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1 GEOMORPHOLOGY

1 Volcanoes in News

Volcanism

- It is the eruption of magma onto the surface of the Earth. It is a phenomenon associated with the surface **discharge of molten rock, pyroclastic fragments, or hot water and steam**, including volcanoes, geysers, and fumaroles.
- A volcano is a **vent or fissure in Earth's crust** through which **lava, ash, rocks, and gases erupt.**

Why does a volcano erupt?

- There are three types of volcanoes: **active, dormant or extinct**.
- An eruption takes place when magma rises to the surface. It is a thick flowing substance and formed when the earth's mantle melts.
- As magma is lighter than the rock, it is able to rise through vents and fissures on the surface of the earth. After its eruption, the magma is called **lava**.
- Not all volcanic eruptions are explosive as it depends on the composition of the magma.
- When the magma is runny and thin, the gases can easily escape it. In this case, the magma will flow out towards the surface.
- When the magma is thick and dense, gases cannot escape it, which builds up pressure inside resulting in a violent explosion.

About Pacific Rim's "Ring of Fire" region:

- Pacific Rim's "Ring of Fire" region is also called the **Circum-Pacific Belt**; it is a path along the Pacific Ocean characterized by active volcanoes and frequent earthquakes.
- It traces boundaries between **several tectonic plates including the Pacific, Cocos, Indian-Australian, Nazca, North American, and Philippine Plates.**
- This ring is said to be dotted with **75% of Earth's all active volcanoes**.
- The ring stretching nearly **25,000 miles** apparently includes more than 450 volcanoes. According to seismologists, this belt stretches from the southern tip of South America, along the North America coast, across the Bering Strait, down through Japan, and into New Zealand.

❑ Mount Semeru

Context: **Indonesia's Mount Semeru has erupted, pouring ash an estimated 5.6km (3.4 miles) into the sky above Java.**

About Mount Semeru:

- Semeru, also known as "**The Great Mountain**", is the **highest volcano in Java** and one of the most active.
- It is also one of Indonesia's most popular tourist hiking destinations.
- The volcano previously erupted in December, when about 550 people were evacuated.

Indonesia is home to 130 active volcanoes:

- Indonesia sits on the Pacific "Ring of Fire" where tectonic plates collide, causing frequent volcanic activity as well as earthquakes.
- With a **population of over 27 crores**, Indonesia is reportedly home to **at least 130 active volcanoes.**

❑ Mount Sinabung

Context: **Indonesia's Mount Sinabung erupted in a massive column of volcanic ash and smoke 3,000 metres (3 km) into the sky.**

About the Mount Sinabung:

- Mount Sinabung is a Pleistocene-to-Holocene stratovolcano of andesite and dacite in the Karo plateau, **North Sumatra, Indonesia.**

- It is 40 kilometres from the **Lake Toba supervolcano**.
- The volcano has been active since 2010 when it erupted after nearly 400 years of inactivity.

❑ Fukutoku-Okanoba Submarine Volcano

Context: **Fukutoku-Okanoba Submarine Volcano exploded in the Pacific Ocean, off Japan that may poses a risk to the passage of planes and ships.**

About Fukutoku-Okanoba volcano:

- The Fukutoku-Okanoba volcano is situated about 25 metres (80 feet) below the sea five kilometres north of **Japan's South Iwo Jima Island**.
- The **plume reached a height of 16 kilometres** above the surface, posing a risk to the passage of planes and ships.
- The eruption could have happened in shallow water due to which the ash plume had reached such a height.
- The normal cruising altitude of aircraft is about 10 kilometres.

Submarine volcanoes

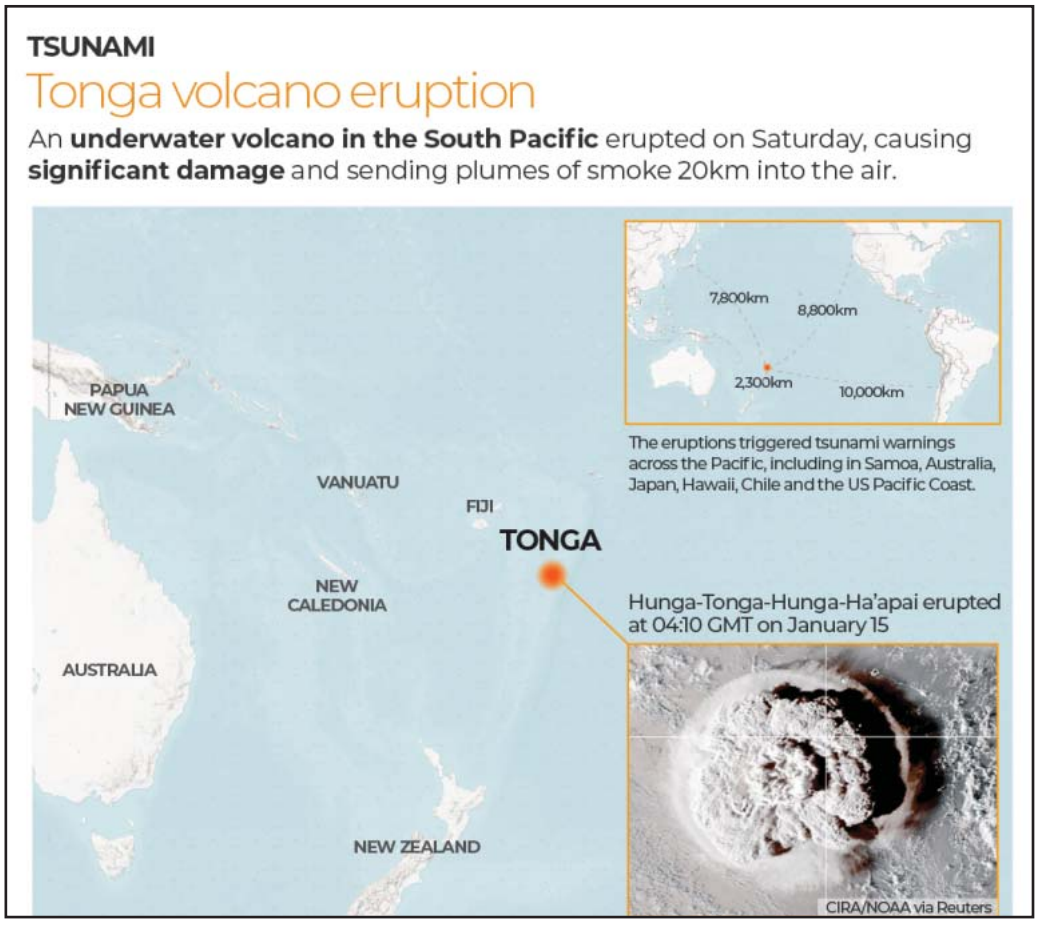
- Submarine volcanoes are erupting basaltic lavas and new crust material is actively formed with substantial piles of pillow lavas.
- Submarine volcanoes are underwater vents or fissures in the Earth's surface from which magma can erupt.
- Many submarine volcanoes are located near areas of tectonic plate formation, known as **mid-ocean ridges**.
- The volcanoes at mid-ocean ridges alone are estimated to account for 75% of the magma output on Earth.

❑ Hunga-Tonga-Hunga-Ha'apai volcano

Context: **The Hunga Tonga–Hunga Ha'apai volcano has caused significant damage in Tonga.**

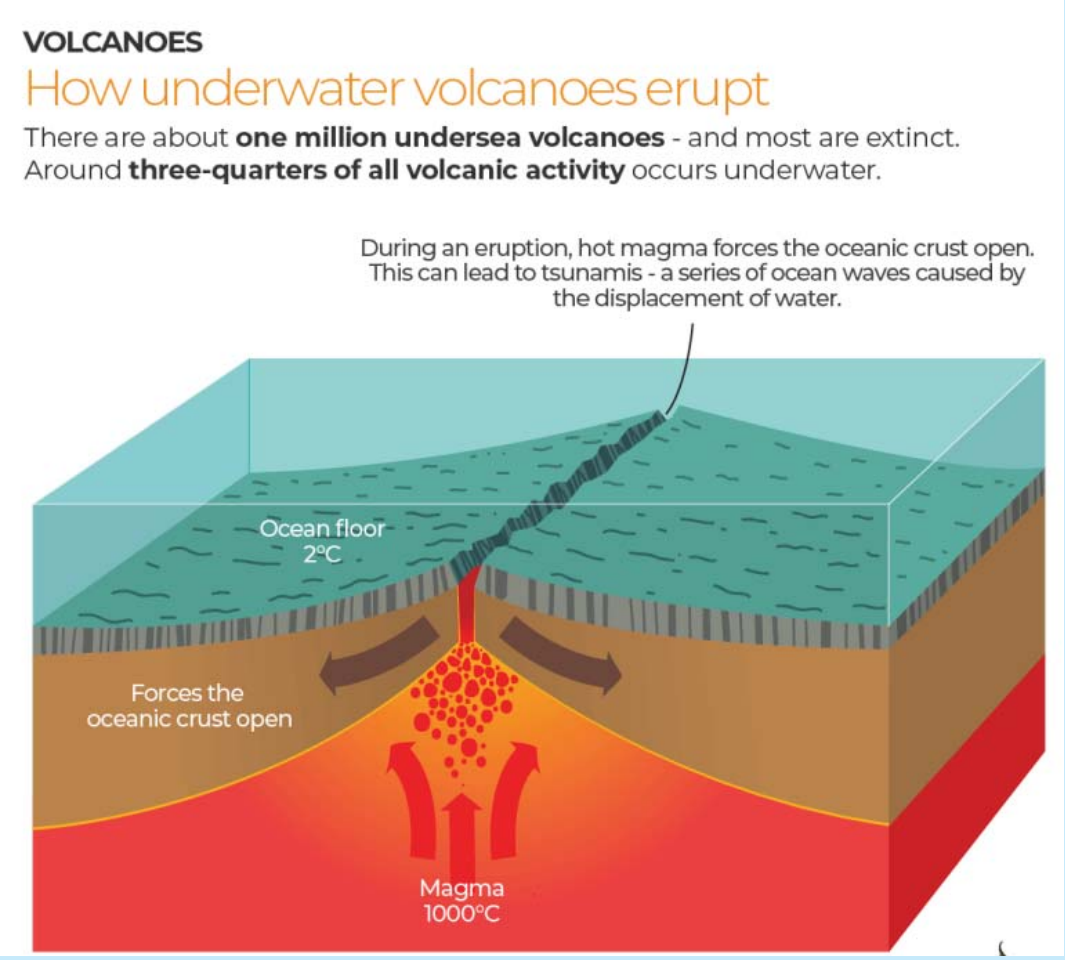
About Hunga Volcano:

- The Hunga-Tonga-Hunga-Ha'apai volcano has erupted regularly over the past few decades.
- It consists of two small uninhabited islands, Hunga-Ha'apai and Hunga-Tonga, poking about 100m above sea level 65km north of Tonga's capital Nuku'alofa.
- But hiding below the waves is a massive volcano, around 1800m high and 20 kilometres wide.



How do underwater volcanoes occur?

- There is no specific difference in the formation of submarine (underwater) and subaerial (on land) volcanoes.
- An undersea or **submarine volcano is located below the ocean surface** and mostly erupts underwater.
- Volcanoes form when molten rock is produced in the second layer of the Earth's interior — the mostly solid upper mantle — and makes its way through the crust.
- About "**three-quarters of all volcanic activity on Earth actually occurs underwater**".
- During an eruption, hot magma forces the oceanic crust open. This can lead to tsunami- a series of ocean waves caused by the displacement of water.



❑ Mount Nyiragongo

Context: **Thousands have fled a volcanic eruption in the Democratic Republic of Congo from Mount Nyiragongo on the outskirts of Goma City.**

About the Mount Nyiragongo:

- Mount Nyiragongo is an active stratovolcano in the **Virunga Mountains** which is associated with the **Albertine Rift.**

- It is located inside the Virunga National Park, in the **Democratic Republic of the Congo**.
- The main crater is about two kilometres wide and contains a lava lake.
- Nyiragongo and nearby Nyamuragira both are responsible for 40% of Africa's volcanic eruptions.
- It is one of the world's most active volcanoes and is considered among the most dangerous volcanoes.
- Nyiragongo's was erupted last in 2002 which killed 250 people and left 120,000 homeless.

What is Lava Lake?

- Lava lakes are **large volumes of molten lava** that are usually basaltic.
- Lava is contained in a **volcanic vent, crater, or broad depression**.
- It describes both lava lakes that are wholly or partly molten and those that are solidified.
- Lava lakes can form in **three ways**:
  - from one or more vents in a crater which erupts enough lava to partially fill the crater
  - when lava pours into a crater or broad depression and partially fills the crater
  - atop a new vent that erupts lava continuously for a period of several weeks or more and slowly builds a crater progressively higher than the surrounding ground

- **Some notable examples:**
  - **Mount Erebus, Ross Island, Antarctica**
  - **Kilauea, Big Island, Hawaii**
  - **Mount Nyiragongo, Democratic Republic of the Congo**

❑ Sangay volcano

Context: **Recently, the Sangay volcano erupted in Ecuador spewing clouds of ash as high as 8,500 meters into the sky.**

About Sangay volcano:

- It is one of the highest active volcanoes in the world and one of Ecuador's most active ones.
- It is located within the Sangay National Park.
- **Sangay National Park** is located in the central part of **Ecuador** on the Andes mountains' eastern side. It is a world heritage site.
- Sangay was formed by volcanic processes associated with the subduction of the Nazca Plate under the South American Plate at the **Peru–Chile Trench.**

2 International Mountain Day 2021

Context: **December 11** is celebrated as International Mountain Day every year.

About International Mountain Day:

- The formation of International Mountain Day dates back to 1992 when Agenda 21 "**Managing Fragile Ecosystems: Sustainable Mountain Development**" was adopted at the United Nations Conference on Environment and Development.
- Seeing the increasing attention towards the importance of mountains, the UN General Assembly declared in 2002 the UN International Year of Mountains and designated 11 December as International Mountain Day from 2003.

Theme 2021:

- The theme of International Mountain Day 2021 is "Sustainable mountain tourism."

What are mountains?

