



Geography Current Affairs

Compilation

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UPSC Prelims 2026



How to Use This Current Affairs Magazine Effectively for UPSC Prelims?

This Current Affairs Magazine is designed to help you understand current affairs, not just read them.

What makes this magazine different?

Topic-wise, Complete Coverage

- ✓ Each topic is covered as a single unit, with **all relevant news from the last 1 to 1.5 years placed together**. This helps you understand every dimension of an issue and recall it easily in real exam conditions.

Subject-wise Structure

- ✓ The magazine is **organised subject-wise, not month-wise**. If you are preparing Geography, you can read only Geography current affairs. This **aligns perfectly with UPSC-style preparation and PRAYAAS test series**, improving conceptual clarity and recall.

Direct Newspaper Source Links

- ✓ Each topic **includes direct links to original newspaper articles**, allowing you to read the source anytime and develop a deeper, authentic understanding of the issue.

Simple & Sober Language

- ✓ The **content is written in easy, clear language, without heavy words**, making reading and revision smooth and stress-free.

Static + Current Linked Together

- ✓ Every current issue is **directly linked to the static syllabus**, so you don't need to search for background information elsewhere. **Everything is available at one place.**

Prelims-Focused Highlighting

- ✓ Important facts, ministries and keywords are bolded for quick identification. You can highlight directly—no separate note-making needed in the first readings.

Focus on Understanding, Not Memorising

- ✓ This magazine **ensures you don't just read current affairs—you understand them conceptually**. When used along with video lectures, it becomes an extremely powerful learning tool.

Our Aim is-

To make current affairs a **core part of your UPSC preparation, not an extra burden.**

- ❖ Read less.
- ❖ Understand more.
- ❖ Connect everything.

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1. Economic Geography

1.1 National Critical Mineral Mission

Context (PIB):

- Union Cabinet has **approved** the National Critical Mineral Mission (NCMM) with an expenditure of ₹34,300 crore to strengthen **India's critical mineral value chain**.

Link for reference- <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2097308®=3&lang=2>

Features of NCMM: -

- Encourages both **public & private investment** in global mining projects
- Establishment of **mineral processing parks** and promotion of critical mineral recycling.
- Plans to **build a national reserve** of critical minerals to ensure long-term supply security.

Critical Minerals Under NCMM

- Lithium & Cobalt: Essential for electric vehicle (EV) batteries and electronics.
- Graphite & Nickel: Used in battery storage and alloys.
- Rare Earth Elements (REEs): Key for high-tech manufacturing and defence applications.
- Titanium & Tungsten: Critical for aerospace and industrial applications.
- Vanadium & Molybdenum: Used in steel production and energy storage solutions.

Governance Framework:

- Activities will be coordinated by the Empowered Committee on Critical Minerals.
- Ministry of Mines** will be the administrative Ministry.

What are Critical Minerals?

- It is a **metallic or non-metallic element** crucial for modern technologies, economies, and national security, with the potential risk of disruptions to its supply chains. It **includes both primary and processed minerals**.
- A mineral is **critical when the risk of supply shortage and associated economic impact** is (relatively) higher than that of other raw materials.
- Countries **create their own critical minerals list** based on strategic needs.
- Essential to **economic development and national security**.
- Currently, **India has heavy reliance** on imports of critical minerals.
- China controls** 60% of rare earth production, 60% of critical minerals production and 80% of the processing worldwide.
- In 2024, China banned exports** of gallium, germanium, antimony, and other key materials to US
- Democratic Republic of Congo supplies ~70% of the world's cobalt**, but political instability has led to supply disruptions.

Critical Minerals of India

- GoI has unveiled the **country's first report on "Critical Minerals for India"** and has **identified 30 critical minerals**.
- 30 critical minerals of India:** - Antimony, Beryllium, Bismuth, **Cobalt**, **Copper**, Gallium, Germanium, Graphite, Hafnium, Indium, **Lithium**, Molybdenum, Niobium, Nickel, PGE, Phosphorous, Potash, **REE**, Rhenium, Silicon, Strontium, Tantalum, Tellurium, Tin, Titanium, **Tungsten**, Vanadium, Zirconium, Selenium and Cadmium.

Initiatives taken for critical Minerals

Policy and Regulatory Framework

- Mines and Minerals (Development and Regulation) Amendment Act, 2023: It enables exploration and mining of critical minerals.
- Elimination of customs duties on majority of the critical minerals in Union budget 2024-25

Exploration and Domestic Production

- **Geological Survey of India (GSI):** Conducting extensive exploration for lithium, rare earths, and other critical minerals.
- **Lithium Reserves Discovery (2023):** Significant lithium deposits **found in Reasi, Jammu & Kashmir**.
- **Strategic Mineral Reserves:** Plans to establish reserves for critical minerals like lithium and cobalt.
- International Collaborations & Trade Agreements
- **Khanij Bidesh India Limited (KABIL), 2019:** A joint venture company of Ministry of Mines to acquire critical minerals globally. KABIL has engagements with countries like Argentina, Australia etc.
- **Minerals Security Partnership (MSP):** India joined the **US-led initiative** to ensure stable critical minerals supply chain in 2023.

Geological Survey of India (GSI)

- It was conceived as "Geological Survey of India" by **John McClelland** who initiated the appointment of David Hiram Williams as the Geological Surveyor on February 5, 1846, by the East India Company.
- **Second oldest survey body** in India after Survey of India (founded in 1767).
- First Indian Head: Dr. M. S. Krishnan.
- Initially established to locate coal deposits for the Railways, the GSI has evolved into a premier institution with international recognition, serving as a comprehensive repository of geoscience data.
- **Headquarters:** Kolkata.
- **Six Regional offices** at Lucknow, Jaipur, Nagpur, Hyderabad, Shillong and Kolkata.
- **Nodal Ministry:** Attached office to the **Ministry of Mines**.

Functions of GSI

- Its core functions include the **creation and regular updating of national geoscientific information and mineral** resource assessment.
- Designated as the **Nodal Agency for landslide** investigations in India.
- **Declares geo-heritage sites** and national geological monuments

PYQs

Q. Consider the following minerals: (2020)

- 1) Bentonite
- 2) Chromite
- 3) Kyanite
- 4) Sillimanite

In India, which of the above is/are officially designated as major minerals?

- a) 1 and 2 only
- b) 4 only
- c) 1 and 3 only
- d) 2, 3 and 4 only

1.2 Conflict Minerals

Context: -

- **Democratic Republic of Congo (DRC)** has initiated **legal action** against Apple's subsidiaries in France and Belgium, accusing the company of sourcing conflict minerals from sub-Saharan Africa.

What Are Conflict Minerals?

- Minerals extracted from **conflict-affected regions**, where profits fund armed groups and human rights abuses.
- **Key Conflict Minerals (3TGs): Tin, Tantalum, Tungsten, and Gold**, classified by OECD.
- **Major Sources:** DRC, Sierra Leone, Venezuela, and other conflict-prone areas.
- **Extraction Process:** Sourced from ores like cassiterite (tin), columbite-tantalite (tantalum), and wolframite (tungsten).

1.3 India-Canada Collaboration on Critical Minerals

Context:

- India and Canada have resumed negotiations on a Free Trade Agreement (FTA), with renewed focus on strategic collaboration in the critical minerals sector.

Link for Reference: <https://indianexpress.com/article/opinion/columns/when-it-comes-to-critical-minerals-india-cannot-rely-on-china-it-needs-to-fast-track-its-own-exploration-10077064/>

About: -

- Canada holds **reserves of over 31 critical minerals** and exported over \$50 billion worth in 2023.
- It is **recognised globally for ESG-compliant mining practices**, offering India a reliable and ethical alter-native.

Why Critical Minerals Matter to India?

- India's **clean energy and tech sectors** EVs, solar panels, electronics rely heavily on **critical minerals like lithium, cobalt, nickel, graphite, copper, and rare earths**.
- **India's Dependence on China:**
 - **Lithium:** 71% of India's imports come from China (Canada contributes just 0.13%).
 - **Rare Earth Elements:** China accounts for 42% of India's imports (Canada at a negligible 0.02%)

1.4 Reclassification of Major Minerals

Context (PIB):

- Ministry of Mines has **upgraded Barytes, Felspar, Mica, and Quartz** from **minor minerals to major minerals**.

Link for Reference: <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2105215®=3&lang=2>

What is Mineral?

- A mineral is a **naturally occurring inorganic substance** with a definite chemical composition and crystalline structure.

Reclassification of Barytes, Felspar, Mica and Quartz: -

- Decision aligns with **recently approved National Critical Mineral Mission**, which promotes domestic exploration, mining, and **recovery of critical minerals** from existing mines and waste materials.
- **Quartz, Felspar and Mica** are found in **pegmatite rocks**, which are an important source of many critical minerals such as Beryl, Lithium, Niobium, Tantalum, Molybdenum, Tin, etc.

- These minerals have **vital role in various new technologies**, in energy transition, spacecraft industries, healthcare sector, etc.
- **Baryte often occurs as concretions** and vein fillings in limestone and dolostone. It is found in association with ores of Antimony, Cobalt, Copper, Lead, Manganese and Silver

Difference between Major and Minor minerals: -

Parameter	Major Minerals	Minor Minerals
Definition	Minerals specified in 1st schedule appended in Mines and Minerals (Development & Regulation) Act, 1957 (MMDR Act 1957).	Minerals which are declared as such by the Central Government in exercise of the powers conferred by MMDR Act 1957.
Examples	Gold, coal, uranium, lignite, iron etc.	Stones, gravel, ordinary clay etc.
Regulation	Central Government	State Governments

1.5 Limestone Reclassification

Context: -

- **Ministry of Mines (MoM) has reclassified** limestone entirely as a **major mineral** to modernise regulation and enhance ease of doing business.

Link for Reference: <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2179064®=3&lang=2>

Why is it done?

- Previously **classified based on its use**—a minor mineral when used in kilns for the manufacture of lime, and as a major mineral for producing cement, chemicals, fertilisers, steel, sugar, etc.
- **NITI Aayog-led inter-ministerial committee recommended** the change because **industrial use has greatly exceeded traditional uses**, making dual classification outdated.

Limestone

- Limestone is a **sedimentary rock mainly composed** of calcium carbonate (CaCO_3), formed from the remains of marine organisms over millions of years.
- Mainly consists of **calcite, aragonite, and sometimes mixed with dolomite**.
- **Uses:** It is vital in cement, steel, fertiliser, glass, chemical, and construction industries, and also used in agriculture for soil conditioning.
- **Largest Reserves:** **Karnataka** holds about 25–28% of India's total limestone resources (IMYB 2022).
- **Top Producers:** **Rajasthan** leads in production, followed by Madhya Pradesh and Andhra Pradesh; together they contribute about 50% of national output (MoM).

1.6 Private Mining of Critical Minerals

Context (DTE):

- GoI amended the Mines and Minerals (Development and Regulation) Act of 1957, **allowing private players to mine six critical minerals** — **lithium, titanium, beryllium, zirconium, niobium, and tantalum**.
- These six minerals have been removed from the country's atomic minerals lists to allow private players to mine them.
- **Atomic minerals:** naturally occurring minerals that contain significant quantities of radioactive elements.

Critical Minerals

- GoI has unveiled the first report of the country on "Critical Minerals for India" and has identified **30 critical minerals**.
- The identification of the critical minerals is a part of multiple strategic value chains.

- These are minerals that are **essential for economic development and national security**.
- The lack of availability of these minerals or the concentration of extraction or processing in a few geographical locations can lead to “supply chain vulnerabilities and even disruption of supplies”.
- A mineral is critical when the risk of supply shortage and associated economic impact is (relatively) higher than other raw materials.

Critical Minerals of India

- The minerals were identified based on a report by an Expert Committee of the Ministry of Mines.
- **These 30 critical minerals are** Antimony, Beryllium, Bismuth, Cobalt, Copper, Gallium, Germanium, Graphite, Hafnium, Indium, Lithium, Molybdenum, Niobium, Nickel, PGE, Phosphorous, Potash, REE, Rhenium, Silicon, Strontium, Tantalum, Tellurium, Tin, Titanium, Tungsten, Vanadium, Zirconium, Selenium and Cadmium.
- The committee also recommended the creation of the Centre of Excellence for Critical Minerals (CECM) under the Ministry of Mines.
- This proposed Centre will periodically update the list of critical minerals for India.

IMP Critical Minerals: -

Lithium

- Lithium is a non-ferrous, soft, silvery-white alkali metal.
- It is also called '**white gold**' due to its high demand for rechargeable batteries.

Properties: -

- Under standard conditions, it is the least dense metal and the least dense solid element.
- Like all alkali metals, it is highly reactive and flammable, so it must be stored in vacuum, inert atmosphere, or inert liquid (such as purified kerosene or mineral oil).
- It exhibits a metallic lustre. But it corrodes quickly in the air to a dull silvery grey, then black tarnish.

Occurrence

- It **never occurs freely** in nature but occurs mainly as pegmatitic minerals.
- Due to its solubility as an ion, it is present in ocean water and commonly obtained from brines (high-concentration salt solution in water).
- Pegmatite is a coarse-textured igneous rock that forms during the **final stage of magma's crystallisation**. It contains large crystals and minerals rarely found in other types of rocks.

Global Reserves and Production: -

- **Countries with largest reserves:** 1st Bolivia > 2nd Argentina > 3rd Chile > 4th US > Australia > China.
- 54% of the world's lithium reserves are in three South American countries: Argentina, Bolivia, and Chile. The area is referred to as the '**Lithium Triangle**'.
- **Top Producers:** 1st Australia > 2nd Chile > 3rd China > 4th Argentina > 5th Zimbabwe

Uses: -

- Lithium-ion batteries are used in laptops, mobiles, electric vehicles, wind turbines, solar panels, etc.
- It is used to make alloys with aluminium and magnesium, which are stronger but lighter.
- It is used in nuclear reactions, the ceramics and glass industry, and lubricating greases.
- It is also used for carbon dioxide removal and air purification (esp. in confined areas, such as spacecraft and submarines).

Titanium

- Titanium is a metal that has a silver-grey appearance.
- **Properties:** high strength, lightweight, and is corrosion-resistant, heat resistant (due to high melting point), and **biocompatible** (compatible with living tissues and has low reactivity with the human body).

