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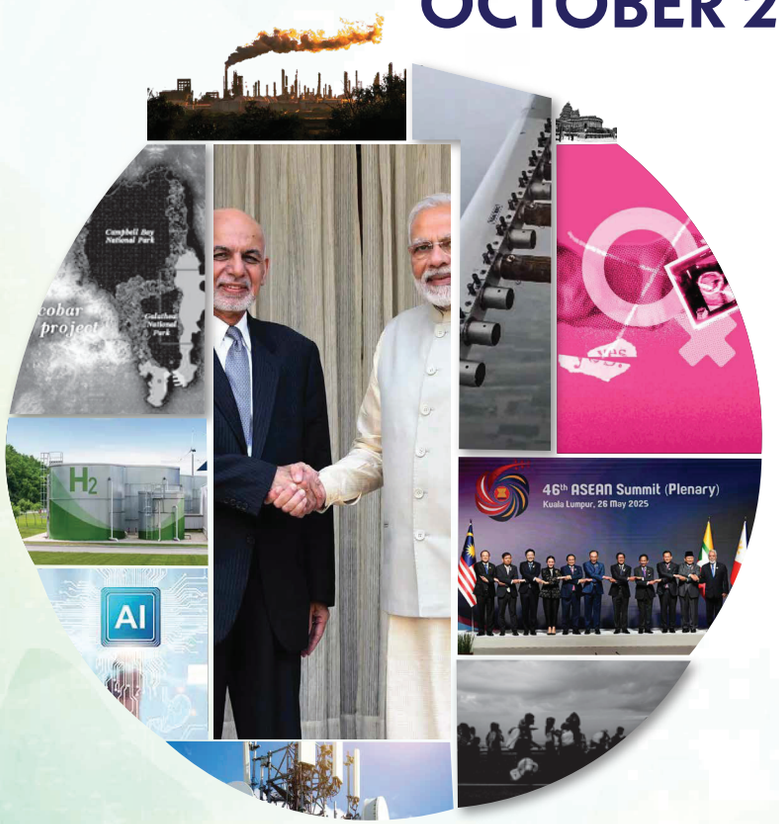


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# GEOGRAPHY, ENVIRONMENT & DISASTER MANAGEMENT

## Topics for Mains

### Climate Models: The Science Behind Predicting Earth's Future

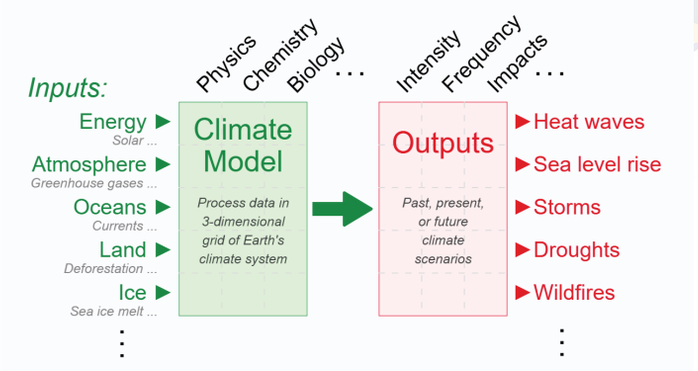
*Syllabus Mapping: GS 1- Geography*

#### Context

During a UN General Assembly speech, US President Donald Trump dismissed climate change as a "con job," criticizing UN climate predictions. However, these predictions are based on **climate models**, which are core tools of modern climate science used to understand and project changes in Earth's climate.

#### About Climate Models

- A **climate model** is a sophisticated **computer simulation** that mathematically represents how the Earth's climate system operates - including the **atmosphere, oceans, land surface, and ice**.




- These models are based on fundamental physical principles such as: Conservation of energy, Fluid dynamics, Thermodynamics, and Radiative transfer.
- They are designed to simulate the interactions among these components to understand **past climate trends**, assess **current variations**, and **predict future climate scenarios** under different greenhouse gas emission pathways.
- **How Do Climate Models Work?**
  - **3D Grid Framework:** The Earth is divided into a **three-dimensional grid** - horizontally (latitude, longitude) and vertically (from surface to atmosphere and ocean depths). Each grid cell represents temperature, humidity, pressure, and energy flow.
  - **Equations and Interactions:** Mathematical equations describe the exchange of energy, water, and momentum within and between grid cells. Inputs include solar radiation, greenhouse gas concentrations, aerosols, and land-use patterns.
  - **Simulation Process:** The model solves millions of equations repeatedly to simulate changes over years or centuries. The output gives projections on: Temperature rise, Rainfall patterns, Sea-level rise, Frequency of heatwaves, droughts, or cyclones.

**Models and Approaches Used in India**

- **ITM Earth System Model (IITM-ESM):** Developed by the Indian Institute of Tropical Meteorology (IITM), this model is specifically designed for long-term climate studies and contributes to international initiatives like CMIP6.
- **Global Climate Models (GCMs):** India evaluates and utilizes a variety of GCMs from international projects like CMIP5 and CMIP6. The best-performing models are selected for specific seasons and regions, with a focus on future projections for temperature and precipitation.
- **Regional Climate Models (RCMs):** Models such as PRECIS are used to provide high-resolution climate projections for the Indian region. India has also developed its own capacity to run regional climate models to simulate climate change scenarios at local scales.
- **Ensemble and statistical models:** To handle uncertainty and improve reliability, Indian researchers use ensemble methods like Reliability Ensemble Averaging (REA) and Bayesian Model Averaging. REA, for example, assigns different weights to models based on their performance in simulating current climate conditions.
- **Other international models:** Models such as the Community Climate System Model (CCSM), Community Earth System Model (CESM), and the Global Forecast System (GFS) are also used for various climate modeling activities in India.
- **Bharat Forecast System:** It is an indigenous, high-resolution weather prediction model developed in India to provide more accurate, localized forecasts for the country. It uses a new Triangular Cubic Octahedral (TCo) dynamical grid to achieve a 6 km horizontal resolution

#### Analysis of Climate Models

**Strengths and Achievements**

- **Accurate Long-Term Trends:** A climate model provides long-term global and regional projections, unlike weather models, which offer short-term forecasts.
  - E.g., Models from the 1970s correctly predicted global temperature rise corresponding to increased $CO_2$.
- **Successful Forecasts:** Predicted Arctic ice decline, sea-level rise, and ocean heat content changes with remarkable precision.
- **Enhanced Accuracy:** Integration of AI, machine learning, and satellite data has improved spatial resolution and realism.
- **Policy Formulation:** Serve as a basis for IPCC assessments and Paris Agreement targets. Governments use them to design Nationally Determined Contributions (NDCs) and climate adaptation strategies.
- **Disaster Preparedness:** Provide inputs for early warning systems, urban flood management, and agricultural planning.
- **Environmental Planning:** Guide long-term decisions on energy transition, infrastructure resilience, and water resource management.

- **Education and Awareness:** Help communicate complex climate science to policymakers and the public in understandable terms.

**Limitations and Uncertainties**

- **Data Gaps:** Sparse ground and ocean observations in many regions reduce accuracy.
- **Resolution Constraints:** Typical grid cells (100–250 km wide) cannot capture **local microclimates** or **urban heat islands**.
- **Simplified Processes:** Phenomena like **cloud formation** or **aerosol interactions** remain difficult to model accurately.
- **Natural Variability:** Sudden events—like **volcanic eruptions** or **solar cycles**—add unpredictability.
- **Regional Weaknesses:** Struggles persist in modelling **South Asian monsoons**, **El Niño–Southern Oscillation**, and **tropical cyclone intensity**.
- **Dependence on Scenarios:** Future projections rely on assumptions about **emissions, population, and technology**, which carry uncertainty.

## The Global South Challenge

- **Western Bias:** Most advanced models originate from **North America, Europe, and Japan**, regions with dense observation networks.
  - Consequently, projections are **more accurate for the Global North** than for regions like Africa or South Asia.
- **Complex Regional Systems:** Monsoon-dependent climates, mountain ranges, and intersecting oceanic currents make South Asia, Africa, and Latin America harder to model.
  - Local variability, crucial for agriculture and water management, is often underrepresented.
- **Limited Modelling Infrastructure:** The Global South lacks supercomputers, high-resolution datasets, and trained climate modellers.
  - Further, indigenous adaptation planning is constrained by reliance on external projections.
- **Data Deficiency:** Sparse and inconsistent weather stations, buoy networks, and long-term records reduce the ability to calibrate models.
- **Climate Justice and Equity:** Countries most affected by climate change like India, Bangladesh, Pacific Islands, and Sub-Saharan Africa have less reliable predictions to plan for it. This inequity deepens vulnerability and limits evidence-based policymaking.

## Way Forward

- **Strengthen Regional Climate Modelling:** Encourage indigenous institutions like IITM Pune's Earth System Science Organisation (ESSO) and IMD to develop region-specific models.
- **Data Collaboration:** Global sharing of open-source climate data through frameworks like WMO's Global Framework for Climate Services (GFCS).
- **High-Resolution Modelling:** Investment in AI and supercomputing for finer-scale climate predictions.
- **South–South Cooperation:** Collaborative climate research among Global South nations (e.g., BRICS Climate Centre, Indian Ocean Observing System).
- **Policy Integration:** Mainstream climate projections into urban planning, agriculture, and disaster management policies.

# Cloud Seeding in Delhi — Fact, Fiction, or Futile Experiment?

*Syllabus Mapping: GS-3, Environment*

## Context:

Delhi's authorities have proposed cloud seeding as a measure to tackle the city's hazardous air quality.

## Why is Delhi's air fouler in Winters?

1. **Meteorological Dimension**
   - **Weak Winds:** During winter, the northwestern winds become weak and stagnant, preventing dispersal of pollutants.
   - **Temperature Inversion:** The ground cools faster than the air above, trapping pollutants near the surface.
   - **Stable Air Mass:** High-pressure systems create stable atmospheric conditions that suppress vertical air mixing.
   - **Dry Continental Air:** After monsoon withdrawal, moisture levels drop drastically, leading to very dry air.
   - **Low Humidity:** Cooler air holds less water vapour, reducing the potential for condensation and rainfall.
   - **Lack of Rainfall:** Absence of rain prevents natural washing away of particulate matter.
2. **Geographical Dimension**
   - **Topography of the Indo-Gangetic Plain:** Surrounded by the Himalayas in the north and Aravallis to the west, pollutants tend to get trapped within the basin-like geography.
   - **Landlocked Position:** Being far from coastal influences, Delhi lacks sea breezes that could help clean the air.
3. **Anthropogenic Dimension**
   - **Crop Residue Burning:** Stubble burning in Punjab and Haryana peaks in October–November, releasing massive particulate matter.
   - **Vehicular Emissions:** Cooler temperatures increase fuel inefficiency and worsen tailpipe emissions.
   - **Construction Dust & Urban Activities:** Winter months see intensified construction, biomass burning, and waste burning for heating.
4. **Atmospheric & Chemical Dimension**
   - **Higher PM2.5 Concentration:** Particulate matter remains suspended longer due to poor air circulation.
   - **Photochemical Smog:** Although less sunlight reduces ozone formation, pollutants like $NO_2$ accumulate more densely in the stagnant layer.

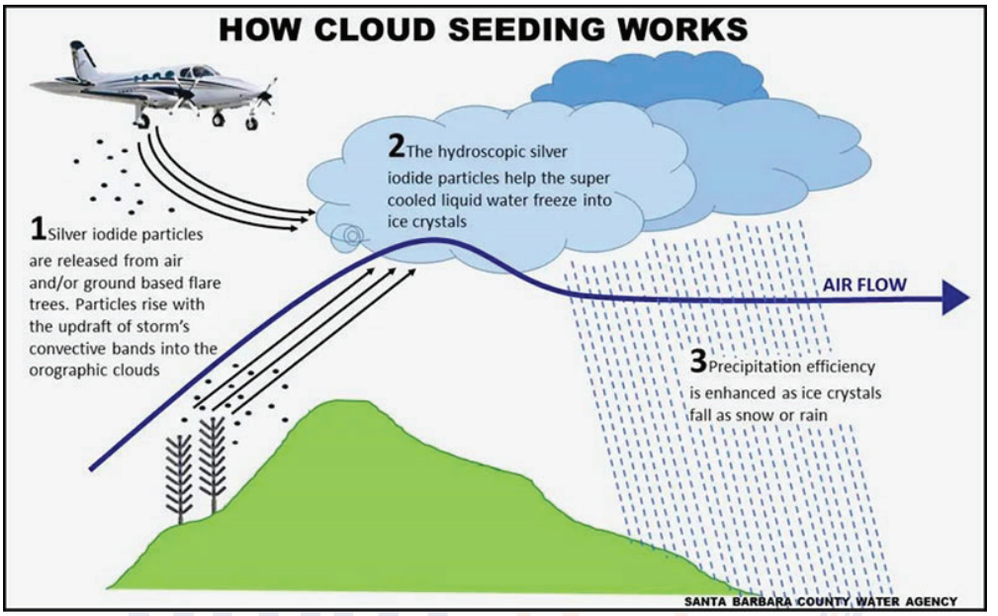
**Note:**

Western disturbances bring brief rains from the Mediterranean region, but they are infrequent and inconsistent. Such rain events can clear the air momentarily but are too sporadic to improve overall winter air quality.

## What is Cloud Seeding?

- Cloud seeding is a weather modification technique that aims to increase precipitation (rain or snow), mitigate hail, or disperse fog by introducing specific substances into clouds.
- It works by introducing **Cloud Condensation Nuclei (CCN)** or **Ice Nuclei (IN)** to enhance the natural processes of droplet and ice crystal formation.

| Type of Seeding | Target Cloud | Seeding Agent | Mechanism |
|---|---|---|---|
| **A. Cold Cloud Seeding** | Cold Clouds (Supercooled water below 0 degree Celcius) | Silver Iodide or Dry Ice | Silver Iodide: Acts as an Ice Nucleus, causing supercooled water to freeze and rapidly form precipitation via the Bergeron-Findeisen process. Dry Ice: Causes dramatic cooling, triggering the homogenous freezing of water droplets into ice crystals. |
| **B. Warm Cloud Seeding** | Warm Clouds (Entirely above 0 degree Celcius, common in tropical areas like India) | Hygroscopic Salts (e.g., Sodium Chloride) | Hygroscopic Salts: Act as large Cloud Condensation Nuclei, attracting water vapor. This accelerates the Coalescence Process (droplets colliding and merging), quickly forming droplets large enough to fall as rain. |




## Delhi's Cloud Seeding Project

- **Implementers:** The project is a joint initiative between the Delhi government and the **Indian Institute of Technology (IIT) Kanpur**, in coordination with the India Meteorological Department (IMD) and others.
- **Goal:** To induce **artificial rain** to wash away pollutants like PM2.5 and PM10, providing temporary relief from the severe winter smog.
- **Method:** A modified **Cessna-206H aircraft** is used to disperse **seeding agents**—a mix that includes nano-sized **silver iodide**, micro-sized common salt, and rock salt—into the clouds.
- **Cost:** The Delhi government allocated a budget of approximately **₹3.21 crore** (about ₹64 lakh per trial) for **five experimental trials**.
- **Results:**
  - **Three sorties (trials) were conducted** (as of the most recent reports).
  - The attempts resulted in **zero significant rainfall** in Delhi.
  - IIT Kanpur claimed **negligible drizzle** (e.g., 0.1–0.2 mm) in neighboring areas like Noida and Greater Noida following the seeding.
  - There were claims of a **marginal improvement in air quality** (e.g., PM2.5 levels dropped by 6–10%) in some areas immediately after one trial, but experts question the direct link to seeding in the absence of rain

## The Scientific Debate: Real or Fake Effectiveness

| Aspect | The Challenge in Delhi (The 'Fake' Argument) | Supporting Evidence (The 'Real' Argument) |
|---|---|---|
| **Cloud Availability** | **Absence of Seedable Clouds:** The peak pollution months (Nov-Jan) in Delhi are characterised by **dry, stable atmospheric conditions** and low humidity, which are **not conducive** for the formation of the large, moisture-rich clouds necessary for effective seeding. | **Occasional Western Disturbances:** Rainfall in winter is caused by Western Disturbances. If seeding coincides with the **early stages** of such a system, there may be a **narrow window** to enhance natural precipitation. |

| Aspect | The Challenge in Delhi (The 'Fake' Argument) | Supporting Evidence (The 'Real' Argument) |
|---|---|---|
| **Scientific Efficacy** | **Weak & Inconclusive Data:** Global studies, including World Meteorological Organization (WMO) reports, suggest only **marginal enhancement** (5–20%) of precipitation in controlled conditions. It **cannot create clouds** from a clear sky. | **Past Indian Experiments:** The Ministry of Earth Sciences (MoES) **CAIPEEX** (Cloud Aerosol Interaction and Precipitation Enhancement Experiment) over Solapur, Maharashtra, reported a rainfall enhancement of up to **46%** in specific zones under favourable monsoon conditions.<br>**Note:** MoES had previously conducted CAIPEEX in four phases in the southern peninsular India region. During the phased studies done in 2009, 2010-2011, 2014-2015, and 2017-2019. |
| **Impact on Pollution** | **Temporary & Episodic Relief:** Even if successful, the rain-induced washout of pollutants (PM) is **short-lived**, lasting only 1–2 days. Pollution levels quickly **rebound** as the underlying emission sources (vehicles, industries, etc.) remain active. | **Local PM Reduction:** Post-trial reports from the executing authority (e.g., IIT-Kanpur) claimed a **marginal, temporary reduction** in PM 2.5 and PM 10 in the seeded corridor, attributing it to particle settling due to increased moisture content. |

## Environmental, Policy and Ethical Concerns associated with Cloud Seeding

### Environmental

- **Chemical residues**: Silver iodide and other seeding agents may accumulate in soil and water bodies, potentially affecting local ecosystems.
- **Ecological disruption:** Changing natural weather patterns might impact local flora and fauna dependent on specific hydrological cycles.
- **Water quality concerns**: Contaminants from artificial rain chemicals could degrade water quality if concentrations become significant.
  - **Note:** The chemicals used in artificial rain, particularly silver iodide, have low toxicity, but prolonged or high-level exposure could cause respiratory or skin irritation in humans.

### Policy and Governance

- **Misallocation of Resources:** The cost of ₹64 lakh per sortie is considered a hugely expensive investment for an uncertain and ephemeral result.
- **Policy Diversion:** Focusing on a "silver bullet" technology like cloud seeding allows policymakers to deflect accountability from implementing politically difficult but necessary structural reforms like tackling stubble burning, cleaning industrial emissions, and controlling construction dust.
- **Safety Risks**: Aircraft deployment over populated areas requires stringent safety measures to avoid accidents.

### Ethical

- **Accountability:** There is a lack of clear legal or governance frameworks to address liability if the artificial rain coincides with and exacerbates a natural event like flooding.
- Even if the rainfall and flooding are unrelated to seeding, public perception could still link the two, undermining trust in both science and governance.
- **Conflict:** If a state seeds clouds and receives increased rain, a downwind state could claim the operation "stole" their potential rainfall, leading to inter-state disputes (no clear national governance framework exists).

#### Global Case Studies

- In the United Arab Emirates, cloud seeding has been used to increase rainfall in the arid region, with the country investing heavily in weather modification technologies.
- China has also extensively used cloud seeding to combat drought and air pollution, particularly in the lead-up to major events such as the 2008 Beijing Olympics.

## Long-Term Solutions for Delhi's Air Quality

Experts emphasize that sustained air quality improvement for Delhi requires a commitment to structural, long-term solutions, particularly through an **airshed-based approach** involving coordinated action.

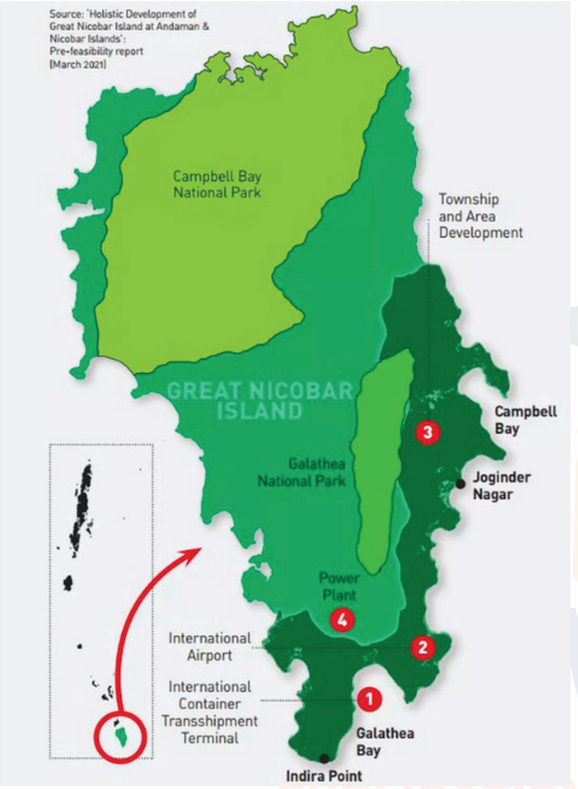
| Sector | Actionable Steps |
|---|---|
| **Transportation Reform** | • **Expand** public transport (metro and electric buses).<br>• **Promote** non-motorised mobility (cycling and walking infrastructure).<br>• **Introduce** vehicle scrappage policies and **congestion pricing**. |
| **Industrial & Energy Shift** | • **Phase out** coal-based power plants across the NCR.<br>• **Incentivise** a switch to renewable and cleaner industrial fuels. |
| **Agricultural Transition** | • **Scale up** subsidies for bio-decomposers and other effective stubble management technologies.<br>• **Encourage** crop diversification to reduce the volume of paddy residue burning. |
| **Construction & Waste** | • **Mandate** dust control technologies at all construction and demolition sites.<br>• **Enforce** bans on open waste burning and **improve scientific landfill management**. |
| **Governance & Cooperation** | • **Strengthen** the Commission for Air Quality Management (CAQM) with clear, **binding enforcement powers**.<br>• **Establish joint task forces** across Delhi, Haryana, Punjab, and UP for seamless, coordinated regional action. |
| **Public Health & Awareness** | • **Integrate** air pollution reduction targets into public health, education, and urban planning policies.<br>• **Promote** citizen-led monitoring programs using mobile air-quality sensors. |

# The Great Nicobar Island Development Project (GNI): Promise and Peril

*Syllabus Mapping: GS-1- Geography, GS-3- Environment*

## Context

The Great Nicobar Island Project - involving a transshipment port, power plant, township, and airport - has reignited debate over India's environmental governance and the concept of granting legal rights to nature.




## About Andaman and Nicobar Islands

The Andaman and Nicobar Islands comprise two groups: the Andaman Islands and the Nicobar Islands, covering a total area of 8,249 sq km. The entire chain includes 836 islands, islets, and rocky outcrops, with around 38 of them being permanently inhabited.

## Significance of Andaman and Nicobar Islands

### Environmental Significance

- **Biodiversity Hotspot:** The Andaman and Nicobar Islands are home to over 2,200 species of plants, 270 species of birds, and numerous mammals and reptiles.
  - E.g., Great Nicobar Biosphere Reserve, which hosts endemic species like the Nicobar Megapode.
- **Marine Ecology**: The islands' coral reefs and mangroves are vital for protecting coastlines from erosion and supporting marine biodiversity.
  - E.g., The coral reefs around Havelock Island, which support diverse marine species and protect against coastal erosion.
- **Climate Regulation**: The dense forests and vast marine ecosystems play a crucial role in carbon sequestration and regulating local climate patterns.

### Strategic significance

- **Strategic Hub for Indo-Pacific Security**: The Andaman and Nicobar Islands position India as a key player in maintaining peace and security in the Indo-Pacific.
- **Countering Chinese Influence**: The islands serve as a strategic 'metal chain' that can potentially block China's access to the Indian Ocean.
- **Securing Maritime Chokepoints**: The islands' strategic location allows India to safeguard the Malacca Strait, through which 30% of the world's traded goods pass annually.
- **Expanded Maritime Partnerships:** The islands' geo-strategic location enhances India's maritime collaboration with countries like the US, Japan, Australia, and France.
  - E.g., participation in joint exercises such as Exercise KAVACH.

## Great Nicobar Island Development Project (GNI)- Overview

- Launched in 2021, the GNI Project envisions developing the southern tip of Great Nicobar Island into a global trans-shipment hub. Spearheaded by NITI Aayog and ANIIDCO, the ₹72,000 crore project includes:
  - Trans-shipment port at Galathea Bay (capacity: 16 million TEUs/year)
  - International airport (dual civil-military use)
  - 450 MVA gas & solar power plant
  - Township for ~3 lakh residents over 166 sq km

### Significance of the GNI

- **Strategic and Defense**
  - **Geostrategic Location**: Great Nicobar Island sits near the mouth of the Malacca Strait, one of the world's busiest shipping lanes, through which one-third of global sea trade passes. It is also in proximity to the vital Sunda Strait and Lombok Strait, and the Coco Islands.
  - **Defense Capability**: Developing a naval-capable deep-water port and an airfield will significantly strengthen India's existing tri-services military command.
    - » This allows India to position ships, aircraft, and drones closer to the eastern Indian Ocean's strategic crossroads to monitor critical sea lanes and enhance regional security.
- **Economic and Connectivity**
  - **Regional Maritime Hub:** The establishment of a Transhipment Port will attract cargo that is currently handled by ports in nearby countries like Singapore or Colombo, capitalizing on the island's closeness to the Malacca Strait.--> Currently, nearly 75% of India's transhipped cargo is handled outside the country.
- **Economic Benefits:** The project is expected to generate significant economic advantages, including forex savings, attracting Foreign Direct Investment (FDI), increasing economic activity at other Indian ports, and generally improving logistics infrastructure.
- **Improved Connectivity:** The development will enhance the island's connection to the Indian mainland and other destinations, making Great Nicobar more accessible for tourism, trade, and strategic logistics.