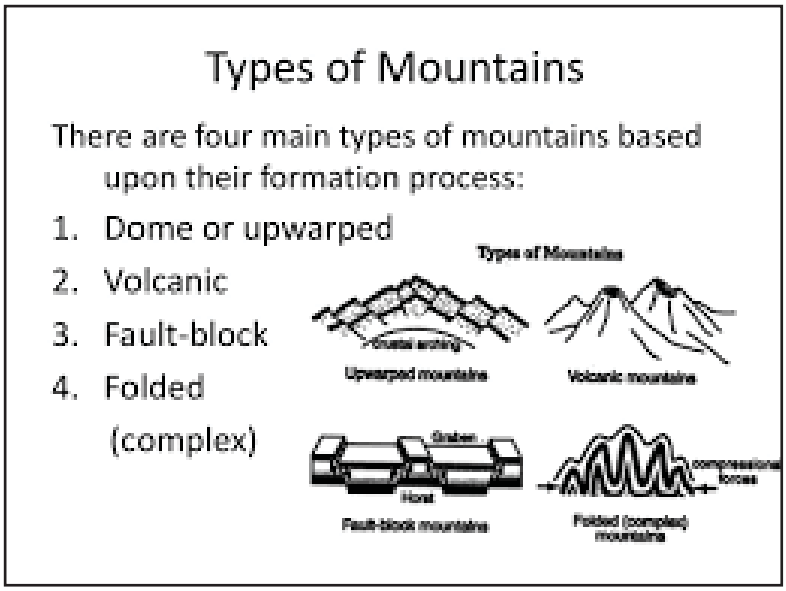
- Mountain refers to landforms that rise prominently above its surroundings, generally exhibiting steep slopes, a relatively confined summit area, and considerable local relief.
- Mountains generally are understood to be larger than hills, but the term has no standardized geological meaning.

Types of mountains:

- **Volcanic Mountains:** Volcanic mountains are formed when a tectonic plate is pushed beneath another (or above a mid-ocean ridge or hotspot) where magma is forced to the surface.
- **Fold Mountains:** They occur when two tectonic plates collide at a convergent plate boundary, causing the crust to over-thicken.
- **Block Mountains:** Such mountains are caused by faults in the crust, a seam where rocks can move past each other.
  - Also known as rifting, this process occurs when rocks on one side of a fault rise relative to the other.
  - The uplifted blocks become Block Mountains (also known as horsts) while the intervening dropped blocks are known as graben (i.e. depressed regions).
- **Dome Mountains:** Dome Mountains are formed where a region of flat-lying sedimentary rocks is warped or bowed upward making a structural dome.
  - Their topography is characterized by a relatively flat, dissected surface sloping gradually toward the surrounding lowlands, or basins.
  - These mountains may also result from the erosion of a structural dome.
  - Typical examples of domed mountains include the Black Hills of South Dakota and the Weald in southeast England

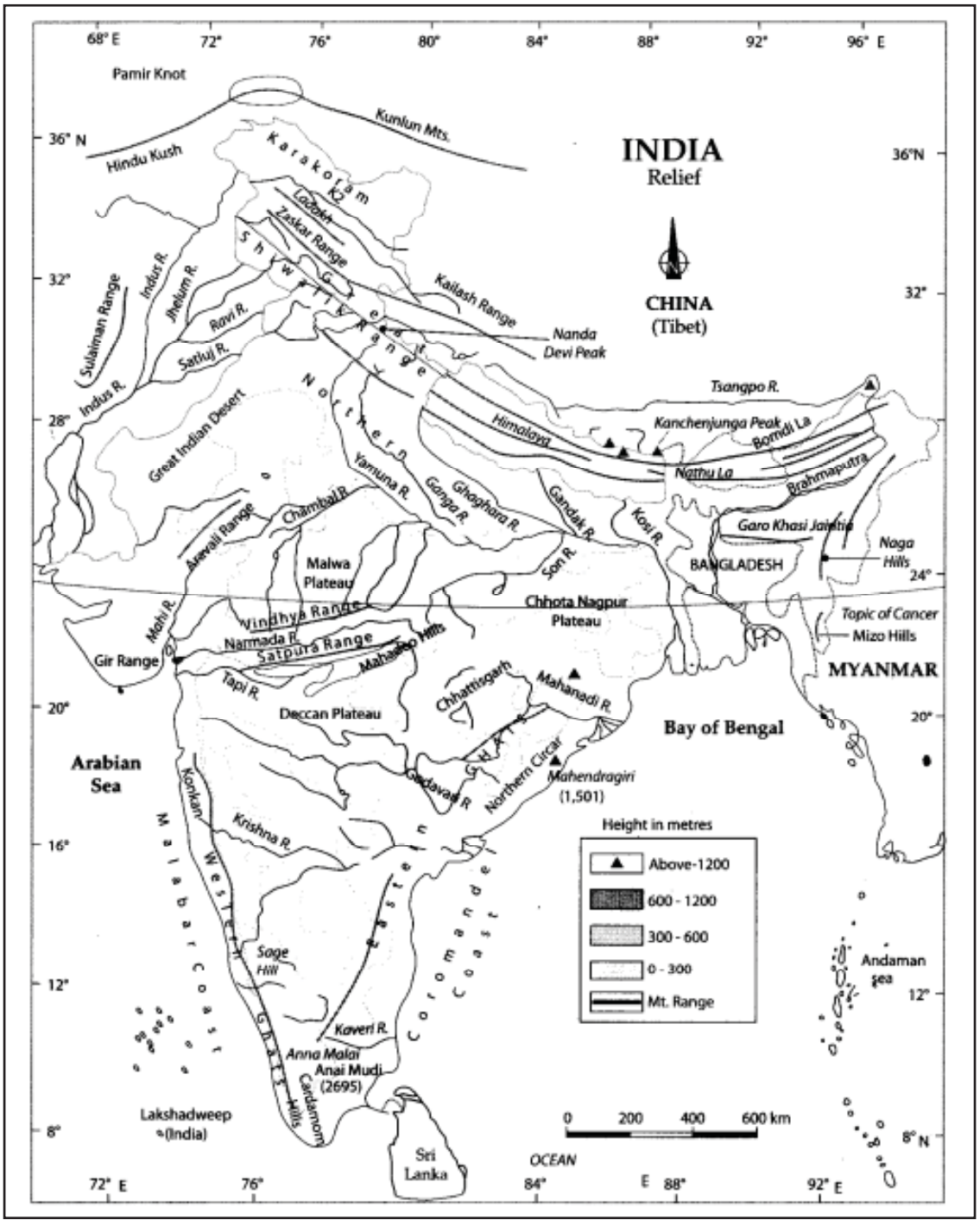
Important Mountain ranges in India:

- **Himalayas:** The world's highest mountain range, the Himalayas, spans five countries including India.
- **Aravalli Range:** The oldest mountain range of India, the Aravalli Range is also the oldest mountain range in the world.
- **Satpura and Vindhaya Range:** The Satpura and Vindhaya Range lies in central India and both these ranges run parallel to each



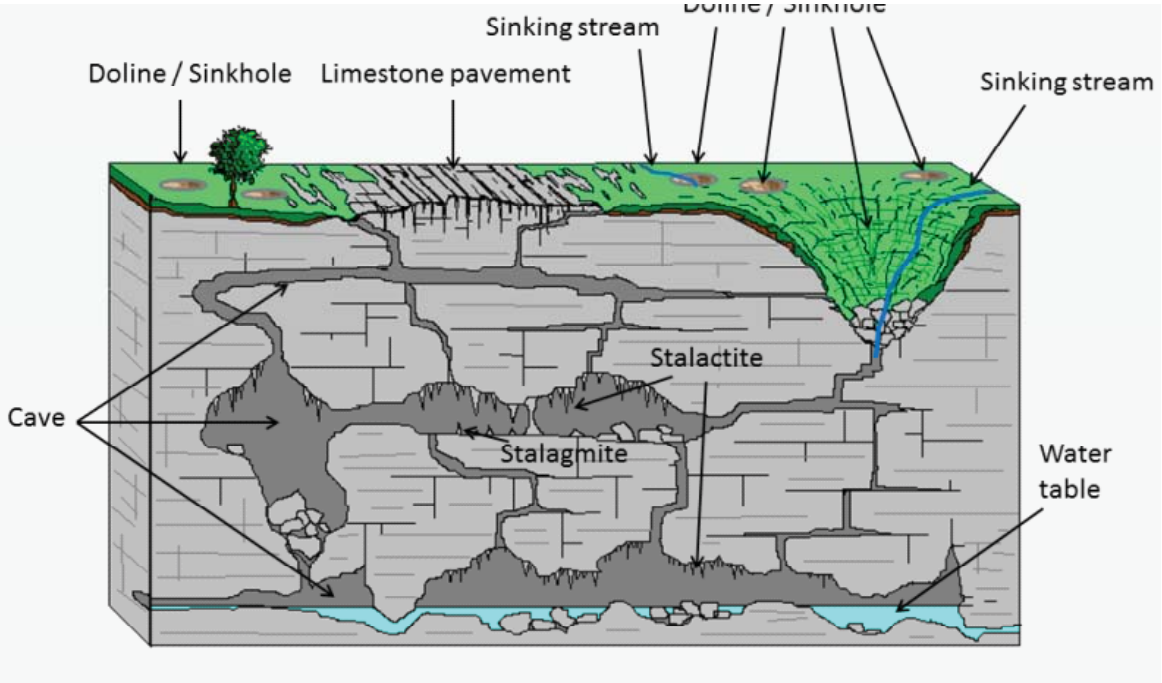
other. Both Satpura and Vindhaya are mainly situated in Madhya Pradesh and Maharashtra with some extension to Gujarat, Chattisgarh and Uttar Pradesh.

- **Western Ghats:** Western Ghats is 1600m long mountain range that runs from Gujrat to Kanyakumari in south India.
  - This mountain range is also called "Sahyadri Mountains".
  - It comprises the mountain range of Nilgiris, Anaimalai and Cardomom.
- **Eastern Ghats:** Eastern Ghats is mountain range running in eastern part of Indian Peninsula parallel to Bay of Bengal. This range is not continuous and is lower in elevation when compared to Western Ghats.



3 Cave Formation

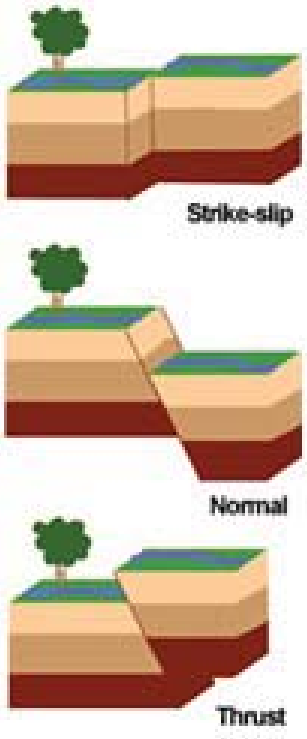
- Caves are formed by the **dissolution of limestone**. Rainwater picks up carbon dioxide from the air and as it percolates through the soil, which turns into a weak acid.
- This slowly dissolves out the limestone along the joints, bedding planes and fractures, some of which become enlarged enough to form caves.



- **Icicles:**
  - Icicles formed in caves are also known **as ice stalactites**.
  - It starts with a few frozen droplets and after reaching a certain size drops begin to drip along the side of the structure turning into a pointy stick-like structure.
  - Icicles typically form on days when the **air temperature is subfreezing** but sunshine warms and melts some snow or ice. As it drips off, a water droplet freezes when it loses its heat to the cold air.
  - Stalactite: A stalactite is an icicle-shaped formation that hangs from the ceiling of a cave and is produced by precipitation of minerals from water dripping through the cave ceiling.
    - Most stalactites have **pointed tips**.
- **Stalagmite:** A stalagmite is an **upward-growing mound** of mineral deposits that have precipitated from water dripping onto the floor of a cave.
- Most stalagmites have **rounded or flattened tips**.
- If stalactites and stalagmites continue to form and eventually meet, **a column** will form. This creates a decorative post that reaches from floor to ceiling.
- There are many other types of mineral formations found in caves. Some deposits are named based on their appearances, such as a **showerhead or a conulite**.

4 Himalayan Fault Lines and Seismic Gaps

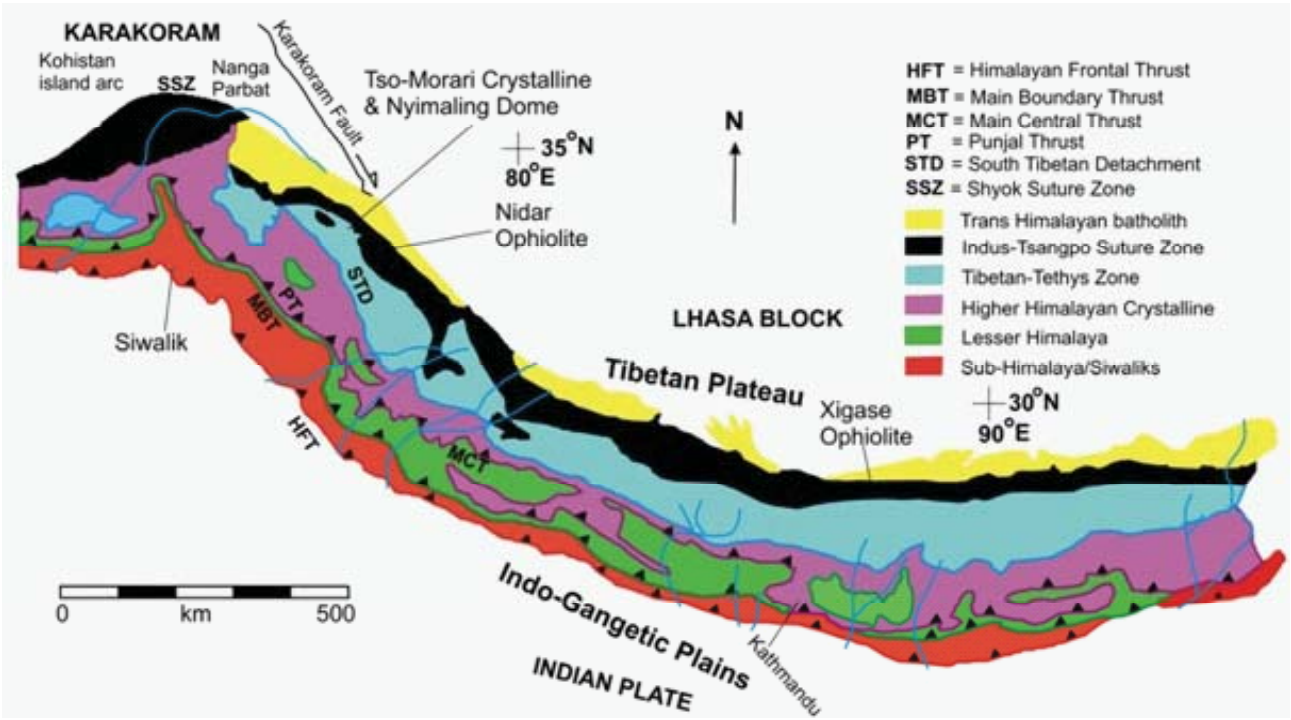
What is a fault?