- **Occurrence:** found in nature only as an oxide, not in its pure metallic form.
- It is found in various minerals, rocks, and soils. It is also present in plants, animals, natural waters, deep-sea dredgings, meteorites, and stars.
- An oxide is a chemical compound that contains at least one oxygen atom bonded to one or more other elements. Oxides are formed when an element reacts with oxygen.
- **Ores:** The most abundant titanium ore is ilmenite. Other titanium ores include **rutile and titanite**.
 - **Ilmenite:** It is an iron-black, heavy, metallic oxide mineral. It is composed of iron and titanium oxide. It is commonly found in igneous rocks.
 - **Rutile:** It has a distinctive reddish-brown colour and a higher titanium dioxide content than ilmenite. It occurs in igneous and metamorphic rocks and is often found in association with ilmenite.
 - **Titanite:** It is a calcium titanium silicate mineral. It is green, yellowish-green, brown, or black in colour. It is commonly found in metamorphic and igneous rocks.
- **Top Producers of Titanium:** 1st China > 2nd Russia > 3rd Japan > 4th Kazakhstan > 5th Ukraine
- **Uses:** nuclear applications, defence, aerospace, marine, and construction industries, high-performance alloys, electrical goods, medical implants, and jewellery.

1.7 Offshore Areas Mineral (Development and Regulation) Amendment Act, 2023

Context: -

- The Offshore Areas Mineral (Development and Regulation) Amendment Bill, 2023, received assent from the President.

About: -

- It has amended the Offshore Areas Mineral (Development and Regulation) Act 2002.
- It provides for the development and regulation of mineral resources in the territorial waters, continental shelf, exclusive economic zone (EEZ), and other maritime zones of India.
- Offshore mineral resources are **controlled and regulated by the Union**.
- Offshore mining is the process of retrieving mineral deposits from the deep seabed at a depth of more than 200 meters.

Key Changes in the Act

Sphere	Offshore Areas Mineral (Development and Regulation) Act, 2002	Offshore Areas Mineral (Development and Regulation) Amendment Act, 2023
Licence	Different licences for reconnaissance, exploration, and production.	Composite licence for granting rights for exploration as well as production.
Validity	Production lease is granted for a period of up to 30 years, further renewed for up to 20 years.	Production lease under a composite licence will be valid for 50 years.
Auction Process	Provides for the grant of concessions through administrative allocation.	Provides two types of operating rights to the private sector by competitive bidding, viz. production lease, and composite licence.
Mining in reserved areas	Allows the government to reserve offshore areas that are not held under any operating right.	Allows the administering authority to grant a composite licence or production lease to the government or a government company.
New Provisions in the 2023 Act		
• Mining of atomic minerals: Exploration, production, and composite licenses will be granted only to the government or government companies. • Offshore Areas Mineral Trust: Will manage funds under the Public Account of India that will be non-lapsable in nature. ◦ Funds will be used for specified purposes including exploration in offshore areas, etc.		

Offshore Mineral Wealth of India Geographical Position

- Its 7,517-km coastline is home to nine coastal states, four Union territories, and 1,382 islands.

India's EEZ is spread over 2 million sq. ft. Mineral Resources (As per Geological Survey of India) :-

- Lime mud within the EEZ off Gujarat and Maharashtra coasts.
- Construction-grade sand off Kerala coast.
- Heavy mineral placer deposits in the inner-shelf and mid-shelf off Odisha, Andhra Pradesh, Kerala, Tamil Nadu and Maharashtra.
- Phosphorite in the Eastern and Western continental margins.
- Polymetallic Ferromanganese (Fe-Mn) nodules and crusts in Andaman Sea and Lakshadweep Sea.

1.8 Critical Mineral Recycling Incentive Scheme (CMRIS)

- CMRIS is a **central sector scheme under the National Critical Minerals Mission (NCMM)** to promote recycling of critical minerals from secondary sources
- The Ministry of Mines serves as the implementing body.
- It aims to **establish a secondary domestic supply chain** for critical minerals, thereby reducing India's dependence on imports.
- An annual recycling capacity of 270 kilotons, along with 40 kilotons of recovered critical minerals each year by FY 2031.
- It will operate for **six financial years**, from FY 2025–26 to FY 2030–31, with a total outlay of ₹1,500 crore.
- Incentives are provided on a reimbursement basis for both capital expenditure (Capex) and operational expenditure (Opex) components.
- CMRIS **covers all stages of recycling**, from collection and processing to extraction and purification, ensuring full and transparent mineral recovery.

1.9 State Mining Readiness Index

- **Ministry of Mines has released** the first-ever State Mining Readiness Index (SMRI) and corresponding state rankings to promote mining sector reforms across India.
- **SMRI evaluates States on four criteria:** auction performance, mine operationalisation, exploration efforts, and sustainable mining practices.
- Serves as a reform **benchmarking tool promoting** non-coal mineral development, investment-friendly policies, sustainable resource management, & cooperative federalism among States.

Top Performers:

- **Category A:** Madhya Pradesh, Rajasthan, Gujarat (Mineral-rich States).
- **Category B:** Goa, Uttar Pradesh, Assam (Moderate mineral endowment).
- **Category C:** Punjab, Uttarakhand, Tripura (Limited mineral endowment).

1.10 World Water Day 2025

Context: -

- World Water Day (**March 22**) 2025 **focuses on "Glacier Preservation"**.

About: -

- World Water Day was **first proposed at the 1992 UN Conference on Environment and Development (UNCED) in Rio de Janeiro**.
- Officially recognised by the United Nations General Assembly in 1993.

Government Initiatives in India

- **Jal Jeevan Mission:** Aims to provide 100% tap water coverage in rural households by 2024.
- **Jal Shakti Ministry:** Formed by merging various ministries, it is responsible for clean drinking water, resolving inter-state water disputes, and Ganga rejuvenation.

- **Jal Shakti Abhiyan (JSA):** Launched in 2019, JSA focuses on water conservation, recharge, and rainwater harvesting. Initially targeting 256 water-stressed districts, it now covers all 740 districts in India.
- **Atal Bhujal Yojana:** Focuses on sustainable groundwater management and recharge, with priority in seven states facing critical groundwater issues.
- **Amrit Sarovars:** Aims to create 50,000 water bodies, each covering one acre, for water conservation.
- **Nal Se Jal Scheme:** Part of the Jal Jeevan Mission, this scheme aims to provide piped drinking water to every rural household by 2024.
- **Namami Gange Program:** Focuses on pollution abatement and rejuvenation of the Ganga River to ensure clean water (Nirmal Dhara) and continuous flow (Aviral Dhara).
- **National Water Policy:** Promotes water conservation and the protection of water resources, emphasising rainwater harvesting.
- **National Aquifer Mapping and Management Program:** Aims to map and scientifically manage aquifers to ensure sustainable groundwater use.
- **Mission Sahbhagita:** Launched by the Ministry of Environment, Forest and Climate Change (MoEF&CC), this initiative encourages the participatory conservation and wise use of wetlands.

1.11 World Water Development Report 2025

Context: -

- **UNESCO released** 'The UN World Water Development Report 2025 – Mountains and Glaciers: Water Towers' to mark the 1st ever World Day for Glaciers on March 21.

Link for Reference: <https://indianexpress.com/article/explained/explained-climate/global-warming-mountain-ranges-9900360/>

Status of the world's water resources: -

- As per most recent global estimates (from 2021), the **agriculture sector dominates freshwater withdrawals (72%)**, followed by industry (15%) and domestic (or municipal) use (13%).
- **Over the period 2000–2021**, global freshwater withdrawals increased by 14%. Most of this increase occurred in cities, countries and regions undergoing rapid economic development.
- Climate change is increasing seasonal variability in, and uncertainty about, water availability.
- **Pollution, land and ecosystem degradation, and natural hazards** can further compromise the availability of water resources.

UNESCO

- The United Nations Educational, Scientific and Cultural Organization (UNESCO) is a **specialized agency of the United Nations**.
- **Goal:** It is dedicated to strengthening our shared humanity through the promotion of education, science, culture, and communication.
- UNESCO was **started in 1945 after World War II**. It took over from an older group called the International Committee on Intellectual Cooperation.
- UNESCO is **part of the United Nations Sustainable Development Group**.
- UNESCO focuses on five main areas: Education, Natural sciences, Social and human sciences, Culture, Communication and information.
- **Member countries:** UNESCO has 194 member countries and 12 associate members.
- **Headquarter:** Paris, France

1.12 Deep Sea Mining

Context: -

- **Pacific Ocean seabed** has not recovered after 40+ years, raising concerns over the long-term ecological impact.

Link for Reference- <https://indianexpress.com/article/explained/explained-sci-tech/deep-sea-mining-impact-9913290/>

What is Deep Sea Mining?

- Process of **extraction of mineral-rich nodules, sulphides, and crusts** from the deep seabed **below 200m depth** (covers about 2/3rd of the total seafloor).

Clarion-Clipperton Zone (CCZ)

- CCZ is a vast, mineral-rich geological submarine fracture zone with **unique deep-sea biodiversity in the northern Pacific Ocean**.

Types of Deep-Minerals

- **Polymetallic Nodules:** They are **rounded potato-sized lumps of minerals** found usually on the seabed across the **abyssal plains**. They are **composed of manganese, iron, nickel, copper, and cobalt**.
- **Seafloor Massive Sulfides (SMS):** They are found **around hydrothermal vents** (where hot, mineral-rich fluids are released from the seafloor). They are **composed of copper, gold, silver, zinc, etc.**
- **Cobalt-rich Crusts:** They are **found on seafloor seamounts** and other volcanic features. They comprise cobalt, nickel, iron, manganese, and other metals.

Who does regulate it?

- **International Seabed Authority** Regulation
- **United Nations Convention on Law of the Sea (UNCLOS)** Oversight: High-seas mineral wealth designated as the "common heritage of mankind."

International Seabed Authority

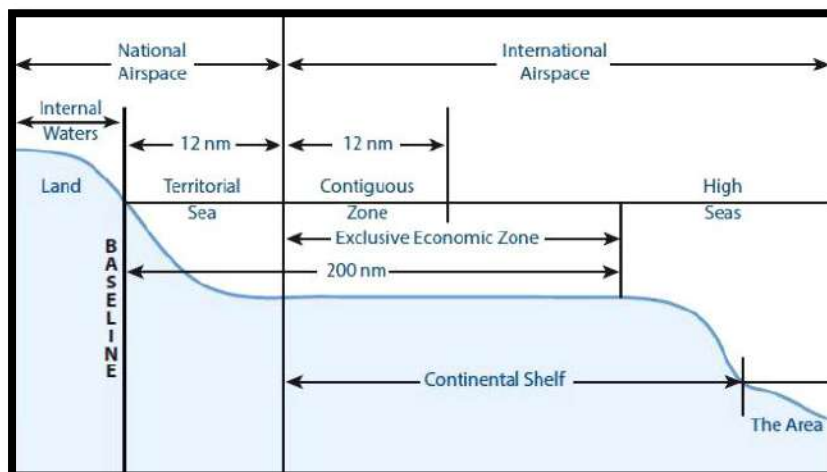
- **Autonomous international organization** established **under the 1982 United Nations Convention on the Law of the Sea (UNCLOS) and the 1994 Agreement** relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea (1994 Agreement).
- **Headquarters in Kingston, Jamaica**, came into existence on 16 November 1994, upon the entry into force of UNCLOS.
- **Mandate:** To regulate **mining and related activities** in the international seabed **beyond national jurisdiction**.
- ISA is the organization through which states parties to UNCLOS organize and control all mineral-resources-related activities in the international seabed area for the **benefit of humankind**.
- **Members:** 168 Member States (**including India**) and European Union.
- All nations that ratify UNCLOS **automatically** become members of ISA.

India and ISA

- India is **among 38 countries** that maintains permanent missions to ISA.
- Recently, **India submitted two applications** for seabed exploration in two Indian Ocean regions:
 - Polymetallic sulphides in **Carlsberg Ridge**.
 - Cobalt-rich ferromanganese crusts of **Afanasy-Nikitin Seamount**.
- Currently, India holds two contracts for exploration in the Indian Ocean:
 - Polymetallic nodules exploration in Central Indian Ocean Basin.
 - Polymetallic sulphides exploration in Indian Ocean Ridge.

UNCLOS

- UNCLOS 1982 is an **international agreement that establishes** the legal framework for marine and maritime activities.
- It is also known as Law of the Sea.
- It **divides marine areas into five main zones namely-** Internal Waters, Territorial Sea, Contiguous Zone, Exclusive Economic Zone (EEZ) and the High Seas.
- Only international convention which **stipulates a framework for state jurisdiction** in maritime spaces. It provides a different legal status to different maritime zones.



MARITIME ZONES

Baseline

- Meaning: Low-water line along the coast officially recognized by the coastal State.
- Purpose: All maritime zones are measured from the baseline.
- Remember- 1 nm = 1.85 km

Internal Waters

- Location: On the landward side of the baseline.
- Examples: Bays, ports, rivers, lakes connected to sea, harbours.

Rights:

- Full sovereignty of coastal State (same as land territory).
- No right of innocent passage for foreign ships.

Territorial Sea

- Extent: Up to 12 nautical miles (nm) from baseline.
- Rights of Coastal State:
- Full sovereignty over water, seabed, subsoil and airspace.
- Right of Foreign Ships: Innocent Passage allowed (not harmful to peace & security).

Contiguous Zone

- Extent: 12–24 nm from baseline.
- Nature: Buffer zone beyond territorial sea.
- Rights: Can prevent & punish violation of Customs, Immigration, Fiscal & Sanitary laws (CIFS).
- No airspace rights for State only land rights.

Exclusive Economic Zone (EEZ)

- Extent: Up to 200 nm from baseline.
- Rights: Sovereign rights over natural resources (living & non-living).
- Energy from wind, water, tides.
- Cannot restrict navigation & overflight.

High Seas

- Location: Beyond EEZ.
- Status: Common Heritage of Mankind.
- Rights: Free for navigation, fishing, research, cable laying, etc.
- Only for peaceful purposes.

1.13 India's Contract for exploration of polymetallic sulphides

Context: -

- India became the first country to sign an agreement with the International Seabed Authority (ISA) for exploration of polymetallic sulphides in the Carlsberg Ridge.

