disaster Risk Reduction (DRR) scheduled in May 2019 — is very well-timed and deserves to be discussed on behalf of the Asian nations to strengthen disaster resilience in the region.

Key Findings:

- With nearly 38,000 disaster fatalities per year between 2000 and 2018, the region accounted for 55 percent of the 60,000 disaster fatalities across the world.
- The region also accounted for 26 percent of the \$128 billion in economic damage due to natural disasters.
- In Asia, 82 percent of the disasters ensued from extreme weather events such as floods, storms, and droughts.

Who suffers the most?

- It has been recognised that the poor suffer the maximum brunt of natural catastrophes.
- A survey conducted across five Asian countries found that, among the rural households surveyed, 90 percent suffered either loss of life or significant damage to assets from floods in the past decade, and their financial recovery took more than three times longer compared to urban households.
- The ADB report highlights case studies from Indian cities like Mumbai, Chennai, and Puri, which show that in the absence of social protection; disaster-hit families deplete their savings or borrow at high-interest rates from informal sources, pushing them into indebtedness and poverty traps.

Funding needed to strengthen disaster resilience

- Asia is projected to need 26 trillion in infrastructure investment between 2016 and 2030, or 26 trillion in infrastructure investment between 2016 and 2030, or 1.7 trillion per year.
- Hence, planning for and investing in climate-friendly and disaster-resilient infrastructure from the start will be a cost-effective way to reduce future losses.
- The report calls upon international agencies for more financial support.
- At present, international agencies provide seven times more assistance to the developing countries to respond to disasters after they occur than fund preparation programmes beforehand.
- Even though many countries in the region are adopting the **Sendai Framework for Disaster Risk Reduction 2015-2030**, the increasingly high losses from such disasters need effective actions too.
- It also urges governments in the region to work on realistic policy and budget planning.

Sendai Framework

- It is the first major agreement of the post-2015 development agenda, with seven targets and four priorities for action.
- It was endorsed by the UN General Assembly following the 2015 third UN World Conference on Disaster Risk Reduction (WCDRR).
- It is a 15-year, voluntary, non-binding agreement.
- UNISDR has been tasked to support the implementation, follow-up, and review of the Sendai Framework.
- **Aim:** The substantial reduction of disaster risks and losses in lives, livelihoods, and health and the economic, physical, social, cultural and environmental assets of persons, businesses, communities, and countries.
- The Sendai Framework is the successor instrument to the Hyogo Framework for Action (HFA) 2005-2015: Building the Resilience of Nations and Communities to Disasters.

- It suggests that Asian nations integrate disaster risk reduction into national development and investment plans, and spend more on prevention.

Insurance against catastrophes

- According to the report, although climate change is spurring more natural hazards and rapid urbanisation is increasing exposure to such hazards, only around 8 percent of Asia's catastrophe losses since 1980 have been covered by insurance.
- Many developing countries in Asia now boast of multiple disaster insurance schemes, including 15 in India, but the effectiveness of such schemes needs to be prioritised.
- **Southeast Asia Disaster Risk Insurance Facility (SEADRIF)** — Asia's first regional facility to provide climate and disaster risk financing and insurance solutions, including a regional catastrophe risk insurance pool — was established nearly four months ago.

6 The Montreal Protocol

Context: The year 2019 celebrates over three decades of remarkable international cooperation to protect the ozone layer and the climate under the Montreal Protocol.

What is the Montreal Protocol?

- The Montreal Protocol is an international environmental agreement with universal ratification which was adopted in 1987 to protect the earth's ozone layer by eliminating the use of ozone-depleting substances (ODS).

Positive outcomes of the Montreal protocol:

- The Montreal Protocol has led to the phase-out of 99 percent of ozone-depleting chemicals in refrigerators, air-conditioners and many other products.
- The latest Scientific Assessment of Ozone Depletion completed in 2018, shows that, as a result, parts of the ozone layer have recovered at a rate of 1-3% per decade since 2000.
- At projected rates, Northern Hemisphere and mid-latitude ozone will heal completely by the 2030s. The Southern Hemisphere will follow in the 2050s and Polar Regions by 2060.
- Ozone layer protection efforts have also contributed to the fight against climate change by averting an estimated 135 billion tonnes of carbon dioxide equivalent emissions, from 1990 to 2010.

Ozone layer

- Atmospheric ozone concentrated in a layer in **stratosphere**.
- About 9 to 18 miles above Earth's surface.
- Absorbs a range of ultraviolet energy
- Weakening ozone layer causes skin cancer, cataracts and impairs immune systems.

Ozone Depleting Substances:

- Chlorofluorocarbons; Hydrochlorofluorocarbons; Carbon tetrachloride; Methyl chloroform; Methyl chloroform; Halons; Methyl bromide

7 Goldschmidtite

Context: A new, curious mineral has been discovered inside a diamond unearthed from a mine in South Africa.

More on News:

- The mineral has been named goldschmidtite, after Victor Moritz Goldschmidt, the Norwegian scientist acknowledged as the founder of modern geochemistry.
- Goldschmidtite has an unusual chemical signature for a mineral from Earth's mantle
- While the mantle is dominated by elements such as magnesium and iron, goldschmidtite has high concentrations of niobium, potassium and the rare earth elements lanthanum and cerium.

8 Geo-engineering

Context: With the intensified debate on climate change, alternate methods like geoengineering can be considered.

More on News:

- Also known as "**climate engineering**", geo-engineering is the intentional large-scale intervention in the Earth's climate system to counter climate change.
- It includes techniques to **remove carbon dioxide** from the atmosphere and technologies to rapidly **cool the Earth by reflecting solar energy** to space.

Types of geoengineering proposals

- **Carbon dioxide removal techniques (CDR):** Techniques to remove carbon dioxide from the atmosphere.
- **Ocean fertilisation using phytoplankton and iron:**
 - ▶ Phytoplankton in the ocean use photosynthesis to capture CO₂.
 - ▶ When they die, they **sink deep** into the ocean, taking all that CO₂ with them.
 - ▶ Phytoplankton **needs iron to grow**.
 - ▶ Increasing the ocean's iron content will cause the phytoplankton population to increase, thereby removing more CO₂.
- **Biochar Production:**
 - ▶ Biochar is a type of charcoal made from animal wastes and plant residues (such as wood chips, leaves, and husks) which can **sequester carbon by circumventing the normal decomposition process** or acting as a fertilizer to enhance the sequestration rate of growing biomass.
- **Artificial trees:**
 - Artificial trees essentially would be a series of **sticky, resin-covered filters** that would **convert captured CO₂ to a carbonate called soda ash**.
 - Periodically, the soda ash would be washed off the filters and collected for storage.
- **Carbon filtering:**
 - ▶ Carbon burial: For example; **burning large quantities of wood in power plants** with carbon-capture technology, grazing cattle in a way designed to turn **grasslands into giant carbon sinks**, or **converting CO₂ into stones**.
 - ▶ Direct Air Capture: This technology uses huge fans to **suck air through a filter to which CO₂ chemically bonds**. When heated, the filter releases the CO₂, which can then be sold for other uses, such as growing vegetables in greenhouses, making carbonated drinks or even fuel.
 - ▶ **Solar geoengineering, or "solar radiation management" (SRM);** technologies to rapidly cool the Earth by reflecting solar energy to space.

- **Stratospheric aerosol injection:**

- ▶ The idea is to **simulate the cooling effects of volcanic eruptions**, and enhancing the reflectivity of marine clouds.
- ▶ When volcanoes erupt, they spread into the atmosphere tiny particles, commonly known as **"aerosols."**
- ▶ Light-coloured aerosol particles can reflect incoming energy from the sun in cloud-free air, and dark particles can absorb it.
- ▶ A small fleet of aircraft, for example, could **conceivably inject sulphate-aerosols or other reflecting particles into the stratosphere** and drive large-scale cooling.

- **Marine cloud brightening:**

- ▶ Another idea is to increase the **Earth's 'albedo'**, which is the measure of the amount of solar radiation the planet reflects than it absorbs.
- ▶ Because **whiter surfaces reflect more light** than darker ones, a whiter Earth will reflect more of the Sun's energy into space, helping to keep temperatures cooler.
- ▶ One way to do this is to **make clouds brighter and whiter.**
- ▶ This can be done by **spraying seawater into clouds over the ocean.** The saltwater will cause them to grow bigger and brighter.
- ▶ Other proposals to increase the Earth's albedo **include painting houses white, planting crops that are pale** and perhaps even laying out **reflective sheets in deserts.**

- **Cirrus cloud thinning (CCT):**

- ▶ CCT is almost the **opposite of marine cloud brightening.** High-altitude Cirrus clouds are thin and wispy, so they don't reflect much solar radiation into space, and instead trap long-wave radiation on earth.
- ▶ CCT proposes **thinning** them further **through cloud seeding, letting more long-wave radiation escape.**
- ▶ The **problem** with CCT is that the cloud seeding can have the exact opposite effect, **thickening the Cirrus formations.**

- **Space reflectors:**

- ▶ Technologies like **giant mirrors in space or umbrellas in orbit** can be built to reflect sunlight away and keep the planet cooler.

9

Eurasian Resources and CNMC firms eye Vedanta's Zambia Arm

Context: Eurasian Resources and China Non-Ferrous Metals (or CNMC), which already have copper assets in Zambia and Congo, expressed their interest in buying Konkola Copper Mines (KCM), in case the Zambian government seizes it from Vedanta Resources Ltd.

More on News:

- **Zambia is Africa's second-largest copper producer** and copper exports account for 70% of its total export earnings and 12.2% of its gross domestic product.
- According to the Zambian government, "Many companies" are interested in taking over Konkola Copper Mines.
- The government has accused KCM of breaching its operating license, while the company says it is a "loyal investor" that's spent more than \$3 billion in the country since 2004.

- Many mining operations do not yet pay tax on profits because they say they are still paying off capital expenditure, and the government is keen to increase its tax take.
- Eurasian Resources declined to be identified by name. CNMC also wanted to buy the assets. The Chinese company offered to spend \$2.5 billion on development.

Konkola Copper Mines

- KCM and its resources are at stake. It is one of the world's richest and wettest deposits, which stretch from Zambia's Copper-belt region into the southern Democratic Republic of Congo.
- KCM's flagship operation is Konkola Deep with 140 Olympic-sized swimming pools worth of water having to be pumped to the surface daily. The ore bodies also contain cobalt, a prized metal that's used in rechargeable batteries that power mobile phones and electric cars.

10 Deep-sea Mining

Context: According to a report by Greenpeace, deep-sea mining is threatening international waters. It also questions the role of the International Seabed Authority (ISA).

More on News:

- Only 1% of international waters are properly protected from multiple industrial activities in the absence of a **global ocean treaty**.
- This report stressed the fact that if deep-sea mining continues on a large scale without any proper protection, **it can ruin species and ecosystems**.
- If the ecosystem under the sea is devastated, it is not clear if it can be restored. The report cited examples of cold-water coral reefs devastated by bottom trawling in the 1960s.

International Seabed Authority (ISA)

- The ISA was established in 1982 by the **United Nations Convention on the Law of the Sea (UNCLOS)** and is an autonomous intergovernmental body with 167 members. The ISA is responsible for the mineral resources and the marine environment in the Area.
- The ISA considers applications for **exploration and exploitation of deep-sea resources** from contractors, assesses environmental impact assessments and supervises mining activities in the 'Area'.
- It has granted 29 exploration contracts for industrial-level mining of poly-metallic nodules, sulphides, and cobalt-rich ferromanganese crusts.
- These contracts are spread over around a million square kilometres of the international seabed. Countries sponsoring these activities include the United Kingdom, China, France, Belgium, India, Germany, and Russia.

Greenpeace

- It is a non-profit organisation, with a presence in 40 countries across Europe, the Americas, Asia, and the Pacific.
- **To maintain its independence, it does not accept donations from governments or corporations but relies on contributions from individual supporters and foundation grants.**
- In pursuing its mission, it has no permanent allies or enemies. It promotes open, informed debate about society's environmental choices.
- It has a general consultative status with the United Nations Economic and Social Council.

11 Marine Debris

Context: Under the Ocean Cleanup project, a floating device designed to catch plastic waste has been redeployed in a second attempt to clean up an island of trash swirling in the Pacific Ocean between California and Hawaii.