- A fault is a fragmentation or **zone of fractures** between two blocks of rock. Faults allow the blocks to move relative to each other in different directions.
- This movement of blocks of rock can be rapid, in the form of an earthquake or may occur slowly, which is called as **creep**.
- Range of a fault can be few millimeters to thousands of kilometers. Most faults produce repeated displacements over geologic time.
- During the earthquake disaster, the rock on one side of the fault suddenly falls over with respect to the other.
  - The fault surface can be vertical, horizontal or some arbitrary angle in between.

Main Himalayan Thrust

- The Main Himalayan Thrust follows a **North West-South East strike** and is a décollement beneath the Himalaya Range, and gently dip towards the north, beneath the Himalayan region.
- MHT is the largest active continental mega-thrust fault in the world.
- Deformation of the crust is also accommodated along splay structures including the
  - Himalayan Frontal Thrust (HFT)
  - Main Boundary Thrust (MBT)
  - Main Central Thrust (MCT)



What is seismic gap?

- A seismic gap a section of an **active fault** which has the potential to produce significant earthquake(s).
- The rocks at the gap have not slipped from their position, compared with other segments along the same structure in a long time.
- A hypothesis suggests that over along period of time, the displacement on any segment must be equal to the displacement experienced by all the other parts of the fault.
- Any large or longstanding gap in displacement is considered to be the fault segment most likely to suffer future earthquakes.

Three main seismic gaps in Himalayas

- **Assam Gap:** between the 1950 Assam and 1934 Bihar–Nepal earthquake ruptures, this has potential to cause at least three great earthquakes.
- **Central Gap**: between the 1905 Kangra and 1934 Bihar–Nepal earth-quakes, this has potential to cause three great earthquakes.
- **Kashmir Gap:** lies west of the1905Kangra earthquake rupture, this has potential to cause at least two great earthquakes.

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2 CLIMATOLOGY

1 Sudden Stratospheric Warming (SSM)

Context: A "**sudden stratospheric warming**" event took place in early January 2021, according to weather forecasting models.

About Sudden Stratospheric Warming (SSM):

- The term sudden stratospheric warming refers to what is observed in the **stratosphere**.
- It is a **rapid warming** (up to **about 50 °C** in just a couple of days), between 10 km and 50 km above the earth's surface.
- The stratospheric sudden warming doesn't happen every year, and it doesn't always affect weather when it does.
- It was **first discovered in 1952**.

How does it occur?

- Every year in winter, strong **westerly winds circle around the pole high** up in the stratosphere.
- This is called the **stratospheric polar vortex** and it circulates around cold air high over the Arctic.
- In some years, the winds in the polar vortex **temporarily weaken**, or even **reverse to flow from east to west.**
- The **cold air then descends** very rapidly in the polar vortex and this causes the temperature in the stratosphere to rise very rapidly, as much as 50°Cover only a few days; hence the term sudden stratospheric warming.

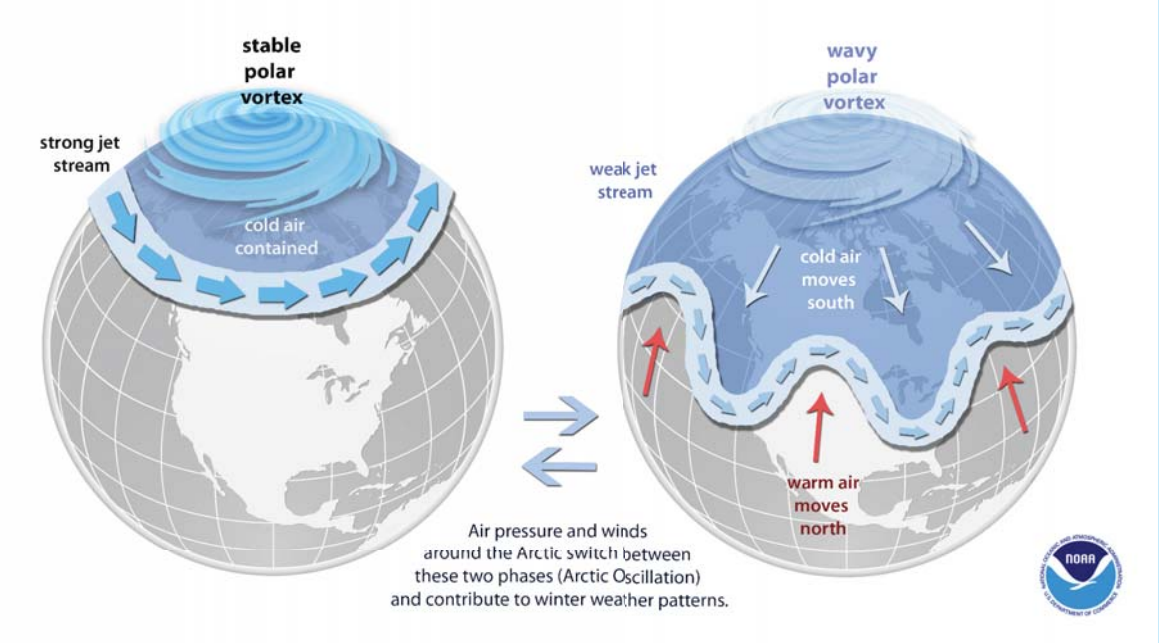
How SSW impact the weather?

- As the cold air from the stratosphere sinks into the troposphere, it **changes in the jet streams** that cause the weather to change.
- SSW is often followed by very **cold weather and heavy snowstorms**.
- The effects are more pronounced in the regions of **Northern America** and **Northern Europe**.

What is Polar Vertex?

- Polar Vertex can refer to one of two different, but related, weather patterns.

- The polar vortex is a **large area of low pressure** and **cold air** surrounding both of the Earth's poles. It always exists near the poles, but **weakens in summer** and **strengthens in winter**.
- The term "vortex" refers to the **counter-clockwise flow of air** that helps keep the colder air near the Poles.



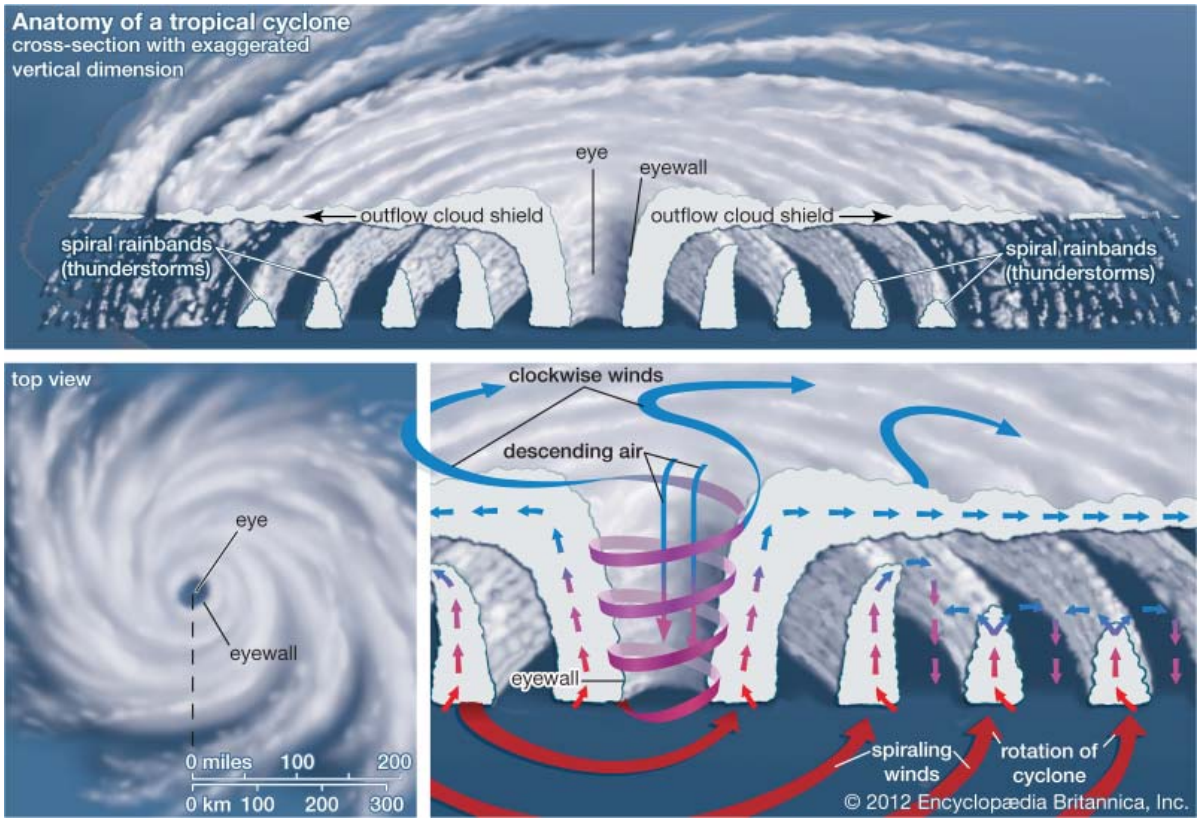
2. Cyclones in News

What is Cyclone?

- Cyclones are rapid inward air circulation around a low-pressure area. The air circulates in an **anticlockwise direction in the Northern hemisphere and clockwise in the Southern hemisphere.**
- Cyclones are usually accompanied by violent storms and bad weather.
- The word Cyclone is derived from the Greek word **Cyclos** meaning the coils of a snake. It was coined by **Henry Peddington** because the tropical storms in the Bay of Bengal and the Arabian Sea appear like coiled serpents of the sea.

What are tropical cyclones?

- Tropical cyclones are low pressure systems that form over warm tropical waters.
- They typically form when the **sea-surface temperature is above 26.5°C.**
- Tropical cyclones can continue for many days, even weeks, and may follow quite erratic paths.
- A cyclone will dissipate once it moves over land or over cooler oceans.



About naming of cyclones:

- 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** were – **Bangladesh, India, Maldives, Myanmar, Oman, Pakistan, Sri Lanka and Thailand.**
- The **5 new member countries** are: **Iran, Qatar, Saudi Arabia, United Arab Emirates and Yemen**
- A new list comprises 13 names of cyclones each for the 13 member countries list was adopted by the World Meteorological Department (WMO) panel in April 2019.

List of Northern Indian Ocean tropical cyclone names (effective from 2020)

List	Contributing nation												
	Bangladesh	India	Iran	Maldives	Myanmar	Oman	Pakistan	Qatar	Saudi Arabia	Sri Lanka	Thailand	U.A.E.	Yemen
1	Nisarga	Gati	Nivar	Burevi	Tauktae	Yaas	Gulab	Shaheen	Jawad	Asani	Sitrang	Mandous	Mocha
2	Biparjoy	Tej	Hamoon	Midhili	Michaung	Remal	Asna	Dana	Fengal	Shakhti	Montha	Senyar	Ditwah
3	Arnab	Murasu	Akvan	Kaani	Ngamann	Sail	Sahab	Lulu	Ghazeer	Gigum	Thianyot	Afoor	Diksam
4	Upakul	Aag	Sepand	Odi	Kyarthit	Naseem	Afshan	Mouj	Asif	Gagana	Bulan	Nahhaam	Sira
5	Barshon	Vyom	Booran	Kenau	Sapakyee	Muzn	Manahil	Suhail	Sidrah	Verambha	Phutala	Quffal	Bakhur
6	Rajani	Jhar	Anahita	Endheri	Wetwun	Sadeem	Shujana	Sadaf	Hareed	Garjana	Aiyara	Daaman	Ghwyzi
7	Nishith	Probaho	Azar	Riyau	Mwaihout	Dima	Parwaz	Reem	Faid	Neeba	Saming	Deem	Hawf
8	Urmi	Neer	Pooyan	Guruva	Kywe	Manjour	Zannata	Rayhan	Kaseer	Ninnada	Kraison	Gargoor	Balhaf
9	Meghala	Prabhanjan	Arsham	Kurangi	Pinku	Rukam	Sarsar	Anbar	Nakheel	Viduli	Matcha	Khubb	Brom
10	Samiron	Ghurni	Hengame	Kuredhi	Yinkaung	Watad	Badban	Oud	Haboob	Ogha	Mahingsa	Degl	Shuqra
11	Pratikul	Ambud	Savas	Horangu	Linyone	Al-jarz	Sarrab	Bahar	Bareq	Salitha	Phraewa	Athmad	Fartak
12	Sarobor	Jaladhi	Tahamtan	Thundi	Kyeekan	Rabab	Gulnar	Seef	Alreem	Rivi	Asuri	Boom	Darsah
13	Mahanisha	Vega	Toofan	Faana	Bautphat	Raad	Waseq	Fanar	Wabil	Rudu	Thara	Saffar	Samhah

3. Cyclone Gulab

Context: Recently, Cyclone Gulab made landfall on the eastern coast of India.

About Cyclone Gulab:

- This name gulab is proposed by Pakistan which means (pronounced as Gul-Aab) Rose.
- The Gulab cyclone is formed in the **Bay of Bengal**.
- In the 22 years of the 21st century, Cyclone Gulab is only the third Bay of Bengal cyclone to make landfall in September, during the active monsoon season.

❑ Cyclone Tauktae

Context: Cyclone Tauktae (pronounced Tau-Te) hit southern **Gujarat**.

About Cyclone Tauktae:

- Cyclone 'Tauktae' name was suggested by Myanmar. Tauktae means a highly vocal lizard gecko.
- This cyclone has been classified as a very severe cyclonic storm (VSCS).
- The Cyclone has been developed in the Arabian Sea.

Why is Cyclone Tauktae unique?

- Cyclone Tauktae will be the first cyclonic storm along the Indian coast in the year 2021.
- This will also be the fourth cyclone in consecutive years to have developed in the Arabian Sea, that too in the pre-monsoon period (April to June).
  - All these cyclones since 2018 have been categorised as either 'Severe Cyclone' or above.

❑ Cyclone Yaas

Context: Cyclone Yaas hit the coastal areas of **Odisha and West Bengal**.

About Cyclone Yaas:

- Cyclone Yaas is a Tropical Cyclone. It has been named by Oman. Yaas means a tree bearing fragrant flowers.
- Cyclone Yaas is the first cyclonic storm to develop over the Bay of Bengal in 2021.
- Cyclone Yaas crossed the northern Odisha coast around 20 km south of Balasore at its peak intensity as a very severe cyclonic storm.

❑ Bomb Cyclone

Context: The US East Coast was hit by a "bomb cyclone" that is on course to barrel in from the mid-Atlantic.