Link for reference- <https://www.thehindu.com/sci-tech/energy-and-environment/india-gets-licence-to-scour-new-part-of-indian-ocean-for-precious-metals/article70053704.ece>

India's Previous Applications for Rights

- **First Contract:** India obtained exploration rights in the **Central Indian Ocean Basin in 2002**, which have been extended twice and are **valid until March 2027**.
- **Second Contract (2016):** A new licence was signed for polymetallic sulphides in the Indian Ocean Ridge, valid until September 2031.
- **2024 Applications:** India applied for **rights in Carlsberg Ridge and Afanasy-Nikitin Seamount**, but **Sri Lanka contests the latter** under UNCLOS continental shelf provisions, which allow claims up to 350 nautical miles, and in the Bay of Bengal up to 500 miles.

Polymetallic Sulphides:

- These are **rock-like deposits on the deep ocean floor, rich in manganese, cobalt, nickel, and copper**, seen as future sources of essential minerals for clean energy transitions.
- Uses: In batteries, electronics, renewable energy systems, and advanced alloys.

Carlsberg Ridge:

- It is a 300,000 sq. km **underwater mountain range in the Arabian Sea**, forming the boundary between the Indian and Arabian tectonic plates.

Deep Ocean Mission (DOM)

- DOM is a **multi-institutional mission launched** by GoI to explore the deep ocean for resources and develop deep-sea technologies for sustainable use of ocean resources.
- Aim of DOM is to help India **achieve over Rs. 100 billion "Blue Economy" through its ocean resources**.
- **Ministry of Earth Sciences (MoES) will be the nodal Ministry** implementing the mission.
- MoES has **collaborated with** ISRO, National Institute of Ocean Technology (NIOT), Vikram Sarabhai Space Centre (VSSC) and the International Seabed Authority (ISA) for this mission.
- Under this mission, deep ocean explorations will be carried **out in the Central Indian Ocean Basin**.

Samudrayan

- Samudrayan is **India's first manned ocean mission**.
- It is **launched in 2021 as a part of the Deep Ocean Mission**. With this, India joined the **club of the USA, Russia, Japan, France and China**, which have underwater vehicles for subsea activities.
- Samudrayan will carry out **deep ocean exploration of the non-living resources, such as** polymetallic manganese nodules, gas hydrates, hydro-thermal sulphides and cobalt crusts, located at a depth between 1000-5500 m.
- Under this mission, the **manned submersible MATSYA 6000 is indigenously built with the help of ISRO, the Indian Institute of Tropical Meteorology (IITM) and the DRDO**.

1.14 SHAKTI Policy

Context (PIB):

- Cabinet Committee on Economic Affairs approved the Revised SHAKTI Policy.

Link for Reference- <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2127408>

What is SHAKTI?

- SHAKTI (**Scheme for Harnessing and Allocating Koyala Transparently in India**), launched in 2017
- **By the Ministry of Coal**, is a transparent framework for allocating coal linkages aimed at replacing opaque nomination-based allocation with auction and tariff-based bidding to power producers, reducing import dependence and reviving stressed thermal assets.

Key Highlights of the Revised Coal Linkage Policy: -

Simplified Allocation Mechanism-

- Reduced from eight categories to two windows:
- Window-I: Nomination-based allocation for Government Generating Companies.
- Window-II: Auction-based allocation for all thermal power producers.

Window-I Provisions-

- Coal linkages **at notified prices** will continue to be provided to:
 - Thermal power plants owned by the Central Government
 - Thermal power plants owned by the State Governments
 - Their Joint Ventures and subsidiaries

Private Sector Enablement-

- All thermal power producers, including those using domestic coal or imported coal, can secure domestic coal under Window-II.
- **Power Purchase Agreements are not mandatory** for securing coal.
- Coal is provided **by paying a premium** over the notified price.

Flexible Coal Linkages-

- The tenure of coal supply ranges from twelve months to twenty-five years.
- This allows both long-term and short-term planning.

Import Substitution Push-

- Imported coal-based thermal power plants can switch to domestic coal.

Preference to Pithead Power Plants-

- Promotes the **setting up of Greenfield Thermal Power** Projects primarily at pithead sites, **that is, nearer to the coal source.**

Decentralised Implementation-

- An Empowered Committee and delegated powers to ministries enable: Faster decision-making and Effective inter-ministerial coordination

Institutional and Legal Reforms:

- **Coal Mines (Special Provisions) Act, 2015:** Allowed transparent auction and **private** participation.
- **Mines and Minerals (Development & Regulation) Amendment Act, 2021:** Introduced composite Prospecting Licence-cum-Mining Lease (PL-cum-ML) for faster mine development.

- **Commercial Coal Mining (2020):** Opened coal mining to **private players without end-use restriction**.
- **Digital Oversight Tools:** Coal Mines Surveillance and Management System and **Khanan Prahari App** for curbing illegal mining.

1.15 Copper

Context: -

- Filo del Sol project, a **copper-gold-silver mining venture** located on the Chile-Argentina border, has announced the **discovery of one of the world's largest greenfield copper deposits** in South America.

Link for Reference- <https://dailygalaxy.com/2025/05/worlds-largest-copper-deposit-has-just-been-discovered-in-south-america/>

About Copper: -

- **Soft, malleable, and ductile** metal with **excellent electrical and thermal conductivity**, corrosion resistance, and **antimicrobial** properties.
- **Mineral forms:** Chalcopyrite, Chalcocite, **Bornite**, and **Malachite**.

Uses:

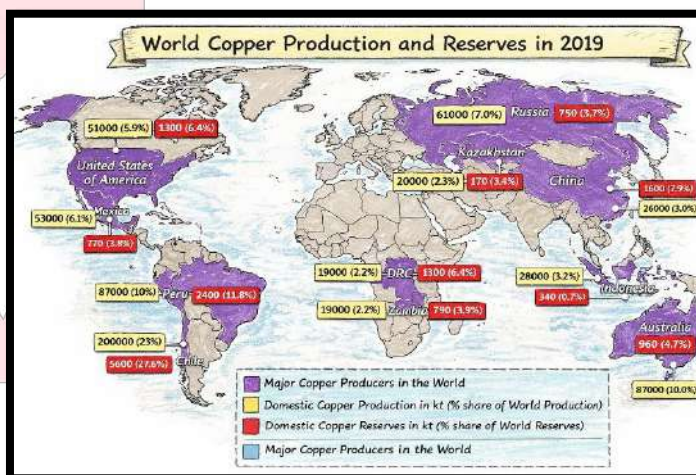
- Electric vehicles (EVs): An EV uses up to four times more Cu than a conventional vehicle.
- Power infrastructure
- Electronics
- Construction
- Renewable energy systems: Solar panels, wind turbines, and smart grids.

Global top producers:

- **Chile (leading with over 25% of global output)**, followed by the Democratic Republic of Congo (DRC), Peru, and China.
- **Major global reserves: South America** dominates copper reserves, with significant contributions from **Chile, Peru, and Argentina**. The **Andes Copper Belt** is known as the world's richest copper zone.

Cu in India:

- **Key Reserves:** Rajasthan (52%), Madhya Pradesh (23%), and Jharkhand (15%).
- **Major Mines:** Singhbhum Copper Belt (Bihar), Khetri Copper Belt (Rajasthan), and Balaghat District (Madhya Pradesh).
- **Production Challenges:** Domestic copper production is limited. The country relies heavily on imports of refined copper, especially after the **closure of the Sterlite Copper plant, Tuticorin or Thoothukudi**, Tamil Nadu, in 2018.



1.16 Uranium Reserves

Context:

- Uranium is a key **mineral for nuclear energy**, supplying about 10% of the world's electricity

Link for Reference: <https://www.wionews.com/photos/5-countries-with-the-largest-uranium-reserves-in-the-world-1759474991986/1759474991991>

Top 5 Countries with the Largest Uranium Reserves: -

- **Australia: Largest uranium reserves** globally with 3.6 million tonnes.
- **Kazakhstan**: World's **top uranium producer**, supplying about 40% of global output annually; holds nearly 3 million tonnes, mainly via in-situ leaching.
- **Canada**: Third in reserves with 1.7 million tonnes; the Athabasca Basin hosts the highest-grade uranium deposits in the world.
- **Russia**: Around 1.2 million tonnes of reserves, powering its civil nuclear plants and military programmes.
- **Namibia**: Africa's uranium hub, with about 1 million tonnes, exports most of its supply to Europe & Asia.

Uranium in India

- India's domestic **uranium output remains much lower than demand**, leading to imports of over 7,600 tonnes in recent years, mainly from Kazakhstan and Canada.
- **Atomic Minerals Directorate for Exploration & Research (AMD)** under the Department of Atomic Energy continues active exploration.
- Some quality reserves were recently **discovered in parts of Andhra Pradesh and Telangana between Seshachalam forest and Sresailam** [Southern edge of Andhra to Southern edge of Telangana].

About Uranium

- A **silvery-grey metallic radioactive element**, naturally formed only in supernova explosions.
- Along with thorium and potassium, it contributes to natural terrestrial radioactivity.
- Naturally Occurring Isotopes: U-238 (99.27%) and U-235 (0.72%).
- All isotopes are **radioactive & fissionable**, but **only U-235 is fissile** (supports neutron chain reaction).

1.17 Rare Earth Elements

Context: -

- **China's new export curbs on 12 rare earth elements** have reignited trade tensions with the US. The US responded by imposing 100% tariffs on Chinese exports effective November 1, 2025.

What are Rare Earth Elements?

- Group of 17 metallic elements
- 15 Lanthanides (La to Lu) + Scandium (Sc) + Yttrium (Y)
- Misnomer:
- Not "rare" in abundance
- Rare because they are not found in concentrated, economically exploitable forms
- **Key Characteristics:** High magnetic, luminescent, and electrochemical properties

Major Applications:

- Electronics
- Screens, semiconductors, smartphones
- Example elements: Europium, Terbium
- Green Technology
- EV motors (Neodymium, Dysprosium)
- Wind turbines
- Solar technologies
- Defence
- Missiles, radars, jet engines
- Precision-guided weapons
- Energy
- Catalysts in oil refining

- Rechargeable batteries

Sources of REEs (Minerals)

- Bastnäsite
- Monazite (very important for India)
- Loparite

NOTE- REEs are **extracted as by-products**, not primary ores.

Categorisation:

- Light Rare Earth Elements (LREEs)
- Heavy Rare Earth Elements (HREEs)

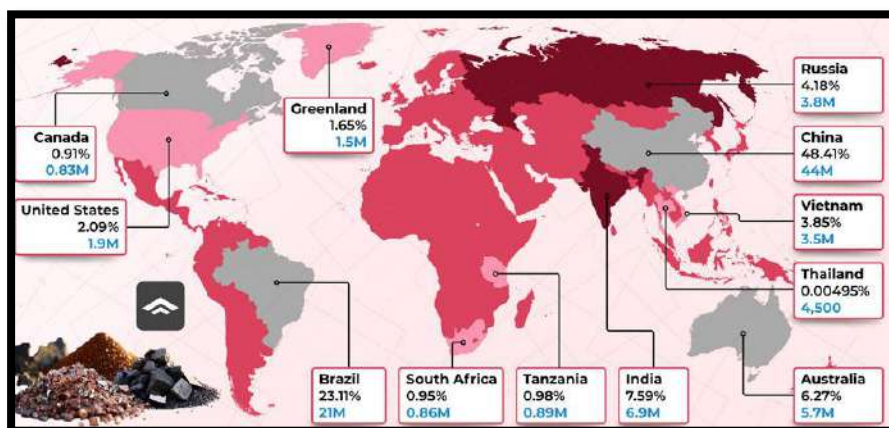
Global Distribution

China-

- ~60–70% of global production
- ~36% of global reserves
- Controls ~90% of global supply chain
- Strategic leverage in geopolitics

India-

- **3rd largest** REE reserves
- ~6% of global reserves
- Major source: **Monazite** sands



Coastal states:

- Kerala
- Tamil Nadu
- Odisha
- Andhra Pradesh

Other IMP Countries: -

- Vietnam
- Brazil
- Australia
- Russia
- United States
- Greenland
- South Africa
- Tanzania
- Canada

Mining & processing controlled by:

- Atomic Minerals Directorate
- IREL (India) Limited

1.18 Royalty on Critical Minerals

Context: -

- **Union Cabinet approved** revised royalty rates for **Graphite, Caesium, Rubidium, and Zirconium** under the Mines and Minerals (Development and Regulation) Act, 1957 (MMDR Act).

Link for Reference: <https://economictimes.indiatimes.com/industry/indl-goods/svs/metals-mining/royalty-rates-on-4-key-minerals-rationalised/articleshow/125282670.cms?from=mdr>

Royalty Rates for Critical Minerals:

- For Caesium, it is **2% of Average Sale Price (ASP)** on metal content in ore, and for Rubidium, it is 2% of ASP on metal content in ore.
- For Zirconium, 1% of ASP on metal content in ore and for Graphite, if it is 80% fixed carbon, 2% of ASP and < 80% fixed carbon, 4% of ASP.

MMDR Act, 1957

- Governs mining and **regulation of minerals across India, excluding petroleum and natural gas**, and to ensure fair revenue sharing between the Centre and States.

Jurisdiction:

- **Central Government:** Formulates policy, **approves royalty rates**, and **regulates major minerals**.
- **State Governments:** Grant mineral concessions for minor minerals and **collect royalties**.
- **Royalty Fixation:** Central Government specifies royalty rates under Section 9(3) of the Act.
- **Key Agencies:** The Indian Bureau of Mines (IBM) is the technical regulator for mining and data reporting, and the Geological Survey of India (GSI) conducts exploration and mapping.

Amendments:

- **2015 Amendment:** Introduced auction-based allocation of mineral blocks and District Mineral Foundation (DMF) for local development.
- **2021 Amendment:** Allowed transfer of clearances, permitted private sector exploration, and empowered the Centre to auction minerals in case of State delay.
- **2023 Amendment:** Added 24 critical and strategic minerals to promote energy transition.

1.19 Tungsten

Context: -

- Hindustan Zinc Ltd. has received a **composite licence from the Andhra Pradesh government** to explore and potentially mine a tungsten mineral block.