- **Intended Objectives**
  - Strengthen India's logistics and shipping network.

- Enhance defence preparedness in the eastern Indian Ocean.
- Generate employment and tourism opportunities for the region.

## Risks Associated with the GNI

**Ecological Risks**

- **Massive Deforestation:** The project will destroy 130 sq km of tropical rainforest, with over 10 million trees likely to be cut, leading to massive biodiversity loss.
- **Threat to Endangered Species:** It threatens the nesting habitat of the endangered leatherback sea turtle in Galathea Bay, violating the Marine Turtle Action Plan (2021).
- **Coastal and Marine Ecosystem Damage**: Port construction in CRZ 1A areas endangers coral reefs and marine ecosystems through dredging and industrial activity.
- **Increased Disaster Vulnerability:** The project increases disaster risk in Seismic Zone V and weakens natural coastal defences against tsunamis and climate shocks.

**Social Risks**

- **Disruption of Indigenous Communities**: The project could displace indigenous tribes like the Shompens and Nicobarese, disrupting their sustainable lifestyle, traditional ecological knowledge, and forest-based subsistence practices.
- **Weak Afforestation Substitutes:** Compensatory planting in Haryana or Madhya Pradesh cannot mimic the ecological value of Nicobar's tropical forests.

### Legal and Judicial Context of the Great Nicobar Island Development Project

The GNI Project's environmental clearance process has faced scrutiny, especially when viewed against established legal precedents regarding community rights and emerging global concepts on nature's legal status.

**The Niyamgiri Hills Precedent (2013)**

- The Supreme Court's judgment in the Niyamgiri Hills case (Orissa Mining Corporation vs. MoEF, 2013) affirmed the principle of environmental democracy in India.
- The Court held that Gram Sabhas (Village Councils), under the Forest Rights Act, 2006, possess the final authority to decide on forest diversion that affects their cultural, religious, and livelihood rights.
- This created a binding precedent linking forest governance with the constitutional protection of indigenous rights and identity, a framework that requires the informed consent of tribal communities before proceeding with large-scale projects.

**The Rights of Nature**

- Globally, a shift is occurring from anthropocentric (human-centered) environmental laws to 'Earth Jurisprudence' or the 'Rights of Nature'. This movement, adopted in countries like Ecuador and New Zealand, grants legal personhood to natural entities (rivers, forests).
- India briefly adopted Rights of Nature in 2017 when the Uttarakhand High Court declared the Ganga and Yamuna rivers as "living entities" with legal personhood. Though stayed by the Supreme Court, it set a powerful philosophical precedent aligned with India's constitutional ethos.

**Why Legal Rights for Nature Matter for GNI?**

The 'Guardianship Model' inherent in the Rights of Nature concept offers a way to:

- Ensure Direct Protection: Ecosystems gain protection independent of human claims.
- Empower Communities: Tribal councils (like the Shompen) can be legally recognized as custodians of the ecosystem.
- Strengthen Accountability: The ecosystem can be represented in court, holding authorities accountable for irreparable harm.

## Balancing Development and Nature Rights in A&N Islands

- **Phased & Minimal-impact Approach:** Projects should be phased, with pilot modules, rigorous EIAs for each phase, minimal deforestation and adaptive management based on real-time monitoring.
- **Prioritise Nature-First Defence Infrastructure:** Infrastructure must utilise existing clearings, avoid critical habitats, integrate green engineering, and not displace ecosystems just for security gain.
- **Empower Indigenous Communities:** Recognise and formalise the roles of Nicobarese and Shompen communities in planning and conservation; uphold FPIC, promote their livelihoods via eco-tourism, traditional knowledge systems and benefit-sharing.
- **Blue Economy with Ecological Safeguards:** Ports, shipping and tourism must be aligned with UNESCO/MAB ecosystem guidelines, strict CRZ norms, reef-safe tourism, mangrove restoration and marine protected area strengthening.
- **Disaster Resilience & Climate Adaptation:** Coastal infrastructure must integrate sea-level rise, tsunami wave modelling, mangrove and coral reef buffers, and avoid large concrete footprints in highly vulnerable zones.
- **Transparent Monitoring & Governance:** The monitoring committees for GNI must include independent scientists, tribal representatives, civil society and audit mechanisms. Data on deforestation, species loss, habitat destruction and compensation spending should be publicly available.
- **Offset Mechanism that Maintains Spatial Integrity:** Compensation for ecological loss should ideally be within the same bio-region rather than remote states; the unique biodiversity of Great Nicobar cannot be substituted by planting trees in Haryana or Madhya Pradesh.
- **Strategic Vision Aligned with Sustainability:** India's vision of climate leadership, maritime strength and sustainable development must converge in A&N policy, not conflict. The goal should b**e "sustainable sovereignty" rather than "unchecked infrastructure".**
- **Learning from Best Practices:** Harness the international precedent of Colombia's Atrato River Case (2016) by adopting a "bio-cultural rights" model that grants the Great Nicobar ecosystem legal status and establishes a Commission of Guardians.

# Topics for Prelims (Geography)

## Dark Stars

### Context

Astronomers have recently identified four potential "dark stars" using data from the James Webb Space Telescope (JWST).

### About Dark Stars

- Dark stars are theoretical celestial objects that might have formed in the early universe (around 200–400 million years after the Big Bang).
- Unlike ordinary stars powered by **nuclear fusion**, dark stars are thought to be powered by **dark matter annihilation** - a process where dark matter particles collide and release energy.
- **Composition and Structure:**
  - Made mostly of **hydrogen and helium** (like normal stars), but contain a **small amount of dark matter** at their core.
  - Dark matter acts as a **fuel source**, releasing enough heat to prevent the collapse of gas and allowing the star to **grow extremely large**.
  - These stars could reach sizes up to **10 billion times the Sun's luminosity** and **millions of times its mass**, yet remain relatively **cool** (surface temperatures around 10,000 K).

#### Dark Matter

- It is a mysterious form of matter that doesn't emit light but exerts gravitational effects.
- If composed of WIMPs (Weakly Interacting Massive Particles), they can annihilate each other when they collide, producing high-energy particles and heat.
- This energy supports the star against gravitational collapse, much like fusion does in ordinary stars.

## Supermoon

### Context

A supermoon was visible on the night of October 7 and will appear twice more in November and December.

### About Supermoon

- A **Supermoon** occurs when a **full moon or new moon** coincides with the **Moon's closest approach to Earth** in its **elliptical orbit**, a point called **perigee**.
- Because the Moon's orbit is slightly oval, its distance from Earth varies by about **50,000 km** each month.
- When the full moon occurs near perigee, it appears about **14% larger** and **30% brighter** than when it is farthest (at **apogee**).
- The term **"Supermoon"** was coined by astrologer **Richard Nolle** in the 1970s.

### Impacts on Tides During a Supermoon

- **Perigean Spring Tides:** These are **unusually high and low tides** that occur during a supermoon.
  - Caused by the combined gravitational pull of the Moon (at perigee) and the Sun (during full/new moon alignment).
- **Higher High Tides (Perigean Highs):** Coastal water levels rise slightly more than usual — leading to **stronger tidal currents** and **higher coastal inundation risks**.
- **Lower Low Tides:** Similarly, low tides drop further than average, affecting **navigation and marine ecosystems** near shallow coasts.
- **Coastal Flooding Risk:** Although the increase is modest (a few centimetres), when **supermoons coincide with storms or heavy winds**, they can **intensify storm surges** and **cause temporary coastal flooding**.

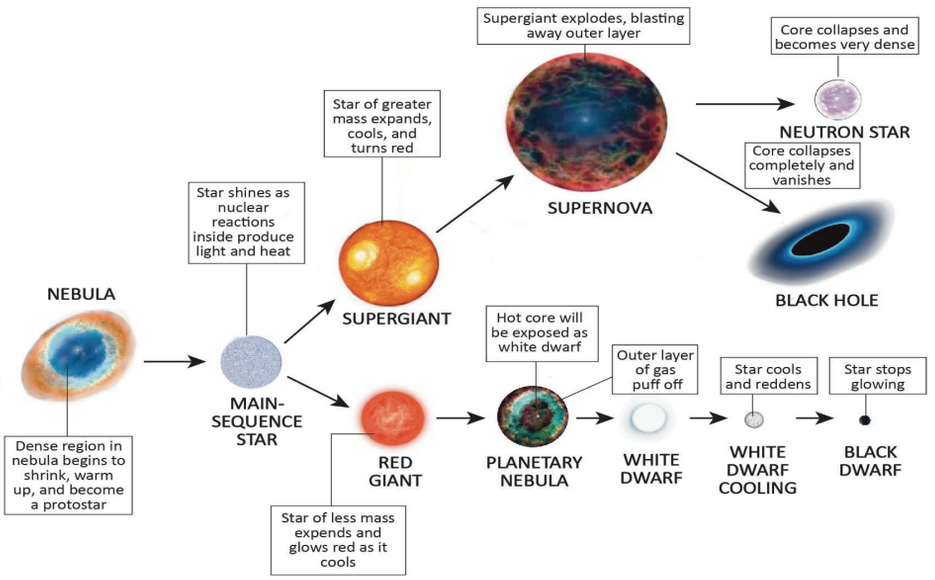
## Black Holes

### Context

Finnish scientists, for the first time, captured an image of two black holes orbiting each other, providing definitive evidence that intergalactic black holes can exist in pairs.

### About the Orbit

- They are orbiting the core of a Quasar OJ287.



- The **larger black hole** has a mass around **18 billion times that of the Sun**, while the **smaller one** is about **150 million solar masses**.
- The two black holes complete an **orbit every 12 years**.

## About Black Holes

- A black hole is a region of spacetime with gravity so powerful that nothing, not even light, can escape.
- Black holes are formed from the collapse of massive stars, and while they are invisible, their presence can be inferred by observing the behavior of stars and gas near them.
- **Two main parts:**
  - Singularity: The central point of a black hole where all of its mass is thought to be concentrated into an infinitely small, infinitely dense point.
  - Event Horizon: The boundary around the singularity that marks the "point of no return". Once matter or light crosses this boundary, it cannot escape the black hole's immense gravitational pull.
- **Types of black holes**
  - **Stellar-mass:** Formed from the collapse of individual stars.
  - **Supermassive:** Found at the centers of most galaxies, with masses millions or billions of times that of the sun.
  - **Intermediate-mass:** A theorized category with masses between stellar and supermassive black holes.
  - **Primordial**: Another theorized type that may have formed in the early universe.

### Quasars

- It is an **extremely bright and energetic galactic nucleus** powered by a **supermassive black hole** that is actively consuming surrounding gas and dust.
- As the material spirals into the black hole, it emits **massive amounts of radiation**, making quasars some of the **most luminous objects in the universe**.
- All quasars are active galactic nucleus (AGN), but not all AGNs are quasars.

# Rogue Planet

## Context

Astronomers spot a young rogue planet, Cha 1107-7626 gobbling up its surroundings.

## About Rogue Planet

- A **rogue planet** is a **planet-sized object** that **does not orbit any star;** instead, it **floats freely through space**, traveling independently across the galaxy.
- These planets are **not bound by gravity** to a solar system like Earth is to the Sun.
- **Formation:**
  - During the early stages of a solar system's formation, gravitational interactions between large planets can throw smaller ones out into space.
    - » These ejected planets become "rogues."
  - Some may form **directly from collapsing gas and dust clouds**, similar to stars, but **without enough mass** to ignite nuclear fusion.
- **Characteristics:**
  - **No parent star** → They do not receive light or heat like planets in a solar system.
  - **Extremely cold and dark**, but may have **internal heat** due to radioactive decay or past collisions.
  - Can vary in size — from **smaller than Earth** to **larger than Jupiter**.

### Cha 11070-7626

- Estimated to be **5 to 10 times that of Jupiter**
- Observed undergoing a **massive outburst** (consuming 6 billion tons of gas and dust per second)
- Forming like a young star**, through accretion.**
- Scientists detected **magnetic field-driven funneling of material** — a process previously observed only in stars.

# Mar Del Plata Canyon

## Context

A first-of-its-kind deep-sea exploration of the Mar del Plata Canyon has uncovered over 40 potential new marine species.

## About Mar del Plata Canyon

- The **Mar del Plata Canyon** is a **deep underwater gorge** located about **190 miles (≈305 km)** off **Argentina's northeastern coast** in the South Atlantic Ocean.
- It plunges to depths of around **3,500 metres (≈11,500 feet)** — nearly **twice as deep as the Grand Canyon**.
- It lies in the zone influenced by the **Brazil–Malvinas Confluence**, where **warm tropical waters** meet **cold Antarctic waters**.
- This confluence creates **nutrient-rich upwellings**, making the canyon a **biodiversity hotspot** that supports coral formations, invertebrates, and fish communities.
- The region acts as a **natural laboratory** to study how marine species adapt to **changing temperatures, nutrient flows, and human pressures**.

## About Submarine Canyon

- A **submarine canyon** is a **deep, steep-sided valley cut into the seabed of the continental slope or continental rise**, often extending from the mouth of a river into the deep ocean.
- These canyons are formed by **erosion caused by underwater currents (turbidity currents), sediment flows, and tectonic activity**.
- They play a vital ecological role by:
  - **Transporting sediments and nutrients** from coastal areas to the deep sea.
  - **Creating diverse habitats** for marine organisms due to variable light, temperature, and pressure conditions.
  - Acting as **pathways for organic matter**, supporting unique deep-sea ecosystems.

## Flying Rivers

### Context

The MAAP analysis warns that Amazon deforestation is disrupting "flying rivers," and scientists caution that if total loss exceeds 20-25% combined with global warming > 2°C, the ecosystem may irreversibly shift into savanna.

### About Flying Rivers

- They are invisible streams of water vapor created by the Amazon rainforest, where trees absorb water through their roots and release it back into the atmosphere through transpiration.
- The term was coined in **2006** by Brazilian scientist **Carlos Nobre** and colleagues.
- **Process**:
  - Moist air from the **Atlantic Ocean** enters South America via trade winds.
  - The **Amazon rainforest acts like a pump** → Trees absorb water through roots, release it as water vapor via **transpiration**.
  - This recycled vapor forms streams of humid air (flying rivers), carrying moisture westward thousands of kilometers → sustaining rainfall in Peru, Bolivia, Andes.
- **Significance:**
  - Supply up to **50% of rainfall in the western Amazon**.
  - Support **agriculture, hydroelectric power, Indigenous livelihoods**.
  - Stabilize regional and even global weather.

#### Amazon Rainforest

- Covers around **5.5 million sq km** across **nine countries**: Brazil, Peru, Colombia, Bolivia, Ecuador, French Guiana, Guyana, Suriname, and Venezuela.
  - **Brazil contains 60%** of the rainforest.
- Known as the **"lungs of the Earth"**, as it produces 20% of the world's oxygen.
- Houses **10% of the world's biodiversity**.
- Stores **150–200 billion tonnes of carbon**, acting as a major **carbon sink**.
- Home to **1 in 10 known species** on Earth, including many endangered and endemic species.


## South Atlantic Anomaly (SAA)

### Context

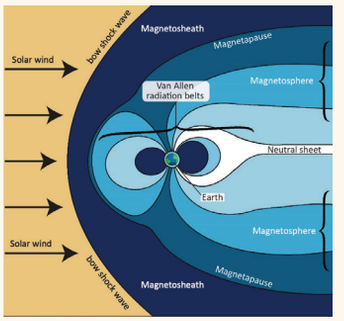
Researchers, using data from the European Space Agency's (ESA) Swarm mission, have reported that the South Atlantic Anomaly (SAA) has **expanded by about 0.9%** since **2014**.

### About South Atlantic Anomaly (SAA)

- It is a **region over South America and the South Atlantic Ocean** where the **Earth's magnetic field is significantly weaker** than in other parts of the planet.
- It forms where the **inner Van Allen radiation belt** (which traps charged particles) comes **closest to Earth's surface** due to this weaker field.
- **Cause:** It is caused by **irregular motions of molten iron and nickel** in Earth's **outer core**, which generates the planet's magnetic field through a process called the **geodynamo**.
  - These flows are **not uniform**, leading to **uneven distribution** of magnetic field strength — some regions stronger, others weaker.
- **Effects:** The weaker magnetic field means **more energetic charged particles** from the Sun penetrate deeper into the atmosphere.

#### Van Allen Radiation Belts

- It is a zone of energetic charged particles, most of which originate from the solar wind. By trapping the solar wind, the two belts deflect the energetic particles and protect the atmosphere.
- Discovered in 1958 by James Van Allen
- These belts serve as Earth's natural shield against harmful cosmic radiation and solar wind
- These belts are highly dynamic in nature and can dramatically change shape and size during solar storms, sometimes even merging into a single belt during intense solar activity.
- There are **two main belts**, sometimes a **temporary third belt** forms during high solar activity.




| Belt | Approximate Altitude | Composition & Characteristics |
|---|---|---|
| **Inner Belt** | 1,000 – 12,000 km above Earth | Mostly **high-energy protons**; stable and dense |
| **Outer Belt** | 13,000 – 60,000 km above Earth | Dominated by **high-energy electrons**; more variable due to solar wind |
| **(Occasional Third Belt)** | Temporary, forms and dissipates based on solar storms | Transient zone of energetic particles |

# Natural Sites in UNESCO's Tentative List of World Heritage

## Context

Seven Natural Heritage Sites from India added to UNESCO's Tentative List of World Heritage.

## Details of the Newly Added Sites

| Site | Details |
|---|---|
| **Deccan Traps at Panchgani and Mahabaleshwar, Maharashtra** | • The Deccan Traps near Mahabaleshwar represent a key site in one of the world's largest single continuous volcanic regions.<br>– It preserves over 2,000 meters of thick lava flows.<br>• Individual flow boundaries are marked by multiple reddish, weathered layers called red boles.<br>• The Mahabaleshwar plateau portion of the Deccan Traps is protected as part of the Koyna Wildlife Sanctuary, which lies within the Western Ghats Biosphere Reserve, an UNESCO World Heritage Site. |
| **Geological Heritage of St. Mary's Island Cluster, Karnataka** | • St. Mary's Islands are a group of four tiny islands, situated off the Malpe in Udupi District.<br>– The four islands are Coconut Island, North Island, Darya Bahadurgarh Island and South Island.<br>• Known for its rare columnar basaltic rock formations, this island cluster dates back to the Late Cretaceous period, offering a geological snapshot from around 85 million years ago. |
| **Meghalayan Age Caves, Meghalaya** | • These caves have a unique signature of the Holocene time period.<br>• They are located in the limestone rich belt of the Garo, Khasi and Jaintia Hills.<br>• The stalactites and stalagmite formed in Mawmluh cave have been identified as the Global Boundary Stratotype Section and Point (GSSP) for the Meghalayan Age Stage of Holocene Series. |
| **Naga Hill Ophiolite, Nagaland** | • The Naga Hills are part of the Arakan Range which to the north rise up to 12,552 feet<br>• These hills are very rich naturally and the region is home to some of the IUCN red-listed species (e.g. Blyth's Tragopan, Dark-rumped Swift, Naga Wren-Babbler)<br>• Naga Hills are also known for its geological feature "ophiolite".<br>– Ophiolites are pieces of oceanic plate that have been thrusted onto the edge of continental plates. They provide models for processes at mid-ocean ridges. |
| **Erra Matti Dibbalu (Red Sand Hills), Andhra Pradesh:** | • Erra Matti Dibbalu also called the Red Sand Hills, is a notified National Geo-heritage Monument.<br>• The site holds significant geological value because it serves as a record of Earth's history during the late Quaternary period.<br>– The sand formations bear evidence of sea level fluctuations, capturing the rise and fall of sea levels over time.<br>– It acts as nature's tide gauge, etching its story into the sediment layers formed over thousands of years.<br>– Also reveal the impact of various climate patterns, such as monsoons, ice age and dry seasons, on the sediments.<br>• It is a unique geo-heritage site and only two such sites are present in the world i.e.one in Sri Lanka and the other in Chennai, Tamil Nadu, India. |
| **Natural Heritage of Tirumala Hills, Andhra Pradesh** | • Features the Eparchaean Unconformity and the iconic Silathoranam (Natural Arch)<br>– The term "Eparchaean Unconformity" refers to a rare and fascinating geological boundary that represents the interface between ancient Precambrian rocks and much younger, overlying geological formations.<br>• The Natural Arch of Tirumala Hills is a unique rock formation located near the Tirumala Venkateswara Temple in Andhra Pradesh, India.<br>– The arch is believed to be over 1.5 billion years old, naturally formed due to erosion and weathering of quartzite rock. |
| **Varkala Cliffs, Kerala** | • The cliffs, overlooking the Arabian Sea, expose the Tertiary sedimentary sequence known as the Warkalli Formation (Mio-Pliocene age).<br>• The Warkalli Formation directly rests on the underlying Precambrian crystalline rocks (Khondalite).<br>• The sequence exposes distinct layers: carbonaceous clay (with lenses of lignite and marcasite sticks), followed by variegated clays and sandstone.<br>• The variegated lithounits (different colored rock layers) contribute to the beauty of the cliffs. |

# Loktak Lake

## Context

A recent study by Nagaland University has raised an environmental alarm over the deteriorating condition of Loktak Lake.

## About Loktak Lake

- **Location:** Bishnupur District, **Manipur**, Northeast India
- **Type:** Freshwater lake
- **Area:** Around **287 sq. km** (varies seasonally)

- **River Basin:** Fed by rivers such as **Nambul, Imphal, Thoubal, and Khuga**, and drained by the **Manipur River**.
- **Status:**
  - Designated as a **Ramsar Site** in **1990**.
  - Listed in the **Montreux Record** (1993) for wetlands under ecological stress.
  - Considered the **largest freshwater lake in Northeast India.**
- **Significance:**
  - The lake is famous for its **phumdis** — floating mats of vegetation, soil, and organic matter — which provide a unique habitat for flora and fauna.
  - The **Keibul Lamjao National Park**, located within the lake, is the **world's only floating national park.**
  - Home to 132 plant species and 428 animal species (including endangered Sangai deer (Rucervus eldii eldii) – Manipur's state animal)
  - Supports fisheries, agriculture, hydropower, transport, and tourism.
  - The **Loktak Hydroelectric Project (1983)** utilizes the lake's water for power generation and irrigation, contributing to Manipur's energy supply.
- **Threats:**
  - Excess fertilizers and pesticides from nearby fields cause eutrophication and water pollution.
  - Shifting (Jhum) Cultivation leads to deforestation, soil erosion, and heavy sedimentation in feeder rivers.
  - Discharge of sewage and solid waste degrades water quality.
  - Ithai Barrage alters natural water flow, affecting **phumdis** and fish habitats.
  - Increased sediment and organic waste reduce water depth and oxygen levels.
  - Due to overfishing, habitat loss, and poor water quality.
  - Conversion of wetland areas into agricultural or residential land.
  - Irregular rainfall and rising temperatures disturb the lake's hydrological balance


## Topics for Prelims (Environment)

### Coral Larvae Cryobank

#### Context

The Philippines has established Southeast Asia's first coral larvae cryobank to preserve and restore coral reefs. This initiative forms part of a regional network of cryobanks across the Coral Triangle.


#### About The Coral Triangle

- **Location:** Covers 5.7 million sq. km across Indonesia, Malaysia, Papua New Guinea, the Philippines, Solomon Islands, and Timor-Leste.
- **Biodiversity:**
  - Home to **>75% of the world's coral species**.
  - Contains **1/3 of all reef fish species**, extensive **mangrove forests**, and **6 of 7 marine turtle species**.
- **Socioeconomic importance:** Supports 120 million people, providing food security, livelihoods, and coastal protection.
- **Nickname:** Known as the **"Amazon of the Seas"** due to its immense biological richness.

#### About Coral Cryobank

- A **Coral Cryobank** is a facility where **coral larvae, eggs, sperm, or fragments** are **preserved at extremely low temperatures** (around –196°C) using **liquid nitrogen**.
- It serves as a **"genetic bank"** that stores coral material for **future reef restoration**, especially after bleaching or other damage.
- **Advantages:**
  - Long-term **genetic preservation** of coral species.
  - Enables **repopulation of reefs** after bleaching events.
  - Acts as a **"genetic insurance policy"** for coral biodiversity.

### National Camel Sustainability Initiative

#### Context

The Central Government is preparing to launch the National Camel Sustainability Initiative aimed at reversing the steep decline in

India's camel population and restoring its ecological and cultural role.

### About the National Camel Sustainability Initiative (NCSI):

- It is a **multi-ministerial mission,** involving:
  - Department of Animal Husbandry and Dairying,
  - Ministries of Environment, Rural Development, and Tourism, and
  - **State governments** (especially Rajasthan & Gujarat).
- Developed in consultation with the **Food and Agriculture Organization (FAO)**.
- **Objectives:**
  - Reverse the decline of camels and **restore their ecological, economic, and cultural significance**.
  - Support **pastoral communities** dependent on camels for livelihoods.
  - Promote **conservation alongside regulated trade** and socio-economic development.