About is Bomb Cyclone:

- **A bomb cyclone is a winter cyclone.** It occurs through the process known as **bombogenesis.**
  - **The word "bombogenesis" is a combination of cyclogenesis which describes the formation of a cyclone or storm and bomb, which is self-explanatory.**
- A bomb cyclone occurs **when a mid-latitude cyclone rapidly intensifies or quickly drops in atmospheric pressure, marking the strengthening of the storm.**
- It occurs when a storm's central barometric pressure drops **at least 24 millibars in 24 hours.**
  - **A millibar is a way of measuring pressure. The lower the pressure, the more powerful the storm.**
- Some storms have intensified as rapidly as **60 millibars in 24 hours.** A few bomb cyclones even develop **"eyes," similar to the centre of a hurricane.**

In which region does a Bomb Cyclone occur?

- There are **four active regions** which are hot spots for Bomb Cyclone:
  - The Northwest Pacific
  - The Northern region of the Atlantic Ocean
  - The Southwest Pacific
  - The Southern region of the Atlantic Ocean.

How is Bomb Cyclone different from Hurricanes?

- It essentially amounts to a rapidly developing storm system, distinct from a tropical hurricane because it occurs over mid latitudes where fronts of warm and cold air meet and collide, rather than relying on the balmy ocean waters of late summer as a catalyst.
- **Bomb cyclones have cold air and fronts:** Cold air rapidly weakens hurricanes, while it is an essential ingredient for bomb cyclones.
- **Bomb cyclones form during winter:** Hurricanes form from late spring to early fall, while bomb cyclones form from late fall to early spring.
- **Bomb cyclones form at higher latitudes:** Hurricanes form in tropical waters, while bomb cyclones form over the northwestern Atlantic, northwestern Pacific and sometimes the Mediterranean Sea.

3. Heat Wave

- A Heat Wave is a period of **abnormally high temperatures**, more than the normal maximum temperature that occurs during the summer season in the **North-Western parts of India**.
- Heat Waves typically occur between **March and June**, and in some rare cases even extend till July.
- The extreme temperatures and resultant atmospheric conditions adversely affect people living in these regions as they cause physiological stress, sometimes resulting in death.
- The **Indian Meteorological Department (IMD)** has given the following criteria for Heat Waves:
  - The IMD says heatwave is considered when the maximum temperature of a station touches at least **40 degrees Celsius** or more for **plains**, **37 degrees Celsius** or more for **coastal regions** and at least **30 degrees Celsius** or more for **hilly regions**.

- **Criterion for declaring heat wave:**

- Based on Departure from Normal
  - H**eat Wave: Departure from normal is 4.50C to 6.40C**
  - **Severe H**eat Wave: Departure from normal is >6.40C b)
- Based on Actual Maximum Temperature
  - Heat Wave: When actual maximum temperature ≥ 450C
  - Severe Heat Wave: When actual maximum temperature ≥470C

Health Impacts of Heat Waves

- The health impacts of Heat Waves typically involve dehydration, heat cramps, heat exhaustion and/or heat stroke. The signs and symptoms are as follows:
  - **Heat Cramps:** Ederna (swelling) and Syncope (Fainting) generally accompanied by fever below 39°C i.e.102°F.
  - **Heat Exhaustion:** Fatigue, weakness, dizziness, headache, nausea, vomiting, muscle cramps and sweating.
  - **Heat Stoke:** Body temperatures of 40°C i.e. 104°F or more along with delirium, seizures or coma. This is a potential fatal condition.

4. Cold Wave

- A cold wave is declared when there's a significant drop in minimum or night time temperature.
- Cold wave is a localised seasonal phenomenon prevalent in the country except in southern India.
- Cold waves are seasonal with more episodes observed from November to March with each of these extreme events mostly experienced during the middle 3-month period.

• Cold Wave Conditions:

- It should be based on the actual minimum temperature of a station. Cold Wave is considered when the minimum temperature of a station is 10°C or less for plains and 0°C or less for hilly regions.
- **Based on Departure**
  - Cold Wave (CW): Negative Departure from normal is 4.5°C to 6.4°C
  - Severe Cold Wave (SCW): Negative Departure from normal is more than 6.4°C
- **Based on Actual Minimum Temperature (For plain stations only)**
  - Cold Wave: When the minimum temperature is ≤ 04°C
  - Severe Cold Wave: When the minimum temperature is ≤ 02°C

- **Cold Wave conditions for coastal stations**: When minimum temperature departure is -4.5°C or less over a station, "Cold Wave" may be described if the minimum temperature is 15°C or less.

The Major Factors for Cold Wave occurrence over India:

- A build-up of a ridge (an extended area of relatively high atmospheric pressure) in the jet stream over northwest Asia;
- Formation of surface high-pressure over **north & central India**;
- Movement of cold air masses in response to steering by upper-level winds;

- Triggering mechanism like a strong westerly wave approaching northwest India to enhance winds for transport cold air south eastward;
- Extensive snow covers over northwest Himalayas.

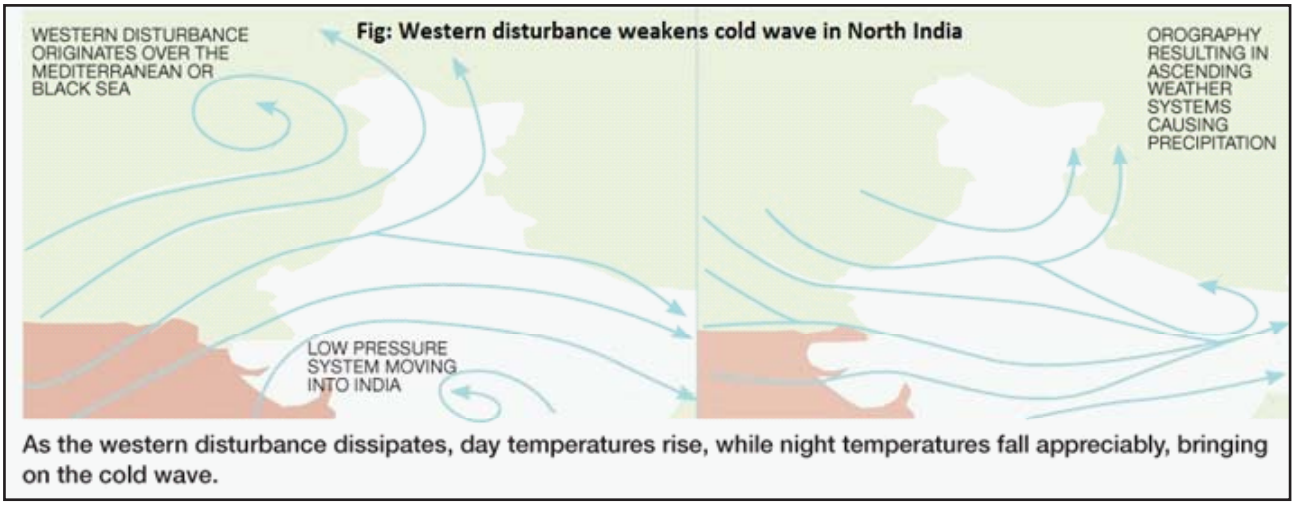


Fig: Western disturbance weakens cold wave in North India

As the western disturbance dissipates, day temperatures rise, while night temperatures fall appreciably, bringing on the cold wave.

5. Chillai-Kalan

Context: One of the harshest winter periods of 40 days, called Chillai Kalan, has begun in Kashmir.

- Chillai Kalan is a Persian term that means 'major cold'.
- Chillai-Kalan is followed by a **20-day long Chillai Khurd** (small cold) that occurs between January 30 and February 18 and a **10-days long Chillai Bachha** (baby cold) which is from February 19 to February 28.
- The 40-day period brings a lot of hardships for Kashmiris as the temperature drops considerably leading to the freezing of water bodies, including the famous Dal Lake here.
- During these 40 days, the chances of snowfall are the highest and the maximum temperature drops considerably. The minimum temperature in the Valley hovers below the freezing point.

Impacts:

- Affects daily life of people, use of **Pheran** (Kashmiri Dress) and a traditional firing pot called **Kanger** increases
- World famous Dal Lake also freezes and it replenishes the perennial reservoirs that feed the rivers, streams and lakes in Kashmir during the months of summer.
- **Cultural Importance**: According to Persian tradition, the night of 21st December is celebrated as Shab-e Yalda-"Night of Birth'', or Shab-e Chelleh. – "Night of Forty".

6. Double-Dip La Nina

Context: Recently, the National Oceanic and Atmospheric Administration (NOAA, an American scientific agency) have declared that La Niña has re-developed. Consecutive La Niña is called Double-Dip.

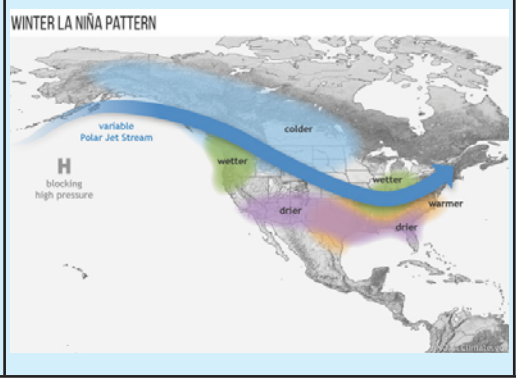
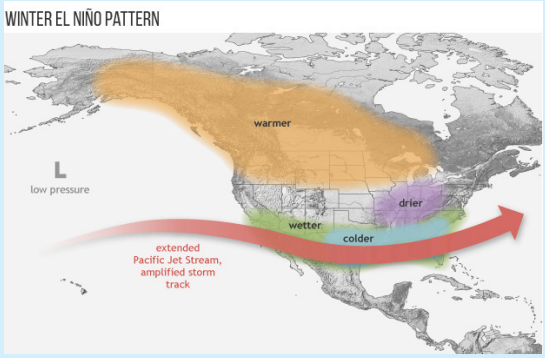
What is Double-dip?

- **Two La Ninas** happening one after the other (with a transition through ENSO neutral conditions in between) is not uncommon.
- It is usually referred to as a '**double-dip'**. In 2020, La Nina developed during the month of August and then dissipated in April 2021 as ENSO-neutral conditions returned.

> Previous La Ninas occurred during the winter of 2020-2021 and 2017-2018. An El Nino developed in 2018-2019.

Understanding the geographic phenomenon

- **La Nina** (means 'little girl' in Spanish) is a natural ocean-atmospheric phenomenon.
- It is marked by cooler-than-average sea surface temperatures across the central and eastern Pacific Ocean near the equator.
- **El Nino:** It is the opposite of El Nino(meaning 'little boy'), that is marked by warmer-than-average sea surface temperatures across the central and eastern Pacific Ocean near the equator.

	La Nina (Little Girl)	El Nino (Little Boy)
Precipitation	La Nina causes an increase in precipitation. It also causes formation of low-pressure areas.	El Nino usually causes a decrease in precipitation and has been found to cause drought-like conditions in India.
Wind strength	Trade winds are even stronger than usual, pushing more warm water toward Asia.	Trade winds weaken. Warm water is pushed back east, toward the west coast of the Americas.
El Nino Southern Oscillation (ENSO) cycle	A part of the El Nino Southern Oscillation (ENSO) cycle.	A part of the El Nino Southern Oscillation (ENSO) cycle.
		

Researchers at the Indian National Centre for Ocean Information Services (INCOIS), Hyderabad have found a method to improve wave prediction and BSISO linked oceanic activity that affects behavior monsoon.

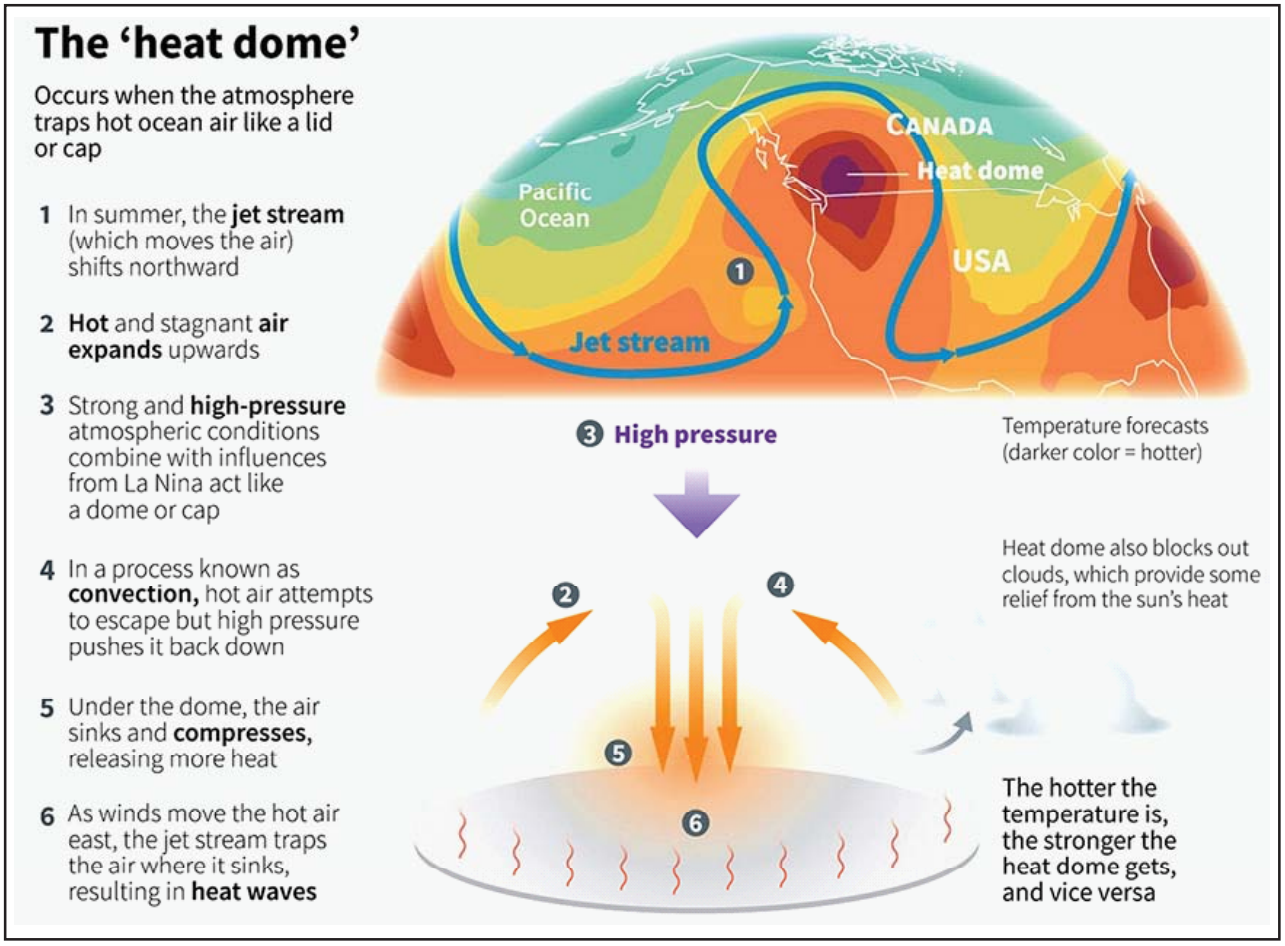
7. Heat Dome

- A heat dome occurs when the atmosphere traps hot ocean air like a lid or cap.