More on News:

- **Marine debris**, including plastics, paper, wood, metal, and other manufactured materials are **found** on beaches worldwide and **at all depths of the ocean**.
- About 80% of **marine debris originates from sources on land** and the other 20%, about 636,000 tons per year, comes from ocean vessels.
- The world produces 300 million **tons of plastic** each year, but only about 10% is recycled. The rest is dumped, landfilled or escapes as trash into landscapes, lakes, rivers, and the ocean.
- About 7 million tons end up in the ocean each year, **making up roughly 75% of all marine debris**.
- Microplastics, in the millimeter size range, come mainly from the breakdown of larger pieces of plastic.
- They comprise most of the plastic in the oceanic '**garbage patches**.'
- There is no way to get **nanoplastics and microplastics** out of the ecosystem, but both enter food webs because they are ingested by filter feeders and small fish, which gain no nutritional value.
- They soak up toxins that leach from the particles or adsorb onto them, which scientists suggest can be passed on to humans as well as other wildlife.

12 Coastal Regulation Zone

Context: Supreme Court has ordered the demolition of Maradu Apartments in Kerala for violation of **Coastal Regulation Zone (CRZ) norms**.

More on News:

- Under the Environment Protection Act, 1986, Ministry of Environment, Forest and Climate Change issued a notification in 1991, for the regulation of activities in the coastal area.
- **Coastal Regulation Zone (CRZ) is the area up to 500m from the high-tide line and a stage of 100m along banks of creeks, estuaries, backwater and rivers subject to tidal fluctuations.**
- CRZ Rules **govern human and industrial activity close to the coastline, to protect the fragile ecosystems near the sea.**
- The Union Ministry of Environment, Forest and Climate Change has notified the 2019 Coastal Regulation Zone (CRZ) norms, replacing the existing CRZ norms of 2011.
- The new CRZ norms **aim to promote sustainable development based on scientific principles.**
- Coastal Regulation Zones (CRZ) 1991 notification gave **fourfold classifications** of coastal areas.
 - **CRZ-1:** These are ecologically sensitive areas as they help in maintaining the ecosystem of the coast. They lie between low and high tide lines. Exploration of natural gas and extraction of salt are permitted
 - **CRZ-2:** These areas are urban areas located in the coastal areas. Now under new coastal zone regulations 2018, the floor space index norms have been de-frozen.

- ▶ **CRZ-3:** rural and urban localities that fall outside the 1 and 2. Only certain activities related to agriculture even some public facilities are allowed in this zone
- ▶ **CRZ-4:** this lies in the aquatic area up to territorial limits. Fishing and allied activities are permitted in this zone. Solid waste should be let off in this zone. This zone has been changed from 1991 notification, which covered coastal stretches in islands of Andaman & Nicobar and Lakshadweep

13 Zero budget natural farming (ZBNF)

Context: In the recent Union Budget of 2019, the ZBNF model has been emphasised, which can help in doubling farmers' income. **Andhra Pradesh and Himachal Pradesh** have been shifted towards this model.

What is ZBNF?

- It is a method of **chemical-free agriculture** drawing from traditional Indian practices.
- Using cow dung, urine-based formulations and botanical extracts would help farmers in reducing the input cost.
- **Intercropping with leguminous crops** is one of the components of ZBNF and it improves the crop productivity and soil fertility by way of fixing the atmospheric nitrogen.
- It promotes soil aeration, minimal watering, intercropping, bunds, and topsoil mulching and discourages intensive irrigation and deep ploughing.

Components of ZBNF

- **Jeevamrutha:** It is a fermented **microbial culture** that uses urine and dung from an indigenous cow breed and paste of green gram to rejuvenate the soil to **provide micro-nutrients to crops**.
- **Bijamrita:** It is a treatment used for seeds, seedlings or any planting material.
- **Acchadana:** It promotes mulching and soil aeration for favourable soil conditions.
- **Whapasa:** It provides moisture to the soil.

14 Pradhan Mantri Kisan Samman Nidhi (PM-KISAN)

Context: Recently, the Government has launched the "Pradhan Mantri Kisan Samman Nidhi (PM-KISAN)" programme to provide assured income support to the small and marginal farmers.

Features of the programme

- Vulnerable landholding farmer families, having cultivable land upto 2 hectares, will be provided direct income support at the rate of Rs 6,000 per year.
- Income support will be transferred directly into the bank accounts of beneficiary farmers, in three equal installments of Rs 2,000 each.
- This programme will entail an annual expenditure of Rs 75,000 crore and will be funded by the Government of India. Around 12 crore small and marginal farmer families are expected to benefit from this.
- It came into effect on 1st December 2018 and the first installment for the period upto 31st March 2019 would be paid during this year itself.

Other Important Income Support Schemes for Farmers

- **Rythu Bandhu scheme (Telangana)/Farmers' Investment Support Scheme (FISS).**
 - ▶ It is a welfare program to support farmer's investment for two crops a year.
 - ▶ The government is providing 58.33 lakh farmers, Rs. 4000 per acre per season to support the farm investment, twice a year, for rabi and kharif seasons.
 - ▶ This was the first direct farmer investment support scheme in India, where the cash is paid directly.
- **Krushak Assistance for Livelihood and Income Augmentation (KALIA):**
 - ▶ State Government of Odisha aims to lend farmers with an all-inclusive and flexible support system, ensuring accelerated agricultural prosperity.
 - ▶ It will cover 92% of the small and marginal farmers of the State. An amount of Rs. 10,000 per family at the rate of Rs. 5,000 for Kharif and Rabi shall be provided as financial assistance for taking up cultivation.
 - ▶ The farmers will have complete independence to take up interventions as per their needs.
 - ▶ This component is not linked to the extent of land owned and will greatly benefit sharecroppers and actual cultivators most of whom own a very small extent of land.

15 Pradhan Mantri Kisan Maan Dhan Yojana (PM-KMY)

Context: Prime Minister Narendra Modi launched the Pradhan Mantri Kisan Maan Dhan Yojana at Ranchi, Jharkhand.

Key features of the Scheme:

- The PM-KMY is a **Central Sector Scheme**, administered by the **Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers' Welfare**, Government of India in partnership with the **Life Insurance Corporation of India (LIC)**.
- **The Life Insurance Corporation of India (LIC) shall be the Pension Fund Manager** and responsible for Pension payout.
- The Pradhan Mantri Kisan Maan-Dhan Yojana (PM-KMY) provides for an **assured monthly pension of Rs. 3000/- to all landholding Small and Marginal Farmers (SMFs)**, whether male or female, on their attaining the age of 60 years.
- The amount of the **monthly contribution ranges between Rs.55 to Rs.200 per month** depending upon the age of entry of the farmers into the Scheme.
- The **Central Government will also make an equal contribution** of the same amount in the pension fund.
- **The spouse is also eligible to get a separate pension of Rs.3000/-** upon making separate contributions to the Fund.
- In case of the death of the farmer before retirement date, the spouse may continue in the scheme by paying the remaining contributions till the remaining age of the deceased farmer.
- If the farmer dies after the retirement date, the spouse will receive 50% of the pension as Family Pension.
- After the death of both the farmer and the spouse, the accumulated corpus shall be credited back to the Pension Fund.

- All Small and Marginal Farmers (SMFs) in all States and Union Territories of the country, **who are of the age of 18 years and above and upto the age of 40 years**, and who do not fall within the purview of the exclusion criteria as mentioned in the guidelines, are eligible to avail the benefits of this Scheme by joining it.

16 Kisan Credit Card

Context:

- The Indian Banking Association (IBA) has issued advisory guidelines requesting banks to waive off the processing, documentation, inspection, ledger folio charges and all other service charges for Kisan Credit Card (KCC) /crop loans upto 3 Rs lakh.
- Ministry of Agriculture has launched a campaign for enhanced registration of Kisan Credit Cards to those who have remained untouched by it so far.

More on News:

- The IBA advisory comes amidst reports that some of the scheduled commercial banks are collecting service charges which are at a bit higher, irrespective of whether the loan is sanctioned or not.
- This often acts as a deterrent for the farmers to approach the banks for loans.

What is KCC?

- The scheme was introduced in 1998 to facilitate and make accessible credit availability to the farmers.
- It is issued based on the landholdings so that the farmer can avail credit for the purchase of agriculture input such as Seeds, Fertilizers, Pesticides, and other production needs.
- GOI provides interest subvention of 2% and **Prompt Repayment Incentive** of 3% to the farmers, thus making the credit available at a very subsidized rate of 4% per annum.
- There are around 6.95 crore active KCCs as per latest estimates

17 National Rural Economic Transformation Project

Context:

- The Union Cabinet approved the implementation of an externally aided project namely the National Rural Economic Transformation Project (NRETP).
- It will be implemented under the Deendayal Antyodaya Yojana – National Rural Livelihoods Mission (DAY-NRLM) through loan assistance (IBRD Credit) from the World Bank.

More on News:

- The development objective of the NRETP for **India is to establish efficient and effective institutional platforms** of the rural poor to enable them to increase household income through sustainable livelihood enhancements and improved access to financial and selected public services.
- The additional financing will bring the following changes:
 - The results target and the intermediate indicators are updated to reflect the changes introduced by the AF

- The project will co-locate areas for investment with those selected under mission Antyodaya
- The project will update the following components-
 - Institutional and human capacity development
 - State livelihood support
 - Innovation and partnership support

Aajeevika - National Rural Livelihoods Mission (NRLM)

- It was launched by the **Ministry of Rural Development** in June 2011.
- Aided in part through **investment support by the World Bank**, the Mission aims at creating efficient and effective institutional platforms of the rural poor.
- It is enabling them to increase household income through sustainable livelihood enhancements and improved access to financial services.
- NRLM set out with an agenda to cover 7 Crore rural poor households, across 600 districts, 6000 blocks, 2.5 lakh Gram Panchayats and 6 lakh villages in the country through self-managed Self Help Groups (SHGs) and federated institutions and support them for livelihoods collectives in 8-10 years.
- Also, the poor would be facilitated to achieve increased access to rights, entitlements, and public services, diversified risk and better social indicators of empowerment.
- In November 2015, the program was renamed **Deendayal Antayodaya Yojana (DAY-NRLM)**.

18 Reforms in Agro-Economy

Context: Prime Minister announces a panel with CMs for deep reforms in agriculture.

More on News:

- In the fifth meeting of the Governing Council of NITI Aayog, the focus was on **increasing investment in the agriculture sector, boosting exports, and addressing issues of water supply and conservation**.
- The focus towards reviving the agrarian sector assumes significance as it has been witnessing low farm prices over the past few years leading to several large-scale farm protests.
- The fifth meeting of the Governing Council of the NITI Aayog comes in the backdrop of challenges on the economic front and rising unemployment rates (45-year high of 6.1 %).

Key Points discussed in the meeting:

- **Increasing Exports:**
 - The meeting focused on the need to increase exports and explore the untapped export potential in several states to drive economic growth and this will also provide a boost to both income and employment.
- **Need for structural reform in agriculture**
 - Meeting emphasizes focusing on fisheries, animal husbandry, horticulture, fruits, and vegetables.

- There is a need to boost corporate investment, strengthen logistics and provide ample market support.
- The food processing sector should grow at a faster pace than food grain production.
- The scrapping of the Essential Commodities Act, 1955 because it is thought to be an “impediment in the free movement of commodities” given that the country is now mostly self-sufficient.
- Flagship schemes like **PM-KISAN** should reach intended beneficiaries well within time.
- **Water Supply and Conservation:**
 - Promoting efficient water conservation practices with rain-water harvesting to be undertaken at the household and community level with proactive policy and investment support.
 - Aside from addressing the issue of agriculture, PM also focused on a collective fight against poverty, unemployment, flood, pollution, corruption, and violence. PM also called for effective steps to tackle drought by adopting a ‘**per-drop, more-crop**’ strategy.
 - Meeting also underlined the need for states to focus on their core competencies and work towards increasing the GDP right from the district level so as “**India can become a \$5 trillion economy by 2024.**”
 - PM also announces a panel with CMs for deep reforms in agriculture, which would submit its report in the next few months.
 - Additionally, with parts of India experiencing a drought situation, some States asked for changes in the National Disaster Response Force and State Disaster Response Fund (SDRF) guidelines. They will work with MHA and Agriculture ministry to make changes.

19**Revision and introduction of MSP for Minor Forest Produce items****Context:**

- The Government has revised the Minimum Support Price (MSP) of 23 Minor Forest Produce (MFP) items and introduced MSP for 17 new MFP items.
- The 23 items whose MSP has been revised include those MFP items which have been covered under the scheme since its inception in the year 2013-14.
- The new MFPs include **Mahua flowers (dried), Tejpatta (dried) Kokum (dry), etc.**

What is Minor forest Produce?