**Camels in India:**

- India's camel population has declined by nearly **75% since 1977.**
- According to the **20th Livestock Census (2019)**, only **2.52 lakh camels** remain, down from **11 lakh in 1977** and **4 lakh in 2013**.
- Around **90%** of India's camels are concentrated in **Rajasthan and Gujarat**.
- Once a symbol of resilience in arid zones, camels are now facing a crisis of survival, threatening the livelihoods of pastoral communities and the ecological balance of desert ecosystems.

## Tigers Outside Tiger Reserves (TOTR) Project

### Context

The Union Environment Minister launched 5 key conservation projects (such as Tigers Outside Tiger Reserves) and 4 national-level wildlife monitoring programmes during Wildlife Week 2025.

### About TOTR Project

- It aims to **manage and protect tiger populations living outside designated tiger reserves**, while **reducing human-tiger conflicts** through:
  - **Rapid Response Teams** for quick conflict management.
  - **Use of Technology: AI tools, drones, and camera traps** for tiger tracking.
    - » **MSTrIPES app** and **wireless networks** for real-time monitoring.
  - **Capacity Building:** Training forest staff, veterinarians, and local volunteers.
  - **Community Engagement: "Bagh Mitra" initiatives**, school awareness programmes, and eco-development projects.
  - **Rescue and Rehabilitation:** Equipped rescue teams and medical facilities.
- **Implementation:**
  - **National Tiger Conservation Authority (NTCA)** acts as the **central coordinating body**.
  - **State forest departments** will execute the plan on the ground.
- **Need**
  - India is home to **70% of the world's wild tigers**, with **3,682 tigers (as of 2022)**.
  - Around **35–40% (1,325 tigers)** now live **outside tiger reserves** due to population growth and territorial expansion.
  - This has increased **human-tiger conflicts**, **livestock losses**, and **retaliatory killings**.

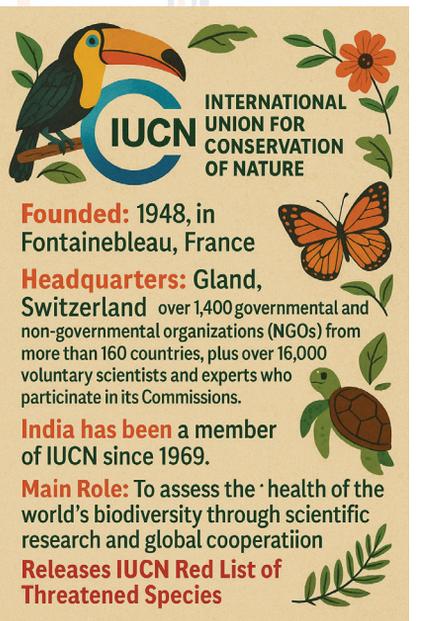
**Other Conservation Projects Launched**

- **Project Dolphin (Phase II):** Focuses on the conservation of **river and marine dolphins**, particularly the **Ganga River Dolphin** and **Indus Dolphin**.
- **Project Sloth Bear:** India's **first national framework** dedicated to **sloth bear conservation**, covering **habitat protection, rescue operations, and conflict mitigation**.
- **Project Gharial:** Aims to **revive and protect gharial populations** in the **Chambal** and **Gandak river ecosystems**.
- **Centre of Excellence for Human–Wildlife Conflict Management (CoE–HWC):** Set up at the **Sálim Ali Centre for Ornithology and Natural History (SACON)** to develop **AI-based conflict prediction systems** and **capacity-building programmes**.

## National Red List

### Context

The Union Minister for Environment, Forest and Climate Change presented India's Vision 2025–2030 for the National Red List Assessment (NRLA) at the IUCN World Conservation Congress in Abu Dhabi.




### About National Red List Assessment

- India will conduct a **comprehensive assessment of the extinction risk** of about **11,000 species** — including **7,000 species of flora** and **4,000 species of fauna**.
- The assessment will help prepare a **'National Red List'**, similar to the global IUCN Red List.

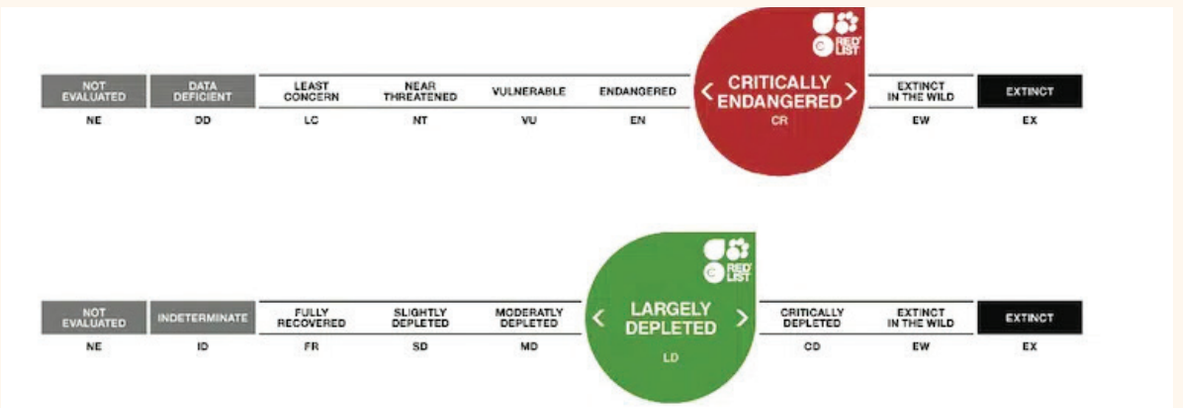
- **Objective:** To establish a **nationally coordinated, participatory, and upgradable "Red Listing" system** that reflects the **true conservation status of India's biodiversity**.
- **Alignment with Global Goals:** The initiative is part of India's commitment under:
  - The **Convention on Biological Diversity (CBD)**
  - The **Kunming–Montreal Global Biodiversity Framework (KM-GBF)**, adopted at **COP15 (2022)**.
  - It also supports the **UN Sustainable Development Goals (SDGs)** related to biodiversity protection (SDG 14 and SDG 15).
- **Implementation Plan:** The project will run as part of a **five-year national-level assessment (2025–2030)**.
- It will be led by the **Union Ministry of Environment, Forest and Climate Change (MoEFCC)** in collaboration with:
  - **Botanical Survey of India (BSI)**
  - **Zoological Survey of India (ZSI)**
  - **Non-profit organizations**, **academic institutions**, and **wildlife biologists**.

## About IUCN World Conservation Congress

- Members of IUCN come together to set conservation agendas and make decisions for nature's future.
- It is held once every **four years.**
- This year's (2025) the congress will tackle 5 critical themes:
  - Scaling Up Resilient Conservation Action,
  - Reducing Climate Overshoot Risks,
  - Delivering on Equity,
  - Transitioning to Nature-Positive Economies and Societies and
  - Disruptive Innovation and Leadership for Conservation.

### IUCN Green Status Assessment

- The International Union for Conservation of Nature (IUCN), released its first-ever Green Status report.
- It is a global framework designed to evaluate and track the recovery of species over time.
- The Green Status uses 8 categories to describe the level of species recovery: Extinct in the Wild, Critically Depleted, Largely Depleted, Moderately Depleted, Slightly Depleted, Fully Recovered, Non-Depleted, and Indeterminate.




# Green Crackers

## Context

The Supreme Court of India ruled that only green crackers, those manufactured by entities registered with the NEERI and having a certificate from the Petroleum and Explosive Safety Organisation (PESO) — can be sold in the NCR Region.

## About Green Crackers

- Green crackers are eco-friendly fireworks developed by the Council of Scientific and Industrial Research – National Environmental Engineering Research Institute (CSIR–NEERI) to reduce environmental pollution caused by traditional fireworks.
- They are designed through innovations such as reducing the size of shells, eliminating ash-producing components, using fewer raw materials, and adding dust-suppressing additives.
- These modifications collectively lead to at least a 30% reduction in particulate matter (PM) and about 10% lower gaseous emissions; notably sulphur dioxide ($SO_2$) and nitrogen oxides ($NO_2$), when compared to conventional crackers.
- The emission reduction is primarily achieved through three key chemical-formulation changes:
  - Incorporation of additives like **zeolite,** which absorb pollutants and improve combustion.
  - Use of water-releasing molecules, such as **boron-based reagents,** that act as dust suppressants.
  - Addition of **metallic composites** to increase combustion temperature and enhance efficiency, ensuring more complete burning with fewer residues.
- **Types Of Green Crackers:**
  - SWAS (Safe Water and Air Releaser): These emit very fine water droplets that absorb dust
  - SAFAL (Safe Minimal Aluminium): These contain a safe amount of aluminum and are quieter
  - STAR (Safe Thermite Cracker): These do not contain potassium nitrate or sulfur, so they emit very little smoke

## Difference between Green Crackers and Traditional Crackers

| Feature | Green Crackers (NEERI Formulations) | Traditional/Conventional Crackers |
|---|---|---|
| **Pollution Reduction** | Achieve a **30% to 40% reduction** in particulate matter (PM) emissions. | High emissions, significantly contributing to smog and air pollution. |
| **Shell Size & Materials** | Have a **reduced shell size**, use **fewer raw materials**, and are made **without ash**. | Use larger shells and high quantities of raw materials. |
| **Banned/Heavy Metals** | **Exclude highly toxic chemicals** like **Barium Nitrate**, Lithium, Arsenic, and Lead. | They often contain toxic metals such as Barium, Strontium, Copper, and Aluminium compounds. |
| **Oxidizers & Fuel** | **Eliminate or sharply reduce** Sulphur and Potassium Nitrate. Use **cleaner oxidizers** and modified thermite compositions. | Heavily rely on Sulphur and Potassium Nitrate. |
| **Dust Suppression** | Include **additives** (like Zeolites or polymers) that act as **dust suppressants** and/or release **water vapor** to settle particulates. | Do not include pollution-mitigating additives. |
| **Noise Level** | Designed to have a **lower sound intensity**, typically around **105 to 125 decibels (dBA)**. | Can exceed 160 dBA, often violating noise pollution norms. |
| **Identification** | Must be certified by **CSIR-NEERI** and carry the official **Green Fireworks logo** and a **unique QR code** for verification. | Lack standardized environmental certification and unique identification codes. |

### NEERI

- It is a prominent research institute of India, established in 1958 in Nagpur.
- It is a constituent laboratory of the **Council of Scientific and Industrial Research (CSIR), under the Ministry of Science and Technology.**
- NEERI conducts research, offers technical solutions, and shares expertise to improve environmental quality, serving government, industry and society.
- NEERI has five zonal laboratories - **Chennai, Delhi, Hyderabad, Kolkata and Mumbai.**

**Petroleum and Explosive Safety Organisation (PESO)**

- It is responsible for ensuring **safety in the manufacture, storage, transport, handling, and use of explosives, petroleum, compressed gases, and fireworks**.
- It functions under the **Department for Promotion of Industry and Internal Trade (DPIIT)**, which is part of the **Ministry of Commerce and Industry**.
- Its headquarters is located in **Nagpur, Maharashtra**.
- It was originally known as the **Department of Explosives**, established during the **British era in 1898** under the **Explosives Act, 1884**.
  - In **2005**, it was renamed **Petroleum and Explosives Safety Organisation (PESO).**
- **Major Acts Administered by PESO:** Explosives Act, 1884, Petroleum Act, 1934, Inflammable Substances Act, 1952, Rules framed under these Acts, such as the Gas Cylinder Rules (2016) and Explosives Rules (2008).

# IUCN's World Heritage Outlook 4 report

## Context

The International Union for Conservation of Nature (IUCN), in its latest report World Heritage Outlook 4 (2025), has expressed serious concern over the conservation status of several natural World Heritage Sites in Asia, including India's Western Ghats, Manas National Park (Assam), and Sundarbans National Park (West Bengal).

## About the IUCN World Heritage Outlook 4 Report

- The report provides a global assessment of the health and management of over 200 natural and mixed World Heritage Sites.
- It classifies sites into four categories based on conservation outlook: Good, Good with some concerns, Significant concern, Critical

## Summary of the IUCN World Heritage Outlook 4

- **Global Conservation Trend:** Only **57%** of natural World Heritage sites now have a **positive conservation outlook**, down from 62% in 2020 - showing a **decline in overall health**.
- **Climate Change Threats:** 43% of natural sites now face severe climate-related threats, up from 33% in 2020.
  - Impacts include coral bleaching, glacier retreat, wildfires, droughts, and ecosystem shifts. **Eg:** Great Barrier Reef (Australia) – continues to experience coral bleaching events.
- **Biodiversity and Ecological Pressures:**
  - **Invasive alien species** impact around **30%** of natural heritage sites.
  - **Pathogens and diseases** are an emerging risk - sites with "high" or "very high" threat from pathogens rose from 2% (2020) to 9% (2025).

### Status of India's Natural World Heritage Sites

- **Sites categorised as "Significant Concern":**
  - Western Ghats (Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu)
  - Manas National Park, Assam
  - Sundarbans National Park, West Bengal
- **Sites rated "Good with Some Concerns"**
  - Great Himalayan National Park Conservation Area
  - Kaziranga National Park
  - Keoladeo National Park
  - Nanda Devi & Valley of Flowers National Parks
- **Site rated "Good"**
  - Khangchendzonga National Park, Sikkim

- **Areas of Concern:** Several sites continue to deteriorate due to conflict, pollution, infrastructure development, and climate stress.
- **Technological and Policy Innovations:** Increasing use of AI, satellite imagery, drones, and eDNA analysis for wildlife and ecosystem monitoring.

  - **Eg:** AI-based monitoring in the Okavango Delta (Botswana) helps track wildlife movements in real time.
- **Success Stories:** Effective local management and community-based conservation have improved the outlook for certain sites, such as:
  - Galápagos Islands (Ecuador) - restored ecosystem balance through invasive species control.
  - Aldabra Atoll (Seychelles) - improved through long-term marine protection.

## Global Forest Resource Assessment (GFRA) report

### Context

The **Global Forest Resources Assessment (GFRA) 2025** was released by the **Food and Agriculture Organization (FAO)** in Bali.

### Highlights of GFRA Report 2025

| Aspect | Key Findings |
|---|---|
| **Global Forest Cover** | 4.14 billion hectares — nearly **32% of global land area**, equivalent to **0.5 hectares per person**. |
| **Geographical Distribution** | Nearly **half of the world's forests are in the tropics**. |
| **Top 5 Forested Countries** | Russia (832.6 M ha), Brazil (486 M ha), Canada (368.8 M ha), USA (308.8 M ha), China (227 M ha). These five account for **54% of the total global forest area**. |
| **Global Deforestation Rate** | **10.9 million hectares per year** — deforestation has **slowed**, but remains **too high**. |
| **Damage to Forests** | Fires affected **261 million hectares annually** (half of which are forested). Insects, diseases, and severe weather damaged **41 million hectares** in 2020, mainly in temperate and boreal regions. |
| **Regional Trends** | **Asia is the only region** showing a **net increase in forest area (1990–2025)**, led by **China and India**. |
| **Agroforestry** | 91 countries reported **55.4 M ha under agroforestry**, with **India and Indonesia accounting for ~70% of the global total**. |
| **Top 10 Countries by Annual Net Forest Gain (2015–2025)** | China (+1.69 M ha/yr), Russia (+0.94 M ha/yr), **India (+0.19 M ha/yr)**, Türkiye, Australia, France, Indonesia, South Africa, Canada, and Vietnam. |
| **India- Specific Highlights** | • Ranked 9th globally in total forest area (up from 10th).<br>• Total Forest Area (2025): 72.7 million hectares, about 2% of global forest area.<br>– According to India's State of Forest Report (ISFR) 2023, India's forest cover is 71.5 M ha — slightly lower due to definitional/methodological differences.<br>• Annual Net Forest Gain: 1.91 lakh hectares per year (2015–2025) — 3rd highest globally.<br>• Agroforestry: India accounts for a major share of Asia's 39.3 M ha agroforestry area, contributing significantly to global total (70%).<br>• Contributing Factors: Large-scale afforestation drives, state-led plantation efforts, and public campaigns like 'Ek Ped Maa Ke Naam' and community participation. |

## An Eye on Methane Report

### Context

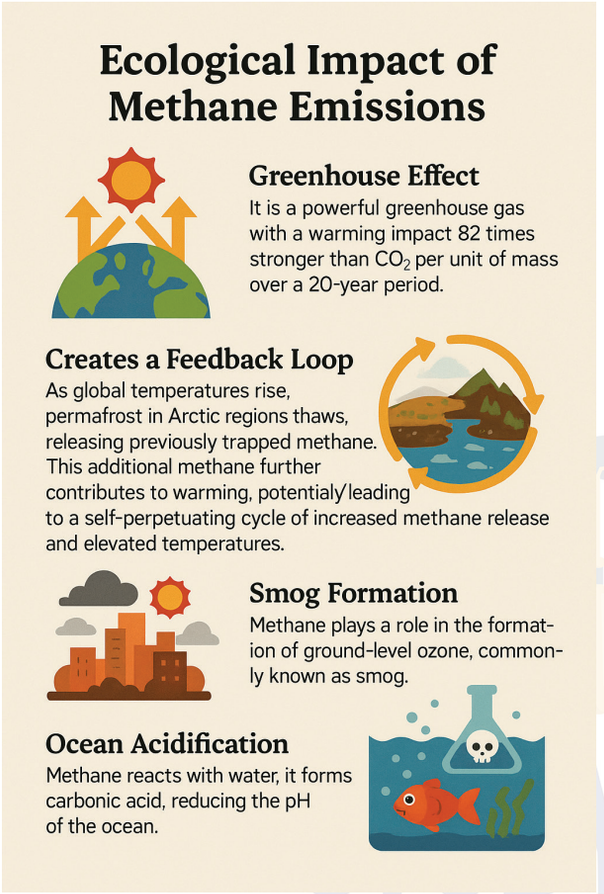
The United Nations Environment Programme (UNEP) released its report "An Eye on Methane 2025"

### Key Highlights of the Report

| Category | Positives (Progress & Achievements) | Negatives (Gaps & Concerns) |
|---|---|---|
| **Methane Detection** | Methane tracking improved **tenfold**; one-third of emissions now measured using real-world data instead of estimates. | Despite detection, **~90% of leaks remain unaddressed**, showing a major data–action gap. |
| **Global Coverage (Oil and Gas Methane Partnership (OGMP 2.0))** | OGMP 2.0 now includes **153 companies across 90 countries**, covering **42% of global oil & gas production**. | **Two-thirds of production** still lies outside OGMP 2.0, leaving large blind spots. |
| **Technology & Monitoring Systems** | **Satellites, AI, and IMEO/MARS systems** have improved global methane visibility with **3,500+ alerts** issued. | Governments often **ignore or delay responses** to alerts; weak follow-up mechanisms. |
| **India's Role** | **Cairn Oil & Gas** and **Pipeline Infrastructure Ltd** joined OGMP 2.0 — India's **first participation** in global methane measurement-based reporting. | National methane inventories still **rely on estimates**, needing faster transition to real measurements. |
| **Sectoral Expansion** | UNEP expanded monitoring beyond oil & gas to **steel, coal, and waste sectors** — identifying **low-cost reduction opportunities**. | **Coal mines and landfills** remain **under-monitored** with limited mitigation measures. |
| **Global Action & Targets** | Clear roadmap and strong scientific base to help meet **Global Methane Pledge (30% cut by 2030)**. | **Slow pace of implementation** risks **missing 2030 target**; only **12% of super-emitter leaks** acted upon. |

## About Methane

- Methane is a hydrocarbon and the primary component of natural gas.
- It is a short-lived climate pollutant and has accounted for roughly 30 per cent of global warming since pre-industrial times




- **Sources of Methane Emissions**
  - **Natural Sources**
    - » **Wetlands:** Natural wetlands, such as marshes, swamps, and bogs, are the largest natural source of methane emissions. Methane is produced in these environments through a process called **methanogenesis.**
    - » **Ruminants:** Livestock such as cattle, sheep, and goats produce methane as a by-product of digestion.
    - » **Termites:** During digestion, gut bacteria in termites produce methane, which is released into the atmosphere through termite exhalation and the breakdown of termite mounds.
    - » **Oceans:** The world's oceans also release methane into the atmosphere through natural processes.
  - **Anthropogenic Sources**
    - » **Agriculture and Livestock Rearing (largest source-40%):** The production of livestock releases methane through digestive processes. Rice paddies also produce methane through anaerobic conditions in flooded fields.
    - » **Fossil fuel production:** The extraction, production, and transportation of fossil fuels such as coal, oil, and natural gas release methane into the atmosphere.
    - » **Landfills:** are a significant source of methane, as organic waste in landfills decomposes anaerobically, producing methane.
    - » **Waste management:** The treatment and disposal of wastewater and solid waste can also release methane into the atmosphere.

### Measures for Mitigation

- **Global Methane Initiative:** It is an international public-private initiative that advances cost effective, near-term methane abatement and recovery and use of methane as a clean energy source in four sectors: agriculture, coal mines, municipal solid waste, oil and gas systems, and wastewater.
- **Methane Alert and Response System (MARS):** It is a data-to-action platform that was set up as part of the UN Environment Programme's (UNEP) International Methane Emissions Observatory (IMEO) strategy to get policy-relevant data into the right hands for emissions mitigation.
- **Global Methane Pledge:** At the 2021 UNFCCC COP 26 climate conference in Glasgow, approximately 100 nations made a non-binding promise called the Global Methane Pledge. The goal is to collectively reduce global methane emissions by at least 30% by the year 2030, using 2020 emission levels as the baseline.
- **Harit Dhara:** Developed by ICAR, it is primarily designed to reduce methane emissions from ruminants by altering rumen fermentation processes

# 21st Green House Gas Bulletin - WMO

## Context

The World Meteorological Organization (WMO) released its 21st Greenhouse Gas Bulletin.

## Key Highlights

- **Record Carbon Dioxide Levels:** Atmospheric **$CO_2$ concentration reached 423.9 ppm in 2024**, marking a **rise of 3.5 ppm from 2023** — the **largest annual increase** since measurements began in **1957**.
- **Warmest Year on Record:** The year **2024 was the hottest ever recorded**, with **global average temperatures 1.55°C above pre-industrial levels**, crossing the **1.5°C threshold** set by the **Paris Agreement** for the first time.
- **Rise in Radiative Forcing: Radiative forcing** from long-lived greenhouse gases increased by **54%** compared to pre-industrial times.
  - **Radiative forcing** measures the impact of changes (like greenhouse gases) on Earth's energy balance — a higher value indicates a **stronger warming effect**.
- **Increase in Other Greenhouse Gases:** Levels of **methane ($CH_4$)** and **nitrous oxide ($N_2O$)** also continued to rise, remaining well above their **pre-industrial concentrations**, further contributing to global warming.

## About Greenhouse Gas Bulletin

- It is an **annual publication** by the **World Meteorological Organization (WMO)** that provides a comprehensive analysis of the concentration of greenhouse gases (GHGs) in the atmosphere.

- The bulletin primarily focuses on three major greenhouse gases **Carbon Dioxide ($CO_2$)**, **Methane ($CH_4$)** and **Nitrous Oxide ($N_2O$)**
- It compares the current levels of **CO2, CH4, and N2O** with the previous year and pre-industrial levels.
- The bulletin is based on data from the **WMO Global Atmosphere Watch (GAW) Programme**, which is a worldwide network of observation stations and scientific infrastructure.

**World Meteorological Organization (WMO)**

- It is a specialized agency of the United Nations responsible for coordinating global efforts in meteorology, climatology, hydrology, and related fields.
- Established in 1950. (HQ - Geneva, Switzerland)
- Members: 193, (India is a founding member of WMO)
- The World Meteorological Congress is the supreme body of the WMO.
- It plays a crucial role in providing reliable weather forecasts, climate data, and early warning systems for natural disasters.
- Other Publications: WMO Statements on the Status of the World Climate (annually), State of Global water resources.

## State of Finance For Forest 2025

### Context

The first edition of the State of Finance for Forests (SFF) Report 2025, **titled "Unlock. Unleash.** released by the UN Environment Programme (UNEP).

### Key Findings of the Report

- **Finance Gap: $216 billion annual shortfall**
  - **Current investment (2023):** $84 billion/year.
  - **Required by 2030:** $300 billion/year (3.6× increase).
  - **Required by 2050:** $498 billion/year.
- **Dominance of Public Funding: 91% of global forest finance** comes from **public sources**.
  - **Private investment contributes less than 10%** — highlighting the urgent need to attract private capital.
- **Domestic vs International Public Finance:** Of total **$75 billion in public forest spending (2023):**
  - **96% ($72.1 billion)** – from **domestic government budgets**.
  - **4% ($2.9 billion)** – from **international public finance** (grants, ODA).
  - Around **80%** of international public finance was **concessional** (low-interest or grant-based aid).

**India's Prominent Role**

- **India** among **top 15 global recipients** of international public forest finance in 2023.
- Received $81 million as international support.
- **Domestic forest expenditure:** $7.1 billion — **3rd highest globally**, after:
  - **China ($19.4 billion)**
  - **United States ($11.7 billion)**
- India's domestic spending mainly targeted **agriculture and forestry sectors**.
- Received **$11.3 million** for **Indigenous Peoples and Local Communities (IPLCs)** programs.
- **Volatility in Voluntary Carbon Markets (VCM):** Value for VCM was $320 million (2019) → $2.1 billion (2021) → $755 million (2023), which indicates volatility.
- **Harmful Flows Continue:**
  - $8.9 trillion in private financing linked to **deforestation-risk companies**.
  - $406 billion in **environmentally harmful agricultural subsidies (2023)**.