- As per National Oceanic and Atmospheric Administration (NOAA), USA, a heat dome is created when strong high-pressure atmospheric conditions combine with weather patterns like La Niña.
- They are more likely to form during La Niña years like 2021, when waters are cool in the eastern Pacific and warm in the western Pacific. Creating vast areas of sweltering.

Duration of Heat Domes:

- According to NOAA, a heat dome typically lasts a week.
- The formation after a week becomes too bog to keep standing and falls over, releasing the trapped air and ending the swelter.



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3 OCEANOGRAPHY

1. International Quiet Ocean Experiment (IQOE)

Context:

- In the latest development, scientists have come together to understand the impact of reduced anthrophony (human-made sounds) due to the COVID-19 pandemic on the marine ecosystem.
- In this regard, the International Quiet Ocean Experiment (IQOE) has identified a network of over 200 non-military hydrophones (underwater microphones) in oceans across the world.

About International Quiet Ocean Experiment:

- The International Quiet Ocean Experiment was originally formed in **2011** by experts who wanted to create a time series of measurements of ambient sound in different ocean locations.
- The main aim behind the initiative was **to reveal variability and changes in intensity and other properties of sound at a range of frequencies.**
- Then 2020 came along, and presented a unique – and potentially unrepeatable – opportunity to compare ocean soundscapes in 'business-as-usual and 'quiet mode'.

How will it be done?

- The underwater microphones would pick up even faraway low-frequency signals from whales and other marine animals, as well as those emanated by human activities.
- The researchers will do a comparative study of this quantitative picture of the ocean acoustics and other sets of data on marine life collected through methods such as animal tagging.
- This will help them understand how the soundscape of the oceans is changing and how it impacts marine life.

About oceanic acoustics:

- Ocean acoustics refers to the **study of sound** and its behavior in the waters.
- When underwater objects vibrate, they create sound-pressure waves that alternately compress and decompress the water molecules as the sound wave travels through the sea.
- Sound waves radiate in all directions away from the source like ripples on the surface of a pond.

- The compressions and decompressions associated with sound waves are detected as changes in pressure by the structures in our ears and most man-made sound receptors such as a hydrophone, or underwater microphone.
- **Components:** The three broad components of oceanic acoustics are
  - **geophony** (sounds created by non-biological natural events like earthquakes, waves, and bubbling),
  - **biophony** (sounds created by the ocean's living creatures)
  - **anthrophony**

2. Atlantic Ocean Current System (AMOC)

Context:

According to the recently released IPCC's Report, Atlantic Meridional Overturning Circulation (AMOC) is losing its stability and is very likely to decline over the 21st century.

About Atlantic Ocean Current System (AMOC):

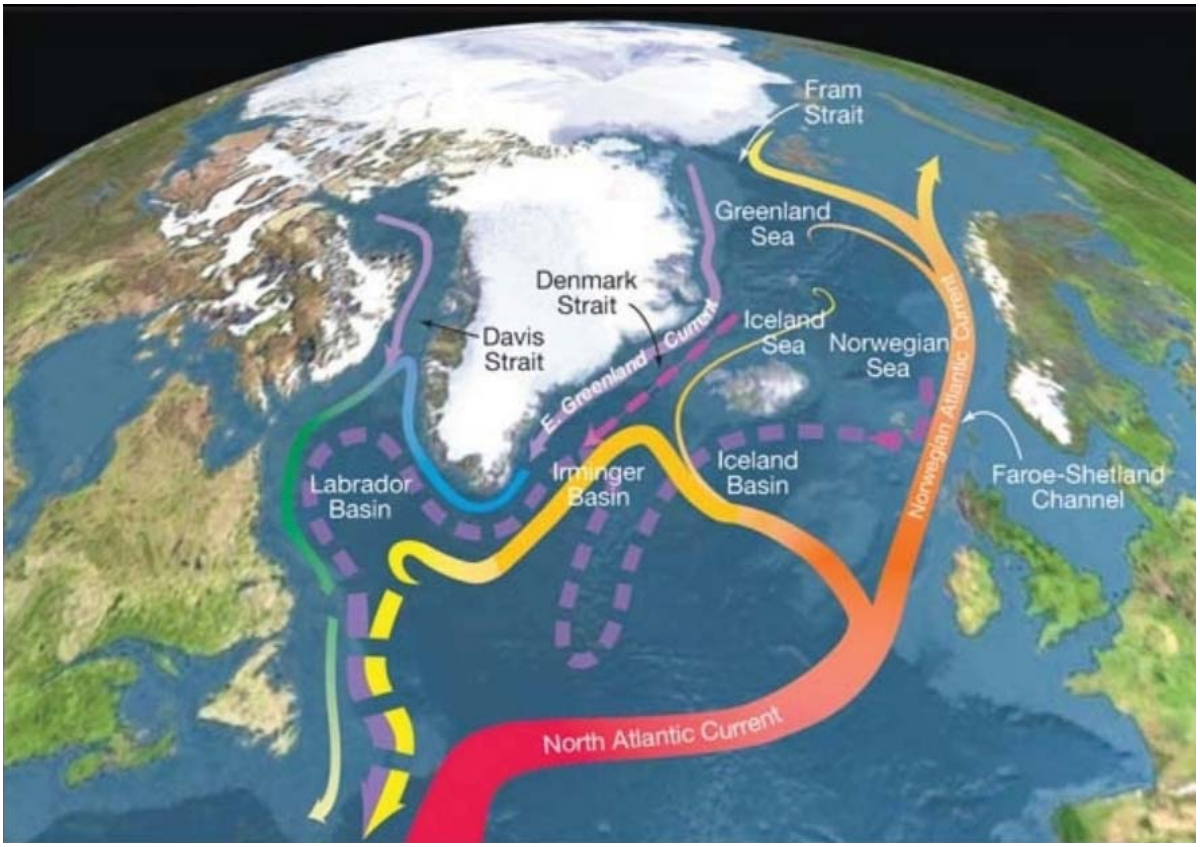
The Atlantic Meridional Overturning Circulation (AMOC) is a large system of ocean currents that carry warm water from the tropics northwards into the North Atlantic.

How does the AMOC work?

- The AMOC is a large system of ocean currents, like a **conveyor belt**, driven by differences in temperature and salt content – the water's density.
- As warm water flows northwards it cools and some evaporation occurs, which increases the amount of salt.
- **Low temperature and a 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.
- This global process makes sure that the world's oceans are continually mixed, and that heat and energy are distributed around the earth.

Implications of decline of AMOC:

- **Without a proper AMOC and Gulf Stream, Europe will be very cold**.
- Gulf Stream, a part of the AMOC, is a warm current responsible for mild climate at the Eastern coast of North America as well as Europe.
- An AMOC shutdown would cool the northern hemisphere and decrease rainfall over Europe.
- It can also have an effect on the El Nino.
- El Nino is a climate pattern that describes the unusual warming of surface waters in the eastern tropical Pacific Ocean.
- It can also **shift monsoons in South America and Africa**.



3. Coral Restoration

Context:

The **Zoological Survey of India** (ZSI), with help from Gujarat's forest department, is attempting for the first time a process to restore coral reefs using biorock or mineral accretion technology in the **Gulf of Kachchh**.

What are corals?

- Coral reefs are one of the most biologically diverse marine ecosystems on the Earth.
- Coral reefs play an important role in marine ecosystems and support the habitats of flora and fauna in the sea.
- The vast diversity of animal and plant species that contributes to its system is increasingly at risk due to climate change.

What is Biorock Technique?

- Biorock is the name given to the substance formed by electro accumulation of minerals dissolved in seawater on steel structures that are lowered onto the sea bed and are connected to a power source, in this case solar panels that float on the surface.
- The technology works by passing a small amount of electrical current through electrodes in the water.
- When a positively charged anode and negatively charged cathode are placed on the sea floor, with an electric current flowing between them, calcium ions combine with carbonate ions and adhere to the structure (cathode).

- This results in calcium carbonate formation. Coral larvae adhere to the CaCO3 and grow quickly.
- Fragments of broken corals are also tied to the biorock structure, where they are able to grow at least four to six times faster than their actual growth as they need not spend their energy in building their own calcium carbonate skeletons.

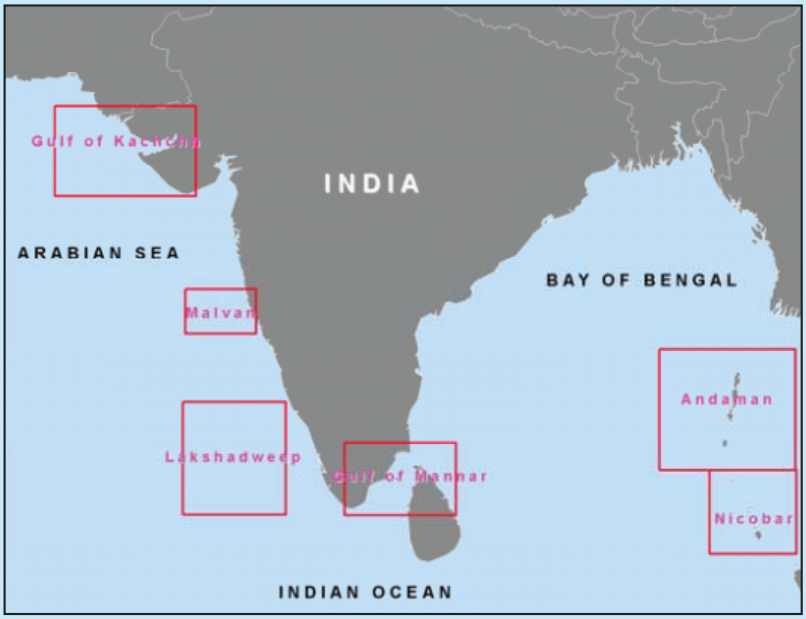
Methods of coral restoration:

- **Biological restoration:** Biological restoration uses various methods involving coral growth and transplanting to assist the restoration of a coral reef.
  - It includes:
    - Asexual propagation
    - Coral Gardening.
- **Structural restoration:** Structural restoration generally involves the construction of artificial reefs, sinking of wrecks, or relocation of rocks/dead coral heads.
- **Physical restoration:** Physical restoration involves addressing the conditions in which the corals are growing to improve their health, growth rates, or reproductive ability.

Zoological Survey of India

- The **Zoological Survey of India (ZSI**) is a subordinate organization of the Ministry of Environment and Forests which was established in **1916**.
- It is a national centre for survey and exploration of the resources leading to the advancement of knowledge on the exceptionally rich faunal diversity of the country.
- It has its headquarters at **Kolkata** and 16 regional stations located in different geographic locations of the country.

Coral reefs in India: The mainland coast of India has two widely separated areas containing reefs:



4. Boreal Summer Intra-Seasonal Oscillation (BSISO)

Context:

Researchers at the Indian National Centre for Ocean Information Services (INCOIS), Hyderabad have found a method to improve wave prediction and BSISO linked oceanic activity that affects behavior monsoon.

What is Boreal Summer Intra-Seasonal Oscillation (BSISO)?

- Boreal Summer Intra-Seasonal Oscillation (BSISO) is the **movement of convection** (heat) from the **Indian Ocean to the western Pacific** in roughly every 10–50 days of the monsoon season from June to September.
- BSISOs represent monsoon's 'active' and 'break' periods, in which weeks of heavy rainfall give way to brilliant sunshine before starting all over again.
- The active phase also enhances monsoon winds and hence the surface waves.

Why it is important to predict BSISO?

- Some phases of boreal summer intra-seasonal oscillation or BSISO induce high wave activity in the north Indian Ocean and the Arabian Sea, the researchers claimed.
- Wave forecast advisories based on the BSISO would be more useful for efficient coastal and marine management.
- This finding has a great significance in developing seasonal and climate forecast service for waves and coastal erosion for India.

BSISO and ENSO:

- BSISO activity over the western Pacific is significantly weakened in El Niño decaying summer.
- Northward propagation (NP) of BSISO (equator to the north of 25° N) attributed to La Nina decaying summer, while the intensity of BSISO NP is rapidly weakened to the north of 15° N in El Niño decaying summer.
- ENSO modulates BSISO activity by regulating circulation and moisture anomalies. Large-scale atmospheric circulation undergoes radical changes between El Nino and La Nina decaying summer.

5. Seabed 2030 project

Context:

Recently, it was announced that mapping of nearly one-fifth of the world's ocean floor had been finished under the Seabed 2030 Project.

About Seabed 2030 Project:

- The global initiative is collaboration between Japan's non-profit Nippon Foundation and the **General Bathymetric Chart of the Oceans (GEBCO).**
- It is the only intergovernmental organisation with a mandate to map the entire ocean floor and traces its origins to the GEBCO chart series **initiated in 1903** by **Prince Albert I of Monaco.**

- The project was launched at the **UN Ocean Conference in 2017**, and coordinates and oversees the sourcing and compilation of bathymetric data from different parts of the world's ocean.

Issues:

- There are certain countries that are hesitant to provide strategic data about the sea bed. This is mainly due to geopolitical tensions, mainly in the South China Sea.

Aim:

- The project aims to bring together all available bathymetric data to produce the definitive map of the world ocean floor by 2030 and make it available to all.
- Bathymetry is the measurement of the shape and depth of the ocean floor.
- In the past, satellites and planes carrying altimeter instruments have been able to provide large swathes of data about the ocean floor.
- However, the Seabed 2030 Project aims to obtain higher quality information that has a minimum resolution of 100 metres at all spots, using equipment such as deep water hull-mounted sonar systems, and Autonomous Underwater Vehicles (AUVs).

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4 CLIMATE CHANGE

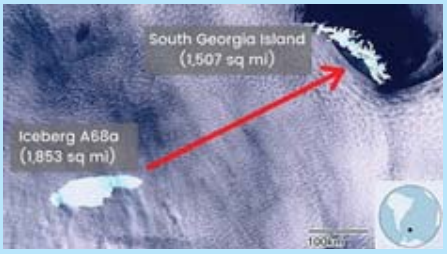
1. Giant iceberg A68

Context:

The giant iceberg A68, the biggest block of free-floating ice from Antarctica with an area of about 5,800 sq. km, has been drifting in the Atlantic Ocean since 2017.