- It is a subset of forest produce.
- The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 defines an MFP as all non-timber forest produce of plant origin and includes bamboo, brushwood, stumps, canes, tusser, cocoon, honey, waxes, Lac, tendu/kendu leaves, medicinal plants and herbs, roots and more.

How government secures the livelihood of these tribal communities besides recognising their rights over MFP?

- The GOI has launched a **central sector scheme** for the marketing of **Minor Forest Produce through Minimum Support Price (MSP)** and development of value chain to ensure fair monetary returns to MFP gatherers for their efforts in the collection, primary processing, storage, packaging, transportation, etc.
- The scheme envisages fixation and declaration of MSP for the selected MFP based on the suggestions /inputs received from Tribal Cooperative Marketing Development Federation of India (TRIFED) which came into existence in 1987, and the States concerned.

- Procurement and marketing operation at pre-fixed MSP is undertaken by the designated State agencies.
- TRIFED has also introduced the **MFPnet portal** which is designed to act as an adjunct and a catalyst for implementing the scheme of Minimum Support Price (MSP) for Minor Forest Produce (MFP).
- This portal provides information about TRIFED, MFP trade in India, marketing prospects for MFPs, MFP development training and TRIFED's retail marketing activities, MSP for MFPs and its current status.
- It is intended with the main objective of ensuring fair price to MFP gatherers who are mainly tribals, enhancing their income level and ensuring sustainable harvesting of MFPs.
- It is a one-stop destination for all information needs on MFPs and facilitates stakeholders in MFP trade.

20 New Agri Project- "Green Ag."

Context: The government launched a Global Environment Facility (GEF) assisted project namely, "Green - Ag." in collaboration with the Food and Agriculture Organisation (FAO) during September 2018.

More on News:

- 'Green Ag.' will help in transforming Indian Agriculture for global environmental benefits and the conservation of critical biodiversity and forest landscapes.
- The aim of the project is to **mainstream biodiversity, climate change and sustainable land management objectives and practices into Indian agriculture.**
- **It will also support harmonization between India's agricultural and environmental sector priorities** and investments so that the achievement of national and global environmental benefits can be fully realized without compromising India's ability to strengthen rural livelihoods and meet its food and nutrition security.
- It started in high-conservation-value landscapes of five States including- Madhya Pradesh: Chambal Landscape, Mizoram: Dampa Landscape, Odisha: Similipal Landscape, Rajasthan: Desert National Park Landscape and Uttarakhand: Corbett.
- Key missions that will be targeted for strengthening include the National Mission on Sustainable Agriculture; National Livestock Mission; National Food Security Mission; National Initiative on Climate-resilient Agriculture, National Mission for Horticulture and Rashtriya Krishi Vikas Yojana.

21 Agri-Market Infrastructure Fund

Context: The Cabinet Committee of Economic Affairs recently approved the creation of a corpus of Rs. 2000 crore for Agri-Market Infrastructure Fund (AMIF).

More on News:

- The fund would be created with NABARD for development and up-gradation of agricultural marketing infrastructure in Gramin Agricultural Markets and Regulated Wholesale Markets.
- It will provide the State/UT Governments subsidized loan for developing marketing infrastructure in 585 Agriculture Produce Market Committees (APMCs) and 10,000 Grameen Agricultural Markets (GrAMs).

- States may also access AMIF for innovative integrated market infrastructure projects including Hub and Spoke mode and in Public-Private Partnership mode.
- In these GrAMs, physical and basic infrastructure will be strengthened using MGNREGA and other Government Schemes.
- After approval of the AMIF Scheme, the interest subsidy will be provided by DAC&FW to NABARD in alignment with annual budget releases during 2018-19 and 2019-20 as well as upto 2024-25.
- The Scheme being demand-driven, its progress is subject to the demands from the States and proposals received from them.

What are Grameen Agriculture Markets?

- These are called by varied names like “Gramin Haats, Haats, shandies, painths, and fairs, etc.
- They are owned by Local Bodies (Panchayats/councils), Agricultural/ Horticultural Departments of State Governments, Cooperatives, Marketing Boards/APMCs and Private Sector.
- As per information provided by State Agricultural Marketing Boards/State Governments, there are 22941 Rural Haats.
- State Marketing Boards provided only numbers without other information like location, etc on village haats under local bodies and private sector.

22 Declining Trend in Casual Labour in Agriculture Sector

Context:

- According to a data series released by NSSO, the **share of rural households with major income from casual labour in agriculture decreased by 10 percentage points since 2011-12.**
- There is a drop of 15 million families (from 36 million to 21 million) who were dependent on casual farm work.
- Since 2011-12, India’s national workforce shrunk by 4.7 crore — more than the population of Saudi Arabia.
- **More on News:**
 - It is estimated that 3.2 crore casual laborers lost their jobs in rural India between 2011-12 and 2017-18. Of these, almost 3 crores were those working on farms.
 - This implies that there is a 40 percent shrinkage in the casual farm labor workforce since 2011-12.
 - The basis of the above findings is rooted in the **Periodic Labour Force Survey (PLFS) 2017-2018** report by **NSSO** which the government has declined to release.

What is the Periodic Labor Force Survey (PLFS) of the NSSO?

- One of the major statistical hurdles in our country is the estimation of reliable employment and unemployment data.
- The NSSO (National Sample Survey Office) has historically been conducting Employment and Unemployment Surveys as part of its National Sample Surveys.
- These surveys were the prime source for statistics about the employment and unemployment situation in the country.
- **From 2017 onwards**, a nationwide Labor Force Survey called Periodic Labour Force Survey (**PLFS**) was **launched by the NSSO**.
- The PLFS was aimed to provide quarterly employment and unemployment data. The report of the PLFS was expected in December 2018 but was postponed.

23 Food Processing

Context:

- **Ministry of Food Processing Industries** inaugurated **Computational Modelling and Nanoscale Processing Unit** at the **Indian Institute of Food Processing Technology (IIFPT)** in Thanjavur, Tamil Nadu.
- The Ministry also inaugurated a **National Conference on Emerging Techniques in Food Processing**.

More on News:

- **Computational Modelling and Nano-scale Processing Unit**
 - Modelling is a powerful tool for optimizing and improving process control over various unit operations by acquiring an in-depth understanding of the intricate transport phenomena in food systems.
 - This unit will focus on the application of computational fluid dynamics in various agri-food processing applications.
- **Other steps were taken by the Government of India (GOI) towards food processing**
 - GOI has entrusted specialized agro-processing financial institutions to finance/refinance the food processing sector and has launched neoteric initiatives such as '**Operation Greens**', to monitor price fluctuations.
- **Pradhan Mantri Kisan Sampada Yojna**
 - (PMKSY) is approved by GOI and it is a centrally sponsored scheme under the Ministry of Food Processing Industries. It is a scheme for **Agro-Marine Processing and Development of Agro-Processing Clusters**.
 - It is a big step towards doubling the farmer's income through the assets (Sampada) of the farmer.
 - It is a comprehensive package that will result in the creation of modern infrastructure with efficient supply chain management from farm gate to retail outlet.
 - It will provide a big boost to the growth of the food processing sector in the country and creates huge employment opportunities in the rural areas, reducing wastage of agricultural produce and increasing the food processing level and its export.
- **The following schemes will be implemented under PMKSY:**
 - Mega Food Parks
 - Integrated Cold Chain and Value Addition Infrastructure
 - Creation/ Expansion of Food Processing/ Preservation Capacities (Unit Scheme)
 - Infrastructure for Agro-processing Clusters
 - Creation of Backward and Forward Linkages
 - Food Safety and Quality Assurance Infrastructure
 - Human Resources and Institutions
 - Operation Greens

24 'Meri Fasal Mera Byora'

Context: The Haryana government announced the launch of the 'Meri Fasal Mera Byora' portal whereby farmers can avail benefits of several government schemes directly after uploading their crop-related details.

'Meri Fasal Mera Byora' Portal

- It is a multi-level transparent system and this initiative is a step forward towards **doubling farmer's income by 2022**.
- This simple system will enable farmers to self-report their land and crop details and help them receive the benefits of several government schemes directly.
- The portal, **fasalhry.in**, has brought the **departments of agriculture and farmer's welfare**, revenue, food civil supplies, and consumer affairs and science and technology on a single platform for the betterment of the farmers.
- The portal has been designed to ensure that the farmers get the benefits offered by the State Government including insurance cover, compensation on account of crop damage due to natural calamities and other financial assistance under different schemes.
- Through the portal, the government will also get accurate data of the area and name of crop cultivated in various parts of the state.
- The farmers will be required to upload information like the name of crop sown, the area under cultivation, cropping month, bank account number and mobile number on the portal at the nearby **Common Service Centres (CSCs)** or **Atal Seva Kendras** with the help of **Village Level Entrepreneurs (VLEs)** by July 31.
- The farmer would also be required to fill the details about the non-cultivated land in case he has not sown any crop yet.
- **E-girdawari** (harvest inspection) would be conducted under this system and while conducting girdawari, the concerned officer or official would have to remain physically present at the field.
- Thereafter, the registration would be done by the departments.
- When the crop is ready for harvesting, satellite photography of the field would be conducted by the Science and Technology Department. These images would also be enclosed with their registration. In case any discrepancy is found in the girdawari, a special girdawari would be got conducted by the Deputy Commissioner concerned.
- The financial incentive of Rs 10 per acre or part thereof, subject to a minimum of Rs 20 and a maximum of Rs 50, would be provided to each farmer for registering on the portal.

25 Revision and introduction of MSP for Minor Forest Produce items

Context:

- The Government has revised the Minimum Support Price (MSP) of 23 Minor Forest Produce (MFP) items and introduced MSP for 17 new MFP items.
- The 23 items whose MSP has been revised include those MFP items which have been covered under the scheme since its inception in the year 2013-14.
- The new MFPs include Mahua flowers (dried), Tejpatta (dried) Kokum (dry), etc.

What is Minor forest Produce?

- It is a subset of forest produce.

- The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 defines an MFP as all non-timber forest produce of plant origin and includes bamboo, brushwood, stumps, canes, tusser, cocoon, honey, waxes, Lac, tendu/kendu leaves, medicinal plants and herbs, roots and more.

26 Northeast Gas Grid Project

Context: Recently, the Cabinet Committee on Economic Affairs, chaired by Prime Minister, has given its approval for viability Gap Funding/ Capital Grant of 60% of the estimated cost of Rs. 9,265 crore for the Northeast Gas Grid project to Indradhanush Gas Grid Limited (IGGL) who implements it.

More on News:

- The Northeast Gas Grid Project will connect **Guwahati to the major Northeast cities and major load centers. It is 1, 656 km long.**
- The project is being implemented under the ambitious **Urja Ganga Gas Pipeline Project.**
- Besides connecting all the state capitals in the region, the pipeline will also connect with the National Gas Grid through Barauni-Guwahati Gas Pipeline, which is being laid by GAIL.
- The pipeline will enable the supply of piped cooking gas to households and CNG to automobiles, besides fuel to industry.
- **Implementing Agency:** The North-East pipeline grid is to be implemented by Indradhanush Gas Grid, a joint venture of state-owned GAIL India, Indian Oil Corp (IOC), Oil and Natural Gas Corp (ONGC), Oil India Ltd (OIL) and Numaligarh Refinery Ltd (NRL).

Pradhan Mantri Urja Ganga project:

- The gas pipeline project aims to provide piped cooking gas to residents of Varanasi and later to millions of people in states like Bihar, Jharkhand, West Bengal, and Odisha.
- From Varanasi's perspective, an 800-km long MDPI pipeline will be laid and 50,000 households and 20,000 vehicles will get PNG and CNG gas respectively. The government estimates that around 5 lakh gas cylinders will be sent in rural areas annually.
- According to GAIL, with the Urja Ganga project, 20 lakh households will get PNG connections. The project is said to be a major step towards collective growth and development of the Eastern region of India.
- GAIL has built a network of trunk pipelines covering the length of around 11,000 km. With Urja Ganga project, this number will further increase by 2540 km.

27 Railways' CONCOR begins Coastal Operations

Context: Container Corporation of India Ltd (CONCOR)'s voyage vessel- SSL Mumbai undertook its maiden coastal journey from Kandla Port to Tuticorin Port recently.

More on News:

- The project of which a voyaging vessel is a part is a joint venture of CONCOR and the Ministry of shipping.

CONCOR

- **It was incorporated in March 1988 under the Companies Act** and commenced operation from November 1989.
- From its humble beginning, it is now an undisputed market leader having the largest network of 81 ICDs/CFSs in India (73 terminals and 8 strategic tie-ups).
- In addition to providing inland transport by rail for containers, it has also expanded to cover the management of ports, air cargo complexes and establishing cold-chain.
- It has played an important role in promoting containerization in India through its modern rail wagon fleet, customer-friendly commercial practices, and extensively used Information Technology.