Link for Reference- [Hindustan Zinc gets licence to explore, mine tungsten block in Andhra Pradesh - The Hindu](#)

About: -

- Also known as wolfram, is a rare, dense, steel-grey transitional metal known for exceptional heat resistance and remarkable hardness.
- It is **classified as a major mineral under the Second Schedule** of the Mines and Minerals (Development and Regulation) Act, 1957.
- MMDR Amendment Act 2023 lists tungsten as both a critical and strategic mineral in Part D of the First Schedule.
- Tungsten has the **highest melting point among all metals** at 3422°C and the lowest vapour pressure at high temperatures.

- It possesses the highest **tensile strength** above 1650°C, while pure single-crystal tungsten remains ductile under controlled conditions.
- This element is **relatively rare and found mainly** in **wolframite and scheelite ores**.
- It is **generally non-toxic**, though inhaled dust may cause respiratory issues. Soluble tungsten compounds pose higher risks than insoluble forms.
- Key Applications: Tungsten is widely used for hard cutting tools, incandescent filaments, high-strength alloys, radiation shielding, and specialised defence and aerospace components.

Global Reserves:

- **China holds over 50% of global tungsten reserves**, with significant deposits also found in Russia, Canada, and Vietnam.
- China produces more than 80% of the tungsten output and supplies around 30% to global exports.

Indian Deposits:

- **Karnataka accounts for 42% of India's tungsten resources**, followed by Rajasthan with 27% and Andhra Pradesh with 17%.

1.20 Antimony

Context:

- China **tightened export controls** on antimony after detecting large-scale smuggling, reinforcing its strategic grip over a dual-use critical mineral.

Link for Reference- [What is antimony & why China is keeping strict control on its movement past its borders](#)

About: -

- **Antimony is a semi-metal**. In its elemental form, it is a silvery white, brittle, fusible, crystalline solid that exhibits poor electrical and heat conductivity properties and vaporises at low temperatures.
- Antimony is **not an abundant element but is found in small quantities** in over 100 mineral species.
- **Uses:** Widely used in flame retardants, batteries, plastics, glass and ceramics, E.g., **flame-retardant** applications consume ~60% of global antimony demand.
- China **accounts for ~48% of global antimony processing**, so export controls directly shape global availability and prices for downstream industries.

Minerals Security Partnership (MSP)

- The MSP is a group of 14 countries, led by the US, started in June 2022.
- It's also **known as the Critical Minerals Alliance**.
- The goal is to **ensure the secure production**, processing, and recycling of critical minerals.
- The alliance **aims to reduce China's control over critical mineral** supplies globally.
- Members include the US, Australia, Canada, Finland, France, Germany, Japan, the Republic of Korea, Sweden, UK, the European Commission, Italy, and India.
- **India is the only developing country in MSP.**
- India became the 14th member of the MSP in June 2023.

2. Physical Geography

2.1 California Fires

Context: -

- Los Angeles area is **experiencing unprecedented winter wildfires**, including the Palisades fire, Eaton fire, Sunset fire, Hurst fire, and Lidia fire.

Link for reference- <https://edition.cnn.com/weather/live-news/los-angeles-wildfires-palisades-eaton-california-01-12-25/index.html>

What is the reason behind it?

- Exceptionally dry conditions**, according to NASA, since October, Southern California has recorded negligible rainfall have turned this vegetation into fuel.

Santa Ana Winds:

- It is **strong, dry, and hot katabatic wind**, a typical feature of California's climate, significantly fanned the flames.
- Between October and January, a **high-pressure system develops over the Great Basin deserts**, causing winds to blow westward towards the coast.
- As these winds **descend over the Sierra Nevada and Santa Ana** mountains, they lose humidity (descending winds undergo compression- temperature rises - reduces humidity), heat up, and accelerate as they **pass through mountain gaps**. When they reach Southern California, the winds are fast, dry, and warm, fuelling wildfires. Unusually strong Santa Ana winds are accelerating fire spread.



Anabatic vs Katabatic wind: -

Katabatic Wind	Anabatic Wind
The wind blows down a slope due to gravity (air moves downhill)	Blows up a hill or mountain slope facing the Sun (air moves higher slopes).
Occurs at night.	Occurs during the day.
It is caused by the cooling of highlands and subsequent denser air flowing downhill.	It is caused by the Sun heating the slope, leading to rising warm air.
It is more pronounced in calm air conditions.	It is best formed on sunny days with clear skies.
Foehn (warmed by compression) and Fall Wind (rapid descent without warming) are the types of Katabatic winds	It has no specific subtypes.

2.2 Polar Vortex and Winter Storms

Context: -

- US is **experiencing severe winter storms**; seven states have declared emergencies due to extreme conditions **caused by the polar vortex**.

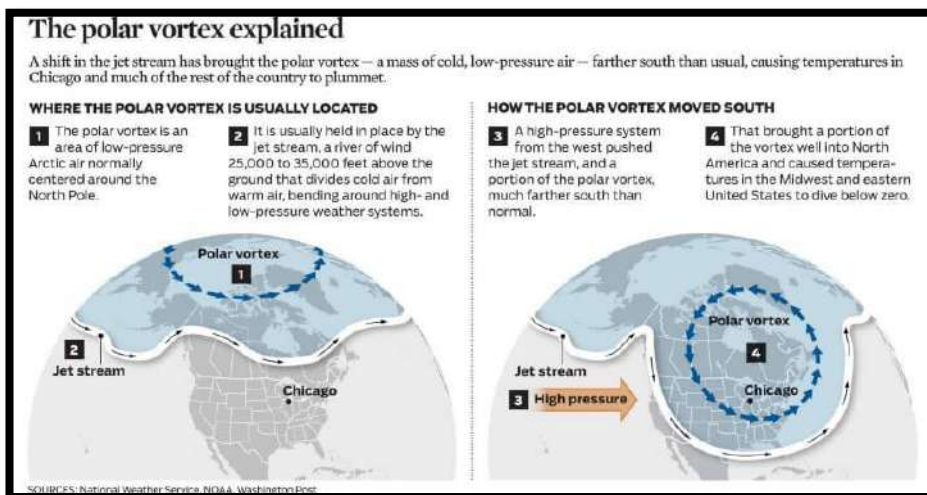
Polar vortex (circumpolar vortex OR Polar cyclone)

- A polar vortex is a **large pocket of very cold air, typically the coldest** air in the Northern Hemisphere, which sits over the polar region during the winter season.

- Polar Vortex is a **cold, upper tropospheric** sometime extending till the lower levels of stratosphere (At poles, the troposphere extends up to 8-9 km),

circumpolar, Low pressure and large cyclonic parcel of air [1000 km] (counter-clockwise in the Northern Hemisphere)

- The term "vortex" **describes the counter-clockwise** flow of air that confines colder air near the poles
- Polar vortex is closely associated with jet streams [Rossby waves].
- It is **formed mainly in winter** and gets weaker in summer.
- It **surrounds polar highs** and lies within the polar front (boundary separating the temperate and polar air masses).



2.3 Sudden Stratospheric Warming (SSW)

Context: -

- Meteorologists warned that **Sudden Stratospheric Warming (SSW)** event might occur in Dec 2025.

Link for reference- [Sudden Weather Phenomenon Could Hit US This Month - Newsweek](#)

About: -

- SSW is a rapid **rise in temperature of up to 50°C within a few days** in the **stratosphere**.
- It is **triggered by Rossby waves** rising upward from the troposphere that dissipate in stratosphere, transferring energy and momentum.
- This weakens the polar vortex.
- If waves are strong enough, the winds of the polar vortex can weaken so much that they can reverse from being westerly to easterly. This leads to cold air descending and warming rapidly.
- This can lead to a **displacement or splitting of the polar vortex**, so instead of cold air being locked above the polar region, it can push further south into the mid-latitudes.
- It disrupts the jet stream & lead to cold spells, blocking patterns, or unusual winter weather at the surface.

Rossby waves

- These are **large-scale bends in high-altitude winds** and ocean currents caused by Earth's rotation and variations in Coriolis forces.

2.4 Soapstone Mining

Context:

- Recently, the **Uttarakhand High Court took suo moto cognizance** and criticized the authorities.
- Unregulated soapstone mining in **Bageshwar, Uttarakhand, has led to land subsidence**.

What is Soapstone Mining?

- Soapstone is **extracted for its heat-resistant properties**. It involves extracting the mineral from open-pit mines or quarries using **semi-mechanised methods** like drilling, blasting, and excavation techniques, often with heavy earth-moving equipment.

About Soapstone:

- It is a **metamorphic rock composed of talc, used in construction**, design & various industries.
- It is **also known as Steatite**.
- Soapstone **most often forms at convergent plate boundaries** where broad areas of Earth's crust are subjected to heat and directed pressure.
- Major soapstone reserves in India: **Rajasthan (57%) and Uttarakhand (25%)**.
- **Major producing countries:** China, India, Brazil, USA and Finland.
- **Uses:** It is mined primarily for producing talc, a soft material used in cosmetics, plastics, ceramics, and pharmaceuticals. It is used in making stoves, countertops, and sculptures.

2.5 Delhi Earthquake

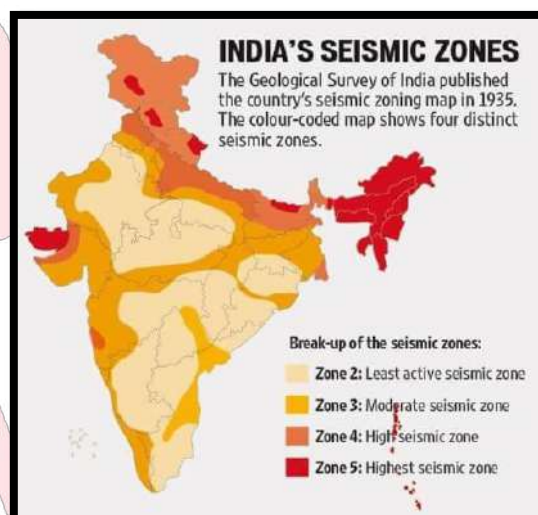
Context: -

- A 4.0 magnitude earthquake struck Delhi-NCR, causing strong tremors.

Link for reference - <https://indianexpress.com/article/explained/explained-sci-tech/explained-the-dawn-quake-in-delhi-9841653/>

Earthquake Zones (Seismic Zones) of India:

- India is divided into **four parts**, zone-2, zone-3, zone-4 & zone 5.
- Of these, the least threatened is Zone 2 & the highest risked is Zone-5.
- **North-East, Jammu & Kashmir, Uttarakhand & parts of Himachal Pradesh fall under Zone-5.**
- **Delhi falls in Zone-4**, central India falls under relatively low danger zone of Zone-3, while most of the south falls in Zone-2 with limited danger, but it is a thicker classification.



Earthquake Waves:

- **Body Waves:** P-waves (Primary Waves) are faster, travel through **solids, liquids, and gases**; S-waves (Secondary Waves) are slower, travel only through solids.
- **Surface Waves:** L-waves are the most destructive, traveling along the Earth's surface.
- **Hypocentre:** The point within the Earth where an earthquake originates.
- **Epicentre:** The point on the Earth's surface directly above the hypocentre.

2.6 Earthquake in Myanmar

Context: -

- 7.7-magnitude earthquake, struck central Myanmar, claiming over 2000 lives.

Link for Reference- <https://indianexpress.com/article/explained/explained-sci-tech/why-myanmar-is-frequently-rocked-by-earthquakes-9912160/>

About: -

- **Took place due to the "strike-slip faulting"** between the Indian and Eurasian plates, meaning these two plates rubbed sideways against each other.

Richter Scale

- Richter magnitude scale is the **most common standard** of measurement for earthquakes.
- **Invented in 1935 by Charles F. Richter**. It is used to **rate the magnitude of an earthquake**, that is, the **amount of energy released** during an earthquake.
- It was traditionally used but is now largely **replaced by Mw for stronger quakes**.

Moment Magnitude (Mw)

- Modern scale measures a **quantity called “moment magnitude”** (denoted as Mw), which is based on **variables such as** the area of the rupture in a fault and the size of the seismic waves.

2.7 Seismic Seiches

Context: -

- Seismic Seiches reported during the Myanmar Earthquake.

About: -

- These are **standing waves set up in enclosed or partially enclosed water bodies** like rivers, reservoirs, ponds, and lakes when seismic waves from an earthquake pass through the area.
- They **can also result** from landslides, submarine slides, tsunamis, and tilting. However, they are in direct contrast to tsunamis, which are giant sea waves created by the sudden uplift of the sea floor.
- The **term was 1st coined by Anders Kvale in 1955** to describe the oscillation of lake levels in Norway and England caused by the Assam earthquake of August 1950.

2.8 Avalanche

Context: -

- Avalanche struck the Border Roads Organisation (BRO) project site **near Mana pass in Uttarakhand's Chamoli district**.

Link for reference - <https://indianexpress.com/article/india/3-bodies-found-uttarakhand-avalanche-toll-7-missing-9864282/>

What are Avalanches?

- Avalanches occur when an **unstable mass of snow breaks** away from a mountain slope. As it descends, it gathers more snow, ice, and debris, turning into a powerful force capable of destruction.

Types of Avalanches

- **Snow Avalanches:** These include sluff avalanches (small slides of dry, powdery snow) and slab avalanches (large, cohesive slabs of snow that break off and slide down).
- **Rock Avalanches:** Consist of massive chunks of rock breaking off and sliding down steep slopes.
- **Ice Avalanches:** Common around glaciers, where large ice masses break off and slide down slopes.
- **Debris Avalanches:** Contain soil, loose stones, and a mix of materials that move downhill with force.

2.9 Gully Erosion

Context: -

- 2025 Nature report highlights **severe gully erosion** in India, threatening **land degradation neutrality by 2030**.

Link for reference - <https://www.downtoearth.org.in/environment/77-indian-districts-experiencing-gully-erosion-report>

About:

- Affects **77 high-risk districts**, mainly in eastern and southern India, with Jharkhand, Chhattisgarh, Madhya Pradesh, and Rajasthan being the worst-hit states.
- **Eastern India experiences more severe gully erosion**, while western India has predominantly Badlands, making Jharkhand the top priority for intervention.

What is Gully Erosion?

- Soil removal along drainage lines due to surface runoff, forming deep channels (gullies).