About A68a:

- A68a, an iceberg roughly the size of the state of Delaware, split off from **Antarctica's Larsen C ice shelf** in July **2017**.
- US National Ice Center (USNIC) confirmed that two new icebergs calved from A68a and were large enough to be named and tracked.
  - They are called A68E and A68F.
- This year, due to an ocean current, the **iceberg was propelled into the South Atlantic Ocean** and since then it has been drifting towards the remote sub-Antarctic island of South Georgia, which is a **British Overseas Territory (BOT).**



Areas of the new fragments

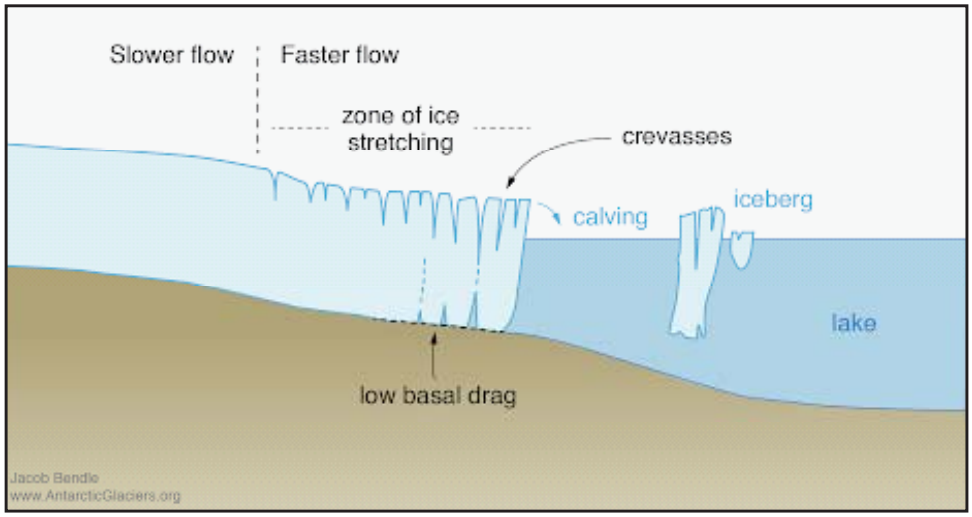
- **A-68a:** 1,004 square miles (2,600 square km)
- **A-68d:** 56 square miles (144 square km)
- **A-68e:** 253 square miles (655 square km)
- **A-68f:** 87 square miles (225 square km)

What are icebergs?

- Icebergs are **pieces of ice** that formed on land and float in an ocean or lake. Icebergs come in all shapes and sizes, from ice-cube-sized chunks to ice islands the size of a small country.
- The term "iceberg" refers to **chunks of ice larger than 5 meters** (16 feet) across.
- Smaller icebergs, known as **bergy bitsand growlers**, can be especially dangerous for ships because they are harder to spot.
- The North Atlantic and the cold waters surrounding Antarctica are home to most of the icebergs on Earth.

Why did the iceberg calve?

- The **iceberg's calving** is thought to be a **natural event** and not a result of climate change.
- However, some models predict that a warming Antarctica in the future could mean more calving events as ice shelves and glaciers retreat.



2. Northern European Enclosure Dam (NEED)

Context:

An extraordinary measure to protect 25 million people and important economic regions of 15 Northern European countries from rising seas has been proposed. It is called Northern European Enclosure Dam (NEED) enclosing all of the North Sea.

About Northern European Enclosure Dam (NEED)

- The scientists have proposed the construction of two dams of a combined length of 637 km — the first between northern Scotland and western Norway.
- It would be 476 km and with an average depth of 121 m and maximum depth of 321 m; the second between France and southwestern England, of length 161 km, and average depth of 85 m and maximum depth of 102 m.
- A/c to scientists, separating the North and Baltic Seas from the Atlantic Ocean is considered to be the "most viable option" to protect Northern Europe against unstoppable sea level rise (SLR).
- They have also identified other regions in the world where such mega-enclosures could potentially be considered, including the Persian Gulf, the Mediterranean Sea, the Baltic Sea, the Irish Sea, and the Red Sea.

- **The rationale behind:** The concept of constructing NEED showcases the extent of protection efforts that are required if mitigation efforts fail to limit sea level rise.

3. Marine Heatwaves

Context:

- According to a study, marine heatwaves or those that kind on oceans are on the increase within the waters around India.
- Emerging studies have found occurrences and impacts in global oceans that however very little is understood within the tropical ocean.
- Intergovernmental Panel on temperature change **(IPCC) Sixth Assessment Report (AR6),** the ocean surface temperature over the ocean is probably going to extend by one to a pair **of °C once there's one.5°C to 2°C warming.**

What are the Findings of the Study?

- The Western ocean region has the most important increase in marine heatwaves at a rate of about 1.5 events per decade, followed by the North Bay of geographic area at a rate of 0.5 events per decade.
- The marine heatwaves within the Western ocean and also the Bay of geographic area augmented drying conditions over the central Indian landmass.
- There's a major increase within the rain over south earth India in response to the heatwaves within the North Bay of geographic area.
- From 1982 to 2018, the Western ocean had a complete 66 events, whereas the Bay of geographic area had 94 events.
- These changes are in response to the modulation of the monsoon winds by the heatwaves.
- This is that the initial time that a study has found in depth link between marine heatwaves and atmospherical circulation and rain.

Marine heatwaves

- Marine heatwaves are periods of **very high temperatures within the ocean**.
- This development causes **high ocean temperatures** that may have vital impacts on marine ecosystems and industries.

What causes marine heatwaves?

- The most common drivers of marine heatwaves include:
  - Ocean currents will build up areas of heat water.
  - Air-sea heat flux or warming through the ocean surface from the atmosphere.
  - Winds will enhance or suppress the warming in a very marine heatwave, and climate phenomena like El Niño will modification the chance of events occurring in bound regions.

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5 GENERAL GEOGRAPHY

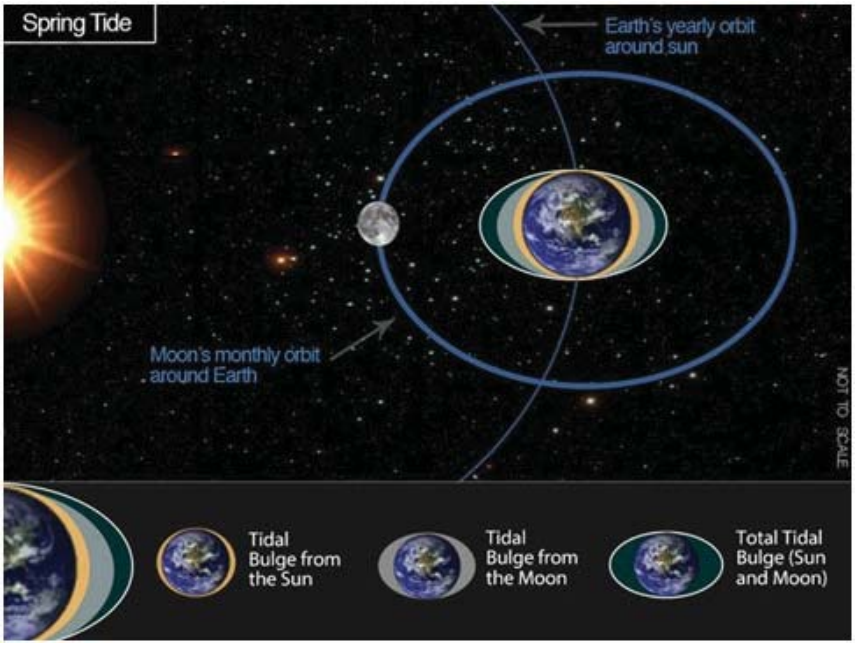
1. Moon 'Wobbling' and its impact on rising tides

Context:

According to a study published, the phenomenon of wobbling is expected to lead to more flooding on Earth in the middle of the next decade.

What is 'wobble'?

- The moon wobble is a **regular swaying in the moon's orbit.**
- It was first documented in **1728**.
- A moon wobble is described as the fluctuations in the moon's orbit.
- The moon's orbital plane around the Earth is at an approximate **5-degree inclined** to the Earth's orbital plane around the sun.
- Because of this, the path of the moon's orbit seems to fluctuate over time and completes a full cycle every **18.6 years (**nodal cycle).
- It is mostly circles and ovals, depending on the perspective.



Origin of wobble

- At certain points along the cycle, the moon's gravitational pull comes at such an angle that it yanks one of the day's two high tides a little bit higher.
- High-tide flooding related to climate change is also expected to break records with increasing frequency over the next decade.

What impact does the wobble have on Earth?

- The moon wobble impacts the gravitational pull of the moon, and it indirectly influences the ebb and flow of tides here on the Earth.
- Each wobble cycle has the power to amplify and suppress the tides on the Earth.
- It is expected that the upcoming changes in the lunar cycle will pose a serious threat, as it will amplify high tides coupled with the rising sea levels.
- It is one of the many factors that can either exacerbate rising sea levels or counteract them, alongside other variables like weather and geography.

2. Leonids Meteor Shower

Context:

The annual Leonids Meteor Shower has begun.

What is the Leonids Meteor Shower?

- Originally discovered **in 1833**, the Leonids Meteor Shower contains debris left behind by the 55P/ Tempel-Tuttle comet that enter Earth's atmosphere.
- As they fall from the sky and brought towards the ground by Earth's gravity, the friction of the atmosphere on their re-entry lights up the debris.
- These debris are called meteors and are seen as bright streaks of light across the night sky.
- The meteor shower has been named the Leonids Meteor Shower as it seems to emanate from the sector of the sky where the head of the Leo constellation lies.
- The meteors are some of the fastest that are seen on Earth, travelling at speeds of up to 2,55,600 kmph.
- The meteors are also seen as streaking very close to the horizon.

Occurrence of the event

- **Every 33 years**, a Leonid shower turns into a meteor storm, which is when hundreds to thousands of meteors can be seen every hour.
- A meteor storm should have at least 1,000 meteors per hour.
- In 1966, a Leonid storm offered views of thousands of meteors that fell through the Earth's atmosphere per minute during a period of 15 minutes.
- **The last such storm took place in 2002**.
- The showers are visible on any cloudless night when the Moon is not very bright.

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6 PLACES IN NEWS

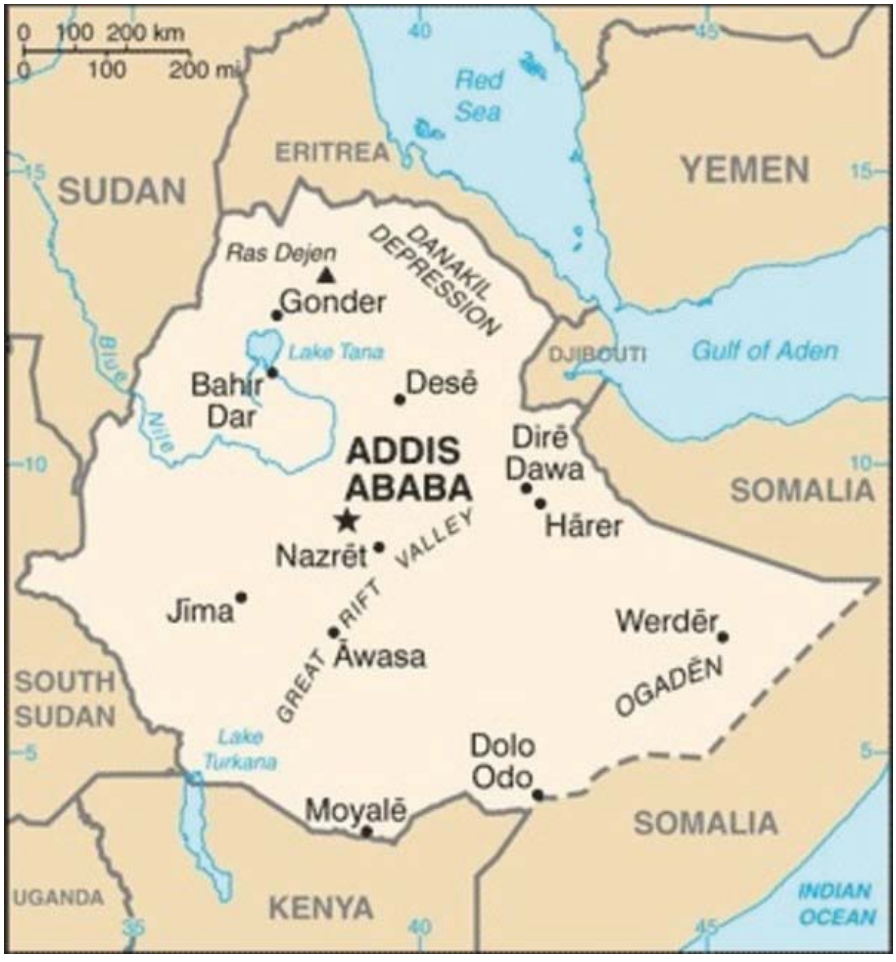
1. Danakil Depression

Context:

A recent study stated that an active and naturally occurring life cannot be sustained at Danakil, Ethiopia.

About Danakil Depression:

- It is located in **northeastern Ethiopia**.



- At the northern end of the Great Rift Valley, and separated by live volcanoes from the Red Sea.
- Danakil is one of the **world's lowest places** at 100 metres below sea level.
- The plain was formed by the **evaporation of an inland water body**.
- All the water entering Danakil evaporates, and no stream flows out from its extreme environment.
- It is covered with more than 10 lakh tonnes of salt.

Why life cannot sustain in the region?

- Magnesium-dominated brines that cause cells to break down
- An environment having simultaneously very low pH and high salt, a combination that makes adaptation highly difficult.

2. Nusantara

Context:

Indonesia passed a bill replacing its capital Jakarta with East Kalimantan, situated to the east of Borneo island. The new capital city of the country will be called Nusantara.

About Nusantara:

- The New State Capital Law Bill has been drafted by a special committee set up by Widodo's government and makes Nusantara, also called IKN, the capital of the Republic of Indonesia.
- The transfer of the status of Jakarta as Indonesia's capital to Nusantara, where 256,142 hectares of land has been set aside for the project, will take place in the "first semester" of 2024.
- East Kalimantan, where the new capital will be, as per the bill is said to have a world-city vision.
- It will be designed and managed with the objective of becoming a sustainable city in the world.