28 Khanij Bidesh India Ltd

Context: Ministry of Mines is setting up a joint venture company namely Khanij Bidesh India Ltd. (KABIL)

More on News:

- It will be set up with the participation of **three Central Public Sector Enterprises** namely,
 - National Aluminium Company Ltd.(NALCO)
 - Hindustan Copper Ltd.(HCL)
 - Mineral Exploration Company Ltd. (MECL)
- It would carry out identification, acquisition, exploration, development, mining, and processing of strategic minerals overseas for commercial use and meeting the country's requirement of these minerals.
- The equity participation between NALCO, HCL, and MECL is in the ratio of 40:30:30

30 National Grid of Ports

Context: Government plans to develop a National Grid for Ports based on the synergy between the major and minor ports in the country.

More on News:

- During the **17th Meeting of Maritime states Development Council (MSDC)**—the apex advisory body for the development of the maritime sector—the government announced a plan to develop a **National Grid for Ports**.
- Out of the 204 minor ports in the country, only 44 are functional; the National Grid for Ports (NGP) **will connect the major and minor ports**.
- Ports have been centres of India's maritime activity in the past; the **objective** is to once again **revive ports as important centres of sea trade**.
- The objective is also to **improve infrastructure** and to reduce and finally **eliminate the human interface**.
- Ministry of shipping is planning a **wider expansion of port capacity** across the country.
- The study on NGP will be different than 'Sagarmala' study.

31 Project Mausam

Context:

- Ministry of Culture has decided to extend Project 'Mausam' up to 2020.
- This project aims to showcase a **Transnational Mixed Route (including Natural and Cultural Heritage) on the World Heritage List of UNESCO.**

Project 'Mausam'

- The project was launched at the 38th World Heritage Session at Doha, Qatar in June 2014.
- This project aims to explore the multi-faceted Indian Ocean 'world' and how the knowledge and manipulation of the monsoon winds have shaped interactions across the Indian Ocean and led to the spread of shared knowledge systems, traditions, technologies and ideas along maritime routes
- Archaeological Survey of India is the nodal agency with research support of the Indira Gandhi National Centre for the Arts (IGNCA) and National Museum as associate bodies.
- It positions itself at two levels:
 - ▶ **Macro-level-** it aims to re-connect and re-establish communications between countries of the Indian Ocean world, which would lead to an enhanced understanding of cultural values and concerns.
 - ▶ **Micro-level-** here focus is on understanding national cultures in their regional maritime milieu.

Indian Ocean countries identified under Project Mausam:

- Bahrain, Bangladesh, Cambodia, China, Comoros, Egypt, Eritrea, French Réunion, Indonesia, Kuwait, Kenya, Lebanon, Madagascar, Malaysia, Maldives, Mauritius, Mozambique, Myanmar, Oman, Pakistan, Philippines, Qatar, Singapore, Sri Lanka, Saudi Arabia, Seychelles, Somalia South Africa, Sudan, Syrian Arab Republic, United Republic of Tanzania, Thailand, Jordan, Turkey, Iran (Islamic Republic), Iraq, United Arab Emirates, Vietnam, and Yemen.

32 Kaleshwaram Project

Context: Recently, the Telangana government inaugurated the **world's largest multi-stage lift irrigation scheme** namely Kaleshwaram Lift Irrigation Project Phase I.

More on News:

- The Kaleshwaram Lift Irrigation Project (KLIP) is a multi-purpose irrigation project on the **Godavari River** in Kaleshwaram, Telangana. The cost of this project is around Rs. 80,500 cr.
- This project is an off-shoot of the original **Pranahitha-Chevella Lift Irrigation Scheme** taken up by the Congress government in 2007 when Andhra Pradesh was not divided.
- With the help of highly advanced **Light Detection and Ranging (LiDAR)** survey and study of flows in the Godavari at different locations, the government separated the original project into two projects- the **Pranahitha project** and **Kaleshwaram project**.

Aim of KLIP

- The main target of this project is to harness the floodwaters of the Godavari River so that Telangana can be made **drought-proof**.

- Under this project, the water of the Godavari will be tapped by reverse pumping and storage which would raise the water level in the whole state and that will lead to refilling thousands of tanks, providing water for industries and supplying drinking water to Hyderabad and Secunderabad by creating a series of storage tanks and a network of pipelines.
- This project has been designed to meet 70% drinking water requirement of the state and to irrigate 45 lakh acres of land for two crops in a year.
- This project will support **Mission Bhagiratha** and **Mission Kakatiya**, which were designed to provide drinking water to many villages and improve the capacities of tanks in the Telangana.

Features of KLIP

- It has the longest tunnel to carry water in Asia, running up to 81 km, between the Yellampally barrage and the Mallannasagar reservoir.
- The project would also utilise the highest capacity pumps, up to 139 MW, in the country to lift water.
- This project has provision for the storage of about 148 tmc ft with plans of utilising 180 tmc ft by lifting atleast 2 tmc ft water every day for 90 flood days.
- The project is designed to irrigate 7,38,851 hectares (over 18.47 lakh acres) uplands in the erstwhile districts of Karimnagar, Nizamabad, Warangal, Medak, Nalgonda, and Ranga Reddy.
- This is the first time the water of the river Godavari has been lifted to the height of 92 meters for the agricultural irrigation and water supply. The maximum height of this water-lifting is 618 meters in Kondapochamma (Telanagana).

Mission Kakatiya

- It is a flagship programme launched by the Government of Telangana.
- The objective of this mission is to enhance the development of agriculture-based income for small and marginal farmers, by accelerating the development of minor irrigation infrastructure, strengthening community-based irrigation management and adopting a comprehensive programme for restoration of tanks.

Mission Bhagiratha

- It is a project for safe drinking water for every village and city household in Telangana.
- The main aim of this mission is to ensure safe and sustainable PIPED drinking water supply from surface water sources and to provide each household with a tap connection.

Light Detection and Ranging

- LiDAR is a surveying method that measures the distance to a target by illuminating the target with pulsed laser light and measuring the reflected pulses with a sensor. Differences in laser return times and wavelengths can then be used to make digital 3-D representations of the target.
- LiDAR sometimes is called 3D laser scanning, a special combination of 3D scanning and laser scanning. It has terrestrial, airborne, and mobile applications.

33 Dam Safety in India

Context: More than 900 people from over 50 villages of Madhya Pradesh staged a dharna outside the Narmada Control Authority (NCA) office in Indore, fearing to flood of their villages if the Sardar Sarovar Dam was filled to its brim.

Types of the dam in India

- **Earth dam:** Earthen dam utilizes natural materials with a minimum of processing. In India, most of the dams are earthen dams.
- **Gravity dam:** A gravity dam is a dam constructed from concrete or stone masonry and designed to hold back water by primarily utilizing the weight of the material. Gravity dams provide some advantages over embankment dams.
- **Composite dam:** It is an earthen dam that is provided with a stone masonry or concrete overflow (spillway) section.

Dam Safety Framework in India

- **National Committee on Dam Safety (NCDS)**

- Constituted by Govt. of India in 1987.
- Chaired by Chairman, CWC and is represented by all the States having a significant number of large dams and other dam owning organizations.
- Suggest ways to bring dam safety activities in line with the latest state-of-art consistent with the Indian conditions.
- Acts as a forum for the exchange of views on techniques adopted for remedial measures to relieve distress in old dams.

- **Central Dam Safety Organization (CDSO)**

- Central Dam Safety Organization was established in CWC, in 1979
- The objective of Central DSO was to:
 - Assist in identifying causes of potential distress;
 - Perform a coordinative and advisory role for the State Governments;
 - Lay down guidelines, compile technical literature, organize training, etc.; and create awareness in the states about dam safety.

- **State Dam Safety Organizations (SDSO)**

- DSO/Cell established in 18 States and 5 dam owning organizations

- **Routine Periodic Inspection**

- Done by trained and experienced engineers from DSO
- At least twice a year: pre-monsoon and post-monsoon
- Examination of the general health of the dam and appurtenant works
- Preparedness of dam and hydro-mechanical structures for handling expected floods

- **Comprehensive Dam Safety Evaluation**

- Once in a 10 year
- More comprehensive examination
- Multi-disciplinary team for a holistic view
- May order additional field and laboratory investigations as well as numerical simulations

34 Polavaram Irrigation Project

Context: The Ministry of Jal Shakti has constituted a committee to examine the cost escalation of the Polavaram irrigation project under the instructions of the Ministry of Finance.

More on News:

- **Revised Cost Committee** has been formed to rework the cost of Polavaram Irrigation Project (PIP) in Andhra Pradesh, under the chairmanship of a joint secretary of the Finance Ministry.
- The revised cost estimates are being assessed by the **Technical Advisory Committee**.
- Ministry of Finance has also asked the state government to soon send an audit of Rs 5,000 crore spent before 2014, as an audit of Rs 3,000 crore spent has been held so far.



Compensation to affected people

- The compensation package of Rs. 6,36,000 has been fixed for per affected family and those whose cattle are also affected, they will get another Rs. 25,000, as per the package decided.
- There is no complaint pending with the Government of India. To ensure the rehabilitation and resettlement of those affected by the project, committees have been formed by state governments and are headed by collectors to look into grievances. Even, a committee has also been set up under the Secretary of Ministry of Tribal Affairs to redress the grievances of tribal people.

Polavaram Irrigation Project (PIP)

- This project is located in the **West Godavari district of Andhra Pradesh**, which will also interlink several rivers in the state.
- It has been accorded national project status by the Centre. Its implementation is monitored by the **Central Water Commission**.
- The project involves relocation of about 50,000 families especially in Khammam, East Godavari and West Godavari districts in Andhra Pradesh, besides 2,000 families in Odisha and Chhattisgarh.

Aim of the Project

- The purpose of this multi-purpose project is to facilitate irrigation and it will also help in the supply of drinking water to Visakhapatnam and water for industrial purposes.
- It also endeavours hydropower to regions of East Godavari, Vishakhapatnam, Krishna and West Godavari districts of Andhra Pradesh.
- It seeks to address the challenges of flooding and droughts witnessed in the respective basins.
- The project also aims to help the Rayalaseema region (comprising Anantapur, Chittoor, Kadapa and Kurnool districts out of the total 13 districts) get more water.

HUMAN GEOGRAPHY

1 World Population Prospects 2019

Context: Recently, the United Nations published a report named World Population Prospects 2019 providing a comprehensive overview of global demographic patterns and prospects.

More in News:

- It is been published by the **Population Division of the UN Department of Economic and Social Affairs**.
- The World Population Prospects 2019 estimates are based on all available sources of data on population size and levels of fertility, mortality and international migration for 235 countries or areas.
- The study stated that the world's population could reach its peak around the end of the current century, at a level of nearly 11 billion.
- The report also confirmed that the world's population is growing older due to increasing life expectancy and falling fertility levels and that the number of countries experiencing a reduction in population size is growing.
- The resulting changes in the size, composition, and distribution of the world's population have important consequences for achieving the Sustainable Development Goals (SDGs), the globally agreed targets for improving economic prosperity and social well-being while protecting the environment.

Key findings of the Report

- The world's population continues to increase, but growth rates vary greatly across regions.
- Nine countries will make up more than half the projected population growth between now and 2050.
- Rapid population growth presents challenges for sustainable development.
- In some countries, the growth of the working-age population is creating opportunities for economic growth.
- Globally, women are having fewer babies, but fertility rates remain high in some parts of the world.
- People are living longer, but those in the poorest countries still live 7 years less than the global average.
- The world's population is growing older, with persons over age 65 being the fastest-growing age group.

- Falling proportions of working-age people are putting pressure on social protection systems.
- A growing number of countries are experiencing a reduction in population size.
- Migration has become a major component of population change in some countries.

Key findings on India by the report:

- India is expected to show the highest population increase between now and 2050, overtaking China as the world's most populous country, by around 2027.
- India, along with eight other countries, will make up over half of the estimated population growth between now and 2050.
- The nine countries expected to show the biggest increase are India, Nigeria, and Pakistan, followed by the Democratic Republic of the Congo, Ethiopia, Tanzania, Indonesia, Egypt and the United States of America.
- Health experts have called for more investment in the healthcare sector in India.
- The employment rates are going down in India and with more younger people, India won't be able to absorb them in the workforce and won't be able to reap the benefits of its demographic dividend.