## Central Asian Mammals Initiative (CAMI)

### Context

Representatives from Central Asian countries have endorsed a **new six-year work programme** under the Central Asian Mammals Initiative (CAMI) to strengthen transboundary wildlife conservation across the region.

**Convention on Migratory Species (CMS)**

- Also known as the Bonn Convention, CMS is an international treaty, under the aegis of the United Nations Environment Programme, established in 1979.
- It is the **only global organization established exclusively for the conservation and management of terrestrial, aquatic and avian migratory species** throughout their range. There are 130 States (including India) and the EU. The major objectives are:
- Conserve migratory species
- Promote international cooperation
- Facilitate species conservation agreements

**Appendices:**

- **Appendix I** – Threatened migratory species: It includes migratory species threatened with extinction
- **Appendix II** – Migratory species requiring international cooperation- It includes migratory species that need or would significantly benefit from international co-operation.

**India and CMS:** Since 1983, India has been a party to the CMS. India has signed Memorandum of Understanding (MoU) with CMS on Siberian Cranes, Marine Turtles, Dugongs and Raptors. India has also signed the Central Asian Flyway Action Plan.

### About CAMI

- **Background:** Launched in 2014 at the 11th Meeting of the Conference of the Parties (COP11) to the Convention on Migratory Species (CMS) and revised at COP13 in Ghandinagar, India (February 2020).
- **Framework**: A regional conservation initiative under the CMS, aimed at protecting migratory \ and mammals across Central Asia.
- **Objective**: To develop a common framework for conservation of migratory species shared across national borders.
  - To tackle threats such as habitat fragmentation, poaching, and climate change.
  - To promote transboundary collaboration among the participating countries.
- **Species Covered:** 17 iconic mammals, including: Snow leopard, Saiga antelope, Bukhara deer, Argali sheep, Asiatic cheetah, Persian leopard, Wild yak, Przewalski's horse, Eurasian lynx, Pallas's cat, and others.

## IUCN upgrades threat to 4 Indian bird species

### Context

The International Union for Conservation of Nature (IUCN) has released its latest Red List update, modifying the conservation status of 12 Indian bird species (8 species have been downlisted, and 4 species have been uplisted).

### Bird Species Whose Threat Level Was Upgraded

| Bird Species | Status | Distribution | Key Threats | Remarks |
|---|---|---|---|---|
| **Indian Courser**  | Least Concern to **Near Threatened** | Found across **arid and semi-arid grasslands** of India, especially Rajasthan, Madhya Pradesh, Maharashtra, and Andhra Pradesh. | Loss of grasslands due to **urbanisation, agricultural expansion, and infrastructure development**. | A **ground-dwelling bird**, symbolic of India's **grassland ecosystems**; its decline signals habitat degradation. |
| **Indian Roller**  | Least Concern To **Near Threatened** | Widely distributed across the **Indian Subcontinent** — often seen perched on wires and trees in **open farmlands and scrublands**. | **Habitat loss**, decline of insect prey due to **pesticide use**, and loss of open feeding grounds. | India's **state bird of several states** (e.g., Karnataka, Telangana); culturally revered and ecologically important for pest control. |
| **Rufous-tailed Lark**  | Least Concern to **Near Threatened** | Found in **dry scrublands, rocky plateaus, and semi-arid farmlands** across peninsular India. | **Conversion of scrublands into croplands**, **mining**, and **afforestation of open habitats**. | A key **indicator species** for India's open-country ecosystems; its decline shows stress on semi-arid habitats. |
| **Long-billed Grasshopper-warbler**  | Vulnerable to **Endangered** | A **migratory species**, breeding in temperate Asia and wintering in **India's northeastern wetlands and grasslands**. | **Wetland degradation**, **loss of grassland cover**, and **climate change** affecting migratory routes. | ******* |

## Lesser Known Endangered Species in Tamil Nadu

### Context

Tamil Nadu sanctions Rs 1 crore for conservation of four lesser-known endangered species (the lion-tailed macaque, Madras hedgehog, striped hyena, and hump-headed mahseer fish.)

| Species | Details |
|---|---|
| **Lion-Tailed Macaque**  | • **Old World Monkey**<br>• **Distinguishing Features:**<br>– Named for its **lion-like, long, thin, and tufted tail**. It is also characterized by a prominent **grey mane** or ruff encircling its face.<br>– **Size:** It is one of the **smallest macaque species** globally.<br>– **Activity:** It is an **arboreal** (tree-dwelling) and **diurnal** (active during the day) animal, typically sleeping high up in the rainforest canopy at night.<br>– **Social & Communication:** These are highly **territorial and communicative** animals.<br>– The males famously define and advertise the boundaries of their home range using specific vocal calls.<br>– Their communication system includes up to 17 distinct vocalizations.<br>– **Diet:** The macaque is **omnivorous**, consuming a wide variety of food, although **fruits** constitute the largest portion of its diet.<br>• **Distribution:** It is **endemic** to the **evergreen rainforests** of the southern region of the **Western Ghats**, across the Indian states of **Karnataka, Kerala, and Tamil Nadu**.<br>• **Conservation Status:**<br>– **IUCN Red List: Critically Endangered**<br>– **CITES: Appendix I**<br>– **The Wildlife (Protection) Act, 1972:** Schedule I (Highest level of protection) |

| Species | Details |
|---|---|
| **Madras or Bare-bellied Hedgehog**  | • Locally known as the "thorny rat"; a nocturnal species found in semi-arid regions.<br>• **Distinguishing Features:**<br>– **Diet:** Insectivorous, also eating small vertebrates, eggs, and scorpions.<br>– **Behavior**: Nocturnal, meaning it is active at night. It also estivates (a state of dormancy similar to hibernation) during hot periods to conserve energy.<br>• **Distribution:** Endemic to India (mainly Tamil Nadu, Andhra Pradesh, and Karnataka)<br>• **Conservation status**<br>– **IUCN Red List:** Least Concerned<br>– **The Wildlife (Protection) Act, 1972:** Schedule II |
| **Striped Hyaena**  | • **Distinguishing Features**<br>– Has a striped coat, which is more prominent in summer.<br>– Front legs are longer and stronger than the hind legs.<br>– It is the smallest of all hyena species.<br>– Primarily nocturnal and solitary or lives in pairs.<br>– Uses scent marking to communicate via "natural lavatories".<br>– **Diet:** Omnivorous, feeding on small animals, fruits, vegetables, and is a major scavenger of carrion.<br>– **Ecological Role:** Cleans up the environment by eating carrion, which helps reduce disease spread.<br>• **Distribution:** Distributed across Afghanistan, Algeria, Pakistan, India, etc.<br>• **Conservation Status**<br>– **IUCN Red List:** Near Threatened<br>– **CITES:** Appendix III<br>– **The Wildlife (Protection) Act, 1972:** Schedule I |
| **Hump-headed Mahseer**  | • Popularly known as the **"Tiger of the Cauvery river."**<br>• **Distinguishing features**<br>– Its most notable feature is its **high-backed body**, which differentiates it from other mahseer species.<br>– It has a **stout, elongated form** with a noticeable **hump behind the head** and a tall dorsal fin.<br>– Its broad **pectoral and pelvic fins** are key adaptations, helping it maneuver and maintain position in fast-flowing currents.<br>– It possesses a **terminal mouth with thick lips** for grazing and **two pairs of barbels** (whiskers) that serve as sensory organs to locate food on the riverbed.<br>– It is one of India's largest freshwater fish, capable of growing up to 1.5 meters in length.<br>– **Diet:** The Humpback Mahseer is an omnivore, feeding on **algae, aquatic insects, and crustaceans**.<br>• **Distribution:** It is endemic to the Cauvery river system, which includes tributaries like the Pambar, Kabini, and Bhavani rivers in Kerala.<br>• **Ecological Significance:** The species is recognized as a **keystone species**, meaning it plays an essential role in maintaining the structure and health of the river ecosystem.<br>• **Conservation Status:**<br>– **IUCN Red List:** Critically **Endangered** |

## UNFCCC NDCs Synthesis Report

### Context

The UN Framework Convention on Climate Change (UNFCCC) recently released its 2025 nationally determined contributions (NDCs) synthesis report.

### Key Highlights of the Report

- NDCs submitted to date would cut global emissions by only 2.6% from 2019 levels by 2030, up slightly from 2% last year—this falls drastically short of the 43% cut scientists say is required by 2030 to keep the Paris Agreement's 1.5°C target within reach.
- Global GHG emissions in 2030 levels would still be **~15.9% higher than 2010 levels**, and **~4.7% higher than 2019 levels**.

### Nationally Determined Contributions (NDCs)

- They are the **climate action plans** submitted by countries under the **Paris Agreement** to reduce greenhouse gas emissions and adapt to climate impacts.
- **India's NDCs (Submitted in 2022):**
  - Reduce **emissions intensity of GDP by 45% by 2030** from 2005 levels (Earlier target: 33–35%).
  - Achieve **50% of cumulative electric power installed capacity** from **non-fossil fuel sources** by 2030 **(Earlier target: 40%).**
  - Create additional **2.5 – 3 billion tonnes $CO_2$ equivalent** carbon sink (through afforestation).

**Paris Agreement**

- Adopted at **COP-21, Paris in 2015**
- Replaced the **Kyoto Protocol** model with a **bottom-up approach**
- Based on the principle of **Common but Differentiated Responsibilities & Respective Capabilities (CBDR-RC)**
- **Target:**
  - Limit global warming to **well below 2°C**, preferably **1.5°C** above pre-industrial levels.
  - Peaking greenhouse gas emissions as soon as possible and reducing them by 43% by 2030, reaching net-zero in 2050.

## International Solar Alliance (ISA)

### Context

President Murmu addressed the 8th Session of the ISA Assembly.

### About International Solar Alliance (ISA)

- Launched by **India and France in 2015** at COP21 (Paris)
- **Headquarters:** Gurugram, India
- **Members:** 125 Member & Signatory countries.
- **Vision:**
  - **Catalytic Finance Hub** to unlock and mobilise investments at scale
  - **Global Capability Centre and Digitisation** to foster innovation, digital platforms, and capacity building across Member Countries
  - **Regional and Country-level Engagement** to drive tailored interventions through strategic partnerships
  - **Technology Roadmap and Policy** to accelerate the deployment of emerging solar technologies through actionable policy frameworks and knowledge resources.

### Recent Major Initiatives

- **SUNRISE platform** for solar waste recycling & upcycling
- **OSOWOG (One Sun One World One Grid)** initiative for cross-border solar grids
- **Global Capability Centre** — "Silicon Valley for solar in India" vision
- **ISA Academy** — AI-driven global solar learning platform
- **Small Island Developing States (SIDS) Solar Procurement Platform with World Bank** to advance solar energy deployment through coordinated procurement, digital integration, and capacity-building to enhance energy resilience..

## Adaptation Gap Report - 2025

### Context

Recently the United Nations Environment Programme (UNEP) released Adaptation Gap Report 2025 titled **"Running on Empty".**

### Key Highlights of the Report

- The scale of adaptation needs for developing countries is enormous, estimated in the order of **US $215 billion to US $387 billion per year by 2030**.
- Actual international public adaptation finance flows are far too low — only around **US $28 billion in 2022**, which is just a fraction of what's required
- A large number of countries (approx. 171 or ~87 %) now have at least one national adaptation planning instrument (policy/strategy/plan), but implementation remains weak and uneven.
- The gap is not only financial but also technological and capacity-related: many countries lack the tech, skills and institutional capacity to translate plans into effective adaptation action.
- The report emphasises that bridging the adaptation gap requires **innovative finance**, **stronger technology transfer**, **enhanced capacity-building**, and **making adaptation more effective and inclusive**.
- There is an urgent call for developed countries and international institutions to **raise adaptation finance**, adopt a **new collective quantified goal (NCQG)** for finance, and strengthen adaptation components in NDCs (nationally determined contributions) for the next decade.
- The report warns that as climate impacts intensify, vulnerable communities and poorer nations face mounting risks — adaptation is no longer optional but essential to safeguarding lives, ecosystems and development gains.

**About UNEP**

- Established in **1972** after the Stockholm Conference on the Human Environment.
- Headquartered in **Nairobi, Kenya**.
- Its mission is to promote sustainable development and protect the global environment by advocating for environmental protection and supporting countries with conservation, sustainable management, and restoration projects.
- **Important Publications (Reports)**: Emission Gap Report, Global Environment Outlook, State of the Climate Services Report (with WMO), Food Waste Index Report, Emissions Gap Report etc.

## Blue Flag Beaches

### Context

5 beaches in Maharashtra have received the international Blue Flag certification by Foundation for Environmental Education (FEE).

### About Blue Flag Beaches

- A blue flag beach is an internationally recognized, eco-tourism label awarded by the Foundation for Environmental Education (FEE) for meeting strict environmental, safety, and accessibility criteria.
- These criteria include water quality, environmental management, environmental education, and providing services like clean facilities and lifeguard support

### Blue Flag Beaches in India

- India officially joined the Blue Flag Programme in 2018.
- As of October 2025, India is home to **18 (13+5) Blue Flag-certified beaches.**
  - Shivrajpur Beach – Gujarat
  - Ghoghla Beach – Diu
  - Kasarkod Beach – Karnataka
  - Padubidri Beach – Karnataka
  - Kadal Beach – Lakshadweep
  - Minicoy Thundi Beach – Lakshadweep
  - Kappad Beach – Kerala (Certified in January 2025)

- Chal Beach – Kerala (Certified in January 2025)
- Kovalam Beach – Tamil Nadu
- Eden Beach – Puducherry
- Rushikonda Beach – Andhra Pradesh
- Golden Beach – Odisha
- Radhanagar Beach – Andaman & Nicobar Islands
- Five beaches from Maharashtra: Shrivardhan, Nagaon, Parnaka, Guhagar, and Ladghar.

**Foundation for Environmental Education (FEE)**

- **Founded in:** 198, Became **global in 2001**, when **South Africa** joined as the first non-European member, and was renamed **FEE**.
- **Headquarters:** Copenhagen, Denmark
- **Membership:** 99 member organizations from **77 countries.**
- **Key Programmes:**
  - **Blue Flag Programme:**
  - **Eco-Schools Programme:** Focuses on **environmental education and sustainable practices** in schools.
  - **Learning About Forests (LEAF):** Encourages hands-on learning about the role of forests in **climate regulation and biodiversity conservation**.
  - **Green Key Programme:** An **eco-label certification** for **hotels, resorts, restaurants, and tourism facilities**.
  - **Young Reporters for the Environment (YRE):** Engages **youth aged 11–25** in **environmental journalism and storytelling**.

## Urban Flood Risk Management Programme

### Context

A High-Level Committee chaired by the **Union Home Minister** has approved the **Urban Flood Risk Management Programme (UFRMP) Phase-II** for **11 cities**.

### About Urban Flood Risk Management Programme

- The **Urban Flood Risk Management Programme (UFRMP)** is a national initiative aimed at **reducing flood vulnerability in urban areas** through a combination of **structural** and **non-structural** measures.
- It seeks to build **flood-resilient cities** by improving urban drainage, strengthening flood protection infrastructure, and enhancing early warning and response systems.
- **Funding Pattern:** Implemented on a **cost-sharing basis** between the **Centre and States**.
  - **Centre:** 90% of project cost
  - **State:** 10% of project cost
  - As per **National Disaster Mitigation Fund (NDMF)** guidelines.
- **Cities Covered:** Bhopal, Bhubaneswar, Guwahati, Jaipur, Kanpur, Patna, Raipur, Thiruvananthapuram, Visakhapatnam, Indore, and Lucknow.
- **Structural Measures: Interlinking of water bodies** for better stormwater management.
  - **Construction of flood protection walls.**
  - **Erosion control and soil stabilization** through **Nature-Based Solutions (NBS).**
- **Non-Structural Measures:** Establishment of **Flood Early Warning Systems**.
  - Development of **Data Acquisition Systems** for real-time monitoring.
  - **Capacity building** and training for effective flood management.

## News in short

| | |
|---|---|
| **WISPIT-2b** | **News:** Astronomers have, for the first time, directly imaged a protoplanet — named WISPIT 2b.<br>**About WISPIT-2b**<br>• **Type:** Protoplanet — an object still gathering material to become a full-fledged planet.<br>• Derived from the **WISPIT programme** – WIde Separation Planets In Time, focused on observing planets forming at wide orbital separations.<br>• **Nature:** A **gas giant**, about **five times more massive than Jupiter**.<br>• **Age:** Extremely young, only about **5 million years old**.<br>• **Host Star:** Forming within the **protoplanetary disk of WISPIT-2**, a young star surrounded by gas and dust.<br>• **Formation Process:** Continues to **accrete material** from its surrounding disk, gradually shaping into a stable planet. |
| **Cyclone Shakti** | **News:** The India Meteorological Department (IMD) reported the formation of Cyclone Shakti, the first cyclonic storm of the 2025 season over the Arabian Sea.<br>**About Cyclone Shakti**<br>• It is a tropical cyclonic storm that developed in the northeast Arabian Sea.<br>• Formed due to low-pressure development over warm Arabian Sea waters in early October 2025.<br>• It was classified as a Severe Cyclonic Storm (SCS) by the IMD.<br>• The naming of Cyclone Shakti follows the guidelines of the World Meteorological Organization (WMO) and the ESCAP Panel on Tropical Cyclones. The name "Shakti," proposed by Sri Lanka. |
| **Limestone** | **News:** The Ministry of Mines has officially reclassified all limestone as a major mineral.<br>**About Limestone**<br>• Limestone is a common sedimentary rock composed mainly of the mineral calcite.<br>• It forms through the accumulation of marine organism shells, coral, and other organic debris, or through the chemical precipitation of calcium carbonate from water. |

| | |
|---|---|
| | • It is widely used in construction, for making cement and aggregate, and is the source of lime for various industrial applications.<br>**Major & Minor Minerals**<br>• **Major minerals** are those listed in the **schedule of the Mines and Minerals (Development and Regulation) Act, 1957 (MMDR Act)**.<br>– These minerals include substances like **calcite, clay, coal, and quartz**, which are mainly used in **large-scale industrial and manufacturing processes**.<br>• **Minor minerals** are defined under the **Minor Mineral Concession Rules**, which are framed by **State Governments** under the provisions of the **MMDR Act, 1957**.<br>– They generally consist of **low-value materials** that are primarily utilized in **construction works and small-scale industries**.<br>– Common examples of minor minerals are **building stones, gravel, ordinary clay, and decorative stones**.<br>• The **Central Government** also has the authority to **notify any other mineral as a minor mineral**, thereby including it in this category. |
| **Arabian Sea Mini Warm Pool (MWP)** | **News:** Scientists have discovered that the **Arabian Sea Mini Warm Pool (MWP)** functions as a **self-regulating system**, enabling the **Indian monsoon to recover from the disruptions** triggered by the **preceding El Niño events**.<br>**About Arabian Sea Mini Warm Pool (MWP)**<br>• It refers to a **localized region of unusually high sea surface temperatures (SSTs)** found in the **southeastern Arabian Sea**, particularly near the **Kerala coast**.<br>• A **warm pool** is characterized by **sea surface temperatures above 28.5°C**, which significantly influences **regional weather and monsoon dynamics**.<br>• The **Arabian Sea MWP** typically **develops annually during April and May**, just before the **onset of the Indian Summer Monsoon**. |
| **Taftan Volcano** | **News:** Taftan Volcano showing signs of eruption as the area of ground near it uplifted.<br>**About Taftan Volcano**<br>• **Location:** Sistan & Baluchestan Province, Southeastern **Iran**.<br>• **Type:** Strato Volcano.<br>• A **stratovolcano** (also called a **composite volcano**) is a **tall, conical volcanic mountain** built up by **multiple layers (strata)** of **hardened lava, ash, pumice, and volcanic rocks**.<br>• The term "strato" refers to these **layered structures** formed over repeated eruptions.<br>• **E.g.,** Mount Fuji (Japan), Mount Vesuvius (Italy), Mount St. Helens (US) |
| **Saranda Forests** | **News:** The Supreme Court (SC) has directed the Jharkhand government to notify the Saranda Forest as a wildlife sanctuary.<br>**About Saranda Forest**<br>• Situated in **West Singhbhum district**, **Jharkhand**, near the **Odisha border**.<br>• The term **"Saranda"** means **"land of seven hundred hills"** in the local Ho tribal language.<br>• Home to one of **India's finest Sal (Shorea robusta)** forests.<br>• Hosts species like **Asian elephants, sloth bears, four-horned antelopes**, and diverse **birds, butterflies, and mammals**.<br>• Inhabited mainly by **Ho, Munda, and other Adivasi communities**.<br>**Notification of Wildlife Sanctuary- Legal Basis**<br>• **Wildlife sanctuaries** are notified under the **Wildlife (Protection) Act, 1972**<br>• The **State Government** is the primary authority responsible for declaring an area as a **Wildlife Sanctuary** under **Section 18** of the Act.<br>• The process involves **identification, notification, settlement of rights, and final declaration**. |
| **Baratang Volcano** | **News:** Baratang Volcano erupted recently.<br>**About Bartang Volcano**<br>• Situated in the **Middle Andaman Island**, part of the **Andaman and Nicobar Islands**, India.<br>• It is a **mud volcano** that means eruptions here involve **mud, water, and gases (mainly methane)** seeping through weak zones in the Earth's crust.<br>• Located in a **tectonically active zone** near the **subduction boundary** between the **Indian Plate and the Burmese Plate**.<br>**Related Fact**<br>• **Azerbaijan holds** the **largest number** of mud volcanoes in the world. |

**SAIEE Report**

**News:** India's wild elephant population stands at 22,446, according to the latest All-India Synchronous Elephant Estimation (SAIEE) 2025, released by the Wildlife Institute of India (WII).

**Key Highlights of Report**

- It is India's latest and **first-ever DNA-based** national elephant population estimation, shift from earlier **visual and indirect count methods** to **genetic fingerprinting**
- It used **genetic mark–recapture models**, similar to methods applied in **tiger population estimates**.
- The 2025 figure is **around 17% lower** than the 2017 estimate of **27,312** elephants.
- **Regional Distribution:** Western Ghats (largest population)> Northeastern Hills & Brahmaputra Floodplains> Shivalik Hills & Gangetic Plains> Central India & Eastern Ghats.
- **Top States by Population: Karnataka** (6,013), **Assam** (4,159), **Tamil Nadu** (3,136), Kerala (2,785), Uttarakhand (1,792)
- **States with Smaller Populations: Odisha** (912), **Arunachal Pradesh** (617), **Meghalaya** (677), Nagaland (252), Tripura (153), Madhya Pradesh (97), Maharashtra (63).

**Great Green Wall Initiative**

**News:** Despite its ambitious objectives, the **Great Green Wall project** continues to face **major implementation challenges across Africa.**

**Great Green Wall Initiative**

- It is an **African-led global movement** launched in **2007 by the African Union (AU)**.
- Its goal is to **combat desertification, restore degraded land, and build climate resilience** across the **Sahel region** — the semi-arid belt south of the Sahara Desert.
- Extends across **11 African countries**, from **Senegal in the west to Djibouti in the east**.
- **Objectives: Restore 100 million hectares** of degraded land by **2030**.
  - **Sequester 250 million tonnes of carbon dioxide ($CO_2$)**.
  - **Create 10 million green jobs** for local communities.
  - **Enhance food security** and **reduce poverty and migration pressures** by revitalizing rural livelihoods.

**#23for 23 Initiative**

**News:** India observed **International Snow Leopard Day** with a special nationwide initiative called **#23for23.**

**About #23for 23 Initiative**

- Citizens are asked to carry out **23 minutes** of physical activity (walk, run, yoga, cycle, trek, etc.) on/around **23 October** to **spread awareness** about the importance of conserving **snow leopards and their fragile ecosystems** in the high Himalayas.

**India's first-ever Snow Leopard Population Assessment (SPAI)**

- **Total Population Estimated: 718 snow leopards** across India.
  - **State-wise Distribution: Ladakh** recorded the largest share (**477 individuals**).
    - » Other estimated numbers: **Uttarakhand 124, Himachal Pradesh 51, Arunachal Pradesh 36, Sikkim 21, Jammu & Kashmir 9**.

**Species Survival Commission**

**News:** Vivek Menon, founder of the Wildlife Trust of India (WTI), has been elected as the Chair of the IUCN Species Survival Commission (SSC).