3. Nagorno-Karabakh region

Context:

- **Location:** Nagorno-Karabakh region is a mountainous land-locked region in the South Caucasus. It is a forested region and geographically lies within the boundary of Azerbaijan.
- **Features:**
  - The region is also **called Artsakh** (chiefly by Armenians).
  - South Caucasus or Transcaucasia is a region on the southern Caucasus Mountains on the border of Eastern Europe and Western Asia.
  - It roughly comprises of the modern countries of **Azerbaijan, Armenia and Georgia**.
  - Nagorno-Karabakh lies in the mountainous range of **Karabakh**.
  - Nagorno-Karabakh is internationally recognised as a part of Azerbaijan, although it is ruled by the Republic of Artsakh (formerly known as the Republic of Nagorno-Karabakh).
  - The **Republic of Artsakh is autonomous but controlled by Armenia**.
  - The major ethnic group of the region is Armenian.

Who Controls it?

- While the area remains in Azerbaijan, it is today governed by separatist Armenians who have declared it a republic called the "Nagorno-Karabakh Autonomous Oblast".
- While the Armenian government does not recognise Nagorno-Karabakh as independent, it supports the region politically and militarily.

Ethnicity and Conflict:

- Ethnic tensions from decades ago have a crucial role in the dispute.
- While the Azeris claim that the disputed region was under their control in known history, Armenians maintain that Karabakh was a part of the Armenian kingdom.
- At present, the disputed region consists of a majority Armenian Christian population, even though it is internationally recognised as a part of Muslim-majority Azerbaijan.

4. Qeqertaq Avannarleq

Context:

A new island has been discovered that is located off the **Greenland's coast.**

About Qeqertaq Avannarleq:

- Measuring 60×30 metres and with a peak of three metres above sea level, it has now become the new northernmost piece of land on Earth.
- Before this, Oodaaq was marked as the Earth's northernmost terrain.
- The new island is made up of seabed mud and moraine, i.e. soil, rock and other material left behind by moving glaciers, and has no vegetation.
- The group has suggested the discovery be named 'Qeqertaq Avannarleq', which is Greenlandic for "the northernmost island".

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7 MISCELLANEOUS

1. Dams in News

Mullaperiyar dam

Context:

Two spillway shutters of the Mullaperiyar dam in Idukki district were opened recently after the water level crossed 138 feet.

About Mullaperiyar dam:

- The Mullaperiyar Dam is a **126-year-old** composite gravity dam located in the upper reaches of the river Periyar, which flows into Kerala after originating in **Tamil Nadu**.
- The reservoir is within **the Periyar Tiger Reserve**.
- The water diverted from the reservoir is first used for power generation in lower Periyar (by Tamil Nadu) before flowing into the Suruliyar, a tributary of Vaigai river, and then for irrigating nearly 2.08 lakh hectares in Theni and four other districts farther away.

History/Background:

- In 1886, the then Maharaja of Travancore signed the 'Periyar Lease Deed' with the British government, which considered the Periyar waters useless to Travancore and wanted to divert the water into arid regions of Tamil Nadu.
- After 20 years of resistance, the agreement was signed and the dam was constructed in 1895.
- The Madras government started hydel power generation in 1959, the capacity of which was increased to 140 MW.
- Kerala brought up the issue of safety before the Central Water Commission in 1961.
- After a joint inspection by Kerala and Tamil Nadu in 1964, the water level was reduced for the first time, from 155 ft to 152 ft.
- In the following years, Tamil Nadu witnessed public agitations demanding that the level be increased.

Periyar River

- The Periyar River is the longest river in the state of Kerala with a length of 244 km.
- It is also known as 'Lifeline of Kerala' as it is one of the few perennial rivers in the state.
- A perennial river is a channel that has continuous flow in parts of its stream bed all year round.
- Periyar River originates from Sivagiri hills of Western Ghats and flows through the Periyar National Park.
- The main tributaries of Periyar are Muthirapuzha, Mullayar, Cheruthoni, Perinjankutti.

❑ Devika River National Project

Context:

River Devika project, built at the cost of over Rs 190 crore, will be complete by June, 2022.

What is the River Devika project?

- The work on the project was started in March 2019 under the National River Conservation Plan (NRCP).
- Under the project, bathing "ghats" (places) on the banks of the Devika River will be developed, encroachments will be removed, natural water bodies will be restored and catchment areas will be developed along with cremation ground.
- The project also includes the construction of three sewage treatment plants, sewerage network of 129.27 km, development of two cremation ghats, protection fencing and landscaping, small hydropower plants and three solar power plants.
- On completion of the project, the rivers will see reduction in pollution and improvement in water quality.

About Devika River

- Devika river originates from the hilly Suddha Mahadev temple in Udhampur district of Jammu and Kashmir.

- It flows down towards western Punjab (now in Pakistan) where it merges with the Ravi river.
- The river holds religious significance as it is revered by Hindus as the sister of river Ganga.
- In June 2020, Devika Bridge was inaugurated in Udhampur.

❑ Glacial Lake Atlas

Context:

Ministry of Jal Shakti has released the Glacial Lake Atlas of Ganga Basin.

About the Glacial Lake Atlas:

- The present glacial lake atlas is based on the inventoried glacial lakes in part of Ganga River basin from its origin to foothills of Himalayas covering a catchment area of 2,47,109 sq. km.
- The study portion of Ganga River basin covers part of India and transboundary region.
- The Ganga River Basin Atlas is brought out under the National Hydrology Project (NHP).
- The atlas is prepared with the efforts of the National Remote Sensing Centre (NRSC), ISRO under the **National Hydrology Project (NHP**).

National Hydrogen Project (NHP):

- National Hydrogen Project (NHP) is a Central Sector Scheme implemented by the Department of Water Resources, River Development & Ganga Rejuvenation (DOWR, RD & GR).
- **Funding:** It is funded by the Department of Water Resources, River Development and Ganga Rejuvenation (DoWR, RD&GR), Ministry of Jal Shakti, Government of India.
- **Objective:** To improve the extent, quality and accessibility of water resources information and to strengthen the capacity of targeted water resources management institutions in India.

About NHP-Bhuvan Portal:

- The NHP–Bhuvan portal is launched by the National Remote Sensing Centre (NRSC).
- NHP-Bhuvan Portal is a repository of information on the initiatives undertaken by NRSC under NHP with a facility to download the reports and knowledge products being developed by NRSC.

Glacial Lake:

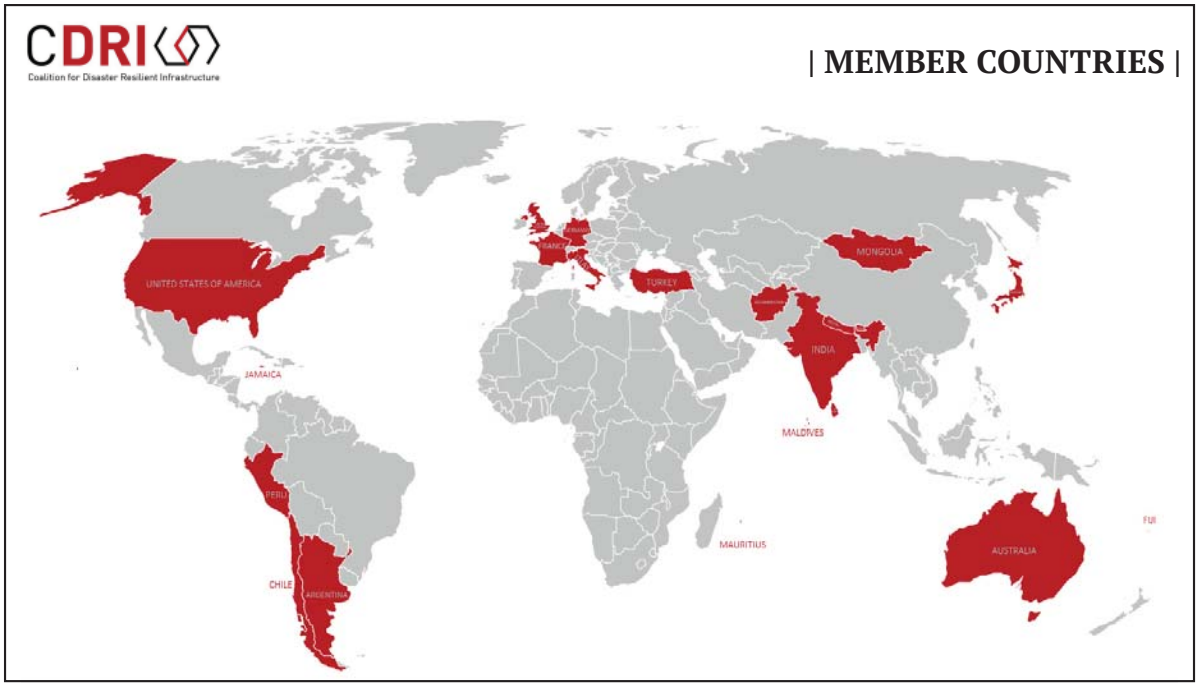
- A glacial lake is defined as water mass existing in a sufficient amount and extending with a free surface in, under, beside, and/or in front of a glacier and originating from glacier activities and/or retreating processes of a glacier.
- As glaciers retreat, the formation of glacial lakes takes place behind moraine or ice 'dam'.

- These damming materials are generally weak and can breach suddenly due to various triggering factors, leading to catastrophic floods. Such outburst floods are known as GLOF.

❑ Coalition for Disaster Resilient Infrastructure (CDRI)

About Coalition for Disaster Resilient Infrastructure (CDRI):

- It is a partnership of national governments, UN agencies and programmes, multilateral development banks and financing mechanisms, the private sector, and knowledge institutions.
- It aims to **promote the resilience of new and existing infrastructure systems to climate and disaster risks in support of sustainable development.**
- Its secretariat is based in **New Delhi, India.**
- **Launched by:** It was launched by Prime Minister of India at the UN Climate Action Summit in 2019.
- **Members:** As of 2021, 28 countries and 7 global organisations are its members.
- **Thematic Areas:** It has 8 thematic areas namely
  - Governance and Policy
  - Risk Identification and Estimation
  - Standards and Certification
  - Capacity building
  - Innovation & Emerging Technology
  - Recovery and Reconstruction
  - Finance
  - Community based approaches

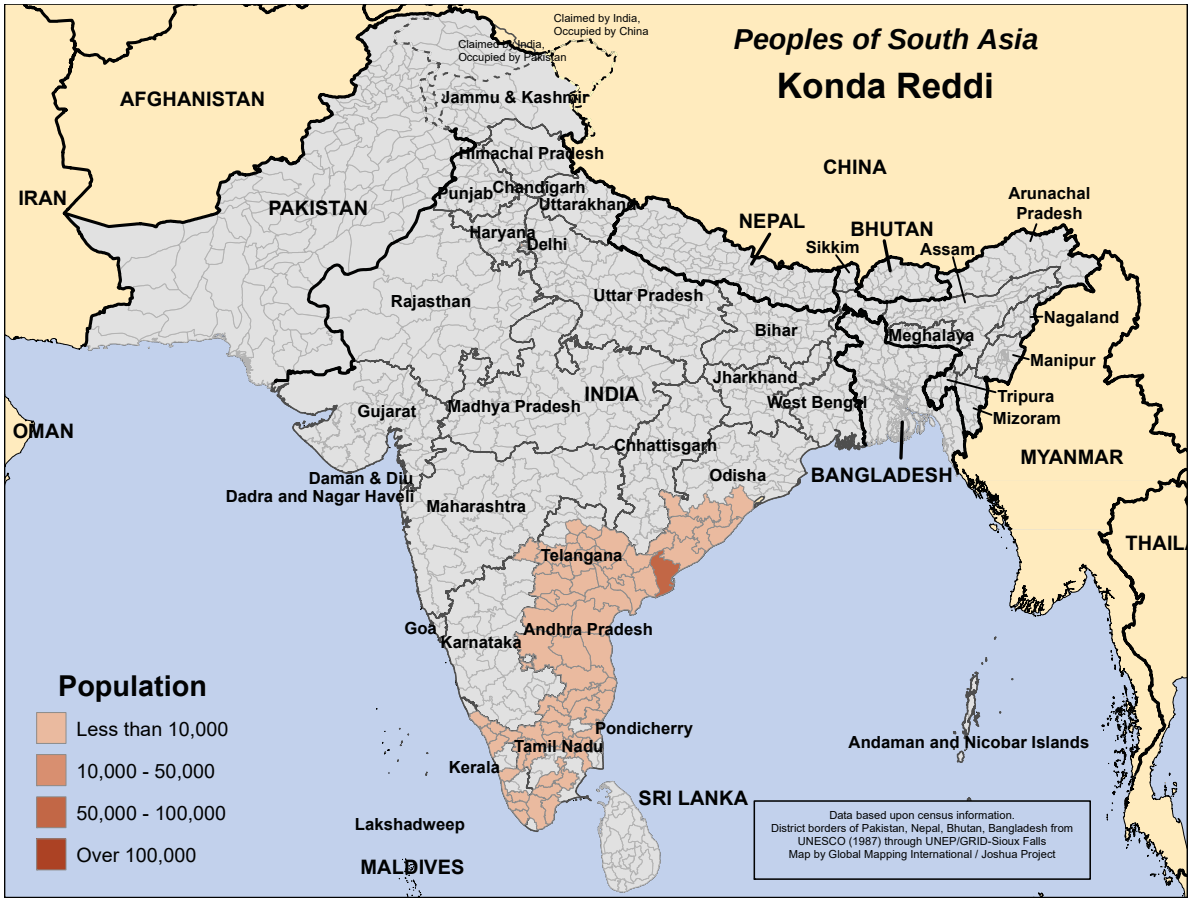


2. Tribes in News

Konda Reddy Tribes

Context:

- Konda Reddis inhabit on the banks situated on either **side of river Godavari** in the hilly and forest tracts of East and West Godavari and Khammam districts of Andhra Pradesh.
- **Language:** Their mother tongue is **Telugu** in its purest and chaste form and a unique accent.
- **Political Organization:** Konda Reddis have their own institution of social control called '**Kula Panchayat**'. Each village has a traditional headman called **'Pedda Kapu'**.
- **Livelihood:** They are primarily shifting cultivators and largely depend on flora and fauna of forest for their livelihood. They eat a variety of tubers, roots, leaves, wild fruits etc.,
  - They collect and sell non timber forest produce like tamarind, adda leaves, myrobolan, broom sticks etc., to supplement their meagre income.
- Konda Reddis have also been recognized as **Primitive Tribal Group** (now Particularly Vulnerable Tribal Groups)
- The Konda Reddis are known for their eco-friendly practices such as use of household articles made of bamboo, bottle gourd, and seed.