2 World Cost of Living Survey 2019

Context: The Economist Intelligence Unit has released the report of the Worldwide Cost of Living Survey 2019.

World Cost of Living Report:

- The Worldwide Cost of Living is a **biannual Economist Intelligence Unit survey** that compares more than 400 individual prices across over 150 products and services in cities around the world.
- These include food, drink, clothing, household supplies, and personal care items, home rents, transport, utility bills, private schools, domestic help, and recreational costs.

Highlights of the Report:

- For the first time, three cities share the title of the world's most expensive city – Singapore, Hong Kong, and Paris.
- This year's top ten is largely split between Asia and Europe, with Singapore representing the only city that has maintained its ranking from the previous year.
- Three Indian cities - New Delhi, Bengaluru, and Chennai are among the cheapest cities in the world.
- India is tipped for rapid economic expansion, but in per-head terms, wage and spending growth will remain low. Income inequality means that low wages are the norm, limiting household spending and creating many tiers of pricing as well as strong competition from a range of retail sources.

Economic Intelligence Unit

- It is the world leader in global business intelligence.
- It helps businesses, the financial sector and governments to understand how the world is changing and how that creates opportunities to be seized and risks to be managed.
- It helps to produce the highest-quality research, analysis and data about countries, cities, industries, and companies, and our consultancy, advisory and networking solutions help our clients to understand and navigate the toughest business challenges.

- Moreover, in India cheap and plentiful supply of goods into cities from rural producers with short supply chains as well as government subsidies on some products, has kept prices down, especially by Western standards.
- Syria's capital, Damascus is the cheapest city in the world. Joining Damascus at the bottom is Venezuela's capital, Caracas and Kazakhstan's business centre, Almaty, in the second and third positions respectively.
- Others in the 10 cheapest cities list include Lagos at the 4th place, Bengaluru (5th), Karachi (6th), Algiers (7th), Chennai (8th), Bucharest (9th) and New Delhi (10th).
- Although the Indian subcontinent remains structurally cheap, instability is becoming an increasingly prominent factor in lowering the relative cost of living of a location. This means that there is a considerable element of risk in some of the world's cheapest cities.
- Singapore retained its title as the world's most expensive city for the fifth consecutive year. Singapore was ranked ahead of Paris placed second on the list, Zurich (3rd) and Hong Kong (4th).

3 Global Population Summit in Nairobi

Context: The Nairobi Summit of International Conference on Population and Development (ICPD25) wrapped up in Nairobi with more than 9,500 delegates from 170 countries, adopting 12 resolutions to promote reproductive health for women and girls.

About:

- This year marks the **25th anniversary of the ground-breaking International Conference on Population and Development (ICPD)**, which took place in Cairo in 1994.
- The world is aiming to achieve the United Nations Sustainable Development Goals by 2030, and universal sexual and reproductive health is central to much of this agenda – ending poverty, security good health and well-being, realizing gender equality and achieving sustainable communities, among many other goals. Urgent and sustained efforts to realize reproductive health and rights are crucial.
- Amid a loud domestic chorus demanding punitive actions to control population, at a global forum, India reiterated to guarantee voluntary and informed choices of contraception.
- India also said it would increase its basket of contraceptives and improve the quality of family planning services.
- Some 25 years ago, India had committed to a similar approach to population control at the International Conference on Population and Development (ICPD) in Cairo. The country was among 179 countries that called for the empowerment of women and girls in all spheres.
- The recent move, however, on the back of the Government of Assam announcing a two-child limit for eligibility in government jobs. This has widely been seen as a punitive measure.
- For a country that would surpass China and become the world's most populous country by 2027, the idea of punitive action to control the population is not new. Despite India's commitment to an international platform, many states have taken steps to formalise population control through penal provisions.

4

World Migration Report 2020 and the trend of migration globally**Issue:**

- At 17.5 million, Indian diaspora largest in the world: UN report. The Global Migration Report 2020 highlighting the international migrants stock was recently released.
- It is released by the **UN-affiliated International Organization for Migration (IOM)**.

Top destinations

- The top destination for international migrants in the US where, as of September 2019, there were 50.7 million international migrants.
- The US remained the top remittance-sending country (68.0 billion) followed by the United Arab Emirates (44.4 billion) and Saudi Arabia (\$36.1 billion).
- The US is followed by Germany, Saudi Arabia, the Russian Federation, and the UK.
- Gulf countries have some of the largest numbers of temporary labour migrants in the world, including the United Arab Emirates, where they make up almost 90 percent of the population.

Indian case:

- India continues to be the largest country of origin of international migrants with a 17.5 million-strong diaspora across the world.
- It received the highest remittance of \$78.6 billion from Indians living abroad
- After India, the largest number of migrants living abroad is followed by Mexico (11.8 million), and China (10.7 million).

International Organization for Migration (IOM)

- It provides services and advice concerning migration to governments and migrants, including internally displaced persons, refugees, and migrant workers.
- IOM's stated mission is to promote humane and orderly migration by providing services and advice to governments and migrants.
- IOM works to help ensure the orderly and humane management of migration, to promote international cooperation on migration issues, to assist in the search for practical solutions to migration problems and to provide humanitarian assistance to migrants in need, be they refugees, displaced persons or other uprooted people.

Other Highlights of the report

- Overall figure represents just a tiny fraction of the world's population, although it is a 0.1 percent increase on the level indicated in its last report, published two years ago.
- More than half of all international migrants (141 million) live in Europe and North America.
- In Africa, Asia, and Europe, most international migrants stay within their regions of birth, but the majority of migrants from Latin America and the Caribbean and North America do not.
- IOM's Internal Displacement Monitoring Centre highlighted that a total of 41.3 million people were forced to flee their homes at the end of 2018 a record since monitoring began in 1998.
- Turning to the impact of climate and weather disasters, the report notes that Typhoon Mangkhut in the Philippines contributed to the fact that 3.8 million people were newly displaced there at the end of 2018, the largest number globally.

5

Migration in India**Context:**

- Recently Census 2011 released migration data.

- The data has come at a time when migration is a major phenomenon across the world, and “illegal Bangladeshis” is a hot-button political issue in India.

Background:

• Migration:

- According to Registrar General & Census Commissioner, “When a person is enumerated in Census at a different place than his/her place of birth, he/she is considered a ‘migrant’.”
- Migration data began to be collected with the Census of 1872 but was not very detailed until 1961.
- Changes introduced in 1961 continued until 2001; in the Census of 2011, a more detailed format for collecting information on migrants was adopted.

Analysis:

• Key inferences regarding migration from the Census numbers:

- Maharashtra had more migrants from Madhya Pradesh than from Bihar, and Gujarat had almost double the number of migrants from Rajasthan than from Bihar.
- Data from Delhi show only 2,321 persons declared Bangladesh as their last place of residence. Over 1.17 lakh said Pakistan — not surprising given the history of Partition.
- Over **58 crore** Indians were found to be “migrants” for various reasons during the enumeration exercises of Census 2011. The previous Census (2001) had recorded the number of migrants at 31.45 crore — more than 30% lower than the 2011 figure.
- **Marriage and Employment are the major reasons for migration.**
- The bulk of the migration takes place within individual states — out of the total number of persons registered as “migrants” in the 2011 Census, only 11.91% (5.43 crore) had moved to one state from another, while nearly 39.57 crores had moved within their states.
- Only 63% of internal migrants who wanted to work were employed as full-time workers. Another 25% were working on a part-time basis, while 12% were not employed—despite wanting to be employed—at the time of the Census.
- The finding that only two out of three individuals who left their place of birth in search of work had full-time employment underscores the uncertain journey migrant workers make and the vulnerabilities they face, that too in a place away from home.

6 Roma Community

Context:

- Recently during his visit to Romania, Pope Francis apologised to the Roma people on behalf of the Catholic Church.
- He asked forgiveness for “all those times in history when we have discriminated, mistreated or looked askance at you”.

About:

• Who are Roma people?

- They are an Indo-Aryan ethnic group that has come to Europe about 1,500 years ago from the northern Indian subcontinent, from the Rajasthan, Haryana, and Punjab regions of modern-day India.

- ▶ Most of them live in southern and central Europe. The EU lists them as the largest ethnic minority in Europe.
- ▶ Some of them have emigrated to the US and Brazil in the 19th century. There are an estimated one million Roma in the United States and 800,000 in Brazil.

Global efforts for their upliftment

- **World Romani Congress:** It is a series of the forum for discussion of issues relating to Roma people around the world with chief goals - standardization of the Romany language, improvements in civil rights and education, preservation of the Roma culture, reparations from World War II, and international recognition of the Roma as a national minority of Indian origin.
- **European Roma Rights Centre:** It is a Roma-led, international public interest law organisation engaging in a range of activities aimed at combating anti-Romani racism and human rights abuse of Romani.
- **Gypsy Lore Society:** It was founded in Great Britain in 1888 with the goal of promotion of the study of Roma, Gypsies, and Travelers. It is currently headquartered in the US.
- **International Romani Union:** It is an organization active for the rights of the Romani people. Its seat is in Prague.
- **Decade of Roma Inclusion:** It was an initiative of 12 European countries launched in 2005 to improve the socio-economic status and social inclusion of the Romani people across the region.
- **International Romani Day (8 April):** It is a day to celebrate Romani culture and raise awareness of the issues facing Romani people

7 City Momentum Index

Context: American professional services and investment management company Jones Lang LaSalle Incorporated or JLL has released its 6th City Momentum Index.

Highlights:

- Bengaluru is the world's most dynamic city among 131 major established and emerging business hubs globally.
- Closely following Bengaluru is Hyderabad that is ranked second with Delhi (4th), Pune (5th), and Chennai (7th) featuring in the top 10 cities. At 15th position, Kolkata was the sixth Indian city ranked amongst the top 20.
- With 19 of the top 20 cities from the Asia Pacific, the rankings highlight and showcase the region's continued rapid urbanization and strong economic growth.
- Asia continues to show strong momentum, with cities that are successfully expanding their innovation economy punching above their weight in terms of attracting capital, companies, and people.

8 State of Food Security and Nutrition in the World 2019 report

Context:

- The **State of Food Security and Nutrition in the World 2019 report**, released by the **UN Food and Agriculture Organization (FAO)**, estimated that 820 million people worldwide did not have enough to eat in 2018, up from 811 million in the previous year.

- At the same time, the number of overweight individuals and obesity continue to increase in all regions

Highlights of the Report

- The 2019 edition of this report continues to signal that significant challenges remain in the fight against food insecurity and malnutrition in all its forms.
- The number of **obese adults in India has risen by a fourth in four years, from 24.1 million in 2012 to 32.8 million in 2016**, while the country's **undernourished population has dropped by roughly the same fraction in 12 years, from 253.9 million in 2004-06 to 194.4 million in 2016-18**.
- Hunger is on the rise in almost all African subregions**, making Africa the region with the highest prevalence of undernourishment.
- Hunger is also slowly rising in Latin America and the Caribbean**, while Western Asia shows a continuous increase since 2010, with more than 12 % of its population is undernourished.
- The report has a section on economic growth in China and India, and its effect on poverty. Between 1990 and 2017, the two countries had an average GDP per capita growth rate of 8.6 % and 4.5 % respectively.
- In both countries, the increase in GDP per capita has been accompanied by poverty reduction. While China's poverty rate declined from 88 % in 1981 to 0.7 % in 2015, India's poverty reduction appeared to be relatively more modest, moving from 48.9 % in 1987 to 21.2 % in 2011, or 13.4 % in 2015.

HOW INDIA COMPARES WITH THE WORLD				
	Headcount (million)		Prevalence in population (%)	
	India	World	India	World
UNDERNOURISHED				
2004-06	253.9	940.0	22.2	14.4
2016-18	194.4	809.9	14.5	10.7
WASTING (UNDER-5)				
2018	25.2	49.5	20.8	7.3
STUNTING (UNDER-5)				
2018	46.0	149.0	37.9	21.9
OVERWEIGHT (UNDER-5)				
2018	2.9	40.1	2.4	5.9
OBSESE ADULTS				
2012	24.1	563.7	3.0	11.7
2016	32.8	672.3	3.8	13.2

State of Food Security and Nutrition Report:

- This joint report is issued annually by the FAO, the International Fund for Agricultural Development, UNICEF, the World Food Programme and the World Health Organization.
- It presents the latest estimates on food insecurity, hunger, and malnutrition at the global and regional levels.
- The report calls for action to safeguard food security and nutrition through economic and social policies that help counteract the effects of such slowdowns and downturns including guaranteeing to fund social safety nets and ensuring universal access to health and education.