**About Species Survival Commission**

- It is **one of the six expert commissions** of the **International Union for Conservation of Nature (IUCN)**.
- It comprises **more than 9,000 experts and scientists** from around the world.
- The SSC **advises the IUCN Secretariat** on global biodiversity and species conservation matters.
- It plays a major role in:
  - Preparing and updating the **IUCN Red List of Threatened Species.**
  - **Coordinating specialist groups** on different species and ecosystems
  - Providing **scientific input for conservation policy and action**

## Places in News

**Phillipines**


**News:** A 6.9 magnitude earthquake struck off the coast of central Philippines.

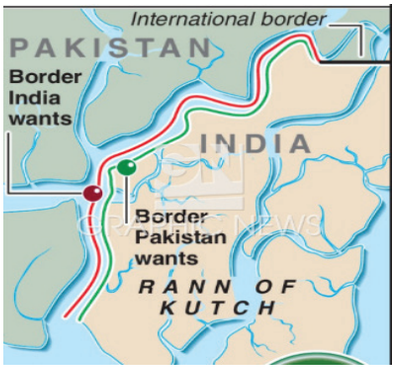
**About Phillipines**

- **Location:** Southeast Asia, an archipelago of over **7,600 islands** between the **Philippine Sea (Pacific Ocean)** and the **South China Sea**.
- **Capital:** Manila (with Quezon City as the most populous city).
- **Geography:** Mountainous, volcanic islands with a tropical maritime climate.
- **Other key facts:** Part of the **Coral Triangle**, rich in biodiversity; member of ASEAN.

**Why is It Prone to Earthquakes?**

- Located in the **Pacific Ring of Fire** , where ~90% of earthquakes occur.
- Lies at the convergence of the **Philippine Sea Plate** and **Eurasian Plate**, creating intense seismic activity.
- Crisscrossed by major faults like the **Philippine Fault System** and **Valley Fault System**.
- **Presence of deep trenches** (Philippine Trench, Manila Trench) and ~24 active volcanoes linked to frequent quakes.

## Sir Creek




**News:** Recently, the Defence Minister of India flagged Pakistan's military infrastructure being set up in Sir Creek region.

**About Sir Creek**

- A **98-km long tidal estuary** in the **Rann of Kutch**, lying between **Kutch (Gujarat, India)** and **Sindh (Pakistan)**.
- **Dispute:** Both **India and Pakistan** claim the creek, but disagree on the **maritime boundary**.
  - **Origin:** 1914 agreement between **Sindh (under British India)** and **Ruler of Kutch**.
  - Difference lies in the **interpretation of the boundary line**:
  - **India's claim**: Boundary lies along the **eastern bank** (thus the entire creek belongs to India).
  - **Pakistan's claim**: Boundary lies in the **middle of the creek** (thus half belongs to Pakistan).

## Pazan Gas Field


**News:** A new natural gas discovery of about 10 trillion cubic feet has been made in the Pazan gas field.

**About it**

- **Location:** Southern Iran, Fars Province.

**Related Facts:**

- Iran is the 9th largest oil producer globally and the 4th largest within OPEC.
- Also, Iran holds the world's second largest natural gas reserves, after Russia and 3rd highest producer of natural gas behind the US and Russia.
- Iran's biggest operating gas field is South Pars, the world's largest natural gas discovery, which Iran shares with Qatar in the Persian Gulf.

## Atacama Desert


**News:** Unusual winter rain turns Atacama desert into fuchsia flower carpet.

**About Atacama Desert**

- **Location:** Chile
- **Geography:** Arid region, considered the driest nonpolar desert on Earth due to the **Humboldt ocean current**
  - It is a key source of **sodium nitrate fertilizer**.
- Extremely Large Telescope, which is an advanced ground-based optical and infrared telescope in the world, is being constructed in the Atacama desert.

## Morocco


**News:** After **Indonesia**, **the Philippines**, and **Nepal**, similar **youth-led protests** have now erupted in **Morocco** (North Africa)

**About Morocco**

- **Location**: North Africa, bordered by the **Atlantic Ocean, Mediterranean Sea, Algeria**, and **Western Sahara**.
- **Capital**: Rabat | Largest city: Casablanca.
- **Global Membership**: Member of **African Union, Arab League, UN, WTO**.

## Madagascar


**News:** The Madagascar presidency is facing youth-led protests in the country and termed this as an "attempted illegal and forcible seizure of power."

**About Madagascar**

- **Island nation** in the **Indian Ocean**, off the **southeastern coast of Africa**.
- Separated from mainland Africa by the **Mozambique Channel**.
- **Capital:** Antananarivo
- **Neighbouring countries (by sea):** Mozambique (west), Comoros, and Mauritius (north & east).
- **Geography and Economy:**
  - **World's 4th largest island.**
  - Known for its **unique biodiversity 9** (endemic species like lemurs and baobab tree)
  - Largest producer of vanilla in the world (about 80% of the global supply).

## Durand Line


**News:** Pakistan and Afghanistan clashed along the Durand line.

**About Durand Line**

- **Boundary:** 2,670 km border between **Pakistan and Afghanistan**.
- **Drawn in: 1893** by **Sir Mortimer Durand** and **Amir Abdur Rahman Khan**.
- **Purpose:** To separate **British India** and **Afghan spheres of influence**.
- **Dispute: Afghanistan doesn't recognize** it as an international boundary.

## Sharm EL-Sheikh


**News:** World leaders gathered in Sharm El-Sheikh to discuss plans for ending the war in Gaza.

**About Sharm El-Sheikh**

- **Location: Coastal city in Egypt**, located on the **southern tip of the Sinai Peninsula**, along the **Red Sea**.
- Hosted the **27th Conference of the Parties (COP27)** to the **UNFCCC (Nov 2022)**.

**Related Facts: Egypt**

- Located in the northeast corner of Africa and southwest corner of Asia via the Sinai Peninsula.
- It is bordered by the Mediterranean Sea to the north, Palestine (Gaza Strip) and Israel to the northeast, the Red Sea to the east, Sudan to the south, and Libya to the west; the Gulf of Aqaba in the northeast separates Egypt from Jordan and Saudi Arabia.

## Thitu Island


**News:** A Chinese maritime vessel and a Philippine ship collided near the Philippine-held Thitu Island.

**About Thitu Island**

- Also known as **Pag-asa Island**.
- Part of **Spratly Islands archipelago.**
- The Philippines first took possession of the island in 1974.
- Its neighbors are the North Danger Reef to the north, Subi Reef to the southwest, and the Loaita and Tizard Banks to the south.

## Mount Lewotobi Laki-laki


**News:** Indonesia's Mount Lewotobi Laki-Laki erupted recently.

**About Mount Lewotobi Laki-Laki**

- **Location:** Flores Island, southeastern Indonesia.
- It is part of the **Lewotobi twin volcano complex**, comprising Lewotobi Laki-Laki (Male) and Lewotobi Perempuan (Female) stratovolcanoes.
- **Strato volcano:** It is a large, steep-sided volcano that's formed by layers of hardened lava, ash, and other volcanic debris. They are known for their steep sides, **explosive eruptions and high viscosity magma.**

**Related Facts**

- Indonesia has the most volcanoes in the world, including 120 active volcanoes and 126 total volcanoes, including six submarine volcanoes.
- Most of Indonesia's volcanoes are located on the **Sunda Arc, a 3,000 km long chain.**
- The volcanoes were created by the **subduction of the Indian Ocean crust under the Asian Plate.**

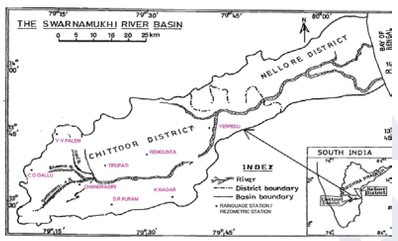
## Kunar River


**News:** Afghanistan has announced plans to construct a dam on the Kunar River that will limit water flowing into Pakistan.

**About Kunar River**

- It is a **major tributary of the Kabul River**, flowing through **Afghanistan and Pakistan**.
- It **originates in the Hindu Kush mountains**, near **Khyber Pakhtunkhwa, Pakistan**, where it is known as the **Chitral River**.
- After entering **Afghanistan**, it takes the name **Kunar River**.
- **Tributaries:** Pech, Bashgal, Lutkho Rivers

## Swarnamukhi River




**News:** Four boys have washed away in the Swarnamukhi river.

**About Swarnamukhi River**

- **Location:** Situated in **Andhra Pradesh**, within the **Rayalaseema region**.
- **Origin:** Emerges from the **Eastern Ghats near Pakala village** in **Chittoor district**.
- **Length:** Extends for approximately **130 kilometres**.
- **Course:** Flows in a **northeast direction**, passing through **Tirumala, Tirupati, and Srikalahasti**, before **draining into the Bay of Bengal**.
- **Religious Importance:** Holds great significance as it passes by the **Tirumala** and **Srikalahasti temples**.
- **Tributary:** The main tributary is the **Kalyani River**, associated with the **Kalyani Dam (constructed in 1977)**.

## Manas National Park


**News:** Put on " significant concern list of IUCN's World Heritage Outlook 4 report

- **Location: I**t is located in the Himalayan foothills in Assam. It is contiguous with the Royal Manas National Park in Bhutan.
- **Rivers:** Manas River, Beki River
- Conservation Status & Recognition: a Natural World Heritage Site, Tiger Reserve, Elephant Reserve, Biosphere Reserve and an Important Bird Area (IBBA).
- **Climate and Vegetation:** Tropical monsoon climate; The primary forest types include semi-evergreen forests, mixed moist and dry deciduous forests, alluvial grasslands and creeper swamp forests.
- **Important fauna:** Asiatic elephant, tiger, greater one-horned rhino, clouded leopard, sloth bear. It also harbours endemic species like pygmy hog, hispid hare and golden langur as well as the endangered Bengal florican**.**

## Sundarbans National Park


**News:** Put on " significant concern list of IUCN's World Heritage Outlook 4 report

- **Location:** Southern part of West Bengal, India, in the delta region of the Ganga, Brahmaputra, and Meghna rivers — adjoining the Bay of Bengal.
- It forms part of the largest mangrove forest in the world.
- **Major rivers:** Ganga, Hooghly, Matla, Raimangal, and Meghna.
- **Fauna:** Famous for the Royal Bengal Tiger (adapted to saline, amphibious conditions). Other species: Saltwater crocodile, spotted deer, fishing cat, Gangetic dolphin, water monitor lizard, and estuarine reptiles.
- **Flora:** Dominated by mangrove species like Sundari, Gewa, Keora, Dhundi, and Garjan.
- **Conservation Status & Recognition:** UNESCO World Heritage Site, Biosphere Reserve, Ramsar Wetland Site, Tiger reserve under Project Tiger.

# INTERNATIONAL RELATIONS & INTERNAL SECURITY

## Topics for Mains

### India's Re-engagement with Afghanistan

*Syllabus Mapping: GS-2 Neighbourhood of India*

#### Context

India's cautious re-engagement with Taliban-led Afghanistan in 2025 marks a significant recalibration of its foreign policy. The visit of Afghan Foreign Minister Amir Khan Muttaqi to New Delhi and India's decision to reopen its embassy in Kabul indicate a shift from isolation to pragmatic diplomacy.

#### Background: India–Afghanistan Relations Through the Decades

India's ties with Afghanistan are **centuries old**, rooted in **civilizational, cultural, and trade linkages**. Modern diplomatic relations evolved through distinct phases:

- **Pre-1979 Era:** India and Afghanistan shared strong bilateral relations under **King Zahir Shah** and later under **President Daoud Khan**.
  - India was among the first to recognize the **Republic of Afghanistan (1973)**, supporting its non-aligned and independent foreign policy.
- **Soviet Invasion (1979–1989):** India maintained ties with the Soviet-backed government in Kabul, while Pakistan, the US, and China supported the Mujahideen insurgents.
- **Taliban Rule (1996–2001):** India **did not recognize the Taliban regime**, aligning with the **Northern Alliance**. Taliban were **deeply entrenched in Pakistan's sphere of influence**, making serious engagement difficult for India.
  - The **IC-814 hijacking (1999)** by Pakistan-based groups using Taliban-controlled Kandahar further strained ties.
- **Post-2001 (Democratic Republic Era):** Following the US-led intervention, India became one of Afghanistan's largest regional donors, investing over USD 3 billion in:
- **Infrastructure:** Salma Dam, Zaranj–Delaram Highway
- **Education & Health:** Scholarships, hospitals, capacity building
- **Parliament building** and civil service training
- **Post-2021:** After the **Taliban seized Kabul (August 2021)**, India **evacuated its mission** and adopted a wait-and-watch policy.
- India initiated its first official contact with the new Taliban government when India's Ambassador to Qatar, Deepak Mittal, met Sher Mohammad Abbas Stanekzai, head of the Taliban's political office in Doha. This meeting was driven by the Taliban's request and their intent to maintain ties with India.
- India emphasized its concern over the Taliban's exclusionary cabinet and lack of representation for ethnic minorities and women.
  - However, the Taliban reassured India that it would be "reasonable" in addressing India's concerns.
- India sent humanitarian aid to Afghanistan, reinforcing its intent to differentiate between the **Taliban government and the Afghan people.**
- Gradually, India re-engaged via humanitarian aid (wheat, vaccines) and opened a **Technical Mission in Kabul (2022)**, paving the way for the 2025 diplomatic thaw.
- Taliban Foreign Minister Amir Khan Muttaqi's visit marked the first high-level contact, focusing on trade, connectivity (Chabahar, Wagah), healthcare, development aid, and counter-terrorism.

**Significance of Strong India–Afghanistan Relations**

- **Strategic Depth and Security:** A stable Afghanistan limits **Pakistan's strategic leverage** and restricts cross-border terrorism from extremist sanctuaries. India remains highly focused on preventing Afghanistan from becoming a haven for anti-India terrorist groups.
- **Economic and Connectivity Goals:** Afghanistan is a gateway to Central Asia - vital for India's energy security and trade diversification.
  - Projects like Chabahar Port, Zaranj–Delaram Highway, and the International North-South Transport Corridor (INSTC) hinge on Afghan stability.
- **Cultural and Historical Ties:** Centuries-old civilizational links reinforce India's image as a benevolent and reliable partner.
- **Regional Balancing:** Good ties with Kabul help India counterbalance Pakistan- China influence and strengthen its continental strategy beyond South Asia.
- **Humanitarian Support**: India has been a significant provider of humanitarian aid, which aligns with its longstanding policy of supporting the Afghan people.

#### Current Scenario: Re-engagement Under Pragmatism

- **Reopening the Embassy:** Recently EAM S. Jaishankar announced the formal reopening of the Indian Embassy in Kabul, posting a Chargé d'Affaires instead of a full ambassador. This indicates that India does not diplomatically recognise the Taliban till there is a consensus in the international community to do so.
- **Balancing Geopolitical Realities:** India's cautious approach also stems from regional geopolitics. China, Pakistan, Iran, and Russia have all deepened their presence in Afghanistan post-2021.
- **Calibrated engagement:** India is signalling that **any recognition of the Taliban must come within a multilateral framework**. New Delhi uses platforms like the **Moscow Format, SCO, and Voice of Global South Summit** to shape a collective regional response instead of unilateral outreach.
- **Symbolic Caution:** India avoided official symbols, addressing Muttaqi as Foreign Minister of Afghanistan without recognising the Islamic Emirate, reflecting strategic ambiguity - engagement without endorsement.

- **Security Concerns:** India's core concern remains the **risk of cross-border terrorism and radicalization** spilling into Kashmir and the broader region. During the **October 2025 Joint Statement**, Afghanistan reaffirmed that its soil will **not be used against any country**—a critical assurance sought by New Delhi.

**Objective of fine balance between pragmatism and principle.**

- It ensures **strategic presence** without premature recognition.
- It protects **security interests** while projecting India as a responsible regional power.
- It leverages humanitarian and cultural diplomacy to **preserve long-term influence.**

This calibrated policy reflects India's transition from **reactive diplomacy to adaptive engagement**—an approach likely to continue until Afghanistan attains internal stability and international legitimacy.

### Neighbourhood Dynamics and Geopolitical Evolution

India's approach to Afghanistan cannot be seen in isolation; it is shaped by shifting power equations in its western neighbourhood.

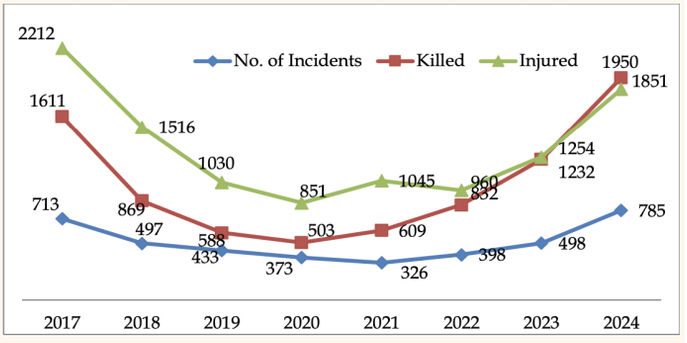
- **Pakistan - From Patron to Problem:** Taliban's defiance and TTP violence have strained ties with Pakistan, creating space for India's limited re-engagement.

**Strategic Space for India in Afghanistan**

Spiralling violence along the Afghanistan-Pakistan border region gives a strategic space to India to play a key role in Afghanistan. Though Pakistan supported the Taliban in its struggle against the US and its allies, the equation changed after the Taliban came to power. The given graph shows Overall Incidents of Violence & Casualties on the Pak-Afghan Border.

**Reason for frigid relation between Pakistan and Taliban:**

- **Border issues:** Durand line is not recognised by Taliban as it separated the Pashtun region into two parts. However, Pakistan has fenced along the Durand line.
- **Deportation of the Afghan refugees:** Pakistan has started deporting 1.7 million undocumented Afghan refugees which is treated by Taliban as the "pressure tactics against Taliban."
- **Support to Tehrik-e Taliban Pakistan (TTP), also known as the Pakistani Taliban:** Since the Taliban reclaimed power in Afghanistan, terrorist attacks in Pakistan – in which 2,267 Pakistanis have died – have increased by 60 percent. Pakistan's caretaker Prime Minister has blamed the Taliban for supporting the TTP.
- **Air Strikes:** Pakistan launched air strikes in Afghanistan's Paktia province, which borders Pakistan's tribal district of South Waziristan.
- **Anti-Pakistan Rhetoric:** Pakistan has used Afghanistan as a pawn against India in its policy of maintaining Strategic depth in Afghanistan. This policy has robbed Pakistan of legitimacy among Afghans.




- **China - Expanding Influence:** China's growing presence via **BRI and mineral projects** pushes India to reassert influence and counter Beijing's dominance.
- **Iran – Strategic Gateway:** Through **Chabahar Port**, India seeks to restore **Central Asian connectivity** via non-Pakistani routes, balancing ties with Tehran and Kabul.
- **Russia and Central Asia:** Russia's recognition of the Taliban contrasts with India's cautious stance, yet India stays engaged through **Moscow Format Consultations**.
- **US and the West:** While the US maintains leverage via aid and counterterror tools, India pursues a balanced, autonomous Afghan policy, avoiding firm alignment with any bloc.

**Afghanistan's resource: New linchpin of the global economy**

Afghanistan's vast mineral sector is very important from a strategic point of view. According to a report by the US Geological Survey, Afghanistan has mineral resources worth about ₹83 lakh crore. These include lithium, copper, iron, cobalt, gold and rare earth elements. Large reserves of lithium and copper have become the focus of the global race for lithium, the so-called "white oil" of the 21st century.

Global Politics: China, Russia and Iran have intensified efforts to increase their economic-strategic influence in the region.

- **China:** China Metallurgical Corporation of China recently got the green light to restart the Mes Aynak copper project — believed to be one of the largest disused copper mines in the world.
- **European Union:** The EU has classified Afghanistan as a "potential supply source" in its "Critical Raw Materials Act" for 2024.
- **US:** According to US Department of Energy report (2023) Afghanistan could become the next global hub of the lithium supply chain if political situation improves in the country.

**India's opportunity:**

Given India's 95% import dependency of Lithium, Afghanistan can become a long-term strategic partner for India. India had earlier proposed investment in the Hajigak iron mine project in 2011, but it was stopped due to security reasons. Now the Taliban is showing a "pragmatic investment" attitude towards India, which opens a new diplomatic window. This partnership with Afghanistan can provide an opportunity to convert India's soft power into strategic power.

## Challenges in India-Afghanistan Relations

- **Ideological Divide:** The Taliban's Sharia-based governance contrasts sharply with India's democratic and secular values, especially due to curbs on women and minorities.
- **Security Risks:** Rising threat of Pakistan-backed terror outfits and cross-border radicalization targeting Indian assets.
- **Diplomatic Dilemma:** Premature recognition risks Western backlash; delay could push Kabul closer to China and Pakistan.
- **Economic Constraints:** Pakistan's transit blockade and global sanctions hinder trade and aid delivery.
- **Humanitarian Concerns:** Economic collapse and human rights violations heighten regional instability and refugee pressures.

## Way Forward

- **Pragmatic Engagement:** Maintain limited diplomatic presence; continue aid in education, health, and infrastructure.
- **Security Cooperation:** Develop discreet counterterror channels and support regional anti-terror efforts.

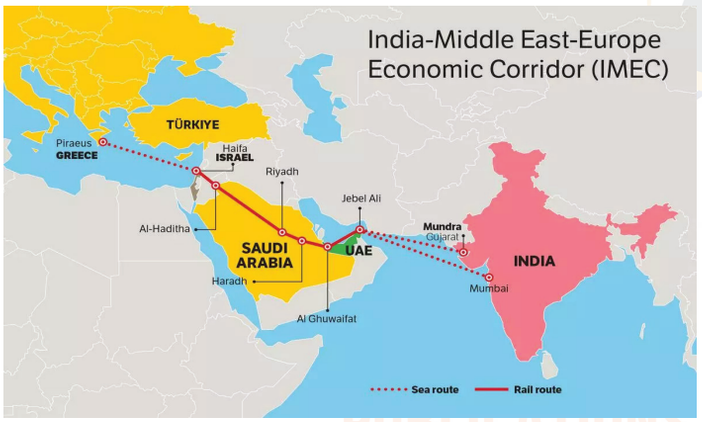
- **Regional Connectivity:** Strengthen Chabahar and INSTC routes with Iran and Central Asia as alternatives to Pakistan.
- **Diplomatic Coordination:** Engage through multilateral forums like the Moscow Format and SCO-Afghanistan Contact Group.
- **People-to-People Links:** Expand scholarships, medical visas, and cultural outreach to Afghan society.
- **Institutional Strategy:** Create a dedicated Afghanistan Policy Cell within the MEA for coordinated strategic and humanitarian planning.

## Future of the India–Middle East–Europe Economic Corridor (IMEC)

*Syllabus Mapping: GS-2 Regional Connectivity Projects*

### Context

Launched at the 2023 G-20 Summit in New Delhi, the India–Middle East–Europe Economic Corridor (IMEC) sought to connect India, the Arabian Peninsula, and Europe. However, shifting geopolitics in West Asia - particularly after the Hamas–Israel conflict in October 2023 - have made its implementation and route planning more challenging.




### What is the IMEC?

- **Route and Structure:** The IMEC comprises **two main corridors**:
  - **Eastern Corridor** - connecting **India to the Arabian Gulf** (via sea routes).
  - **Northern Corridor** - connecting **the Arabian Gulf to Europe** (through rail and maritime networks).
- **Proposed Route:** India → UAE → Saudi Arabia → Jordan → Israel (Haifa Port) → Greece/Italy → Rest of Europe.
- **Core Components:** The corridor integrates multi-modal connectivity and clean energy infrastructure:
  - **Maritime Connectivity:** Upgradation of ports between India and UAE.
  - **Rail Network:** High-speed rail links from **UAE ports to Haifa (Israel)** through **Saudi Arabia and Jordan**.
  - **Clean Energy Pipeline:** For transporting **green hydrogen** across regions.
  - **Electricity Cable:** Enhancing cross-border power connectivity.
  - **High-Speed Undersea Digital Cable:** Strengthening digital infrastructure and data exchange.
  - **Logistics and Industrial Clusters:** Ports, free-trade zones, and industrial parks along the route.

Together, these components aim to enhance **trade efficiency, energy security, and regional integration** across Asia, the Middle East, and Europe.

#### Background and Evolution

- The **G20 Summit (New Delhi, 2023)** provided the global stage for the announcement of IMEC, endorsed by India, the US, EU, France, Germany, Italy, Saudi Arabia, and the UAE.
- The timing was perfect — peace in the Middle East seemed possible because of the **Abraham Accords**, which had improved ties between **Israel and several Arab countries**. It laid the political foundation for regional cooperation.
  - India's relations with **UAE and Saudi Arabia** were strong, and the **I2U2 grouping (India–Israel–UAE–U.S.)** had already been formed to enhance regional cooperation.
- The project began with a sense of optimism, but its progress was hindered after the Hamas–Israel conflict in October 2023, which once again brought instability to West Asia.

**Benefits of IMEC**

- **Transit Time Reduction**: Projected to reduce transit time between its eastern & western nodes by 40%.
- **Cost Efficiency**: Transportation costs are expected to decrease by 30% compared to routes via the Suez Canal.
- **Impact on Maritime Trade:** Once operational, IMEC is anticipated to be transformative for international maritime trade.
  - **E.g.** boost Indian exports in pharmaceuticals, textiles, automobiles, and engineering goods.
- **Resilience Supply chain:** It will help ensure supply chain resilience in the participating nations
- **Countering BRI:** It is expected as a direct counter to China's BRI by offering an alternative trade route. Counters China's growing presence in the **Indian Ocean and West Asia**, especially via BRI ports in Gwadar (Pakistan) and Djibouti. Benefits over BRI:
  - IMEC emphasizes financial sustainability and fair investment practices unlike debt burden under BRI
  - Unlike China's state-driven approach, IMEC seeks to engage multiple stakeholders, including India, Europe,USA, and Gulf nations
- **Strengthens India's economic and political ties** with Middle Eastern nations, including the UAE and Saudi Arabia
  - E.g. It will lead India to establish itself as a major global manufacturing and trade hub.
- **Energy trade:** It will allow India to streamline its access to Middle Eastern oil and gas resources.
- **high-speed data pipeline:** facilitate the export of India's IT services to Europe and West Asia

### Why IMEC matter for India?

- **Strategic Leverage:**
  - Positions India as a **connectivity hub** between Asia, the Middle East, and Europe.
  - Enhances India's **geo-economic footprint** in West Asia.
- **Economic Diversification:**
  - Facilitates access to high-value European markets.
  - Boosts Indian exports in pharma, textiles, engineering, and green technology.