❑ Tharu Tribe

Context:

Recently, the Uttar Pradesh government has started a new scheme to put Tharu villages on the tourism map, and to create jobs and bring economic independence to the tribal population.

About Tharu tribe:

- **Meaning of 'Tharu':** The word tharu is believed to be derived from sthavir, meaning followers of Theravada Buddhism.
- They live in both India and Nepal. In the Indian Terai, they live mostly in Uttarakhand, Uttar Pradesh, and Bihar
- Tharu community belongs to the **Terai lowlands**, amid the Shivaliks or lower Himalayas.
- Most of them are forest dwellers and some practice agriculture.
- The word tharu is believed to be derived from **sthavir, meaning followers of Theravada Buddhism.**
- They represent the biggest chunk of U.P's tribal population
- **Language:** Tharu tribes speak various dialects of Tharu, a language of the Indo-Aryan subgroup, and variants of Hindi, Urdu, and Awadhi.
  - In central Nepal, they speak a variant of Bhojpuri, while in eastern Nepal, they speak a variant of Maithili.
- **Culture and customs:**
  - They worship Lord Shiva as Mahadev, and call their supreme being "Narayan", who they believe is the provider of sunshine, rain, and harvests.
  - Tharu women have stronger property rights than is allowed to women in mainstream North Indian Hindu custom

❑ Reang-Bru Tribe

- Riang or Bru are one of the 21 scheduled tribes of the Indian state of **Tripura.**
- The Bru are the second most populous tribe of Tripura after the Tripuris.
- The correct nomenclature for this ethnic group is actually Bru although the name Reang was accidentally incorporated by the Indian government during a census count.
- The Bru can be found all over the Tripura state in India.
- However, they may also be found in Mizoram, Assam, Manipur and Bangladesh.
- **Language:** They speak the Reang dialect of Kokborok language which is of Tibeto-Burmese origin and is locally referred to as Kau Bru.

❑ Bridges in news

Chenab Bridge

Context:

Recently, Indian Railways completed the arch closure of the iconic Chenab Bridge in Jammu & Kashmir.

About Chenab Bridge:

- It is the world's highest railway bridge and is part of the **Udhampur-Srinagar-Baramulla rail link project (USBRL).**
- The Project was declared as a Project of National Importance in March 2002.
- This bridge is 1**,315-metre long and is the highest railway bridge in the world** being 359 metres above the river bed level.
- The completion of the steel arch is a major leap towards the completion of the 111 km long winding stretch from **Katra to Banihal.**

Unique Features of this Bridge:

- Bridge designed to withstand high wind speed up to 266 Km/Hour.
- Bridge designed for blast load in consultation with **DRDO** for the first time in India.
- Bridge designed to bear earthquake forces of highest intensity zone-V in India.
- First time on Indian Railways, Phased Array Ultrasonic Testing machine used for testing of welds.

Chenab River:

- **Source:** It rises in the upper Himalayas in the Lahaul and Spiti district of Himachal Pradesh state.
- The river is formed by the confluence of two rivers, Chandra and Bhaga, at Tandi, 8 km southwest of Keylong, in the Lahaul and Spiti district.
- **Some of the important projects/dams on Chenab:**
  - Ratle Hydro Electric Project
  - Salal Dam- hydroelectric power project near Reasi
  - Dul Hasti Hydroelectric Plant- power project in Kishtwar District
  - Pakal Dul Dam (under construction)- on a tributary Marusadar River in Kishtwar District.

❑ Bridge on Mahakali River:

Context:

Recently, the Union Cabinet has cleared a plan to build a new bridge connecting India and Nepal over the **Mahakali river and link Dharchula in Uttarakhand with Nepal's Dharchula**.

About the bridge:

- The bridge will be completed within three years. It will strengthen the relationship between the two countries.
- India and Nepal share unique ties of friendship and cooperation.

- The construction of the bridge will help people living **in Dharchula in Uttarakhand** and in the territory of Nepal.

About Mahakali River:

- It is also known as **Sharda River or Kali Ganga in Uttarakhand**.
- It joins Ghagra River in Uttar Pradesh, which is a tributary of Ganga.
- **River Projects:** Tanakpur hydro-electric project, Chameliya hydro-electric project, Sharda Barrage.

❑ Dhubri-Phulbari Bridge

About Dhubri Phulbari Bridge:

- Dhubri-Phulbari Bridge is a proposed bridge over the Brahmaputra River **between Assam and Meghalaya in North-East India.**
- This bridge, as per the original plan, would be completed by 2027-28. It would be India's longest bridge over water and would span more than 19 kilometres.
- The bridge would reduce the distance between Phulbari in West Meghalaya and Dhubri West Assam from 200 kilometres to almost 19 kilometres.

About Brahmaputra River:

- The Brahmaputra (meaning the son of Brahma).
- The Brahmaputra's source is the Chemayungdung glacier in southwestern Tibet. It's source is very close to the sources of Indus and Satluj.
- Mariam La separates the source of the Brahmaputra from the Manasarovar Lake.
- In Tibet, it passes through the depression formed by the Indus-Tsangpo Structure Zone between the Great Himalayas in the south and the Kailas Range in the north.

- It flows as the Yarlung Tsangpo River across southern Tibet to break through the Himalayas in great gorges and into Arunachal Pradesh where it is known as Dihang.
- Just west of the town of Sadiya, the Dihang turns to the southwest and is joined by two mountain streams, the Lohit and the Dibang.
- Below the confluence, the river is known as the Brahmaputra.
- It flows through Bangladesh as the Jamuna where it merges with the Ganga to form a vast delta, the Sunderbans.
- The biggest and the smallest river islands in the world, Majuli, and Umananda respectively, are in the river in the state of Assam.

❑ Daporijo bridge

- The Border Roads Organisation (BRO) constructed the **Daporijo bridge over Subansiri river in Arunachal Pradesh in a record span of just 27 days.**
- The bridge is of utmost importance in strategic connectivity as it links roads leading upto the Line of Actual Control (LAC) between India and China.
- Subansiri River (gold river), originates in the Tibet Plateau and enters India through Miri hills in Arunachal Pradesh.

- It is the largest tributary of Brahmaputra River.

3. GI Tags in news

About GI Tag:

- A GI is primarily an agricultural, natural or a manufactured product (handicrafts and industrial goods) originating from a definite geographical territory.
- Typically, such a name conveys an assurance of quality and distinctiveness, which is essentially attributable to the place of its origin.
- How long the registration of Geographical Indication is valid?
  - The registration of a geographical indication is valid for a period of 10 years.
  - It can be renewed from time to time for further period of 10 years each.
- In India, Geographical Indications registration is administered by the Geographical Indications of Goods (Registration and Protection) Act, 1999 which came into force with effect from September 2003.
- The first product in India to be accorded with GI tag was Darjeeling tea in the year 2004-05.

❑ Judima

- Judima is a local fermented drink made with rice, brewed by the Dimasa community in **Assam.**
- It derives its name from the words Ju which means wine and Dima means 'belonging to the Dimasa'.
- It is the first traditional brew in the entire northeast to bag GI tag.

❑ Sojat Mehendi

- Sojat Mehendi, originating from Mehendi leaves grown in Sojat, is naturally cultivated using rainwater.
- Sojat tehsil of the Pali district in **Rajasthan** has a suitable geological structure, topography and drainage system, climate and soil for naturally cultivating the mehndi leave crop.

❑ Chinnor Rice

- Chinnor rice is mainly produced in the Balaghat region, although it is also produced in Bhandara, **Maharashtra**, for which the GI tag was claimed by Maharashtra.
- The chalky loamy soil found in Balaghat creates favorable conditions for rice production there. That is why Balaghat is also called the rice bowl of Madhya Pradesh.

❑ Edayur chilli

- Edayur chilli is a local cultivar of **Malappuram district, Kerala.**
- It has been cultivated in the area for at least 150 years.
- Large quantity of Edayur chilli has been sold to nearby markets for making "Kondattom" (sun-dried-curd-chillies).

- Edayur chilli is a unique cultivar of this area with **very low pungency.**
- The distinctiveness can be attributed to its genetic makeup, the specific environmental and soil conditions of the area and the traditional methods of cultivation.

❑ Kuttiattoor mango

- Kuttiattoor mango is a popular and tasty traditional mango cultivar of **Kuttiattoor (Kerala**).
- This mango is famous for its appealing orange-yellow colour in addition to its excellent taste and flavour.
- The ripened fruits do not show speckles or patches on the skin, making it more appealing in the market.
- The distinctiveness of Kuttiattoor mango is aided by the combination of specific environmental conditions of the area of its cultivation and varietal characters.

❑ Rataul Mango

- The Rataul mango, grown in large numbers in **Baghpat in Uttar Pradesh**.
- The mango got its name Rataul from the village where it originated.
- Popular for its special aroma and taste, the mango is also claimed by Pakistan as its native produce.

❑ Tamenglong Oranges

- Tamenglong Orange/Mandarin (Citrus reticulata) is a unique crop that is only found in **Tamenglong district, Manipur**.
- The plant is a perennial evergreen of the Rutaceae family and subtropical in distribution.
- The oranges weigh around 90-110g.
- The fruit is loose skinned, has a smooth surface, approximately 10 segments, and abundant juice (40-50%) with well-blended sweetness and acidity taste.

❑ Hathei chilli

- Hathei chilli, which is found in **Manipur'**s Ukrul district and is known for its unique flavour.
- The Hathei chilly works as a good anti-oxidant and possesses high calcium and Vitamin C levels.
- It has an extremely high American Spice Trade Association **(ASTA) colour value of 164**.
- The extractable colour of chilli is usually expressed using ASTA values.

❑ Mizo Ginger (Saitual Ginger)

- The North Eastern state of **Mizoram** is a treasure trove of ginger diversity with as many as eight native varieties cultivated here since the ancient times.
- Ginger along with turmeric and chillies are important cash crops and widely used to prepare local delicacies as well as medicines.
- Mizo gingers are renowned for their pungency, high content of gingerol (1.23 to 1.25 percent) and

volatile oil (1.45 to 1.80 percent) with less crude fibre content as compared to the varieties found in North East India.

❑ Karuppur Kalamkari Paintings

- Kalamkari paintings are done on pure cotton cloth, predominantly used in temples for umbrella covers, cylindrical hangings, chariot covers and asmanagiri (false ceiling cloth pieces).
- Documentary evidence shows that kalamkari paintings evolved under the patronage of Nayaka rulers in the early 17th century.

❑ Kallakurichi Wood Carvings

- The Kallakurichi wood carvings are a unique form of wood carving practiced in **Tamil Nadu.**
- It involves the application of ornamentation and designs, derived from traditional styles by the craftsmen.
- They are mainly practiced in Kallakurichi, Chinnaselam and Thirukkovilur taluks of Kallakurichi district.

❑ Pithora

- Pithora Art is highly enriched folk art and is the culture of tribes.
- Pithora art is an art form mix of religion and the myths associated with it.
- Pithora Art has been a part of the **Rathwa Tribal Community** for centuries.
- The unique and beautiful style of Pithora Art originated around approximately 3000 years ago.
- Pithora Art is practiced by Lakhara (i.e. Painter- simply means a creative individual of the community) to paint a traditional Pithora, brushes are made from bamboo- shoots or bawal tree twigs, making cones from dry but tough Khakhra leaves to hold colours that are grind into powder from different dried vegetables and mineral sources.

❑ GI tag for 7 indigenous products of Uttarakhand:

- The seven products which got the GI tag are:
  - **Kumaon's Chura Oil**
  - **Munsiyari Rajma**
  - **Bhotia dann**
  - **Aipan**
  - **Ringal Craft**
  - **Copper products**
  - **Thulma**

- Bhotia Dann is a rug made by Bhotia tribes which is a nomadic community.
- Aipan is a traditional art which is made on special occasions.
- Ringal craft is an art of making products by knitting bamboo strands.
- The Thulma blanket is renowned for its luxurious fur and intriguing designs made from locally sourced fabric.

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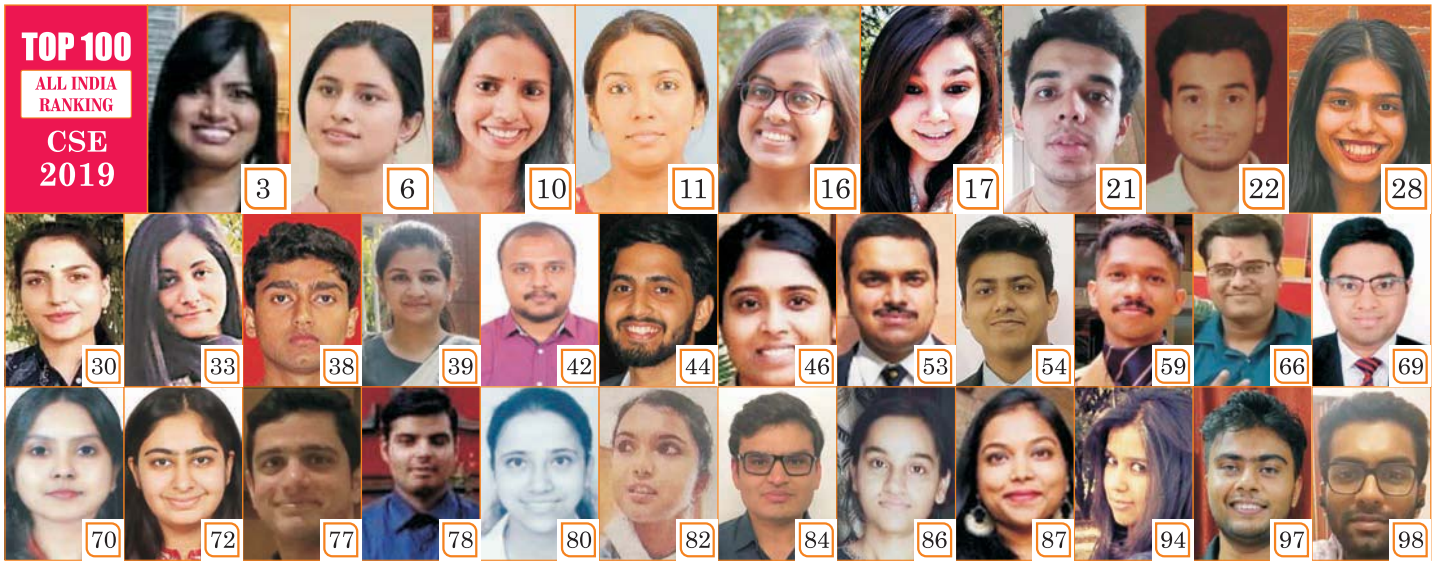

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