Food and Agriculture Organization (FAO)

- FAO is a specialized agency of the United Nations that leads international efforts to defeat hunger.
- Serving both developed and developing countries, FAO acts as a neutral forum where all nations meet as equals to negotiate arguments and debate policy.
- Nodal Ministry: Ministry of Agriculture**
- Flagship Publication/s:**
 - The State of Food and Agriculture
 - The State of World Fisheries and Aquaculture
 - State of the World's Forests
 - The State of Food Insecurity in the World
 - The State of Agricultural Commodity Markets

9 The State of the World's Children 2019

Context: 'Alarmingly high' number of children malnourished worldwide: UNICEF report

About:

- For the first time in 20 years, UNICEF's flagship report examines the issue of children, food, and nutrition, providing a fresh perspective on a rapidly evolving challenge.
- One-third of children under age 5 are malnourished stunted, wasted or overweight while two-thirds are at risk of malnutrition and hidden hunger because of the poor quality of their diets.
- At the center of this challenge is a broken food system that fails to provide children with the diets they need to grow healthy.
- This report also provides new data and analyses of malnutrition in the 21st century and outlines recommendations to put children's rights at the heart of food systems.

Major Highlights:

- Around 200 million children under-five are either undernourished or overweight, while one-in-three globally - and almost two-thirds of children between the fragile ages of six months to two years - are not fed food that nurtures proper development
- The lack of adequate nutrition increases youngsters' vulnerability to health problems, namely poor brain development, weak learning, low immunity, increased susceptibility to infections and in many cases, premature death.
- Despite growing technological advances to address health and nutrition, the world has lost sight of "the most basic fact: If children eat poorly, they live poorly"
- It is not just about getting children enough to eat; it is above all about getting them the right food to eat.

The problem of 'hidden hunger'

- The report describes the "triple burden" of malnutrition: Undernutrition, overweight, and deficiencies in essential nutrients.
- Hidden hunger is a chronic lack of vitamins and minerals that often has no visible warning signs, so that people who suffer from it may not even be aware of it. Its consequences are nevertheless disastrous: hidden hunger can lead to mental impairment, poor health, and productivity, or even death.
- While 149 million youngsters under-five have stunted growth, 50 million are too thin for their height which is a common sign of undernutrition.
- Though breastfeeding is shown to be lifesaving, only 42 percent of children under six months of age are exclusively breastfed, with a growing reliance on infant formula.
- Breastfeeding has demonstrated it can supply a range of benefits, including lowering the likelihood of infant mortality, being overweight and obese; and improving school performance.

PLACES IN NEWS

1 PM renamed three islands of Andaman and Nicobar

Context: Prime Minister announced new names for three islands of Andaman and Nicobar to honour Netaji Subhash Chandra Bose.

About:

- **Ross Island has been renamed as Netaji Subhash Chandra Bose Dweep, Neil Island as Shaheed Dweep and Havelock Island as Swaraj Dweep.**
- PM hoisted a 150-meter-high national flag at Netaji Stadium, Port Blair to mark the 75th anniversary of freedom fighter Subhash Chandra Bose's declaration of the formation of the Azad Hind government in 1943.
- The three islands are part of the Andamans and all three islands are popular with tourists.
- **Havelock Island** was named after a British general, Sir Henry Havelock, who served in India during the British administration.
- Ross Island was once an important headquarter for the British and the Japanese.

Important facts about Andaman and Nicobar islands:

- There are **572 islands in the territory** having an area of 8,249 km
- The Andaman is separated from the Nicobar group by a channel (the **Ten Degree Channel**).
- The highest point is located in North Andaman Island (**Saddle Peak** at 732 m (2,402 ft)) and 2nd highest in Mount Thullier (Nicobar Islands)
- Climate – Tropical, Temperature - 31° C (maximum) and 23° C (minimum).
- Forest area - 92%
- Andaman and Nicobar Islands have India's best nesting beaches for three species of marine turtles – Hawksbill, Green turtle and **world's largest sea turtle, the Leatherback (Dermochelys Coriacea)**
- North Sentinel Island is home to one of the **most isolated paleolithic tribes (Sentinelese) of the world. Other major tribes are Jarawa, Nicobari and Shompen.**
- **Dugong, the gentle sea cow, is the state animal** of Andaman and Nicobar Islands.
- The **only active volcano in India, the Barren Island**, is present in Andaman Islands.
- **Baratang in Andaman is the only place in India with mud volcanoes.**

- **Jal Hans, India's first commercial seaplane** was launched in the Andaman Islands
- Andaman and Nicobar Island has **India's first and only joint tri-service defence command**

2 Reunion Island

Context: India and France, for the first time, have conducted joint patrols from the Reunion Island, signaling New Delhi's intent to engage with friendly foreign partners in expanding its footprint in the Indian Ocean, focusing on the stretch between the East African coastline and the Malacca straits.

More on News:

- India has so far carried out **Coordinated Patrols (CORPAT)** only with maritime neighbours and had rejected a similar offer by the US.
- **Reunion, a French department in the Indian Ocean**, is an island in the east of Madagascar and 175 km southwest of Mauritius.
- The **island is known for its volcanic**, rainforested interior, coral reefs, and beaches. Its most iconic landmark is **Piton de la Fournaise, a climbable active volcano** standing 2,632m (8,635 ft.).

Important facts about Reunion islands:

- Reunion Island is a **small French overseas territory in the Indian Ocean**.
- The **nearest neighbouring countries are Seychelles** to the north, **Mauritius** to the north east and **Madagascar** to the west.
- Despite being located next to Africa in the Indian Ocean, **Reunion is a 'Special Member State' of the European Union**, due to being a French overseas territory. As part of the EU, **Euro is the official currency here**.
- Reunion **grows sugar, vanilla, fruits and vegetables, catches fish and produces rum**.
- Its **industry consists of tourism, sugar, rum, handicrafts and flower oil extraction**.

3 Zoji La Pass

Context: The 434-km strategic Srinagar-Leh National Highway, connecting the Kashmir Valley with the Ladakh region (cold Indus valley desert), was thrown open for traffic after being closed due to heavy snowfall.

About:

- **Zoji La pass:**
 - It runs at an elevation of approximately 3,528 metres (11,575 ft) and **is the second-highest pass after Fotu La on the Srinagar-Leh National Highway**.
 - Every year due to heavy snowfall, vehicle flow stops for 4 months during winter from December to April.

- During the Indo-Pakistani War of 1947, it was seized by Pakistani supported invaders in 1948 in their campaign to capture Ladakh. The pass was re-captured by Indian forces on 1 November in an assault codenamed **Operation Bison**, which achieved success primarily due to the surprise use of tanks, then the highest altitude at which tanks had operated in combat in the world.

- **Zoji La Tunnel:**

- It is a 14.2 km long road tunnel under Zoji La pass on the Himalayas **between Sonmarg and Dras town of Kargil district of Jammu and Kashmir**. It is currently under construction.
- The project was approved by the government of India in January 2018 and the construction commenced from May 2018. The construction period is 5 years.
- The tunnel along with 6.5 km long Z-Morh Tunnel, (which is 22 km before Zoji La tunnel towards Srinagar) will ensure year-long road connectivity between Srinagar and Leh which currently remains closed for about 4 months due to heavy snowfall on the Zoji La pass.
- It takes more than 3 hours to cross the pass but the tunnel will reduce the time to only 15 minutes. This tunnel was a strategic requirement of the army and the Ladakhi people as the pass is close to LOC and vulnerable to hostile actions by terrorists.
- Once built, this will be the longest bi-directional road tunnel in Asia.



4

Gulf of Guinea

Context:

- Recently, nine Chinese and eight Ukrainian seamen have been abducted after two merchant vessels came under attack in Cameroonian waters.
- The **attacks took place off the Port of Douala**.

Gulf of Guinea

- The **Gulf of Guinea** is the north-easternmost part of the **tropical Atlantic Ocean**.
- The **intersection of the Equator and Prime Meridian** (zero degrees latitude and longitude) is in this gulf.

- Among the many rivers that drain into the Gulf of Guinea are the **Niger and the Volta**.
- The coastline on the Gulf of Guinea **consists of the Bight of Benin (Slave Coast.) and the Bight of Biafra (or Bonny).**
- The islands that can be found in the Gulf of Guinea include: Bobowasi Island, Corsico Island, Bioko Island, Elobey Grande Island, Elobey Chico Island, and Principe Island.
- The Gulf of Guinea has **natural resources such as offshore oil deposits and deposits of hard minerals (Gypsum, Topaz, Quartz, etc.).**

Piracy in the Gulf of Guinea:

- Piracy in the Gulf of Guinea affects several countries in West Africa as well as the wider international community making it becoming an issue of global concern.
- Pirates here are often part of heavily armed criminal enterprises, who employ violent methods to steal oil cargo.
- The International Maritime Bureau (IMB) has recently described the Gulf of Guinea as the most dangerous area in the world for shipping.
- According to its estimations, 73 percent of all sea kidnappings and 92 percent of hostage-takings occur there, with pirates normally taking sailors for ransom.



5 Gibraltar

Context: Gibraltar recently allowed a detained Iranian supertanker Grace 1 to leave the British overseas territory after a last-minute U.S. attempt to seize the vessel.

Gibraltar

- Gibraltar is a **British Overseas Territory** located at the bottom of Spain on the narrow gap between Europe and Africa.
- **Known as the Gib or the Rock (A limestone outcrop)**, it is a small 2.5-mile-squared area with a population of just 30,000 - but it has huge strategic importance.
- This is because from this spot a navy can potentially control shipping in and out of the Mediterranean - much of it coming from Asia having traveled through the Suez canal.
- The UK, a key member of NATO, has a naval and military base there for this reason.
- The **majority of Gibraltar's income comes from customs duties, offshore finance, internet gaming, tourism** and the provisioning of ships because it doesn't have a large agricultural or industrial trade.
- **Gibraltar is home a labyrinth of tunnels known as The Great Siege Tunnels.** They are said to be the most impressive defence system devised by man, created when France and Spain made an attempt to recapture the Rock from the British in Gibraltar's 14th siege.

History of Gibraltar

- Spain originally began controlling Gibraltar in 1501.
- But the Rock then came under British control during the War of Spanish Succession in 1704.
- Then in 1779 Spain tried but failed to win it back in what was known as the Great Siege of Gibraltar.
- The rock was declared a colony in 1830.
- The people of Gibraltar voted in 1967 to be a dependency of the United Kingdom.
- This effectively guarantees the unique community independence from Spain but allows support from a major Western country.



6 Chenani-Nashri tunnel

Context: The Chenani-Nashri tunnel, the longest tunnel in Jammu and Kashmir, will be renamed after Bharatiya Jana Sangh founder Shyama Prasad Mukherjee.

More on News:

- This tunnel **links Kashmir Valley with Jammu** by an all-weather route.
- This 9 km long, twin-tube, all-weather tunnel between Udhampur and Ramban in Jammu & Kashmir is not only **India's longest highways tunnel but also Asia's longest bi-directional highways tunnel.**
- **Built at an elevation of 1200 metres** on one of the most difficult Himalayan terrains, **the tunnel cuts the travel time between Jammu and Srinagar by two hours, bypassing about 41 km of road length.**

- It also ensures an all-weather passage on a route that often sees heavy traffic jams and disruptions due to landslides, snow, sharp curves, breakdown of vehicles and accidents.
- **The tunnel is a part of the 286-km-long four-laning of the Jammu-Srinagar National Highway.**
- **The tunnel has an efficient, transverse ventilation system.** Inlets are bringing fresh air at 8 metre intervals and an outlet for exhaust every 100 metres.
- **There is also a fully-integrated control system with ventilation, communication, power supply, incident detection, SOS call box, and fire fighting.**
- Fitted with intelligent traffic mechanisms, the **tunnel has fully automatic smart control and no human intervention will be required for its operations.**
- **The tunnel is also equipped with advanced scanners to ward off any security threat. Very few tunnels in the world have this kind of fully integrated tunnel control.**

7

M.P.'s Orchha makes it to a tentative list of UNESCO World Heritage Sites

Context: The architectural heritage of Orchha town in Madhya Pradesh which depicts the peculiar style of the Bundela dynasty has been included in UNESCO's tentative list of world heritage sites following a proposal sent by the Archaeological Survey of India (ASI) to the U.N. body (UNESCO) on April 15, 2019, to include the sites in its list.