- **Energy Security:** The hydrogen and electricity corridors can secure **clean energy imports** for India's decarbonisation goals.
- **Inclusion of electricity grid:** facilitates the export of green energy
- **Proposed clean hydrogen pipeline:** facilitate clean hydrogen that could be the long-term alternative to fossil fuels
- **Diplomatic Capital:** Strengthens India's partnership with the **EU and Gulf states**, while aligning with **US strategic interests**. Reinforces India's image as a responsible global connector.
- **Supply Chain Resilience:** Diversifies global supply chains away from East Asia, enhancing trade reliability amid global disruptions (e.g., Houthi attacks, Red Sea crisis).

## Challenges

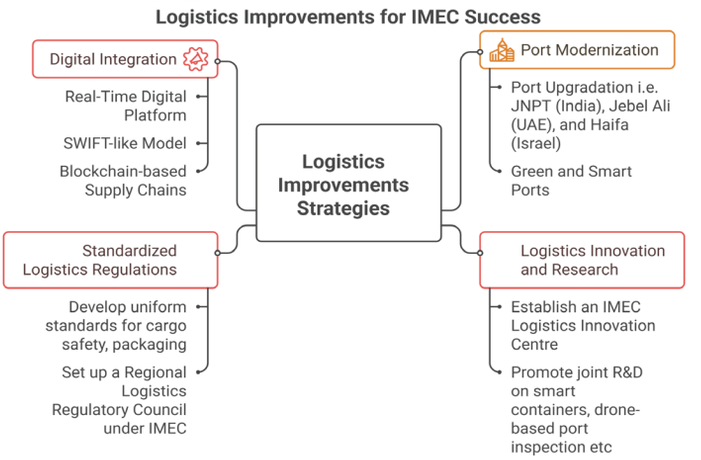
- **Geopolitical Instability:** The **Israel–Hamas conflict**, proxy wars in Yemen and Lebanon, and Iran–Saudi tensions threaten route stability.
  - **E.g.** Maritime and rail routes may face risks from piracy, terrorism, cyberattacks, and sabotage—especially in the Red Sea and Mediterranean. For example, Houthi rebels in the Red Sea pose security challenge
- **Coordination**: There are issues with coordination among the multiple countries involved with difference governance models.
  - **E.g.** Israel (Democracy) and UAE (Monarchy)
- **Divergent Strategic Interests:** While India prioritises trade and connectivity, European and Gulf partners may have varying motivations - e.g., energy, political leverage, or regional influence.
- **Logistical and Financial Complexity:** The project demands **multi-billion-dollar investments** and **regulatory harmonisation** across countries with differing standards.
- **Competing Corridors:** China's Belt and Road Initiative (BRI) and Russia–Iran's North–South Transport Corridor (INSTC) offer parallel connectivity options.
- **Environmental and Technical Challenges:** Building high-speed rail and undersea infrastructure across deserts and seas will require advanced engineering and long timelines.
- **Political Delays:** Parliamentary approvals in Europe and domestic pressures in Gulf nations may slow execution.
- **Exclusion of important regional players** such as Egypt, Oman, and Turkey raises concerns about the corridor's inclusivity.

### Europe's Concerns

- **Climate change** is melting Arctic ice, opening **new northern trade routes** that shorten shipping time between Asia and Europe.
- Countries like **the U.S., Russia, and China** could benefit from these new Arctic routes.
- But **Mediterranean countries** like **Italy** and **France** fear losing trade importance if ships bypass the Mediterranean.
- So, they see **IMEC as a way to remain important in global trade** — by partnering with a fast-growing economy like **India**.

## Way Forward

- **Regional Stability:** Multistakeholder consensus should be reached in favour of IMEC despite various regional conflicts.
- **Adaptive Route Planning:** Explore alternative routes via **Egypt, Oman, or Kuwait** to bypass conflict-prone zones.
- **Multilateral Governance Framework:** Establish a **joint steering mechanism** for project coordination, financing, and dispute resolution.
  - E.g. Establishing a **formal IMEC secretariat** could organise & streamline the corridor's structure, trade processes etc.
- **Secure Maritime and Energy Lanes:** Strengthen **naval cooperation** with Gulf partners to ensure uninterrupted sea connectivity.
- **Financial sources:** Mobilize blended finance through sovereign wealth funds,Securing private sector investment and multilateral institutions like the World Bank and AIIB to ensure its success.
- **Integration with Other Corridors:** Link IMEC with India's **INSTC (via Iran)** and **Chabahar Port** for greater route redundancy.
- **Focus on Early Deliverables:** Prioritise port upgrades, digital cable laying, and hydrogen pilot projects to build momentum.




# India–UK Ties

*Syllabus Mapping: GS-2 Bilateral Relations*

## Context

British Prime Minister Keir Starmer's first official visit to India in October 2025 marked a major milestone in the India-UK Comprehensive Strategic Partnership, deepening cooperation across trade, defence, technology, climate, and education under the Vision 2035 framework.

### Historical Context and Evolution

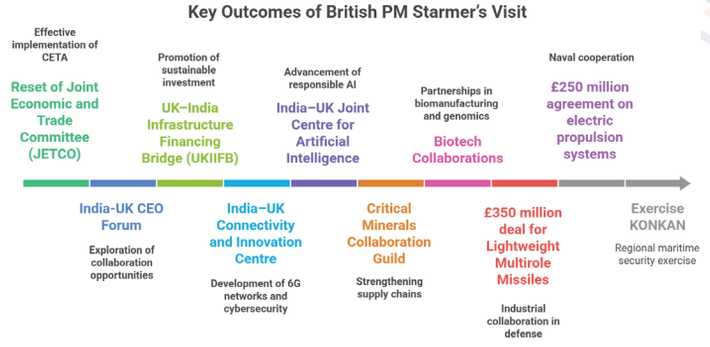
- Diplomatic relations were established in **1947**, and upgraded to a **Strategic Partnership in 2004**.
- The **Comprehensive Strategic Partnership (CSP)** launched in **2021** broadened cooperation to **defence, innovation, health, and climate action**.
- The partnership deepened after the signing of the **India–UK Comprehensive Economic and Trade Agreement (CETA)** and the **Vision 2035** framework during PM Modi's visit to London in July 2025.

**India–UK Comprehensive Economic and Trade Agreement (CETA)**

- **It is an FTA** signed in **July 2025** that eliminates or reduces tariffs on most goods and services.

  - **Projected benefits:**
    - » UK exports to India to rise by **~60%**, Indian exports to UK by **~25%**, adding **£25.5 billion** in total trade.
    - » India gains in **textiles, leather, gems and jewellery, auto components**, while UK benefits in **green tech and financial services**.
  - Once ratified, it will provide **duty-free access for 99% of Indian exports by value**, benefiting **MSMEs** and **job creation**.
  - The **Double Contributions Convention** exempts Indian professionals in the UK from dual social security payments, benefiting ~75,000 workers.
- **Target**: doubling the Bilateral trade from $ 56 Billion (2024) by 2030.


## List of outcomes




## Institutional Mechanisms For implementation of FTA :

- **The Joint Economic and Trade Committee (JETCO)** has been reset with the signing of the term of reference to implement CETA effectively.
- **CEO Forum for Private Sector Engagement:** India-UK CEO Forum convened business leaders from key sectors to explore collaboration opportunities. Co-chaired by industry veterans from both sides, the forum focused on unlocking innovative avenues in trade, investment, and technological synergy.
- **The UK–India Infrastructure Financing Bridge (UKIIFB)** between NITI Aayog and the City of London promotes sustainable investment in clean energy and infrastructure.

## Technology and Innovation

**Key Announcements under Technology Security Initiative (TSI)**

- **India–UK Connectivity and Innovation Centre:** £24 million joint funding to develop 6G networks, Non-Terrestrial Networks, and cybersecurity solutions.
- **India–UK Joint Centre for Artificial Intelligence:** To advance responsible and trustworthy AI in health, climate, and fintech.
- **Critical Minerals Collaboration Guild:** Strengthening supply chains and downstream processing; Phase 2 includes a satellite campus at IIT–ISM Dhanbad.
- **Biotech Collaborations:** Partnerships between CPI–BRIC, Henry Royce Institute–IISc, and Oxford Nanopore–CDFD in biomanufacturing, 3D bioprinting, and genomics.

**Defence and Security**

- **Industrial Collaboration:** £350 million deal for Lightweight Multirole Missiles, co-produced under Atmanirbhar Bharat.
- **Naval Cooperation:**
  - £250 million agreement on electric propulsion systems for Indian ships.
  - **Exercise KONKAN** and a new Regional Maritime Security Centre of Excellence (RMSCE) under the IPOI.
- **Capacity Building:** Indian instructors integrated into Royal AirForce(RAF training) - a first.
- **Counter-Terrorism:** Enhanced information sharing and coordination through **UN and FATF** mechanisms.

**Climate, Energy, and Sustainable Development**

- **Climate Finance Initiative:** Mobilising investment for clean energy and resilience projects.
  - Launched the **India-UK Climate Finance Initiative** to mobilize capital for clean energy and climate resilience projects.
- **Climate Tech Start-up Fund:** Jointly launched by the UK Government and SBI.
- **Offshore Wind Taskforce & Global Clean Power Alliance:** Collaboration on green growth and net zero goals.

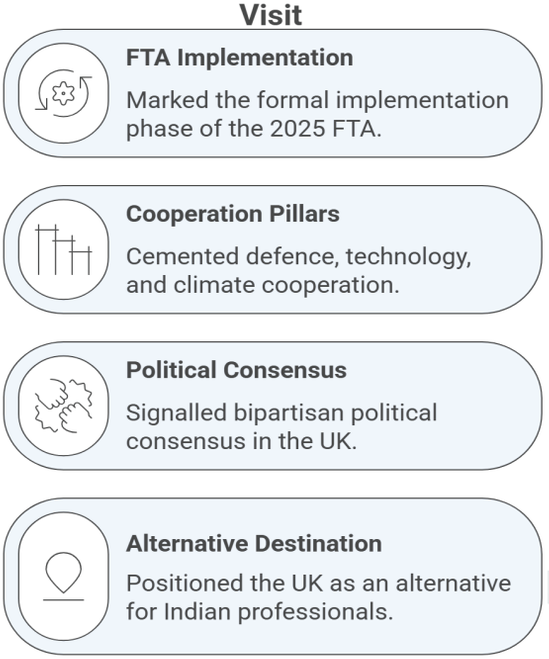
**Education, Culture, and People-to-People Ties**

- **Higher Education:** Nine UK universities opening campuses in India; mutual degree recognition easing mobility.
- **Migration & Mobility:** Young Professionals Scheme enables 3,000 citizens annually to work across borders.
- **Cultural Links:** 2025 Cultural Cooperation Programme strengthens arts, heritage, and sports collaboration.
- **Indian Diaspora:** 2.6% of UK population - a "living bridge" of shared prosperity.

**Regional and Global Cooperation**

- Joint commitment to a **rules-based international order** and **UNSC reform.**
- Cooperation in the **Commonwealth**, **Indo-Pacific**, and **climate governance**.
- Coordinated stances on **Ukraine** and the **Middle East**, supporting peace and humanitarian relief.

### Significance of PM Kier Starmer Visit




## Challenges Ahead

- **Ratification Delays:** The FTA and CETA still require **UK Parliamentary approval**, which could face domestic lobbying hurdles.
- **Regulatory Barriers:** India must address **non-tariff and sanitary restrictions** on exports like mangoes and marine products.
- **Carbon Border Adjustments:** The UK's **CBAM** may penalize Indian **steel and cement exports**.
- **Mobility Concerns:** Balancing **visa liberalization** with domestic politics in the UK remains sensitive.
- **Implementation Gaps:** Converting MoUs into tangible outcomes will test bureaucratic and political agility on both sides.

## Way Forward: Vision 2035 in Action

- **Economic Depth:** Swift ratification and operationalisation of **CETA** to unlock trade and investment flows.
- **Defence Self-Reliance:** Expand **co-production** of defence technologies under **Atmanirbhar Bharat**.
- **Tech and Innovation Leadership:** Joint investments in **AI, 6G, and critical minerals** to shape global supply chains.
- **Climate Leadership:** Co-develop scalable models for **climate finance and green energy transition**.
- **People-Centric Diplomacy:** Expand education and mobility pathways to sustain the "living bridge."

# India & the Multi-Polar West

*Syllabus Mapping: GS-2 Global Power Politics*

## Context

Recent diplomatic moves - British PM Keir Starmer's Mumbai visit, the India–EFTA trade pact, and ongoing India–EU FTA talks - highlight Europe's growing centrality in India's foreign policy. After decades of limited engagement, a resurgent Europe and India's strategic diversification mark a new phase in ties amid the rise of a **multipolar West.**

### What Is the "Multipolar West"?

The term **"Multipolar West"** captures the fragmentation and diversification within the Western bloc — where the United States, Europe, and allied democracies now act as semi-autonomous strategic poles rather than a single unified entity.

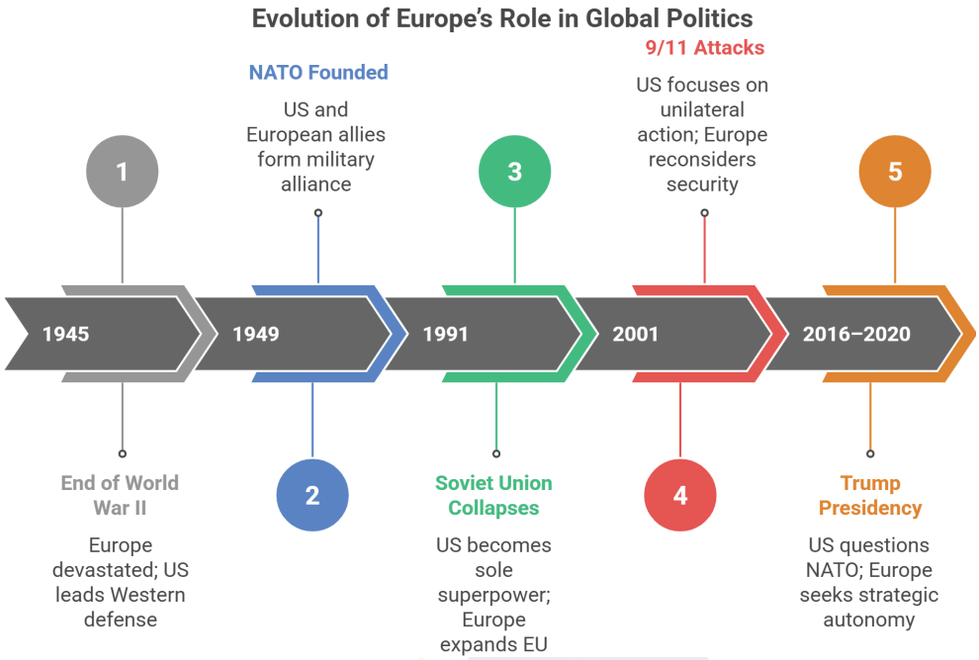
**Historical Contest:** Traditionally, "the West" meant transatlantic cohesion under U.S. leadership, built through NATO, Bretton Woods institutions, and liberal internationalism. However, by 2025, political populism in the U.S., strategic autonomy in Europe, and differing approaches to China, Russia, trade, and technology have reshaped this unity.

**Is this decline of the West?**:

**Multipolar West** is not Western decline but a "re-arrangement within"—a transition from an American-led order to a plural Western constellation, where power and agency are more distributed among its members. This transformation reflects a more plural, self-reliant, and competitive Western world order.

## Evolution of Europe's Role in Global Politics

- **After World War II (The Atlantic Order):**
  - When World War II ended in 1945, Europe was badly damaged - both economically and militarily.
  - The **United States took the lead** in protecting Western countries through NATO (North Atlantic Treaty Organization).
  - Europe became a **junior partner** to the US in fighting against Soviet communism during the Cold War.
  - In this period, the term **"the West"** mainly meant **America and its European allies** working together.
- **After the Cold War (Unipolar World and Western Expansion):**
  - **Spread of Capitalism:** When the Soviet Union collapsed in 1991, the US became the only global superpower - this was called the "unipolar moment." Liberal democracy and capitalism spread widely, and even Russia tried to join Western groups like the **G7**.
  - **Europe turned its attention inward:** it **expanded the European Union**, built a **common market**, and strengthened its **welfare systems**.
  - However, it didn't try to build an **independent military or foreign policy**, relying instead on the **US for security**.
- **The 21st Century (Disruption and Reassertion)**
  - **Rise of China:** The world began changing again with the rise of **China** as a major power, **Russia** became assertive again.
  - **Unilateral action of USA:** The **US**, especially after the 9/11 attacks, acted more on its own (e.g., in Iraq and Afghanistan).
    - » Under **Donald Trump (2016–2020)**, the US questioned NATO and pushed Europe to spend more on its own defence.
    - » This made Europe realise that **depending entirely on the US was risky**.
- As a result, Europe started talking about building its own **"strategic autonomy"** - the idea of a **"Europe that protects itself."**




## The Rise of a Multipolar West

- **America First and Internal Fissures**
  - Donald Trump's second term (2024-) has accelerated Western diversification. His "America First" nationalism questions collective defence, multilateralism, and trade liberalisation—hallmarks of post-war Western unity.
- **Divergence within the Western Alliance:**
  - **Differences on Russia** (energy security, sanctions), **China** (trade and technology), and **climate policy** have exposed Western fault lines.
  - US's unpredictable domestic politics and isolationist trends have pushed Europe to seek greater strategic autonomy.
- **Europe's Strategic Awakening:** EU's aspiration for self-reliance in defence, energy, and technology has reduced dependency on Washington.
  - European leaders such as **Emmanuel Macron** and **Olaf Scholz** now push for **strategic sovereignty**: building autonomous defence industries, energy independence, and technological capacity, a **Zeitenwende** (turning point) in foreign policy.
  - EU's 2025 State of the Union address by Ursula von der Leyen declared Europe's need to "stand on its own feet - economically, technologically, and militarily."
  - Europe's policies—**Global Gateway connectivity**, **Green Deal Industrial Plan**, and partnerships with India, ASEAN, and Africa—reflect a bid to act globally rather than as a U.S. adjunct.
  - Europe is enhancing its **defence spending**, developing **independent digital infrastructure**, and pursuing **energy diversification** post the Ukraine crisis.
- **Global South and Systemic Shifts:** The rise of the **Global South**, including India, Brazil, and ASEAN, also contributes indirectly. As the West adjusts to its declining monopoly, Western states now compete—and sometimes collaborate—individually to engage rising powers. This external rebalancing reinforces the internal differentiation of the West itself.

### Significance of a Multipolar West

- **Redefinition of Power Balances:** The West's pluralisation allows middle powers like India, Japan and South Korea to engage with multiple Western actors on different issues.
- **Autonomous Europe:** The emergence of a self-reliant Europe enhances global multipolarity and reduces the dominance of any single superpower.
- **Diversification of Global Partnerships:** Multiple Western centres - the US, EU, UK - create new opportunities for economic and technological collaboration for developing powers.
- **Strategic Hedge Against US Unpredictability**: Europe's rise provides a counterbalance in case of shifts in American foreign policy priorities.

## Opportunities for India

- **Diversified Partnerships:** A fragmented West gives India multiple strategic entry points. Rather than engaging a single transatlantic bloc, India can pursue parallel partnerships—defence and technology with France, digital and education with the UK, and green transition cooperation with the EU and Nordic nations.
- **Strategic Autonomy Synergy:** Europe's quest for strategic autonomy mirrors India's own long-standing emphasis on sovereign decision-making.
  - E.g. Collaborating on connectivity (Global Gateway and India-Middle East-Europe Corridor), renewable energy, and Indo-Pacific security allows India to become a partner of choice for an autonomous Europe. It enhances India's maritime and continental connectivity to Central Asia and Europe.
- **Trade and Technology Cooperation:** India's ongoing trade negotiations with the EU, EFTA, and the UK—and its

participation in digital public infrastructure collaborations—reflect this opportunity.
  - E.g. As European firms seek alternatives to China, India's market size, talent pool, and democratic stability make it a natural partner for supply-chain diversification.
- **Strategic Balancing Between U.S., EU, and Russia:** A plural West reduces pressure on India to "choose sides." New Delhi can sustain defence cooperation with Russia while deepening technology and energy ties with the U.S. and Europe—preserving strategic flexibility without ideological constraints.
- **Technology and Innovation Partnerships:** Europe's strengths in green technology, digital public infrastructure, and manufacturing complement India's growth needs.
- **Connectivity and Logistics:** Cooperation under **Global Gateway** and **IMEC** enhances India's maritime and continental connectivity to Central Asia and Europe.
- **Leadership in the Global South:** Europe's outreach to the Indo-Pacific positions India as a bridge between the Global South and the developed West, amplifying India's diplomatic influence.

**Challenges for India**

| Challenge | Description | Impact on India |
|---|---|---|
| Fragmentation vs Leadership Vacuum | Plural West weakens collective responses. | Stability benefits India, not paralysis. |
| Policy Volatility in the U.S. | Unpredictable foreign policy disrupts partnerships. | Disrupts defence and technology partnerships. |
| European Divisions | North-South economic and East-West security splits | Slows joint projects with India. |
| Institutional Inertia at Home | Bureaucratic slowness and reform lag. | Prevents leveraging new openings. |

**India's Renewed Engagement with Europe**

- **Recalibrated Focus:**
  - After years of focusing primarily on the US and Indo-Pacific, India is now engaging Europe as a **strategic and economic partner**.
  - Europe's Indo-Pacific strategies increasingly identify **India as a pivotal power**.
- **Key Institutional Developments:**
  - **India-EU FTA Talks (restarted 2022):** Aims to expand trade, investment, and technology cooperation.
  - **India-EFTA Agreement (2025): India and EFTA signed the Trade and Economic Partnership Agreement (TEPA)** on 10 March 2024; it took effect on 1 October 2025, marking India's first FTA with four developed European nations (Switzerland, Norway, Iceland, and Liechtenstein)
  - **India-France, India-Germany Strategic Partnerships:** Cover defence co-production, AI, space, and green energy.
  - **Global Gateway Initiative:** EU's connectivity vision aligns with India's **IMEC (India–Middle East–Europe Corridor)** and **Chabahar–INSTC projects**.
- **Defence and Security Cooperation:**
  - Collaboration in maritime security, cybersecurity, and defence production is growing.
  - European defence companies are exploring **joint ventures under Make in India**.
  - India and France, in particular, are expanding cooperation in Indo-Pacific naval presence.

## Way Forward

- **Institutionalise India–Europe Engagement:** Establish a Comprehensive India–Europe Strategic Council to synchronise economic, defence, and climate initiatives.
- **Strengthen Defence Cooperation with Europe:** Build on partnerships with France, Germany, and Italy for joint production, cyber defence, and maritime surveillance. Engage with emerging European defence structures (PESCO, EDF) for technology access.
- **Deepen Maritime Cooperation:** Strengthen coordination in the **Indian Ocean and Indo-Pacific**, leveraging Europe's renewed naval presence.
- **Promote Technology Partnerships:** Focus on joint research in AI, green hydrogen, cybersecurity, and space technologies.
- **Balance Global Relationships:** Maintain strategic autonomy - engage Europe pragmatically without alienating the US or Russia.
  - E.g. Establish a **Western Coordination Desk** within MEA to synchronise diplomacy with EU, UK, and U.S. separately.
- **Use G20 and Voice of Global South:** Advocate reforms in global institutions (IMF, WTO, UNSC) using Europe's reform mood and the U.S.'s reduced moral authority.
- **Accelerate Domestic Reforms:** Improve ease of doing business, digital governance, and regulatory frameworks to attract European investment.

# The New Diplomacy of Mediation

*Syllabus Mapping: GS-2 Global Politics*

## Context

Amid violent clashes between Pakistan and Afghanistan, ceasefire talks were brokered not by Washington or the UN but by Middle Eastern states - marking a historic shift in conflict mediation from Western-led venues like Geneva and Oslo to a new diplomatic axis in the Middle East and Asia.

## The Changing Landscape of Global Mediation

- **From the West to the Rest:** For much of the 20th century, the geography of peace talks was fixed:
  - **Geneva Accords (1988)** – Soviet withdrawal from Afghanistan.
  - **Oslo Accords (1993)** – Israel–PLO peace framework signed in Washington.
  - **Dayton Agreement (1995)** – Bosnian peace deal negotiated under US leadership.
- Today, however, diplomacy has shifted eastward - to Doha, Riyadh, Abu Dhabi, and Ankara.