Stages:

- **Rill Formation:** Small finger-like channels appear after sheet erosion.
- **Gully Formation:** Rills widen and deepen into large channels.
- **Badlands Topography:** Extensive gully networks create rugged landscapes (e.g., Chambal Ravines).
- **Ravines & Canyons:** Further deepening leads to steep, unstable landforms.



2.10 Norwesters

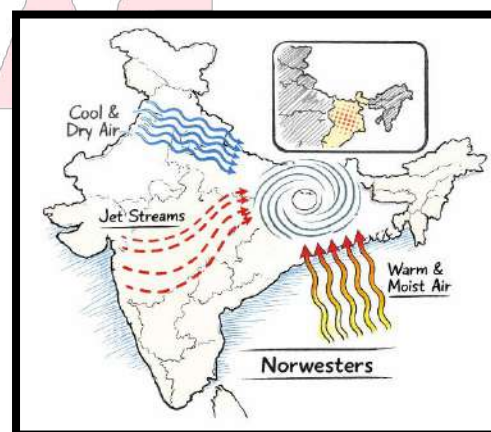
Context: -

- India Meteorological Department (IMD), Indian Institute of Tropical Meteorology (IITM), Pune, and National Centre for Medium-Range Weather Forecasting (NCMRWF), Delhi, are jointly developing India's first **research testbed for studying Norwesters**.

Link for Reference- <https://indianexpress.com/article/cities/bangalore/india-first-research-testbed-study-norwesters-9332848/>

About: -

- **Localised**, intense pre-monsoon thunderstorms.
- Local names:
 - **Kalbaisakhi** – Bengal ("calamity of Baisakh")
 - **Bordoisila** – Assam
- Affected regions: Eastern & North-Eastern India, Bangladesh, Bhutan, Southern Nepal.
- **Season:** March–May (Pre-monsoon).
- Features: Violent winds, heavy rain, hail, lightning; sometimes tornadoes.
- **Type:** Mesoscale Convective Systems (MCS) – formed by strong localised convection over tens hundreds of km.



2.11 Palaeofires

Context (PIB):

- Scientists have uncovered a remarkable **record of Earth's prehistoric wildfires—palaeofires** in the heart of peninsular India of the Godavari Basin.

Link for Reference: <https://pib.gov.in/PressReleasePage.aspx?PRID=2127307>

What are Palaeofires?

- Palaeofires = **Prehistoric natural wildfires** that occurred long before recorded human history.
- Evidence: Found as **fossilised charcoal** in coal-bearing sedimentary rocks.
- Recent finding: Identified in **Godavari Basin** (Peninsular India)
- **Role**: Influenced vegetation patterns, climate and coal formation over geological time.

Significance: -

Aspect	Importance
Carbon Sequestration	Shows how carbon gets locked in Earth's crust for long periods.
Palaeoclimate Studies	Helps reconstruct ancient climate conditions.
Ecosystem Evolution	Explains how ancient vegetation adapted to fires.
Geological Dating	Charcoal layers act as stratigraphic markers for dating rock layers.

2.12 Bow Echo

Context: -

- An intense **storm over Delhi** appeared as a rare **crescent shape on IMD's weather radar** technically known as a "bow echo".

What is a Bow Echo?

- It is a **curved line of thunderstorms often called a squall line** that appears on weather radar in the shape of an archer's bow.
- The term "**bow echo**" was **coined in the 1970s by Ted Fujita**, a renowned Japanese American meteorologist best known for developing the Fujita Scale for **classifying tornadoes**.

2.13 UN Ocean Conference 2025

Context: -

- **3rd UN Ocean Conference** concluded recently.

Link for Reference: <https://www.downtoearth.org.in/environment/unoc3-close-to-100-countries-sign-nice-wake-up-call-for-ambitious-plastics-treaty>

UNOC3:

- Held in **Nice, France**.
- **Host Countries:** France and Costa Rica.
- **Theme:** "Accelerating action and mobilising all actors to conserve and sustainably use the ocean."
- **Objectives:** Address governance, financing, scientific knowledge, and climate adaptation. Reinforce SDG 14: Life Below Water—focus on sustainable fisheries, pollution control, and marine conservation.

Outcomes of UNOC3:

Blue NDC Challenge

- **Launched by:** Brazil and France
- It urges countries to incorporate ocean-focused climate measures into their **Nationally Determined Contributions (NDCs)** ahead of the **COP30 to the UNFCCC in Belem, Brazil**.

Nice Wake-up Call

- "Nice Wake-Up Call" **comes ahead of the next round of UN plastics treaty negotiations, INC-5.2**, scheduled for August 5-14, 2025, in **Geneva, Switzerland**.

- It is a **powerful push for a strong, legally binding global plastics treaty**, especially as negotiations have been challenging and have missed previous deadlines.
- Nice Wake-Up Call has **96 signatories** and remains open for others to join.

India

- India is **not among the signatories** of the 'Nice Wake-Up Call'
- **Backed the swift ratification of the Biodiversity Beyond National Jurisdiction (BBNJ) Agreement** and advocated for a legally binding Global Plastics Treaty.
- **Launched 'SAHAV' digital ocean data portal**, underscoring its leadership in global marine governance.

Key Ocean Conservation Initiatives Announced at UNOC3:

- French Polynesia: Pledged to **create the world's largest marine protected area** — covering its entire exclusive economic zone (5 million sq km) to safeguard marine biodiversity.
- **Indonesia & World Bank**: Introduced a **'Coral Bond'** — an innovative financial tool to fund reef conservation and restoration efforts in Indonesia.
- **High Ambition Coalition for a Quiet Ocean**: A 37-country coalition **led by Panama and Canada**, focused on tackling **underwater noise pollution** to protect marine life.

2.14 Geo-Atlantic Meridional Overturning Circulation

Context:

- Recent study shows that **warming in the Indian Ocean** may temporarily enhance AMOC strength, but long-term weakening remains a serious threat.

Link for reference- https://www.downtoearth.org.in/climate-change/europe-faces-deep-winter-freeze-if-atlantic-current-collapses-study-finds#google_vignette

What is AMOC?

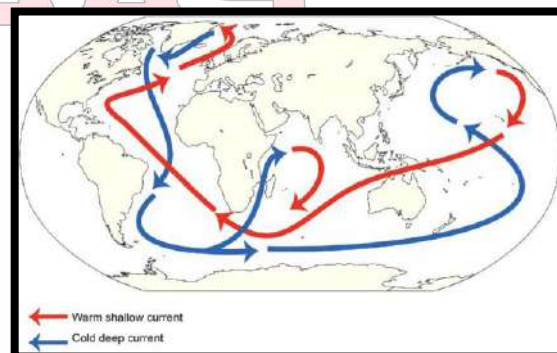
- The Atlantic Meridional Overturning Circulation (AMOC) is a **critical component of the Earth's global ocean circulation system**, responsible for the large-scale movement of heat, salt, and carbon across the Atlantic Ocean.
- It is a **thermohaline-driven** conveyor belt that operates on a north-south axis and plays a pivotal role in regulating regional and global climate systems.

What is thermohaline circulation?

- Thermohaline circulation refers to the **large-scale ocean circulation** driven by global density gradients created by surface heat (thermo) and salinity (haline) differences.

Process:

- In polar regions, surface water becomes cold and salty (due to ice formation), increasing its density.
- Dense water sinks and flows towards the equator at deep ocean levels.
- At lower latitudes, upwelling brings cold deep water to the surface, completing the loop.
- Often called the **"global conveyor belt"**, it connects all ocean basins and transports heat, salt, and nutrients worldwide.



2.15 Mud Volcano

Context: -

- **Wandan mud volcano in Taiwan** recently erupted.

What are Mud Volcanoes?

- It is landforms **formed by the eruption of mud, water, and gases, rather than molten rock**. Eruptions of mud volcanoes are **generally cool**, unlike magmatic volcanoes.
- They **do not involve lava or magma**. They emit methane, CO₂, and nitrogen, often under high pressure.
- Some remain constantly active, while others experience periodic bursts.
- Despite lower explosiveness, they can trigger fires.

Why Flames Occur?

- Hydrocarbon gases like methane may ignite naturally from surface heat or deliberately by human action, e.g., Wandan volcano flames resulted from locals burning ejected methane gas after eruptions.

India's Only Mud Volcano Erupts After 20 Years in Andamans

- The mud **volcano at Baratang in the Andaman and Nicobar Islands** erupted after **being dormant for over two decades**. This event was marked by a loud sound similar to an explosion.
- The **mud volcano is driven by gases** from decaying organic matter deep inside the earth, which push mud and gas to the surface.

Location and Access:

- Baratang is situated in the **North and Middle Andaman district**, about 150 km from Port Blair.
- Site is known for **being India's only mud volcano**, making it a popular tourist attraction.
- Authorities have **informed local tourism stakeholders** about the closure of routes leading to the site.

Relation to Barren Island:

- Recent **minor volcanic eruptions were also observed at Barren Island**, located nearly 140 km from Port Blair. These are **unrelated** to the mud volcano at Baratang.
- Barren Island **lies at the junction** of the Indian and Burmese tectonic plates.
- The island's first recorded eruption was in 1787, with **subsequent activity in 1991, 2005, 2017, and November 2022**.

2.16 Roll clouds

Context:

- **Portugal** witnessed a spectacular and unusual Roll cloud.

About:

- Also **known as volutus**, are a **rare atmospheric phenomenon** and part of a larger category known as **arcus clouds**.
- The roll clouds **are horizontal, cylindrical and appear to 'roll' along the sky like a tube**, unlike the typical storm clouds.
- Roll clouds are **entirely unrelated to seismic activity or tidal waves**, though they look dramatic and sometimes resemble giant tsunami waves.

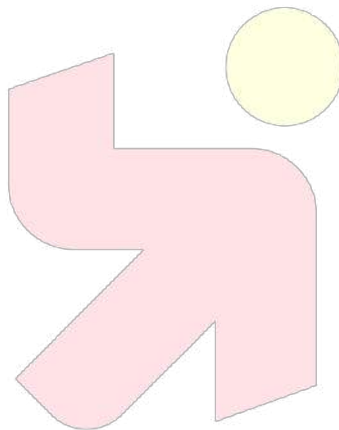


How are Roll Clouds Formed?

- **Warm, dry air ascends quickly** because of intense surface heating (such as in a heatwave).
- This rising air collides with cooler, **more humid sea breezes** coming from the ocean.
- The difference between air masses produces turbulence and condensation, resulting in the formation of a roll-shaped cloud.

Arcus Clouds

- Arcus clouds **are low, horizontal cloud formations** that appear along the leading edge of **thunderstorm** outflows or cold fronts.
- They are often associated with **turbulent weather and mark the boundary between warm and cool air masses.**



PRAYAAS

3. Indian Geography

3.1 Weather Forecasting System

Context: -

- **India Meteorological Department (IMD)** issues **alerts using colour codes** to effectively communicate weather conditions and associated risks.

Link for reference- <https://www.ndtv.com/delhi-news/yellow-alert-for-delhi-light-rain-fog-decline-in-temperature-predicted-7408678>

Understanding IMD's Colour Codes: -

- **Green (No Action Needed):** Normal weather with no significant threats.
- **Yellow (Be Updated):** Light to moderate weather events requiring public awareness.
- **Orange (Be Prepared):** Severe weather likely to disrupt activities; precautionary measures advised.
- **Red (Take Action):** Extreme weather necessitates immediate action to protect life and property.

IMP: -

- **Red Alert is a general term** indicating the need for extreme caution due to imminent danger, whereas **Red Warning by IMD specifically means "Take Action"** for extreme weather events like heavy rainfall or cyclones to safeguard life and property.

Indian Meteorological Department

- The Indian Meteorological Department **completed 150 years** of its establishment.
- The IMD was **established in 1875**.
- It is **India's National Meteorological Service** and the principal government agency in all matters relating to meteorology and allied subjects.
- It is **one of the six Regional Specialized Meteorological Centres** of the **World Meteorological Organization (WMO)**.
- **Headquarters:** New Delhi (Initially at Shimla, later at Poona and finally shifted to New Delhi).
- **Nodal Ministry:** Ministry of Earth Science.
- There are six **Regional Meteorological Centres** located in Chennai, Guwahati, Kolkata, Mumbai, Nagpur, and New Delhi, each under a Deputy Director General.

Initiatives: -

National Framework of Climate Services (NFCS)

- **Objective:** To reduce losses from climate hazards and extreme weather events.

Mausam App

- It provides weather-related services like current weather, **forecast of every hour to 7 days**, Rainfall, Humidity, Sunrise/Sunset, Rain, Lightning & Cyclone Alert, Aviation & Agro-Meteorological advisories.

Decision Support System (Weather Analysis and Forecast Enabling System (WAFES))

- It serves as a **visualization platform to analyse meteorological observations** and prediction models, aiding decision-making for severe weather phenomena and their socio-economic impact.
- It provides real-time information for various sectors such as Urban, Power, Hydrology, Health, Energy, Agriculture, Transport, and Tourism under the **"UPHHEATT" initiative** (for the cause of welfare).

Bharat Forecast System

- **Ministry of Earth Sciences** unveils Bharat Forecast System (BFS), one of the world's first indigenously developed high-resolution weather forecast systems. **(July 2025)**

About: -

- **Developed by:** Indian Institute of Tropical Meteorology (IITM), Pune, an autonomous institute of the Union Ministry of Earth Sciences.
- **Role:** It enhances India's weather **prediction resolution from 12 km to 6 km**, enabling every village in India to access more precise and location-specific forecasts.
- **Provides the world's highest forecasting resolution of 6 km x 6 km grid**, doubling the detail from the earlier 12 km Global Forecast System (GFS) used in India.
- **Data Sources:** Integrates real-time inputs from 40 Doppler Weather Radars, improving accuracy of localised forecasts and nowcasts.
- **Doppler Radar is a specific type of radar** that uses the doppler effect (Change in frequency of wave emitted by a source moving relative to the observer) to gather velocity data from particles that are being measured.
- **Improved accuracy and speed:** Delivers 64% better accuracy in high-risk zones and produces **forecasts within 4-6 hours**, especially for extreme events like heavy rainfall and cyclones.
- **Positions India ahead of countries** like the US, UK, and EU by **achieving 6 km resolution** (compared to 9-14 km in global models).
- **Powered by High-Performance Computing (HPC) systems – Arka** (IITM Pune) and **Arunika** (National Centre for Medium Range Weather Forecasting, Delhi) – to deliver faster simulations.