About Orchha:

- **Orchha is situated on the banks of the Betwa River.** It is located around 80 km away from the Tikamgarh district in Madhya Pradesh and 15 km from Jhansi of Uttar Pradesh.
- It was **built by King Rudra Pratap Singh of the Bundela dynasty** in the 16th century A.D. The ancient town is famous for its Chaturbhuj Temple, Orchha Fort complex, Raja Mahal among others.
- The **Bundela architecture has a Mughal influence** since the two dynasties were very close. The famous King of Bundela dynasty was Veer Singh Dev who was a close friend of Mughal emperor Jahangir and fought wars as Akbar's aid.
- **Orchha is also famous for its two elevated minaret called Saavan and Bhadon and its four palaces — Jahangir Palace, Raj Mahal, Sheesh Mahal, and Rai Praveen Mahal —** and for its concept of open bungalows, stonework windows, animal statues depicting the culture of Bundelkhand.
- It is the only place in India where Lord Ram is worshipped as a king with a dedicated temple in his name called Sri Ram Raja Mandir.

8

Great Barrier Reef

Context: Australia has downgraded the outlook for the Great Barrier Reef to 'very poor' for the first time.

More on News:

- The long-term outlook for **Australia's Great Barrier Reef** was **downgraded to "very poor"** for the first time by the official agency charged with managing the **world heritage site**.

- The **Great Barrier Reef Marine Park Authority** singled out **rising sea temperatures** due to climate change as the biggest threat to the giant organism.
- However, the threats to the 2,300-kilometre (1,400-mile) reef were “**multiple, cumulative and increasing**” and, in addition to warming seas; **agricultural run-off and coral-eating crown of thorns starfish** are the rising threats.
- If the condition of the Great Barrier Reef continues declining, it may lose its world heritage status.

Important facts about The Great Barrier Reef:

- With almost 3,000 individual reefs, 900 islands, and stretching for 2,600km, located off Australia’s East Coast is the largest coral reef in the world.
- It is home to an incredible diversity of species and home to a wide range of life, including fish, sea turtles, giant clam, seahorse, sea snakes, nudibranch, sea turtles, stingray, sharks and many more.
- The Great Barrier Reef has experienced two mass coral bleaching events in 1998 and 2002. Bleaching was more severe in 2002, when aerial surveys showed that over 50% of reefs experienced some coral bleaching.
- The Great Barrier Reef is a popular tourist destination with around 2 million visitors every year.



9 Top Five Largest Ramsar Sites in India

Following are the top five largest **Ramsar sites** in India:

Sr No.	Ramsar site	State	Designation year	Area (in sq. km.)
1.	Sunderbans Wetland	West Bengal	2019	4230
2.	Vembanad Kol Wetland	Kerala	2002	1512.5
3.	Chilka Lake	Odisha	1981	1165
4.	Kolleru Lake	Andhra Pradesh	2002	901
5.	Bhitarkanika Mangroves	Odisha	2002	650

Sunderbans Wetland:

- Sundarban Wetland is located within the **largest mangrove forest in the world**, the Sundarbans that encompasses hundreds of islands and a maze of rivers, rivulets, and creeks, in the delta of the **Rivers Ganges and Brahmaputra on the Bay of Bengal in India and Bangladesh**.
- The Indian Sundarban, covering the south-westernmost part of the delta, constitutes over 60% of the country's total mangrove forest area and includes 90% of Indian mangrove species.
- The Sundarban Tiger Reserve is situated within the Site and part of it has been **declared a "critical tiger habitat" under national law and also a "Tiger Conservation Landscape" of global importance**.
- The Sundarbans are the only mangrove habitat that supports a significant population of tigers, and they have unique aquatic hunting skills.
- The Site is also home to a large number of rare and globally threatened species such as the **critically endangered northern river terrapin (Batagur Baska)**, the **endangered Irrawaddy dolphin (Orcaella brevirostris)**, and the vulnerable fishing cat (*Prionailurus viverrinus*).
- Two of the world's four horseshoe crab species and eight of India's 12 species of kingfisher are also found here. The uniqueness of the habitat and its biodiversity, and the many tangible and intangible, local, regional and global services they provide, makes the Site's protection and management a conservation priority.

Vembanad Kol Wetland:

- **It is the largest brackish, humid tropical wetland ecosystem on the southwest coast of India**, fed by 10 rivers and typical of large estuarine systems on the western coast, renowned for its clams and supporting the third largest waterfowl population in India during the winter months.
- Flood protection for thickly-populated coastal areas of three districts of Kerala is considered a major benefit, groundwater recharge helps to supply well water for the region, and the value of the system for the local transport of people and trade is considerable.

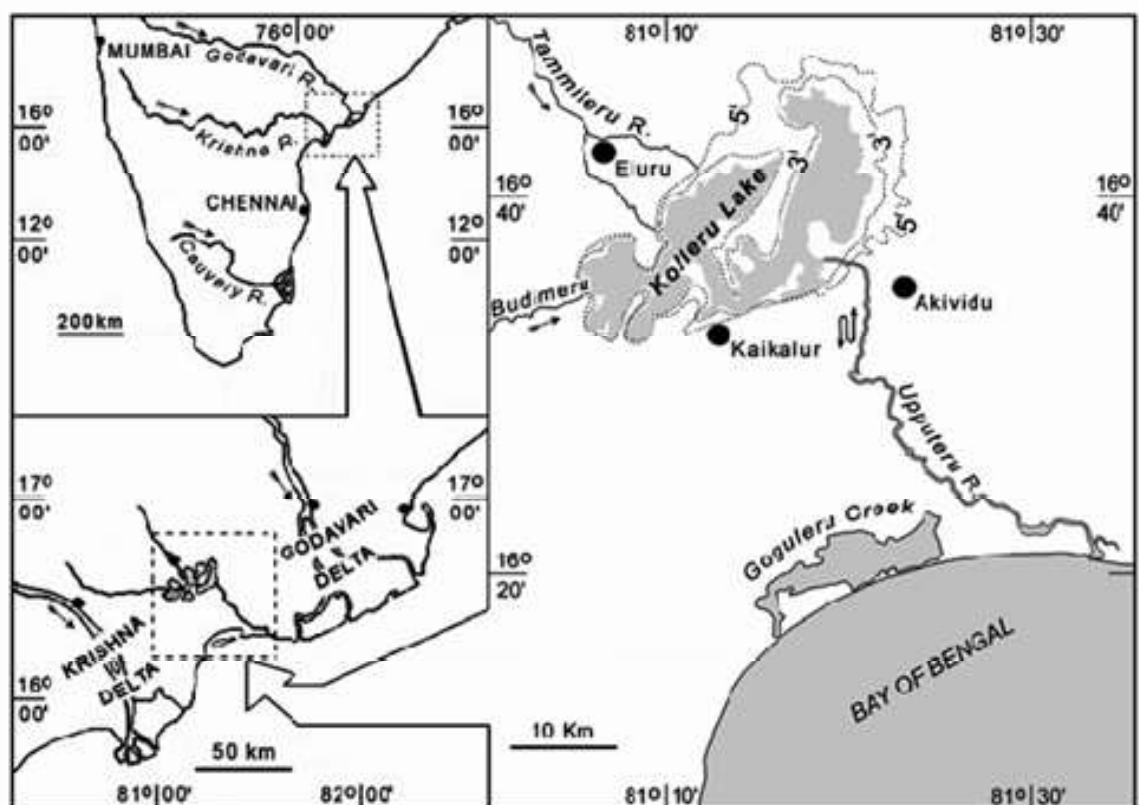
Chilka Lake:

- It is a **brackish lake separated from the Bay of Bengal** by a long sandy ridge and subject to seawater exchange, resulting in extreme seasonal fluctuations in salinity in different sections of the lake. Saline areas support aquatic algae.

- The site is an **important area for breeding, wintering, and staging for 33 species of waterbirds**.
- It also supports 118 species of fish, including commercially important species. Significant numbers of people are dependent upon the lake's resources.
- **Placed on the Montreux Record in 1993 due to problems caused by siltation and sedimentation** which was choking the mouth of the lake; removed from the Record in 2002 following rehabilitation efforts for which the Chilika Development Authority received the Ramsar Wetland Conservation Award for 2002.

Kolleru Lake:

- It is a **naturally eutrophic lake**, situated between the **two major river basins of the Godavari and the Krishna**, fed by two seasonal rivers and a number of drains and channels, which functions as a natural flood balancing reservoir between the deltas of the two rivers.
- It provides habitat for a number of resident and migratory birds, including declining numbers of the **vulnerable Grey Pelican** (*Pelecanus philippensis*), and sustains culture and capture fisheries, agriculture and related occupations of the people in the area.
- Damage and losses due to flooding in monsoon seasons and partial drying out during summers, the results of inadequate management planning and action, are the areas for improvement.



Bhitarkanika Mangroves:

- It is one of the **finest remaining patches of mangrove forests** along the Indian coast.
- The **site's Gahirmatha beach is said to host the largest known Olive Ridley sea turtle** nesting beach in the world, with half a million nesting annually, and the site has the highest density of saltwater crocodile in the country, with nearly 700 *Crocodylus porosus*.
- It is a major breeding and wintering place for many residents and migratory waterbirds and is the east coast's major nursery for brackish water and estuarine fish fauna.
- Like many **mangrove areas**, the **dense coastal forests provide vital protection for millions of**

people from devastating cyclones and tidal surges - of India's 58 recorded species of mangroves, 55 species are found in Bhitarkanika, a wider mangrove diversity than in the Sundarbans!

- Traditionally, sustainable harvesting of food, medicines, tannins, fuelwood, and construction materials, and particularly honey and fish, has been the rule, but population pressures and encroachment may threaten that equilibrium.



10 Louvre Pyramid

Context:

- IM Pei, whose modern designs and high-profile projects made him one of the best-known and most prolific architects of the 20th century, died at the age of 102.
- He was the focus of controversy when he designed a glass-and-steel Louvre Pyramid in Paris in the 1980s.

Louvre Pyramid:

- It is a **large glass and steel pyramid which was designed by I. M. Pei**. It is surrounded by three smaller pyramids, in the main courtyard of the Louvre Palace in Paris.
- This large pyramid serves as the main entrance to the Louvre Museum. It was completed in 1989 and has become a landmark of Paris.
- The pyramid and the underground lobby beneath it were created because of a series of problems with the Louvre's original main entrance, which could no longer handle the enormous number of visitors on an everyday basis. Visitors entering through the pyramid descend into the spacious lobby then ascend into the main Louvre buildings.

What was the controversy?

- The construction of the pyramid triggered many years of strong and lively aesthetic and political debate. The criticisms were:
 - the modernist style of the edifice was inconsistent with the classic French Renaissance style and history of the Louvre;
 - the pyramid is an unsuitable symbol of death from ancient Egypt;
 - the project was an immodest, pretentious, megalomaniacal folly imposed by then-President François Mitterrand.

11 UNESCO World Heritage Sites

Context: UNESCO (The United Nations Educational, Scientific and Cultural Organization) declared the Prosecco Hills of Conegliano and Valdobbiadene as a UNESCO World Heritage Site at the 43rd agency's meeting in Baku (capital of Azerbaijan).

More on News:

- Italy has more UNESCO sites than any other European country—and it ties only with China globally.
- The hills of Conegliano and Valdobbiadene is located north-east of Venice in Italy. It is home to the world-famous sparkling wine Prosecco.
- The landscape is characterized by Cigloni, a small plots of vines on narrow grassy terraces, forests, small villages, and farmland.
- These hills are the eighth UNESCO World Heritage site in the Veneto region, the 55th site in Italy, and the 10th site in the world to be registered under the category of “cultural landscape” in recognition of their unique interaction between man and the environment.
- The new World Heritage Site status is expected to promote awareness, encourage tourism and boost the local economy.
- Earlier this month, UNESCO also added The Twentieth Century Architecture of **Frank Lloyd Wright** as another cultural site to its list of World Heritage properties.

12 Top five longest rivers in the world

Following are the top five longest rivers in the world:

• Nile river:

- **It is in Africa.** It originates in Burundi, south of the equator, and flows northward through northeastern Africa, eventually flowing through Egypt and finally draining into the Mediterranean Sea.
- It is the main source of water in two countries: Egypt and Sudan.
- **The Blue and the White Nile are the two tributaries of the river with the latter having a greater length than the former.**
- The **source of the White Nile is not yet fully determined** but is believed to be somewhere in Burundi or Rwanda. **According to some reports, Lake Victoria is considered to be the source of the White Nile which is, in turn, fed by the Kagera River** whose two major

tributaries are the Ruvyironza and the Nyabarongo rivers of Burundi and Rwanda, respectively.