- E.g **Pak–Afghan ceasefire talks** in Doha (Qatar), attended by Turkish officials.
- **Gaza ceasefire deal** brokered with help from Egypt, Qatar, and Turkey.
- **Russia–Ukraine negotiations** involving Turkey, Saudi Arabia, and the UAE

## Decline of Traditional Institutions and Western Dominance

- **The Waning Role of the United Nations:** UN was once central to global peacebuilding - from Korea (1953) to Namibia (1990). Today, it is absent from most modern crises, whether Ukraine, Gaza, or Afghanistan. Following are the **Reasons:**
  - **Great Power paralysis**: UN Security Council is gridlocked by US–Russia–China veto politics.
  - **Loss of legitimacy:** Perception that UN actions reflect Western priorities, not global equity.
  - **Erosion of funding and influence**: Regional and bilateral initiatives now outpace UN mechanisms.
- **Decline of Western Leadership:**
  - US has shifted from a global guarantor to a transactional actor focused on domestic populism ("America First").
  - **Europe** is preoccupied with internal crises - migration, energy security, and economic stagnation.
- **Rise of Multipolar Order:** The 21st-century world is **polycentric** - with multiple actors capable of influencing outcomes. Middle powers and regional states are filling gaps left by declining Western consensus.

## The New Mediators and Their Strategies

**(A) Turkey: Strategic Activism and Regional Balancing**

- Strategically located between Europe, Asia, and the Middle East, Turkey has institutionalised mediation within its Foreign Ministry and intelligence agencies (MIT).
  - **For example, in Russia–Ukraine War (2022–2024) It** Brokered the **Black Sea Grain Deal**, facilitated **POW exchanges** between Moscow and Kyiv and hosted **Istanbul ceasefire talks (2022)**.
- President Recep Tayyip Erdoğan uses mediation as a means to reassert Turkey's leadership in the Islamic world.
- **Nature:** Not neutral - NATO member, yet maintains cooperation with Russia - giving it unique leverage.

**(B) Qatar: Small-State Diplomacy:** It is known for **"small-state mega-politics.:** Uses wealth and links with groups like Hamas and the Taliban to act as a mediator.

- Backed by **Qatar Fund for Development**, projecting influence through wealth.
- **Mediation style:** Non-neutral but trusted - transactional, faith-based, and well-networked.

**(C) Saudi Arabia:** Under Crown Prince Mohammed bin Salman, Riyadh uses peace diplomacy to reshape its global image.

- **E.g. Jeddah Summit (2023)** on Ukraine and **US–Russia meeting (2025)** reflect its convening power. Similarly efforts in **Yemen and Sudan** underscore its ambition to lead the Arab world diplomatically.

**(D) United Arab Emirates: Silent Facilitator:** The UAE practices **quiet, effective mediation**, facilitating **Russia–Ukraine prisoner swaps**, **Armenia–Azerbaijan talks**, and even the **India–Pakistan ceasefire (2021)**. It converts **economic strength into diplomatic clout**, enhancing its reputation as a trusted mediator.

**(E) China:** Once reluctant to mediate, China now integrates "peace diplomacy" into great-power strategy.

- **Landmark Moves:**
  - **Saudi–Iran détente (2023)** – landmark deal in Beijing.
  - Engagements in **Yemen, Afghanistan, Ukraine, Gaza**, and **Myanmar**.
- Created the International Organisation for Mediation (IOM) in Hong Kong - offering Global South nations an alternative to Western-led frameworks.
- Uses mediation to project an image of responsible leadership, consistent with its Global Security Initiative.

## Why This Shift Matters

- **Redefinition of Power:**
  - Mediation is now **a symbol of state capacity and influence**, not just goodwill.
  - The ability to convene warring sides reflects **global credibility** and **regional leverage**.
- **Multipolar Diplomacy in Action:** The shift represents the regionalisation of conflict management, decentralising global governance. Countries in Asia and the Middle East are shaping their own security architectures.
- **Decline of the Western Monopoly:** Demonstrates a loss of moral and political monopoly once enjoyed by US and EU.
- **Opportunity for the Global South:** The rise of new mediators from Asia and the Arab world creates space for Southern-led diplomacy - more inclusive, regionally grounded, and context-sensitive.
- **Soft power and visibility:** Mediation boosts a nation's global image and bargaining power. Thus Mediation is becoming a new currency of geopolitical relevance.

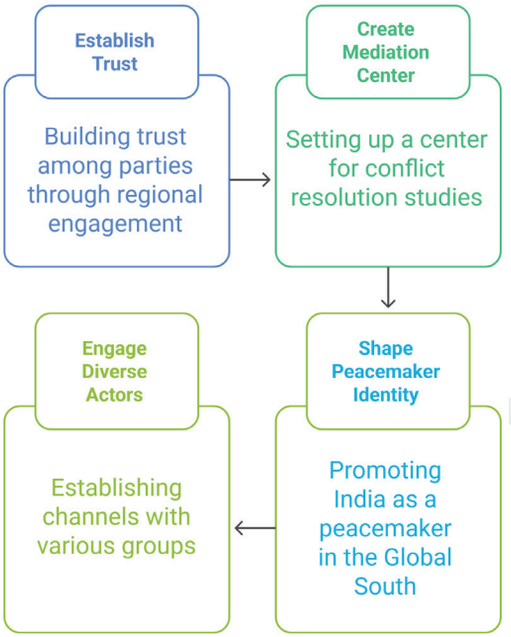
## India's Role and Opportunities

### India's Historical Legacy of Peace Diplomacy

- **Korean War (1950s):** During the Korean War armistice (1953–54), India chaired the **Neutral Nations Repatriation Commission (NNRC)**, liaised with the US, China and the USSR, and supervised POW repatriation.
- **Austria–Soviet Mediation (1955):** India played a pivotal role in persuading Austria to adopt a policy of neutrality, which facilitated the withdrawal of Soviet troops from its territory
- **Vietnam Peace Efforts (1950s–60s):** India **chaired** the International Commission for Supervision and Control (ICSC) in Vietnam in the 1950s–60s. Thus, India played a constructive role in monitoring ceasefire arrangements and maintaining stability, reinforcing its commitment to multilateral peacekeeping.
- Sri Lanka (1987): India–Sri Lanka Accord & IPKF deployment.
- Maldives (1988): Operation Cactus restored democracy.
- Nepal (2006): Supported peace process ending monarchy.

- Domestically, India's **success in integrating insurgencies** (Mizoram Accord, Bodo peace deals) provides a unique template for conflict resolution.

### Preconditions for Effective Indian Mediation




## India's Traditional Reluctance to External Mediation

- India firmly rejects **third-party mediation** on bilateral disputes, particularly **Kashmir**.
- Rooted in the **Simla Agreement (1972)** and concerns over sovereignty.
- However, India recognises that **peacemaking ≠ mediation** - it can facilitate peace globally without compromising national policy.

## Opportunities for India in the New Mediation Order

- **Global South Leadership:** Position as a voice of developing countries in peacebuilding - alternative to Western or Chinese models.
- **Regional Stabiliser:** Engage proactively in South Asian crises (Maldives, Myanmar, Afghanistan).
- **Experience-Driven Capability:** India's democratic conflict management offers lessons for plural, post-conflict societies.
- **Strategic Leverage:** Mediation can enhance India's stature vis-à-vis China in the Indo-Pacific.
- **Multilateral Advantage:** Use platforms like **BRICS, SCO, and G20** to institutionalise "Southern Mediation Mechanisms."

# India–Australia Defence Cooperation

*Syllabus Mapping: GS-2 Bilateral Relations*

## Context

The inaugural **India-Australia Defence Ministers' Dialogue** recently held in Canberra, marked a historic deepening of bilateral defence cooperation.

### Evolution of the India-Australia Defence Relationship

- **Strategic Convergence (2000s–2015):** Shared concerns over China and commitment to a rules-based Indo-Pacific led to closer ties through forums like the **Quad**.
- **Operational Deepening (2015–2023):** Joint exercises (Malabar, Austrahind, Talisman Sabre) and progress in logistics, information sharing, and air refuelling enhanced **military interoperability**.
- **Industrial & Logistical Convergence (2024–present):** The focus now is on **joint production, supply-chain security, and maintenance cooperation**, marking a shift to a long-term, capability-driven partnership.

## Key Outcomes of the 2025 Dialogue

**Major Agreements Signed**

- **Agreement on Information Sharing:** Enables secure exchange of intelligence and operational data, particularly in the maritime and air domains.
- **MoU on Mutual Submarine Rescue Support and Cooperation:** Establishes standard operating procedures for joint submarine rescue operations - enhancing underwater safety and interoperability.
- **Terms of Reference for Joint Staff Talks:** Creates a permanent mechanism for coordinating joint exercises, operations, and interoperability across the Army, Navy, and Air Force.

**Strengthening the Bilateral Defence Architecture**

- Ministers agreed to **institutionalise an annual Defence Ministers' Dialogue**, ensuring policy continuity.
- The **2024 Air-to-Air Refuelling Agreement** was operationalised through a live demonstration involving a **KC-30A tanker refuelling an F-35**, underscoring growing air force interoperability.
- The **Mutual Logistics Support Arrangement (MLSA)** is being implemented to enable reciprocal access to ports, repair facilities, and supplies.
- The establishment of **Joint Staff Talks** marks a new phase of **routine, multi-domain cooperation** between armed forces.

### Drivers of the Growing India-Australia Defence Partnership

- **Strategic Reasons:** The changing power situation in the Indo-Pacific and China's aggressive actions have encouraged India and Australia to work more closely on defence and regional security.
- **Convergence on Indo-Pacific Region:** Australia is a key part of the US and Western Security matrix. Australia has been opposed to China's design in the oceania and south-china sea region. Both countries have joined the QUAD grouping aiming to ensure order and freedom of navigation in the Indo-Pacific.
- **Practical Needs:** Both countries want to become more self-reliant in handling security challenges and not depend too much on any one partner.
- **Industrial Partnership:** India offers affordable defence production, while Australia brings advanced technology — together they form a strong and balanced defence industry team.
- **Geographical Advantage:** India's position in the **Indian Ocean** and Australia's in the **Pacific Ocean** make them natural partners for keeping the Indo-Pacific region safe and stable.
- **Reliable Middle Power Alliance:** In an uncertain global security environment, Australia offers a dependable alternative to over-reliance on the U.S.

## Challenges in India-Australia Defence partnership:

- **Ambiguity in defence relations:** There is an ambiguity in defence and strategic side among both sides.
  - While India aims to gain from closer defence and strategic ties with Australia, India does not want to become a treaty or alliance partner with it. Also, while India wants to counter China, it also wants to engage China by joining forums like SCO, BRICS, AIIB etc.
  - Western countries are also not comfortable in sharing critical defence and intelligence with India. Despite being a QUAD partner, India was not made a party to the AUKUS i.e. not given access to strategic nuclear submarines by the USA, UK & Australia.
  - Also, despite India's interests in joining Five Eyes Alliance, India has not been made a part of it.
- **Defence exercises are in silos:** There is lack of comprehensive defence exercises due to lack of unified approach in the defence forces.
  - E.g. There is increased cooperation in Navy-to Navy but service barriers exist. Air force and army cooperation remains minimal, with little to no joint training or strategic dialogue in these domains.
- There is a lack of cooperation in the maintenance , repair and overhaul(MRO) of naval and Patrol vessels that shows **lack of joint intentions and capabilities.**
- **Weak industrial collaboration: No major defence co-development or co-production projects** exist between the two.
  - Limited presence of Australian defence companies in the Indian market and vice versa.
  - Australia's defence export controls, tied closely to US and NATO-aligned frameworks, can complicate **technology transfer**.
- **Asymmetric Strategic Priorities:** Australia is more focused on the Pacific theatre and China's expansion in Southeast Asia, while India's primary concerns lie in the Indian Ocean and continental threats from Pakistan and China
- **Underdeveloped Maritime Domain Awareness (MDA) Coordination:** Australia is part of **US-led intelligence sharing arrangements (Five Eyes)**; India is not—this limits **real-time intelligence coordination**.

## Way Forward

- **Operationalisation of Agreements:** Swift implementation of the submarine rescue and logistics arrangements is essential.
- **Align MSME Ecosystems:** Facilitate defence startup collaborations and tech-sharing through an India-Australia MSME defence corridor or a model like INDUS X. E.g. Promote **co-development of niche technologies** (e.g., drones, AI, surveillance systems).
- **Deepening Intelligence Sharing:** Secure communication channels for real-time data exchange are critical for maritime domain awareness. **E.g. Information Sharing**: Expand real-time collaboration through initiatives like India's **Information Fusion Centre–Indian Ocean Region (IFC-IOR)** and Australia's **Pacific Fusion Centre**.
- **Upgrade Defence Representation in Canberra:** Elevate India's Defence Adviser post to a one-star rank and deploy dedicated Army and Air Force assistants.
  - A higher-ranking officer can directly engage with **senior Australian defence officials.**
  - Dedicated **Army and Air Force assistants** would allow **all three Indian services (Army, Navy, Air Force)** to be represented in Australia.
  - **Faster decisions, better inter-service integration**, and smoother logistics during military exercises, HADR operations etc
- **Linking with Quad Framework:** Align bilateral cooperation with broader Quad initiatives in technology, supply chain resilience, and maritime security.
- **Capacity Building in the IOR:** Joint training and assistance to smaller Indo-Pacific states would enhance regional goodwill and stability.

# Curbing Cyber Frauds in Digital India

*Syllabus Mapping: GS-3 Cyber Security*

## Context

India's rapid digital expansion through initiatives like Digital India, mobile penetration, and UPI has transformed governance and commerce but it has also widened the attack surface, leading to a sharp rise in cyber frauds that threaten financial security, public trust, and national safety.

### Current Stats

- **Internet Penetration:** Over 86% of households connected to the internet; 970 million internet users and 1.2 billion mobile subscribers.
- **Cybersecurity Incidents:** Increased from 10.29 lakh in 2022 to 22.68 lakh in 2024 (CERT-In data).
- **Financial Impact:** Cyber frauds worth **₹36.45 lakh** reported on the National Cyber Crime Reporting Portal (NCRP) as of February 2025.
- **Budgetary Support:** ₹782 crore allocated for cybersecurity projects in Union Budget 2025–26.
- **SIM & Device Blocking:** 9.42 lakh SIM cards and 2,63,348 IMEIs linked to cyber fraud blocked.
- **Helpline 1930:** Dedicated 24×7 national helpline for cyber fraud victims.
- **Financial Recovery:** Over ₹5,489 crore saved through Citizen Financial Cyber Fraud Reporting & Management System (CFCFRMS) from 17.82 lakh complaints.

## Understanding Cyber Frauds and Emerging Threats

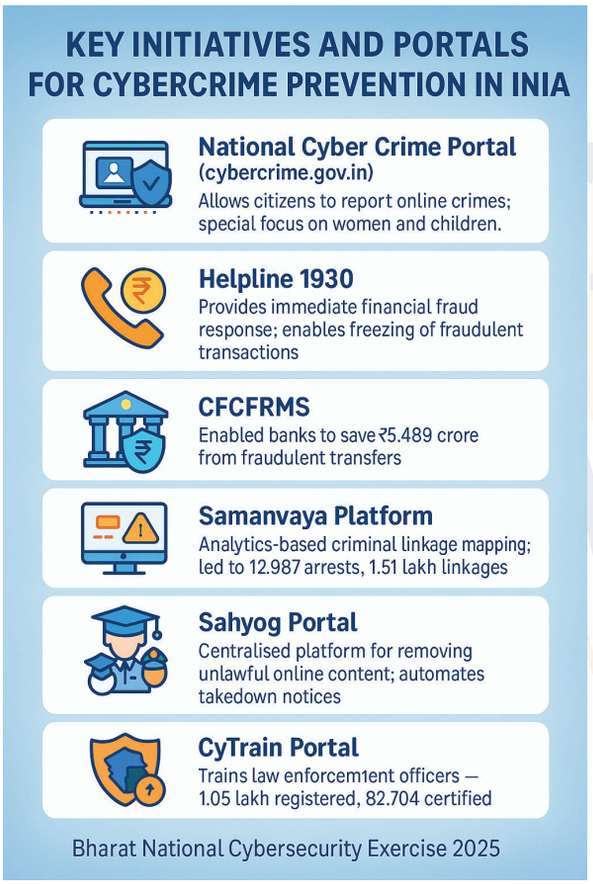
### What are Cyber Frauds?

Cyber frauds involve **deceptive digital practices** aimed at financial loss, data theft, or identity misuse. They exploit vulnerabilities in networks, human behavior, and digital ecosystems.

### Emerging Types of Cyber Threats

- **Phishing and Spoofing:** Fraudsters impersonate legitimate entities (banks, government portals) to steal credentials.
- **Deepfakes and AI Manipulation:** AI-generated videos or voices used for blackmail, misinformation, or fraudulent transactions.

- **UPI and Payment Frauds:** Scams using compromised mobile numbers and fake payment links; addressed through **DoT's Financial Fraud Risk Indicator (FRI)** system.
- **Online Gaming and Betting Scams:**
  - Illegal betting apps lure users with fake returns; over **₹400 crore** generated in criminal proceeds.
  - The **Promotion and Regulation of Online Gaming Bill, 2025** bans money gaming and advertisements.
- **Ransomware and Malware Attacks:** Target businesses, hospitals, and government servers, demanding payments to restore access.
- **Social Engineering and OTP Theft:** Manipulation of users into revealing sensitive information or authorizing fraudulent transactions.




## Legal and Regulatory Framework

- **Information Technology Act, 2000:**
  - Foundation of India's cyber law.
  - Defines offences like identity theft, impersonation, cheating via computer resources.
  - Empowers authorities to block malicious sites and prosecute cybercriminals.
- **IT (Intermediary Guidelines & Digital Media Ethics Code) Rules, 2021:**
  - Imposes **accountability on intermediaries** like social media and digital platforms.
  - Mandates removal of unlawful content and prompt cooperation with law enforcement.
- **Digital Personal Data Protection Act, 2023:**
  - Regulates **lawful processing and protection of personal data**.
  - Strengthens users' consent-based rights and mandates strong security safeguards.
- **Promotion & Regulation of Online Gaming Bill, 2025:** Encourages e-sports and social games but bans online money gaming and related advertising or payments.

## Institutional Mechanisms for Cybersecurity

- **CERT-In (Indian Computer Emergency Response Team):** Nodal agency for cybersecurity incident response, Issues threat advisories, conducts mock drills (109 drills engaging 1,438 organisations).
- **NCIIPC (National Critical Information Infrastructure Protection Centre):** Protects critical infrastructure in **banking, telecom, power, transport** sectors.
- **I4C (Indian Cybercrime Coordination Centre) – Ministry of Home Affairs:** Coordinates cybercrime investigations across states. Develops analytical tools, supports training, and information sharing.
- **NCCC (National Cyber Coordination Centre):** Generates real-time situational awareness of cyber threats.
- **CCMP (Cyber Crisis Management Plan):** Framework for coordinated national recovery during cyber crises.

## Challenges That Still Persist

- **Rising Scale and Sophistication:**
  - AI, deepfakes, and cross-border fraud factories increase detection difficulty.
  - Cybercrime syndicates operate transnationally, evading Indian jurisdiction.
- **Limited Cyber Literacy:** Many citizens lack awareness of safe digital practices, making them easy targets.
- **Fragmented Institutional Coordination:** Overlaps between agencies (CERT-In, NCIIPC, I4C, State police) sometimes slow response.
- **Capacity Gaps in States:** Uneven digital forensics and investigation skills across state police forces.
- **Technological Dependence:** Reliance on imported cybersecurity solutions limits sovereignty and innovation.
- **International Cooperation:** Inadequate data-sharing agreements hamper pursuit of cybercriminals abroad.

## Way Forward

- **Integrated Cybersecurity Governance:** Establish a **National Cybersecurity Coordination Council** for seamless collaboration among CERT-In, I4C, NCIIPC, RBI, SEBI, and telecom regulators.
- **Boost Cyber Awareness:** Launch nationwide **"Cyber Suraksha Jan Andolan"** - awareness campaigns through schools, banks, and digital literacy missions.
- **Capacity Building:** Expand CyTrain and CCPWC models; train district-level investigators and judicial officers.
- **Promote Indigenous R&D:** Encourage startups and academia under NM-ICPS to develop home-grown encryption, AI-based fraud detection, and forensic tools.

- **International Cooperation:** Strengthen cyber diplomacy through **Bilateral Cybersecurity Agreements** with ASEAN, EU, and QUAD partners for intelligence and data sharing.
- **Financial Sector Vigilance:** Enforce **FRI (Fraud Risk Indicator)** and tighter KYC norms for UPI, e-wallets, and fintech platforms.

**Case Study: Telangana – India's Cybersecurity Pioneer**

- Telangana has built one of India's strongest state-level cybercrime frameworks.
- **Cyberabad Security Council (SCSC):** Public–private partnership with IT industry for awareness and coordination.
- **Dedicated Cybercrime Police Stations & Labs** across all districts; advanced data analytics via **T-COP platform**.
- **Citizen initiatives:** "Cyber Mitra" volunteers and helpline 1930 for rapid response.
- **Impact:** Over 12,000 fraud cases resolved (2022–24); 25–30% recovery rate of defrauded funds.
- The model shows how **tech + training + awareness** can make digital governance secure.

## The Changing Battlefield and the Indian Armed Forces

*Syllabus Mapping: GS-3, Armed Forces*

### Context

Modern warfare has expanded beyond land, sea, and air to cyber, space, and information domains, with AI, drones, and automation reshaping the cost and risks of conflict. Facing a potential two-front challenge from China and Pakistan, India must adapt its armed forces to stay operationally credible.

### Changing Nature of Battlefields

- **Technology-driven conflict:** AI-enabled surveillance, autonomous drones, and precision weapons lower the cost of deploying force but raise risks of rapid escalation.
- **Multi-domain operations:** Future wars will begin simultaneously across land, sea, air, cyber, and space, with information warfare shaping narratives.
- **Speed and information dominance:** Decision-making cycles are shortening; whoever can process and act on data faster gains the upper hand.
- **Hybrid warriors:** Future soldiers must combine technical expertise (coding, data analysis) with combat skills to counter cyber, electronic, and narrative threats.
- **Cheaper lethality:** Loitering munitions and low-cost drones mean even small adversaries can inflict significant damage.
- **Fluid frontlines:** Modular, fast-reacting battle groups are replacing large, rigid formations.

### How India is Responding

**Structural and Organisational Reforms**

- **Tri-service integration:** Creation of agencies for cyber, space, and special operations under HQ IDS.
- **Towards theatre commands:** PM Modi has emphasised moving from service silos to integrated commands; review of inter-services command and control rules (2025).
- **New modular formations:** Integrated Battle Groups (IBGs) such as **Rudra** and **Bhairav** combine infantry, artillery, armour, engineers, and surveillance elements for rapid deployment.
- **Amphibious doctrine:** New joint doctrine for amphibious operations integrates maritime, air, and land forces.

**Doctrinal and Conceptual Evolution**

- **Joint Doctrine of Armed Forces (2017) and Land Warfare Doctrine (2018)** provide the basis for synergy.
- **Ran Samvad (2025)** focused on preparing "hybrid warriors" and future-ready doctrines.

**Technological Adaptation**

- **Procurement focus:** MQ-9B drones for ISR and precision strike; Rafale-M to strengthen carrier aviation; Pralay ballistic missile trials for theatre fires.
- **AI-enabled systems:** Akashteer command-and-control network integrated with Air Force's IACCS for seamless air defence.
- **Carrier-centred naval posture:** Rafale-M integration and a 15-year roadmap for naval aviation, subsurface, and unmanned systems.

**Professional Military Education (PME)**

- Joint PME initiatives to train cadres in joint operations and technology-based warfare.

### Gaps That Still Exist

- **Slow pace of integration:** Theatre commands not yet operationalised; jointness remains partial.
- **Unproven joint doctrines:** New formations like IBGs remain largely conceptual, without extensive field validation.
- **Technological asymmetry:** India lags behind adversaries like China in AI-enabled warfare, drone swarms, and electronic warfare.
- **Civil-military fusion gaps:** Weak collaboration between armed forces, DRDO, private industry, and academia in rapid prototyping and innovation.
- **Data interoperability issues:** Lack of common standards and secure interfaces across services.
- **Logistical challenges:** Infrastructure for rapid mobilisation, integration of supply chains, and joint logistics remain underdeveloped.

### Way Forward

- **Accelerate Theatrisation:** Establish integrated theatre commands in a phased manner with evolving mandates; test and adapt based on outcomes.
- **Civil-Military Fusion:** Embed DRDO, industry, universities, and startups into war-gaming, PME, and trials for rapid innovation.
- **Enhance PME:** Train "technologist-commanders" with expertise in AI, cyber, coding, and information warfare.
- **Data and Interface Standards:** Develop common digital systems for real-time interoperability across the Army, Navy, and Air Force.
- **Invest in Next-gen Tech:** Prioritise drone swarms, hypersonics, directed energy weapons, and space-based ISR in procurement and R&D.

- **Test, Fail, Adapt:** Encourage rapid prototyping and iterative field trials; adopt systems that work, retire outdated ones quickly.
- **Strengthen Industrial Base:** Link defence PSUs and private firms into a feedback loop of manufacturing, testing, and deployment.

# Topics for Prelims (International Relations)

## Mutual Legal Assistance Treaty (MLAT)

### Context

Centre has formally invoked the Mutual Legal Assistance Treaty (MLAT) with Singapore for the investigation into the death of singer Zubeen Garg.