3.2 One Nation One Time**Context: -**

- **Department of Consumer Affairs** in collaboration with the **Council of Scientific & Industrial Research - National Physical Laboratory (CSIR - NPL)** and the Indian Space Research Organisation (ISRO), has **drafted** the Legal Metrology (Indian Standard Time (IST)) Rules, 2025.

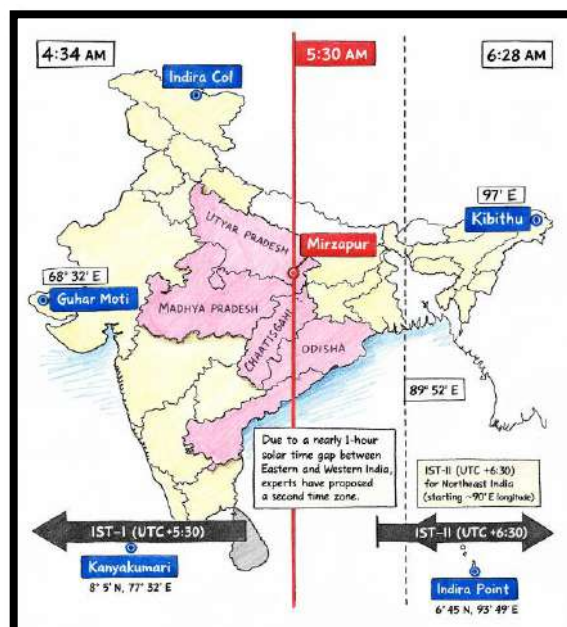
Link for reference- <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2137279®=3&lang=2>

Rules: -

- **Aim:** To establish Indian Standard Time (IST) as a **mandatory time reference across all sectors**, ensuring uniformity and precision.
- Currently, **India uses GPS satellites to determine the time**, down to milliseconds, and it is linked to UTC. The new government proposal changes the way India manages its time zone, using its own **Navigation with Indian Constellation (NavIC) for time dissemination**.
- Adoption of **reliable synchronization protocols** such as Network Time Protocol (NTP) and Precision Time Protocol (PTP) by government offices & public institutions is required.

Indian Standard Time (IST)

- IST was **adopted in 1906 during the British era** with the phasing out of its precursor Madras Time.
- Indian Standard Time is calculated from the **reference longitude of IST at 82°30'E passing near Vindhyachal of Mirzapur, Uttar Pradesh**.
- **CSIR-National Physical Laboratory:** Responsible for the maintenance and for keeping it traceable to the UTC provided by the International Bureau of Weights and Measures.
- **IST passes through 5 States:** UP, Madhya Pradesh, Chhattisgarh, Odisha, & Andhra Pradesh.



- IST is **5:30 hours ahead of Greenwich** Mean Time.
- India **Does Not Observe Daylight Saving Time**. However, it was used briefly during the China-India War of 1962 and the Indo-Pakistani Wars of 1965 and 1971.

Do you Know?

- Chai Bagan Time (Bagan Time) is an **informal time zone used in Assam's tea gardens, set one hour ahead of Indian Standard Time (IST)**, to align work with the region's early sunrise, maximizing daylight for tea plucking and productivity

3.3 India's New Coastline

Context: -

- India's coastline has undergone a **remarkable expansion, growing by 47.6% from 7,516 km in 1970 to 11,098 km in 2023-24.**

Link for reference- https://timesofindia.indiatimes.com/india/mha-indias-recalculated-coastline-up-48-in-53-years/amp_articleshow/116927468.cms

New Measurement Methodology: -

- The increase in India's coastline length is **primarily attributed to an updated scientific methodology introduced by the National Maritime Security Coordinator** (under the Ministry of Home Affairs).
- Unlike previous methods that measured straight-line distances, the new **approach accounts for complex coastal features** such as bays, estuaries, inlets, and other geomorphological formations.
- Earlier data from 1970, **sourced from the National Hydrographic Office and Survey of India**, relied on older measurement techniques (straight-line distance measurements) and technologies. The new method provides a more accurate representation of coastal geography.

State-wise Changes: -

- **Gujarat** experienced the **most significant increase** in coastline length, nearly doubling from 1,214 km to 2,340 km. It is the **state with the longest coastline in India.**
- West Bengal saw the **highest percentage increase**, surging by 357% from 157 km to 721 km.
- Kerala reported the smallest increase, adding just 30 km (5%) to its total coastline.
- **Tamil Nadu's coastline has been revised to 1,068 km** (previous 906 km), **surpassing Andhra Pradesh's 1,053 km and now has the second longest coastline in India.**
- Puducherry's coastline, **encompassing Karaikal, Yanam, and Mahe**, experienced a contraction of 4.9 km.

Length of Coastline of India

The State-wise/UT-wise 'Length of Coastline of India' are hereby mentioned below.

Sl.No.	State/Union Territory	Coastline length (in Km)
1.	Gujarat	2,340.62
2.	Maharashtra	877.97
3.	Goa	193.95
4.	Karnataka	343.30
5.	Kerala	600.15
6.	Tamil Nadu	1,068.69
7.	Andhra Pradesh	1,053.07
8.	Odisha	574.71
9.	West Bengal	721.02
10.	Daman & Diu	54.38
11.	Pondicherry	42.65
12.	Lakshadweep Islands	144.80
13.	Andaman & Nicobar Islands	3,083.50
Total Length of Coastline of India		11,098.81

Survey of India (SoI)

- National Survey and Mapping Organization of the country, **under the Department of Science and Technology.**
- It is the **oldest scientific department** of the Govt. of India.

- It was **set up in 1767** (India under British Rule) and has evolved rich traditions over the years.
- In its **assigned role as the nation's principal mapping agency**, SoI bears a special responsibility to ensure that the country's domain is explored and mapped suitably to provide base maps for expeditious and integrated development.
- It acts as an **adviser to the Govt. of India on all survey matters**, viz Geodesy, Photogrammetry, Mapping, and Map Reproduction.

3.4 Monsoon Onset 2025

Context: -

- IMD **declared the onset of the southwest monsoon over Kerala**, eight days ahead of its normal June 1 schedule, last seen in 2009.

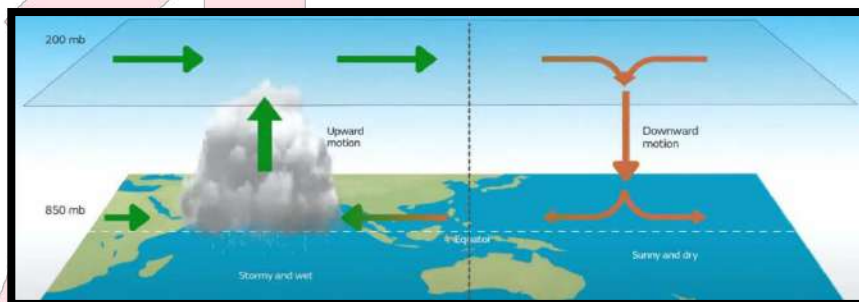
Link of Reference: <https://indianexpress.com/article/explained/explained-climate/early-monsoon-onset-india-reason-factors-meaning-10027688/>

IMD's Criteria for Declaring Monsoon Onset:

- **At least 60% of 14 designated meteorological stations in southern India** (e.g., Thiruvananthapuram, Kochi, Mangalore) must **record ≥ 2.5 mm rainfall** for **two consecutive days**.
- **Westerly winds must** dominate up to 600 hPa atmospheric pressure, with wind speeds between 15–20 knots (27–37 km/h) at 925 hPa.
- **Outgoing Longwave Radiation** must be below 200 W/m², indicating enhanced convection and atmospheric conditions suitable for monsoon advancement.
- Monsoon onset is **officially declared on the second consecutive day** after all the above conditions is fulfilled.

Madden-Julian Oscillation (MJO)

- MJO is a **major intraseasonal variability** in the tropical atmosphere, **characterised by an eastward-moving** pulse of clouds, rainfall, winds, and pressure anomalies.
- **Unlike** long-term climate oscillations such as ENSO, the **MJO operates on shorter time scales of 30–60 days**, influencing weather and monsoon patterns worldwide.
- It was **discovered in 1971** by Roland Madden and Paul Julian.



Phases of MJO:

- **Convective (Active) Phase:** Rising moist air leads to cloud formation and heavy rainfall.
- **Suppressed Phase:** Sinking dry air reduces clouds and rainfall, leading to clearer skies.

Formation Mechanism:

- **Initiated by surface wind convergence** in the tropics, causing upward motion and condensation.
- Supported by upper-level divergence, forming a dipole system that **moves eastward** between 30°N and 30°S.
- Regulates **intra-seasonal rainfall variability** and monsoon breaks, and can trigger early monsoon onset in India, as seen in 2024 and 2025.

MJO vs ENSO: A Comparison

Aspect	MJO (Madden-Julian Oscillation)	ENSO (El Niño–Southern Oscillation)
Time Scale	Intraseasonal (30–60 days)	Interannual (2–7 years)
Nature	Primarily atmospheric	Ocean–atmosphere coupled phenomenon
Spatial Extent	Eastward propagating across the tropics	Largely confined to the Pacific Ocean
Impact	Causes short-term variability in Indian monsoon	Causes long-term anomalies in Indian monsoon

3.5 Above-Normal Rainfall

Context: -

- IMD has **forecasted above-normal rainfall** for the second half of the monsoon season after a June–July surplus.

About: -

- Rainfall is termed above-normal **when it equals or exceeds 106%** of the **long-period average (LPA)**.
- The **LPA is IMD's 50-year (1971–2020) baseline** average rainfall, currently **set at 870 mm**.

Reasons: -

- Excess rainfall is **influenced by synoptic systems**, ocean–atmosphere interactions, and snow cover.
- MJO**: Favourable Madden–Julian Oscillation increased rainfall.
- Oceanic Oscillations**: **ENSO neutrality and La Niña-like conditions** boosted monsoon winds and rainfall.
- Dipole Conditions**: Indian Ocean Dipole **stayed neutral**, exerting minimal adverse impact on rainfall.
- Snow Cover**: Below-normal Eurasian snow cover strengthened the land–sea temperature contrast.
- IOD is the **Indian Ocean temperature difference** that modulates monsoon strength and timing.

3.6 Puga Hot Spring

Context: -

- A study **identifies Puga Hot Spring, Ladakh, as a potential site to understand the origin** of life and aid Mars life-detection, owing to its extreme geothermal and organic-preserving conditions.

Link for Reference: <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2149826>

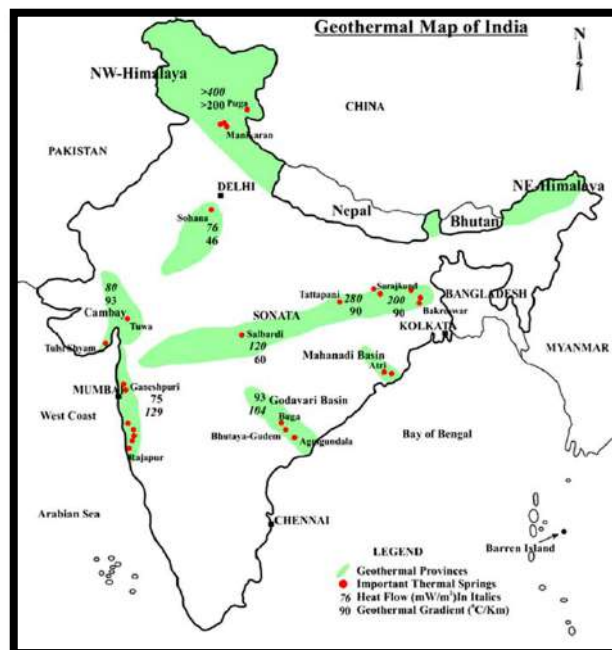
About: -

- Location**: Puga Valley is in the **Changthang Plateau, in the southeastern part of Ladakh**, within the Union Territory of Ladakh, India.
- Geothermal Significance**: Part of the Himalayan geothermal belt, known for **intense hydrothermal activity**.

- **Key Features:** Hot springs, mud pools, sulphur deposits, and surface temperatures reaching up to 84°C, indicating intense geothermal activity.
- **Rich in borax, sulphur, and lithium;** forms travertine deposits through continuous CaCO_3 precipitation, which helps preserve organic molecules.

Hot Springs & Geysers

- Hot springs are geothermal phenomena characterized by the emergence of heated groundwater at the Earth's surface, typically found in regions with significant tectonic activity. Eg: **Manikaran (Himachal Pradesh).**
- Geysers are **volcanic geothermal features that erupt hot water** and steam when groundwater is **superheated by magma** in underground cavities. Eg: **Yellowstone National Park (USA).**



Prominent places where a power plant can be established based on geothermal energy are:

- Manikaran in Himachal Pradesh
- **Jalgaon in Maharashtra**
- Tapovan in Uttarakhand
- Bakreshwar in West Bengal
- Tuwa in Gujarat

3.7 Cyclone Montha

Context: -

- **Cyclone Montha is moving north-northwest** across the west-central Bay of Bengal toward making landfall **along the Kakinada coast in Andhra Pradesh.**

Link for Reference: <https://www.thehindu.com/sci-tech/science/why-do-cyclones-move-towards-land-explained/article70211021.ece>

Factors Influencing the Movement of Cyclones: -

- Atmospheric Circulation Influences
- Steering Effect
- **Trade Winds:** Easterly (east-to-west) trade winds in tropical regions steer cyclones westward, pushing them toward the eastern coasts of continents.
- **Westerlies Influence:** Mid-latitude (30°-60°) westerly winds (west-to-east) steer poleward-moving mature cyclones toward the northeast.
- **Coriolis Effect:** Earth's rotation deflects moving air in cyclones counterclockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere, causing a slight poleward-westward beta drift.
- Monsoon Wind Systems
- Pressure Systems and Interactions
- **Fujiwhara Effect:** Two nearby cyclones rotate around a shared centre, mutually altering their path and speed through angular momentum exchange.