- The Kagera is formed at the confluence of these two rivers near the Tanzania-Rwanda border.
- The Blue Nile has a more defined origin in Lake Tana in Ethiopia. The two tributaries meet near the Sudanese capital of Khartoum.
- The Nile River's final course is through Egypt before it forms a delta and drains into the Mediterranean Sea.
- The Nile basin is huge and includes parts of Tanzania, Burundi, Rwanda, Congo (Kinshasa), Kenya.



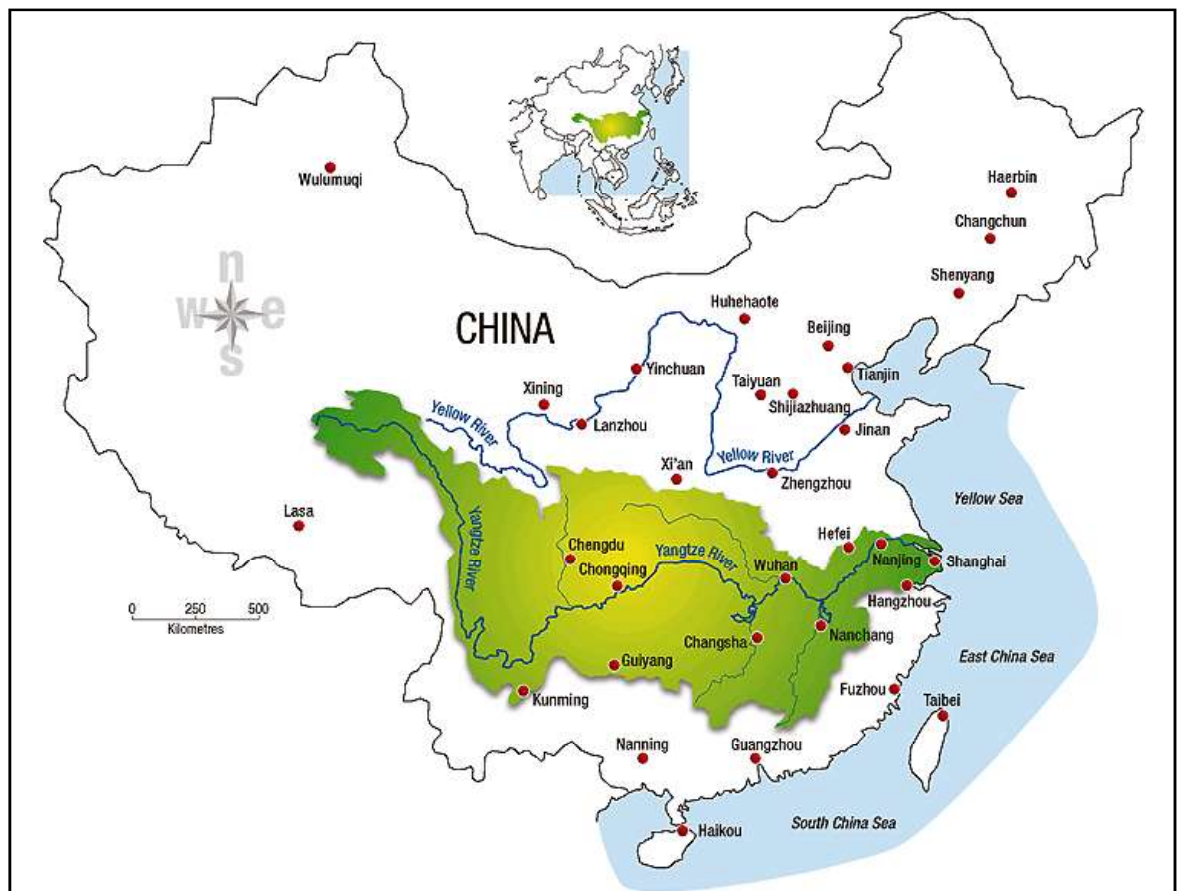
• Amazon River:

- ▶ The Amazon River runs 4,000 miles from the Andes to the sea and is the second-longest river in the world.
- ▶ It is also the largest in terms of the size of its watershed, the number of tributaries, and the volume of water discharged into the sea.
- ▶ The headwaters of the Apurímac River were considered to be the origin of the Amazon River. However, a recent 2014 study claims that the origin of the Amazon can be traced to the Cordillera Rumi Cruz from where Peru's Mantaro River originates.
- ▶ This river then confluent with the Apurímac River (whose headwaters were earlier regarded as the source of the Amazon) and then other tributaries join the river downstream to form the Ucayali River which finally confluent with the Marañón River to form the main stem of the Amazon River.



- **Yangtze river:**

- It is the world's third longest river and the longest to flow entirely within one country.
- It is also Asia's longest river.
- The river basin of the Yangtze houses one-third of the population of China.
- Two origins of the Yangtze River have been suggested. Traditionally, the government of China recognizes the Tuotuo tributary located in the Tanggula Mountains as the source of the river.
- According to new data, however, the source of the Yangtze River is located in the Jari Hill from where the headwaters of the Dam Qu tributary originate. These tributaries and more join to form the mighty Yangtze River which finally drains into the East China Sea at Shanghai.
- The Yangtze River has over 700 tributaries but the principal tributaries are the Hun, Yalong, Jialing, Min, Tuo Jiang, and Wu Jiang.



- **Mississippi river:**

- The river system comprising of the Mississippi, Missouri, and Jefferson rivers, is regarded as the world's fourth longest river system.
- The Mississippi River begins in northern Minnesota where Lake Itasca is believed to be the origin of the river and drains into the Gulf of Mexico.
- When we regard the Jefferson River as the furthest source of the Mississippi River, then we get the Mississippi-Missouri-Jefferson river system.

- **Yenisei river:**

- This is the world's fifth-longest river system and the largest draining into the Arctic Ocean.
- The source of the river is Mungaragiyn-Gol, which is located at the ridge of Dod-Taygasyn-

Noor, Mongolia. The Selenge River is regarded as the headwaters of this river system. The Selenge River is 992 km long and drains into Lake Baikal.

- ▶ The Angara River rises from Lake Baikal near Listvyanka and flows through the Irkutsk Oblast of Russia and finally joins the Yenisei River near Strelka.
- ▶ The Yenisei finally drains into the Kara Sea, Arctic Ocean.



13 Kalapani, a small area on the India map that bothers Nepal

Context: The new political map of India, recently released by the government to account for the bifurcation of Jammu and Kashmir, has triggered fresh protests over an old issue in Kathmandu.

More on News:

- Kalapani is a 35 square kilometre area. The Kali River in the Kalapani region demarcates the border between India and Nepal.
- While the Nepal government and political parties have protested, India has said the new map does not revise the existing boundary with Nepal.
- The Nepal government described India's decision as "unilateral" and claimed that it will "defend its international border".

14 The Drake Passage and "The Impossible Row" project

Context: In a first, six rowers from four countries crossed the Drake Passage, in just under two weeks after pushing off from the southern tip of South America.

More on News:

- The Passage is located between Cape Horn at the tip of South America and the Antarctic Peninsula.

- This is the first completely human-powered crossing of the passage.
- The project was dubbed “The Impossible Row”, for which the team departed from Cape Horn in Chile and arrived at Primavera Base on San Martin Land on the Antarctic Peninsula.

What is the Drake Passage?

- The passage is named after Sir Francis Drake, who was the first Englishman to circumnavigate the globe.
- The passage has an average depth of about 11,000 feet, with deeper regions going up to over 15,600 feet near the northern and southern boundaries.

Why is it considered so treacherous?

- The Drake Passage is considered one of the roughest waterways in the world because here, layers of cold seawater from the south and warm seawater from the north collide to form powerful eddies, which when combined with strong winds and storms can be treacherous for those attempting to navigate it.
- It is also the narrowest stretch in the Southern Ocean and spans approximately 800 km between the southern tip of South America and the northern tip of the West Antarctic Peninsula.
- NASA describes the waters of the passage as “notoriously turbulent, unpredictable, and frequented by icebergs and sea ice.”



15 Rohtang pass tunnel (Atal Tunnel)

Context: Prime Minister honoured the contribution of former Prime Minister Atal Bihari Vajpayee by naming the Strategic Tunnel under Rohtang Pass after him.

About:

- The historic decision to construct a strategic tunnel below the Rohtang Pass was taken on June 03, 2000, when late Atal Bihari Vajpayee was the Prime Minister.

The foundation stone for the Access Road to the South Portal of the tunnel was laid on May 26, 2002.

Important facts about Rohtang Pass

- It is a **high mountain pass (elevation 3,978 m (13,050 ft)) on the eastern Pir Panjal Range** of the Himalayas around 51 km (32 mi) from Manali.
- The pass **provides a natural divide between the Kullu Valley with a primarily Hindu culture (in the south), and the arid high-altitude Lahaul and Spiti valleys with a Buddhist culture (in the north).**
- The pass lies on the **watershed between the Chenab and Beas basins.** On the southern side of this pass, the Beas River emerges from underground and flows southward and on its northern side, the Chandra River (flows from the eastern Himalayas), a source stream of the river Chenab, flows westward.

How long is the tunnel, and what is special about it?

- Upon completion, the 8.8 km-long tunnel will be **the world's longest highway tunnel at an altitude of above 10,000 feet (3,000 metres).**
- It is a 10.5 m-wide single tube, a bi-lane tunnel with a fireproof emergency tunnel built into the main tunnel itself. The 10.5-m width includes a 1-metre footpath on both sides.
- It will reduce the distance between Manali and Leh by 46 kilometres and save crores of rupees in transport costs.
- It will also **provide all-weather connectivity to remote border areas of Himachal Pradesh and Ladakh,** which otherwise remained cut off from the rest of the country for about six months.
- The project has **significant strategic implications for the military.** Once the tunnel is operational, the forces will have access beyond the Rohtang Pass even in peak winter.
- The tunnel is now nearing completion and is a step in the direction of providing all weather connectivity to remote border areas of Himachal Pradesh and Ladakh which otherwise remained cut off from the rest of the country for about six months during winters.
- While **Rohtang Pass is at a height of 13,050 feet, the pass on the road to Leh is Baralacha La at 16,040 feet. A 13.2-km long tunnel would be required to bypass this pass.**
- An alternative road link to Ladakh has also been developed by BRO on the Darcha-Padam-Nimu axis, but here again; a 4.15 km-long tunnel at Sinka La Pass (16,703 feet) would be required for all-weather access.

16 Bougainville

Context: Recently, Bougainville, a chain of islands voted for a referendum of independence from Papua Guinea.

About:

- The Autonomous Region of Bougainville, a chain of islands that lie 959 kilometres northwest of Papua New Guinea's (PNG) capital, Port Moresby, has voted unequivocally for independence.
- The referendum asked Bougainvilleans if they wanted greater autonomy or full independence. Nearly 98% of voters chose independence, with 87.4% voter turnout.
- The referendum was introduced because the peace agreement signed before 20 years ended. The agreement was signed to end nine year conflict civil war that killed almost 10% of the country's population.

Geopolitical Interests in an independent Bougainville:

- For the broader region, an independent Bougainville has a number of implications. Firstly, it sends a strong signal for other self-determination movements across the Pacific, including in New Caledonia which will hold a second referendum for independence in 2020.
- There are also geopolitical implications. The referendum has taken place during a period of heightened strategic anxiety among the Pacific's so-called traditional partners — Australia, New Zealand and the United States, as well as the United Kingdom, France and Japan.
- There have long been concerns China will seek to curry influence with an independent Bougainville. As one Bougainvillean leader informed me, Chinese efforts to build relationships with Bougainville's political elite have increased over the past few years.
- Beijing's interest in Bougainville is two-fold: First, it is seeking to shore up diplomatic support in the Pacific Islands region, thereby reducing support for Taiwan which lost a further two Pacific allies this year. And second, to access to resources, namely fisheries and extractive minerals.

17 Kajin Sara Lake may become world's highest lake

Context: The Kajin Sara lake in Manang district was discovered recently by a team of mountaineers.

About:

- **Kajin Sara lake in Manang district of Nepal** which was discovered only recently is all set to become popular as the world's highest lake. Once it happens, the Kajin Sara Lake will replace **Tilicho lake which is situated at an altitude of 4,919 metres** in the Himalayan nation, which is also located in Manang, from the number one spot.
- As per the measurement of the lake taken by the team, it is **located at an altitude of 5,200 metres**, which is yet to be officially verified. It is estimated to be **1,500-metre-long and 600-metre-wide**.
- **Known as Singar by the local people**, the lake is believed to have formed out of a glacier that melted from the Himalayas. It is accessible by a trek from Manang district headquarters in Chame, which takes about 18 hours. The lake is located 24 km from Chame.



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