IMP NOTE-

- ❖ Please read static of Tropical cyclone as there are many Cyclones were in News. (This is also UPSC's favourite theme)

Indian Ocean Cyclones

Name	Dates	Notes
Fengal	Nov 29 – Dec 4, 2024	Cyclonic Storm; Bay of Bengal. Reported in 2024 listings.
Shakhti	Early Oct 2025	Severe Cyclonic Storm; Arabian Sea.
Montha	Oct 25 – Oct 31, 2025	Severe Cyclonic Storm in Bay of Bengal, landfall and impacts in Andhra Pradesh/Odisha/Tamil Nadu.
Ditwah	Nov 28, 2025	Extremely destructive cyclone that devastated Sri Lanka (many deaths, widespread damage).

3.8 Cold Wave

Context: -

- India Meteorological Department (IMD) has issued a cold-wave alert for several districts in Telangana, signalling an unusual southward shift of winter severity.

About: -

- A cold wave is a **sudden and substantial drop in temperature below the normal average** for a region during winter.
- India Meteorological Department (IMD) **defines**, monitors, and issues colour-coded warnings (Green, Yellow, Orange and Red) for cold waves.

Criteria to Declare Cold Waves:

- Plains Regions:** Declared when either: (a) the minimum temperature is 4°C or lower, or (b) when it is 10°C or lower and 4.5°C-6.4°C below normal.
- Hilly Regions:** When the minimum temperature is 0°C or lower and 4.5°-6.4°C below normal.
- Coastal Regions:** When the minimum temperature is 15°C or lower and at least 4.5°C below normal.
- Severe Cold Wave:** IMD declares a severe cold wave when either: (a) the minimum temperature is 2°C or lower, or (b) it is at least 6.5°C below normal.

COLD WAVE CRITERIA

Plain & Hilly Regions

When minimum temperature of a station $\leq 10^{\circ}\text{C}$ for plains & $\leq 0^{\circ}\text{C}$ for hilly regions.

1 Based on Departure from Normal		2 Based on Actual Minimum (Plains only)	
Cold Wave Min Temp $\leq 4.5^{\circ}\text{C}$ to -6.4°C	Severe Cold Wave Min Temp $\leq -6.5^{\circ}\text{C}$	Cold Wave Min Temp $\leq 4.0^{\circ}\text{C}$	Severe Cold Wave Min Temp $\leq 2.0^{\circ}\text{C}$

Cold Wave declared if criteria met in at least 2 stations in a sub-division for at least two consecutive days.

Coastal Regions

Min temp departure $\leq -4.5^{\circ}\text{C}$
OR
Min temp $\leq 15^{\circ}\text{C}$

COLD DAYS CRITERIA

Plain & Hilly Regions

When minimum temperature of a station $\leq 10^{\circ}\text{C}$ for plains and $\leq 0^{\circ}\text{C}$ for hilly regions.

1 Based on Departure from Normal		Cold Day	
Cold Day Max Temp $\leq -6.5^{\circ}\text{C}$	Severe Cold Day Max Temp $\leq -6.5^{\circ}\text{C}$	Cold Day Max Temp $\leq -4.5^{\circ}\text{C}$ to -6.4°C	Severe Cold Day Max Temp $\leq -6.5^{\circ}\text{C}$

Cold Day declared if criteria mentioned in.

Cold day declared if criteria alvoved are met.

4. Solar System

4.1 Meteorite Impact Crater

Context: -

- Scientists have discovered the **oldest meteorite** impact crater on Earth.

Link for reference- <https://www.thehindu.com/sci-tech/science/scientists-have-discovered-the-oldest-meteorite-impact-crater-on-earth-in-the-very-heart-of-the-pilbara-region-of-western-australia/article69320950.ece>

About: -

- Crater, **estimated to be 3.5 Bn years old**, predates all previously known craters by over a billion years.
- Location: Pilbara region, Western Australia**, specifically within a dome-shaped geological formation near the Antarctic Creek Member.
- Antarctic Creek Member is a distinct rock layer containing sedimentary rocks and impact spherules (molten droplets from meteorite impacts).

Basics Term Differences: -

COMET

- A **mass of ice, rock and dust drifting in space** that often has a tail, which grows as it gets closer to the Sun. The tail is made up of water, dust and various gases vaporized by solar energy.

ASTEROID

- A **body made up of rocks**, both metallic and non-metallic, that orbits the Sun, usually in the asteroid belt between Mars and Jupiter.
- Some asteroids are comet nuclei. They range in size from a few centimetres to a thousand kilometres.

METEOROID

- A rock, **often an asteroid fragment**, that is bigger than a grain of sand and orbits the Sun. The term "meteoroid" refers to the **object before it enters the atmosphere**.

METEOR

- A **meteoroid that enters the Earth's atmosphere** becomes a meteor. It burns up as it travels through the **atmosphere (mesosphere)**, producing a streak of light.
- A meteor can arrive in **Earth's vicinity as a lone object (shooting star) or in clusters** (meteor shower).

FIREBALL

- A meteor that **burns as it travels throughout the atmosphere**, leaving behind a very bright streak of light. This rather rare phenomenon is the result of a meteoroid that is larger or denser than usual. Sometimes, it is **even visible during the day**.

METEORITE

- When a **meteor does not completely burn up as it travels through the atmosphere**, the fragment found on the ground is called a meteorite.

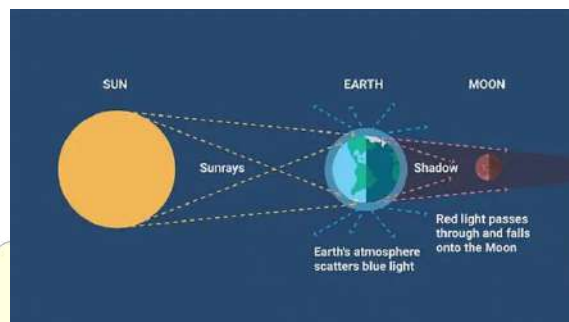
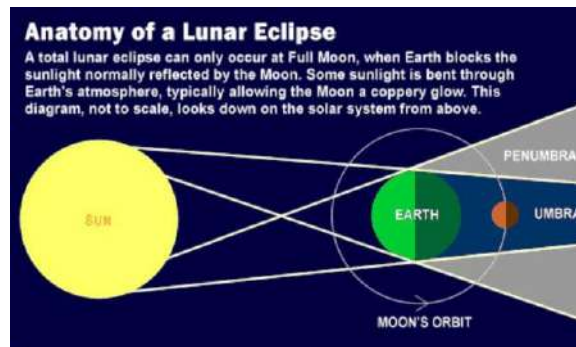
4.2 Blood Moon

Context: -

- September 2025, India witnessed a **total lunar eclipse** popularly called a "Blood Moon."

About: -

- Lunar Eclipse occurs when the **Earth comes between the Sun and the Moon**, casting its shadow on the lunar surface. **Depending on alignment, it can be total or partial.**
- Unlike solar eclipses, it is **safe to view with the naked eye.**
- Blood Moon Effect:** During totality, the **Moon turns coppery-red due to Rayleigh scattering**; the same phenomenon responsible for blue skies and red-orange sunsets.
- Earth's atmosphere scatters **shorter blue wavelengths more strongly**, while longer red/orange wavelengths bend and reach the Moon, giving it a reddish glow.



Types of Lunar eclipse:

Total Lunar Eclipse:

- In a total lunar eclipse, the entire Moon passes through Earth's umbra (the darkest part of its shadow).
- The Moon appears reddish or copper-colored, often called a "blood moon."
- Occurs when Earth's shadow completely covers the Moon.
- Can last for a few hours, depending on the Moon's path.
- Safe to observe with the naked eye.

Partial Lunar Eclipse

- In a partial lunar eclipse, **only a part of the Moon** enters Earth's umbra.
- Part **of the Moon appears dark** while the rest remains bright.
- The shadow gradually moves across the lunar surface.
- Less dramatic than a total lunar eclipse but still noticeable.
- Visibility depends on the **observer's location.**

Penumbral Lunar Eclipse

- A penumbral lunar eclipse **occurs when the Moon passes through the Earth's penumbral shadow, which is the lighter outer part.**
- The Moon appears slightly dimmed, often hard to notice.
- Can be observed with careful observation or photography.
- Happens more frequently than total or partial lunar eclipses.

4.3 Supermoon

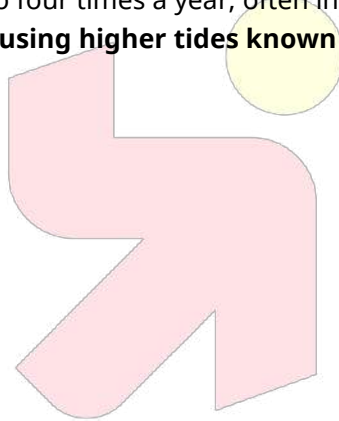
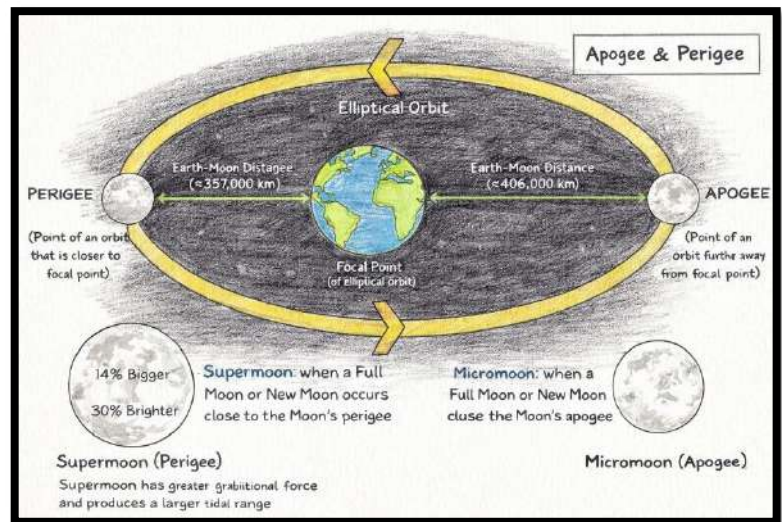
Context:

- A supermoon is a **phenomenon where a new or full moon** appears larger & brighter.

Link for Reference: <https://www.thehindu.com/sci-tech/science/what-is-a-supermoon/article70133754.ece>

About: -

- It occurs when a full or new moon coincides with the Moon's perigee while the Sun, Earth, and Moon are in a straight line (syzygy).
- A supermoon appears nearly **14% larger and 30% brighter** than a full moon at apogee.
- Perigee is the point in the Moon's elliptical orbit where it is closest to Earth (about 3,63,300 km), while apogee is its farthest point (about 4,05,500 km).
- The **Moon's elliptical orbit** causes its distance from Earth to vary, making it appear larger and brighter at perigee and smaller and dimmer at apogee.
- Supermoons usually occur three to four times a year, often in consecutive months.
- It increases **gravitational pull, causing higher tides known** as perigean spring tides.



PRAYAAS

Sample Registration System (SRS)

- **India's largest demographic survey system** designed to provide reliable annual estimates of vital rates, Birth Rate, Death Rate, IMR and TFR.
- **Administered By:** Office of the Registrar General of India (RGI), **Ministry of Home Affairs.**
- **Launched on a pilot basis** in 1964-65, became fully operational in 1969-70 due to the unreliability of Civil Registration System (CRS).

5.2 Rabari community

Context: -

- **Raika tribe/ Rabari of Rajasthan**, once custodians of camel herding and desert ecology, now face a **rapid decline in their traditional way of life.**

Link for Reference: <https://www.downtoearth.org.in/wildlife-biodiversity/raika-tribe-and-the-vanishing-craft-of-camel-herding>

About:

- Also called **Rabari** community, it is an **indigenous pastoralist tribe** primarily in **Rajasthan and parts of Gujarat**, especially in **Kumbhalgarh (Rajsamand district) and the Thar Desert.**
- Raikas have historically been the **breeders of Rajasthan's indigenous hardy Marwari camel**, known for strength, endurance and desert adaptability.
- They consider camel rearing a **divine duty from Lord Shiva**, not merely a profession.

5.3 Dongria Kondh Tribe

Context: -

- NHRC has issued a notice on the deplorable living conditions of Dongria Kondh families.

Identity & Status

- **Category:** Recognised as a **Particularly Vulnerable Tribal Group (PVTG)** due to small population, subsistence economy, and socio-cultural isolation.
- **Habitat:** Indigenous to the Niyamgiri Hills, spread across Kalahandi and Rayagada districts of Odisha.

Belief System & Culture

- Religion: **Practise animism**—nature is sacred and alive. Hills, forests, and streams are worshipped.
- **Festival:** Niyamgiri Festival (April) celebrates Niyam Raja and reaffirms collective identity.
- **Sacred Art:** Shrines feature triangular mountain motifs, symbolising the hills and forest, village, and farm deities.
- **Language:** Speak Kuyi and Kuvi languages (Dravidian family), distinct from Odia, reinforcing cultural autonomy.
- **Primary occupation:** Traditional horticulture and Podu cultivation (shifting agriculture).

What are Particularly Vulnerable Tribal Groups (PVTGs)?

- PVTGs (previously known as a Primitive Tribal Group) are a **sub-classification** of Scheduled Tribes considered more vulnerable among the tribal groups.
- **Dhebar Commission** (or Tribal Panchsheel Committee) recommended the creation of Primitive Tribal Groups (PTGs). Based on this, the **Indian Government created PTGs in 1975. In 2006, PTGs were renamed as PVTGs.**
- At present, **there are 75 PVTGs out of 705 Scheduled Tribes** residing in **18 states** and the Union Territory of Andaman and Nicobar Islands.
- **Largest populations:** Madhya Pradesh (12.28L), Maharashtra (6.2L), Andhra Pradesh (4.9L).

- **Ministry of Tribal Affairs (MoTA) is the nodal ministry** for overall policy planning and coordination of programs for the development of STs.

Habitat Rights of PVTGs

- **Habitat rights** are **given to PVTGs** under Section 3(1) (e) of **Forest Rights Act (FRA)**.
- Ten PVTGs have been **granted habitat rights** in three states (Odisha, Madhya Pradesh, Chhattisgarh).
- Habitat rights don't grant ownership to property.

Pradhan Mantri Janjati Adivasi Nyaya Maha Abhiyan (PM JANMAN)

- **Objective:** To uplift the Particularly Vulnerable Tribal Groups (PVTGs).
- **Nodal Ministry:** Ministry of Tribal Affairs (MoTA), along with 9 Ministries.

The scheme focuses on 11 critical interventions:

- 1) Housing
- 2) Drinking water and sanitation: Mission (JJM) and Swachh Bharat Mission-Gramin (SBM-G)
- 3) Education
- 4) Health and nutrition
- 5) Road connectivity
- 6) Telecom connectivity
- 7) Livelihood opportunities
- 8) Land rights
- 9) Social security
- 10) Cultural preservation
- 11) Institutional support

5.4 Census 2027

Context: -

- Government has **announced that data collection** for India's next Population Census in early 2026.
- **Population Census** will be published in the official gazette as per the **provisions of section 3 of the Census Act 1948**.

About: -

- Census is **conducted by the Office of the Registrar General and Census Commissioner, under the Ministry of Home Affairs**.
- 1st census in India was **conducted in 1872 non-synchronously** in different parts of India. Since 1881, censuses have been conducted every 10 years.
- Conducted under the **provisions of the Census Act, 1948** and the Census Rules, 1990.
- Census is a **subject listed in the Union List** of the **Seventh Schedule** under Article 246 of the IC.
- **Last Census** was conducted in 2011. The 2021 Census was postponed due to the COVID-19 pandemic.

Key Features: -

- It is likely to commence on April 1, 2026, culminating on March 1, 2027.
- **Phase 1:** House Listing (5–6 months from April 1, 2026).
- **Phase 2:** Population Enumeration (February 2027 – completed by March 1, 2027).
- It will be **India's 1st digital census**, marking a shift from paper-based enumeration to a digital format using mobile apps and online platforms.
- Reference Dates:
 - October 1, 2026: For hilly and snow-bound regions (e.g., Ladakh, J&K, Himachal, Uttarakhand).
 - March 1, 2027: For the rest of India.

- **Caste Enumeration:** For the 1st time in post-Independence India, caste data beyond SC/ST categories will be collected. The last complete caste enumeration was conducted in 1931.
- Post-Independence, censuses excluded detailed caste enumeration, recording only Scheduled Castes (SCs) and Scheduled Tribes (STs).

5.5 Geo-Tagging of Buildings in Census 2027

Context:

- Census 2027 will **geo-tag all buildings**, replacing the hand-drawn sketches used previously.

About: -

- Digital Layout Mapping will geo-tag buildings and assign them to geo-referenced House listing Blocks.
- Building Categorisation: Residential, non-residential, partly residential, or landmark.
- Data Collection: Mobile apps will enable self-enumeration and real-time monitoring through the Census Management and Monitoring System (CMMS).
- **Geo-Tagging: Assigning unique latitude-longitude coordinates to buildings through a Geographic Information System (GIS).**
- Geo-Referencing: Matching census maps and boundaries with their exact positions on Earth.

5.6 State of World Population Report

Context:

- The **United Nations Population Fund (UNFPA)**'s **2025 State of World Population (SOWP) Report**, titled '**The Real Fertility Crisis**', was released.

Link for Reference: <https://www.thehindu.com/news/national/indias-population-touches-146-billion-fertility-drops-below-replacement-rate-un-report/article69677930.ece>

Key Findings of the Report: -

Population:

- **World has 8.2 billion people.** There are big differences between rich and poor countries.
- **India's population is expected to reach 1.46 billion in 2025**, becoming the **most populated country**.

Findings about India: -

- **Total Fertility Rate (TFR):** It has **dropped to 1.9 births per woman**, down from nearly 5 in 1970. This is now **below the replacement level of 2.1**.
- **Fertility Differences Between States:** There is a **divide between states with high and low fertility**. Fertility is **below 2.1 in 31 States/UTs**, but **still high in Bihar (3.0), Meghalaya (2.9), and Uttar Pradesh (2.7)**.
- **Adolescent Fertility:** **Teen birth rate is high at 14.1 per 1,000 women aged 15-19**. In comparison: China (6.6), Sri Lanka (7.3), and Thailand (8.3).
- **Age Distribution:** 68% of people are of working age (15-64 years). 7% are elderly (65 and older).
- **Life Expectancy:** At birth, **men are expected to live 71 years and women 74 years**.

UNFPA

- UNFPA is the **United Nations agency focused on sexual and reproductive health**. It started its operations in 1969 as the United Nations Fund for Population Activities (UNFPA).
- In **1987**, it was **renamed the United Nations Population Fund**, but continued to **use the acronym UNFPA**.
- Its **headquarters** are in **New York**.
- UNFPA functions as a **subsidiary body under the United Nations General Assembly**.

- The **agency's main aim is to** guarantee sexual and reproductive rights and choices for everyone, particularly women and youth, by providing access to quality sexual and reproductive healthcare.
- Its responsibilities are defined by the United Nations Economic and Social Council (ECOSOC).
- UNFPA **directly contributes to Sustainable Development Goal (SDG) 3 on health, SDG 4 on education, and SDG 5 on gender equality.**

5.7 Manki-Munda System

Context: -

- Adivasis of the **Ho tribe in Jharkhand's Kolhan** protested administrative interference in the hereditary Manki-Munda system.

About: -

- The Manki-Munda system is an **ancient self-governance structure** of the Ho tribe.
- **Structure:** A Munda heads one village, while a Manki supervises a "pidh," a cluster of 8–15 villages.
- **Current Status:** The Patna High Court (2000) held the system to be customary, not formal law, but allowed its continuation; many Manki and Munda posts currently remain vacant.

Ho Tribe

- Ho are an Adivasi (ST) group belonging to the **Austroasiatic Munda language** family.
- Mainly inhabit **Jharkhand, also parts of Odisha, West Bengal, Bihar, Nepal, and Bangladesh.**
- Ho language is part of the Munda group; it uses Devanagari, Latin, & Warang Citi scripts.
- **Historical Role:** They led the Ho Revolt of 1821–22 and the **Kol uprising** of 1831–33 against the British.
- Culture & Religion: They follow Sarnaism (nature-worship) and celebrate festivals such as Mage Parab (festival of the creator) and Sohrai (harvest), Ba Parab (flowers), and Jomnama Parab (harvest).

5.8 Moran Community

Context: -

- The Moran community has launched an **economic blockade in Assam's Tinsukia district** to demand recognition as a Scheduled Tribe.

Link for Reference- [Morans begin 'economic blockade' in Assam's Tinsukia as community ramps up demand for ST status | India News - The Indian Express](#)

About: -

- **Ethnic Origin:** Morans are an indigenous community of Assam and Arunachal Pradesh with roots in the Tibeto-Burman **Kachari group of tribes.**
- The Kachari tribe **family includes** Bodos, Dimasas, and Chutias in Northeast India.
- **Language:** Native Moran language, related to Dimasa, is extinct; now Assamese is mainly spoken.
- **Religious Culture:** The community largely follows Neo-Vaishnavism through satras and namghars, replacing older animistic practices.
- **Historical Role:** Morans led the **Moamoria Rebellion** (1769–1805), weakening the **Ahom monarchy.**

5.9 Siddi Community

- The Siddis, also known as Sheedis or Habshis, are a **primitive tribal group of African origin.**
- They were **brought from East Africa to India as slaves by Indian rulers & Portuguese traders** between the 15th and 17th centuries.
- They are **mainly concentrated in Gujarat, Maharashtra, Karnataka, and Andhra Pradesh.**
- Cultural Traditions: The Siddis are known **for their Dhamal or Goma tradition**, which combines African drumming and rhythms with Indian influences.

- **Recognised as a Scheduled Tribe in the 2011 Census** and classified as a **Particularly Vulnerable Tribal Group (PVTG) in Gujarat.**

5.10 TRIBES IN NEWS

Ollo Tribe

- Indigenous **Tibeto-Burman** community.
- Inhabits Lazu Circle of Tirap district, **Arunachal Pradesh.**
- Patriarchal and clan-based society.
- Traditionally led by chiefs called Lowang and Ngongpa.
- **Main festival:** Woraang (Voorang)
- Celebrates the harvest season.
- **Not recognised as a Scheduled Tribe.**
- Grouped under Nocte or other Naga tribes.

Ramnammi Tribe

- Originated in the 19th century in **Chhattisgarh.**
- Emerged as a **peaceful resistance movement** against the caste system.
- Often called the “living embodiment of faith”.
- Members do Tattoo of ‘Ram’ all over their bodies.
- Core belief: ‘Ramnam’ (chanting the name) is religion and ‘Rambhakti’ is action.

Abujhmadiya Tribe

- Members of the Abujhmadiya Tribe took part in the **Bastar Olympics**, a government-backed multi-sport initiative in Chhattisgarh.
- Recognised as **one of the seven Particularly Vulnerable Tribal Groups (PVTG) in Chhattisgarh**, under the Ministry of Tribal Affairs.
- Speak Abujhmariya, considered a variant of the Gondi (Dravidian) language family.
- Subsistence base includes: Shifting cultivation and Forest produce collection

Khiamniungan Tribe

- Naga community **inhabiting eastern Nagaland** and north-western Myanmar.
- Livelihood: Agriculture, specifically shifting cultivation.
- Practise unique cliff honey hunting methods.
- Known for: Vibrant traditional attire and Elaborate headgear
- **Language:** Patsho Khiamniungan

Dandami Madia Tribe

- Also known as **Bison-Horn Maria** or Khalpati Maria.
- Tribal community of southern Bastar in Chhattisgarh.
- Known for: Distinctive bison-horn ceremonial headgear.
- Gondi dialects.
- Economy: Primarily agricultural and Supplemented by hunting and fishing.
- Reflects forest-linked subsistence patterns.

6. Miscellaneous

6.1 National Crisis Management Committee

Context: -

- The government of India has given **statutory backing to the National Crisis Management Committee (NCMC) under the amended Disaster Management Act, 2025**, making it the apex decision-making body for national disaster response coordination.

About: -

- Constitution: **Formally constituted by the Ministry of Home Affairs** under Section 8A(2) of the Disaster Management Act, 2005. Earlier, it existed without formal statutory backing.
- Composition:** The NCMC is **headed by the Cabinet Secretary**. Its members include the Union home secretary, defence secretary, secretary (co-ordination), Cabinet Secretariat and member and head of department, the National Disaster Management Authority (NDMA).
- The chairperson of the NCMC can co-opt experts or officers from central/state governments or any organisation, based on the nature of the crisis.
- Key Functions:** The NCMC assesses the country's disaster preparedness and issues directions to strengthen it.

6.2 National Disaster Mitigation Fund

Context (PIB):

- The Union Government has **extended the National Disaster Mitigation Fund (NDMF) to Panchayati Raj Institutions**.

Link for Reference: <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2204819®=3&lang=1>

About:

- It was **established by the Union Ministry of Home Affairs in 2021** to fund projects that prevent or reduce the long-term impact of natural disasters.
- It was **mandated under Section 47 of the Disaster Management Act (DMA), 2005** and is **administered by the National Disaster Management Authority (NDMA)** under the Union Ministry of Home Affairs.
- The 15th Finance Commission allocated ₹13,693 crore to the NDMF for 2021-26, marking India's first dedicated national funding window exclusively for disaster mitigation.
- Key **focus areas of the NDMF** include urban flooding, drought-prone states and seismic risk zones.

National Disaster Management Authority (NDMA)

- It was **constituted in 2006 under the Disaster Management Act, 2005** as the apex body for disaster management in India and is **chaired ex officio by the Prime Minister**.
- It **consists of a Vice-Chairperson and up to eight members**, all appointed by the Central Government, and functions through specialised divisions.
- It **approves the National Disaster Management Plan**, issues binding guidelines to Centre and States, administers disaster funding like NDRF and NDMF, and oversees national preparedness measures.

6.3 Rare Earth Permanent Magnet Manufacturing Scheme

Context: -

- Union Cabinet **approved a landmark scheme to establish domestic manufacturing facilities** for Rare Earth Permanent Magnets (REPMs).

Link for reference:

<https://www.pib.gov.in/PressNoteDetails.aspx?NoteId=156753&ModuleId=3®=3&lang=1>

About: -

- Scheme **combines Production-Linked Incentives and capital subsidies** to create an integrated supply chain of REPMs to reduce import dependence.
- **Nodal Ministry:** Ministry of Heavy Industries with assistance from relevant bodies.
- **Objective:** To create domestic manufacturing capacity of 6,000 Metric Tons per Annum (MTPA).
- Duration: Planned for 7 years, including a 2-year phase to establish the REPM manufacturing facility and 5 years of sales-linked incentives.

About REPM:

- Rare Earth Permanent Magnets (REPMs) are **high-strength permanent magnets** made using rare-earth elements such as neodymium and samarium.
- REPMs provide **very high magnetic strength** in compact size, making them essential for electric vehicle motors, wind turbines, electronics, aerospace and defence applications.
- China controls about **90% of global production** and processing of REPMs.
- Two Types:
 - NdFeB Magnets: Neodymium-iron-boron magnets offer the highest magnetic strength but have lower temperature resistance than samarium-cobalt units.
 - SmCo Magnets: Samarium-Cobalt magnets have lower strength but are highly durable, making them suitable for aerospace, medical, and military uses.
- **Key Applications:** Essential for wind-turbine generators, electric vehicles (EVs), small electronic devices, and medical and defence systems like MRI units and precision-guided weapons.

6.4 World Summit on Disaster Management

Context (PIB):

- At the **World Summit on Disaster Management in Dehradun**, Union Minister Shri Jitendra Singh announced the expansion of meteorological systems in Uttarakhand.

About: -

- A global dialogue platform **organised by Uttarakhand State Council for Science and Technology (UCOST) in collaboration with National Disaster Management Authority (NDMA).**
- **Theme** for 2025 is "Strengthening International Cooperation for Building Resilient Communities".
- **Purpose:** Bringing together diverse stakeholders from over 50 countries to facilitate dialogue, knowledge sharing, capacity building, foster collaboration and showcasing innovation.
- **Structure:** Built around a five-pillar framework known as the "5Es": Engage, Educate, Enable, Empower, and Excel. Workshops delve into five themes related to Earth, Water, Air, Fire, and Space.
- **Bhagirath Awards:** Presented at the summit recognising exceptional leadership & innovation in climate action and disaster risk reduction.



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