### About MLAT

- A **bilateral agreement** between two or more countries for **exchange of information and evidence** in **criminal investigations and proceedings**.
- Enables countries to **seek and provide assistance** in investigating, prosecuting and preventing crimes, including gathering evidence, serving summons/warrants, tracing assets, and extradition-related cooperation.
- **Key Features:**
  - **Scope**: Covers offences such as terrorism, organized crime, drug trafficking, money laundering, cybercrime, corruption, and other serious crimes.
  - **Forms of Assistance**:
    - » Identifying and locating persons.
    - » Serving legal documents.
    - » Obtaining witness statements/testimony.
    - » Executing search and seizure.
    - » Freezing, confiscating, and repatriating proceeds of crime.
    - » Sharing certified documents/evidence.

### In Indian Context

**Ministry of Home Affairs (MHA)** is the nodal authority for handling MLAT requests.


- India has signed MLATs with several countries including **Singapore, USA, UK, France, Russia, UAE, etc.**
- **Chapter VIII (Sections 108–111)** provides the framework for international cooperation:
  - **Section 108** → Sending a letter of request to a foreign country for evidence / assistance.
  - **Section 109** → Acting on a letter of request received from a foreign country.
  - **Section 110** → Service of summons and judicial documents abroad.
  - **Section 111** → Examination of witnesses / collection of evidence in a foreign country.

## New START Treaty

### Context

Russia has offered to voluntarily maintain limits on deployed strategic nuclear weapons under the New START Treaty.

### What is the New START Treaty?

- The **New Strategic Arms Reduction Treaty (New START)** was **signed in 2010** by then U.S. President **Barack Obama** and Russian President **Dmitry Medvedev** in **Prague**, and **came into force in 2011**.
- It limits both nations to **1,550 deployed strategic nuclear warheads** and **700 deployed launchers** (missiles, bombers, submarines).
- It also includes **verification and inspection mechanisms** to ensure compliance.
- **Duration:** 10 years (until 2021), extendable by five years.
- The treaty was **extended for five years in 2021**, making it valid **until February 5, 2026**.
- **Post-Ukraine War:** In February 2023, amid escalating tensions over the Ukraine war, Russia suspended its participation in New START claiming that U.S. hostility and sanctions made "business-as-usual" arms inspections impossible.

### Why Does It Matter?

- The **U.S. and Russia together possess about 87% of the world's nuclear weapons** — around **5,177 (U.S.)** and **5,459 (Russia)**, according to the Federation of American Scientists.
- Arms control treaties like START are crucial to **prevent a nuclear arms race** similar to that during the **Cold War** and to **maintain global strategic stability**.
- Without the treaty, both nations could expand their nuclear forces unchecked, escalating global tensions.

## Pasni Port

### Context

Pakistan has reportedly offered the US to build a port at Pasni which will give Washington potential maritime access close to Iran's border and reduce Pakistan's dependence on China's Belt and Road Initiative (BRI)

### About Pasni Port

- It is a small deep-water harbour in Balochistan's Gwadar district.
- **Location:** located around **70 miles east of Gwadar** and **100 miles from the Iran border**, is being pitched as a **strategic mineral export terminal**.
- Equipped with a fish harbour, cargo jetty, and a Pakistan Maritime Security Agency (PMSA) base.


### About the Proposal

- The proposed facility would be connected to a **new railway line** linking mineral-rich areas of Pakistan, including **Reko Diq**, where **copper, antimony, and rare earth elements** are found.
- Estimated cost: **USD 1.2 billion**, financed through a mix of **Pakistani federal funds** and **US-backed development finance**.
- The idea was reportedly floated ahead of **Pakistan Army Chief Field Marshal Asim Munir's meeting with President Donald Trump** at the White House.

### Implications

- **Reshaping the Arabian Sea's Strategic Landscape:** Its proximity to India's Chabahar Port in Iran (approximately 300 km) and 70 miles east of China-backed Gwadar Port places it at the center of a **maritime triangle** involving **Chabahar (India–Iran), Gwadar (China–Pakistan), and Pasni (US–Pakistan)**.
- **Security and Strategic Concerns for India:**
  - For the United States, it offers a **potential foothold** near both China's Gwadar and Iran's Chabahar, enhancing its maritime influence in the region.
  - For India, it could **impact** maritime surveillance, logistical connectivity, and intelligence operations along the western seaboard.

### Strengthen US–Pakistan Mineral Collaboration

- In **September 2025**, **US Strategic Metals (USSM)** — a Missouri-based company — signed an **MoU** with **Pakistan's military engineering arm** to explore and refine **critical minerals**.
- Pakistan recently shipped a **first consignment of copper, antimony, and neodymium** (less than two tonnes) to the US under this cooperation.
- The **price of antimony** has surged after **China banned exports to the US**, increasing the mineral's strategic value.

### The Pasni proposal indicates Pakistan's attempt to:

- **Diversify foreign partnerships** beyond China.
- **Monetize its mineral resources** amid global competition for critical minerals.
- **Leverage strategic geography** between the **Persian Gulf and Indian Ocean** for political and economic gains.

## Codex Alimentarius Commission (CAC)

### Context

8th Session of the Codex Committee on Spices and Culinary Herbs (CCSCH) held under the aegis of CAC.

### About CAC

- **Established in:** 1963
- **By**: Food and Agriculture Organization (FAO), and World Health Organization (WHO)
- **Headquarters:** Rome, Italy
- **Purpose:** Develops **international food standards** to ensure **food safety, quality, and fair trade practices**.
  - CAC standards are referenced in **WTO's SPS (Sanitary and Phytosanitary) Agreement**.
- **Structure**
  - **Members:** 189 Members (188 countries + 1 member organization — the EU).
  - **Parent Organizations:** FAO and WHO jointly oversee the CAC.
  - **Main Components:**
    - » **Codex Alimentarius Commission** (decision-making body).
    - » **Codex Secretariat** (based at FAO headquarters).
    - » **Subsidiary Committees**, such as:
- Codex Committee on Food Hygiene
- Codex Committee on Pesticide Residues
- Codex Committee on Food Labelling
- Codex Committee on Contaminants in Food, etc.

## United Nations Human Rights Council (UNHRC)

### Context

India has been elected unopposed to the Human Rights Council for the 7th time for a three-year term (2026-28).

#### UN Human Rights Council

- **Establishment:** In 2006 by UN General Assembly resolution 60/251, replacing the UN Commission on Human Rights. It is an intergovernmental body within the UN system.
- The council works under the United Nations Office of the High Commissioner for Human Rights (OHCHR).
- **Membership:** The **UNHRC consists of 47 member states**, elected by the **United Nations General Assembly (UNGA)** for a three-year **term**.
- Seats are distributed based on regional representation:
  - **African Group** – 13 seats

  - **Asia-Pacific Group** – 13 seats
  - **Latin American & Caribbean Group** – 8 seats
  - **Western European & Others Group** – 7 seats
  - **Eastern European Group** – 6 seats
- **Election:**
  - Elected directly and individually by a majority of the 193 states of the UN General Assembly.
  - One-third of the members being renewed each year.
  - Elections take place every year, and a country **is not eligible for immediate re-election after serving two consecutive terms.**
- Earlier, India has been a member of UNHRC for **6 times.**
- **Responsibility:** promoting and protecting human rights through:
  - Serving as an international forum for dialogue on human rights issues
  - Holding Universal Periodic Review to access the Human Rights situation in member countries
  - It investigates **human rights violations**, including **genocide, war crimes, and racial discrimination**.
  - Appoints the Special Procedures, independent human rights experts
- HQs: based at the United Nations Office at Geneva.

## MERCOSUR

### Context

**India and Brazil have agreed** to **expand the existing Preferential Trade Agreement (PTA)** under the MERCOSUR framework, deepening trade ties.

#### What is MERCOSUR?

- **Founded: 1991**, through the **Treaty of Asunción**, and institutionalized by the **Protocol of Ouro Preto (1994)**.
- **Headquarters**: Montevideo, Uruguay.


- **Members:**
  - **Argentina, Brazil, Paraguay, Uruguay**, and **Bolivia** (joined officially in 2024).
    - » Venezuela has been suspended since 2016.
- **Objectives:**
  - **Free Trade Area:** Elimination of customs duties and trade barriers among member countries.
  - **Customs Union:** Adoption of a **Common External Tariff (CET)** for trade with non-member countries.
  - **Common Market Goal:** Long-term aim to ensure the **free movement of goods, services, capital, and people** across member nations.

### India's Engagement with MERCOSUR: Recent Developments

- India signed a Preferential Trade Agreement (PTA) with MERCOSUR in 2004 (came into effect June 1, 2009) covering around 450 tariff lines.
- **India–Brazil trade mission (2025)** — set a target of **USD 20 billion bilateral trade by 2030** and proposed expansion of the **India–Mercosur Preferential Trade Agreement (PTA)** to include new products and services.
- India views the expansion of the PTA as part of its strategic trade diversification (reducing over-dependence on China/ Europe) and strengthening South-South cooperation.

### Why the Expansion Matters: Strategic Significance for India

- **Trade Diversification & Market Access**
  - Latin America (via MERCOSUR) offers India access to large agricultural, mineral and manufactured goods markets, complementing India's export sectors (e.g., pharmaceuticals, engineering goods, textiles).
  - With a deeper pact, Indian firms can gain preferential tariffs and better access to MERCOSUR states.
- **Geopolitical & Diplomacy Benefits:**
  - Strengthening ties with Brazil and other MERCOSUR states enhances India's footprint in Latin America, aligning with its "Act West/Act Global" strategy.
  - Brazil is a key partner in multilateral fora (BRICS, IBSA, G20) — deeper economic linkages fortify overall strategic partnership.
- **Global Trade Context:** At a time when global supply-chains are being re-shaped (post-COVID, amid US-China trade tensions), India moving into Latin America offers diversification
- **Complementarity & Value Chain Opportunities:** MERCOSUR countries are rich in agricultural produce, minerals, and raw materials; India is strong in value-added manufacturing and services. There is a good fit for collaboration.

# United Nations Global Geospatial Information Management for Asia and the Pacific (UN-GGIM-AP)

## Context

India has been elected as Co-Chair of the Regional Committee of the UN-GGIM-AP for a three-year term till 2028.

### About UN-GGIM-AP

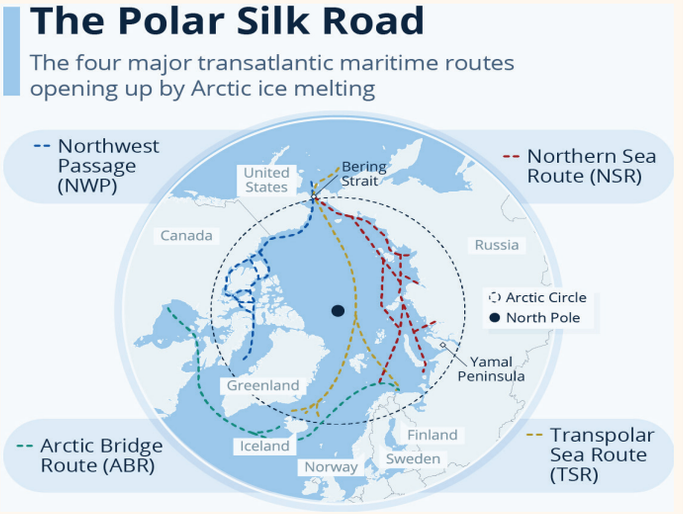
- It is one of the **five regional committees** of the global **UN-GGIM (United Nations Committee of Experts on Global Geospatial Information Management)**.
- It represents **56 countries and economies** in the Asia-Pacific region.
- The **secretariat** is housed under **UN-ESCAP** (United Nations Economic and Social Commission for Asia and the Pacific) for the Asia-Pacific region.
- **Mandate:**
  - **Promote geospatial information use** to address economic, social and environmental challenges in the Asia-Pacific region.
  - **Facilitate coordination** among national geospatial information authorities, share best practices, build capacity, develop standards and frameworks regionally.
  - **Align regional geospatial efforts with UN-GGIM global agenda**, such as the **Integrated Geospatial Information Framework (IGIF)**, geodetic reference frames, geospatial-statistical integration, land administration, etc.

### Polar Silk Route

**Context:** A Chinese vessel has set sail from the **port of Ningbo-Zhoushan**, navigating through the **Arctic Ocean along Russia's northern coast**, marking the launch of the **'Polar Silk Route'**.

**What is Polar Silk Route?**

- It refers to China's plan to develop a **shipping and trade corridor through the Arctic Ocean** as part of its broader **Belt and Road Initiative (BRI)**.
- It was officially introduced in China's first Arctic Policy White Paper (2018).
- China refers to itself as a **"near-Arctic state"** and envisions the **Polar Silk Road** as part of its maritime expansion strategy.
- It envisions using **Arctic sea routes**, especially those along **Russia's northern coast (the Northern Sea Route).**




**Major Arctic Maritime Routes**

- **Northern Sea Route (NSR) –** Along Russia's northern coast, connecting Asia and Europe; currently the main focus of the Polar Silk Road.
- **Northwest Passage (NWP) –** Through the Canadian archipelago, linking the Pacific and Atlantic Oceans.
- **Arctic Bridge Route (ABR) –** Linking Churchill (Canada) to Narvik (Norway) and Murmansk (Russia).
- **Transpolar Sea Route (TSR) –** Direct path across the central Arctic Ocean from the Bering Strait to the Atlantic near Murmansk.

**Note: The ABR and TSR could become viable by the 2070s under high-warming scenarios.**

### Moscow Format

**Context:** India backs Afghan sovereignty & development at 7th Moscow Format consultations.

**About Moscow Format**

- It is a **regional platform** where neighbouring and major regional powers coordinate **practical approaches for achieving peace and stability in Afghanistan**.
- **Establishment:** The format was **introduced in 2017** by **Russia**.
  - It evolved from an earlier **six-party consultation mechanism** on Afghanistan.
- **Membership:**
  - **Regular participants:** Russia, Afghanistan, India, Iran, China, Pakistan, and the five Central Asian republics — **Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan**.
  - **Guest participant: Belarus** joined as a guest delegation during the **7th Moscow Format meeting (2025)**.

**Key Highlights of the 7th Moscow Format**

**India's Position:**

- Reiterated that a **secure, peaceful, and stable Afghanistan** is vital for regional and global security.
- Highlighted India's continued **humanitarian aid**, **infrastructure projects**, and **capacity-building initiatives** for the Afghan people.

**Joint Outcomes:**

- Participants opposed any foreign military presence or infrastructure in Afghanistan.
- Called on the Taliban to ensure Afghan territory is not used to threaten neighbouring states.

**Symbolism:**

- The meeting underscored regional consensus on avoiding Western military re-entry while cautiously engaging the Taliban regime.
- The Taliban's official participation marks growing regional acceptance despite the lack of formal recognition.

### Asia-Pacific Economic Cooperation (APEC)

**Context:** The APEC summit will be held from October 31-November 1 in Gyeongju, South Korea.

**About APEC**

- It is a regional economic forum and was formed in **1989** to promote trade, investment, and economic growth across the Asia-Pacific region.
- **Member Countries: (21) -** Australia, Brunei, Hong Kong, New Zealand, Papua New Guinea, the Philippines, Indonesia, China, Japan, South Korea, Russia, Canada, the United States, Mexico, Peru, Chile, Malaysia, Vietnam, Singapore, Thailand and Taiwan.
  - **Membership Criteria:** Members must be an independent economic entity, rather than a sovereign state. (e.g. Hongkong & Taiwan)

  - India is **not a member of APEC,** presently it is an **Observer state.**
- Decisions made within APEC are based on consensus and are **not legally binding.**
- Hosting of APEC rotates each year among member economies.
- **Contribution:** Accounts for nearly **40% of the global population**, almost **half of global trade**, and about **60% of global GDP.**

### Kafala System

**Context:** Saudi Arabia ends the Kafala system.

**About Kafala System (Sponsorship-Based Employment System)**

- A **kafeel (sponsor or employer)** takes legal responsibility for the migrant worker's visa and residency.
- The worker **cannot change jobs, leave the country, or even quit employment** without the sponsor's permission.
- Prevalent in Gulf Cooperation Council (GCC) countries (Bahrain, Kuwait, Oman, and the United Arab Emirates) as well as Jordan and Lebanon.

### International Solar Alliance (ISA)

**Context:** President Murmu addressed the 8th Session of the ISA Assembly.

**About International Solar Alliance (ISA)**

- Launched by **India and France in 2015** at COP21 (Paris)
- **Headquarters:** Gurugram, India
- **Members:** 125 Member & Signatory countries.
- **Vision:**
  - **Catalytic Finance Hub** to unlock and mobilise investments at scale
  - **Global Capability Centre and Digitisation** to foster innovation, digital platforms, and capacity building across Member Countries
  - **Regional and Country-level Engagement** to drive tailored interventions through strategic partnerships
  - **Technology Roadmap and Policy** to accelerate the deployment of emerging solar technologies through actionable policy frameworks and knowledge resources.

**Recent Major Initiatives**

- **SUNRISE platform** for solar waste recycling & upcycling
- **OSOWOG (One Sun One World One Grid)** initiative for cross-border solar grids
- **Global Capability Centre** — "Silicon Valley for solar in India" vision
- **ISA Academy** — AI-driven global solar learning platform
- **Small Island Developing States (SIDS) Solar Procurement Platform with World Bank** to advance solar energy deployment through coordinated procurement, digital integration, and capacity-building to enhance energy resilience.

# Topics for Prelims (Internal Security)

## Mission Sudarshan Chakra – India's Nationwide Air Defence Shield

### Context

India has launched Mission Sudarshan Chakra to develop a nationwide, AI-driven air defence shield integrating radars, satellites, and laser weapons to counter emerging aerial threats.

### About Mission Sudarshan Chakra

- **Mission Sudarshan Chakra** is a new national initiative aimed at building a **comprehensive, integrated air defence shield** across India.
- The system will integrate 6,000–7,000 radars, 52 surveillance satellites (by 2030), and Directed Energy Weapons (DEWs) into one real-time, networked defence ecosystem.
- **Objective:** To establish a **multilayered, AI-driven, space-linked air defence network** capable of:
  - **Monitoring**, **detecting**, and **tracking** enemy threats beyond visual range.
  - **Identifying** and **neutralising** hostile aircraft, drones, and missiles.
  - Providing **nationwide coverage** beyond military bases, extending to key population centres and strategic installations.

### Key Components of the Mission

- **Multi-Layered Defence Architecture:** The shield will combine:
  - **Over-the-Horizon (OTH) Radars:** Capable of tracking targets far beyond the line of sight, deep into enemy territory.
  - **Short-, Medium-, and Long-Range Missile Systems:** For interception at multiple distances.
  - **Anti-Drone Systems and Air Defence Guns:** For close-range and swarm threats.
  - **Directed Energy Weapons (DEWs):** High-powered **laser-based systems** for neutralising aerial targets instantly.
- **Space-Based Surveillance Integration:** Under Phase 3 of the Space-Based Surveillance (SBS) Programme, 52 new surveillance satellites are to be deployed by 2030. These satellites will:
  - Continuously **scan and track** enemy movements from space.
  - Feed data into Sudarshan Chakra's **central AI-driven command network**.
  - **Cue missile or DEW systems** for interception.
- **Massive Radar Network:** Between **6,000 and 7,000 radars** will be deployed across the country. Includes multiple types:
  - **OTH radars** for long-range detection.
  - **Ground-based and mobile radars** for tactical tracking.
  - **Coastal and high-altitude radars** for strategic depth.
  - These will be interlinked through a **centralised command-and-control system** to share data in real time.

### Recent DRDO Achievements

- **DRDO** has successfully tested the **Integrated Air Defence Weapon System (IADWS)** - a key component of Sudarshan Chakra.
  - Combines **QRSAM**, **VSHORADS**, and a **5-kilowatt laser-based DEW**.
  - Provides layered defence against multiple aerial threats.
- Demonstrates India's growing capability in indigenous air defence technologies.

- **Integration with Advanced Computing and AI:** The mission will rely heavily on:
  - **Artificial Intelligence (AI)** for real-time threat assessment.

- **Big Data and Advanced Analytics** for processing massive volumes of sensor data.
- **Quantum Computing and Large Language Models (LLMs)** for predictive threat modelling and automated response systems.

## I4C & Operation Chakra V

### Context

Under Operation Chakra-V, Central Bureau of Investigation (CBI) arrested three people in connection with a transnational cyber fraud case based on input from the Indian Cyber Crime Coordination Centre (I4C).

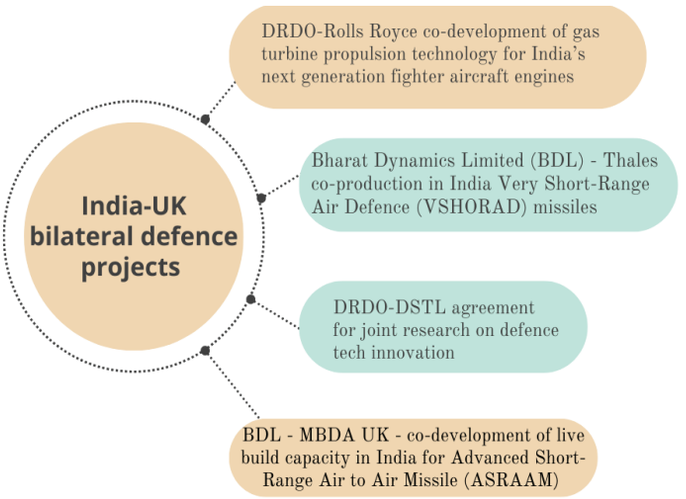
### Indian Cyber Crime Coordination Centre (I4C)

- I4C is a government initiative that works to **combat cybercrime in India**.
- It facilitates easy filing of Cybercrime related complaints and identifying Cybercrime trends and patterns.
- It assists States in capacity building of Officials in the area of cyber forensic, cyber hygiene, cyber-criminology etc.
- **Nodal Ministry:** Ministry of Home Affairs
- According to I4C, There are **4 types of Scams:** Digital arrest, Trading Scam, Investment Scam (Task Based), Romance/Dating Scam.

## Light Weight Modular Missiles

### Context

The **Indian Army** signed a **£350 million ($468 million)** contract with **UK-based Thales** to buy the **Light Weight Modular Missile (LMM) system.**




### More in News

- Both countries signed an **Implementation Arrangement** to advance collaboration on **electric-powered engines for Indian naval ships** (an initial package worth about **£250 million**).

### What is the Light Weight Modular Missile (LMM)?

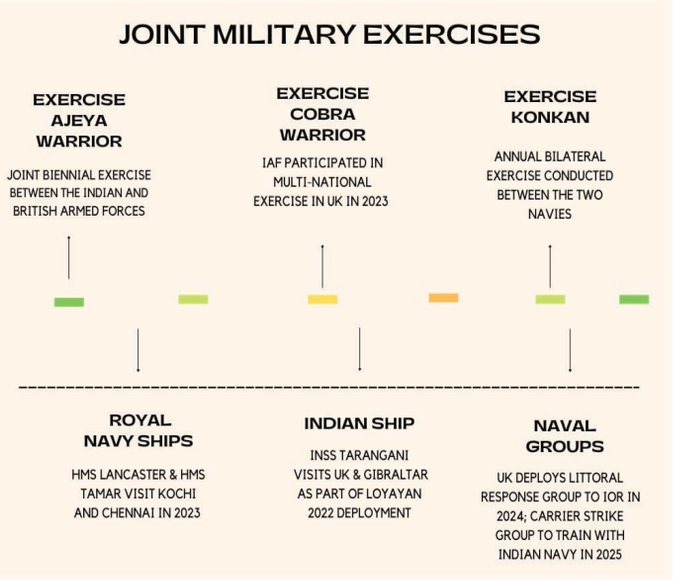
- **Type:** A man-portable, lightweight multirole missile system.
- **Role:** Designed for short-range air defence — to detect and destroy high-value drones and UAVs, and engage other aerial threats.
- **Features**:
  - **Guidance**: Operates on the Laser Beam Riding principle (missile rides a laser beam to the target).
  - **Deployment modes**: Usable on tripod (man-portable) and in vehicle or land-system configurations.

### Exercise Konkan

**Context:** British and Indian warships begin four-day maritime exercise Konkan in the Indian Ocean.

**About Exercise Konkan**

- **Exercise KONKAN** was first held in **2004** as a **bilateral naval drill** between India and the UK.
- The **2025 edition** marks the **first-ever participation of carrier strike groups** from both nations - India's **INS Vikrant** and the UK's **HMS Prince of Wales**.
- The exercise aims to enhance joint maritime and air warfare capabilities between the two navies and deepen defence cooperation under the **India-UK Vision 2035 framework.**




**India-UK defence Ties**

**Cooperation for the Indo-Pacific:**

- India is a member of QUAD whereas UK is a member of AUKUS which present complementary role for the security in the Indo-Pacific to counter the Chinese aggression.
- In 2022, Britain granted India an **Open General Export Licence (OGEL)**—its first to a country in the Indo-Pacific—to permit the export of military technology and dual-use goods.
- The UK's decision to deploy a **Littoral Response Group** in the Indian Ocean and its membership in India's **IFC-IOR (Gurugram)** enhance maritime domain awareness and interoperability.
- UK's tilt toward Indo-Pacific can be seen with the UK **becoming a dialogue partner of ASEAN, joining the CPTPP, participating in the Global Combat Air Programme (GCAP)** with Italy and Japan and deploying the HMS Queen Elizabeth and carrier strike group to the region.

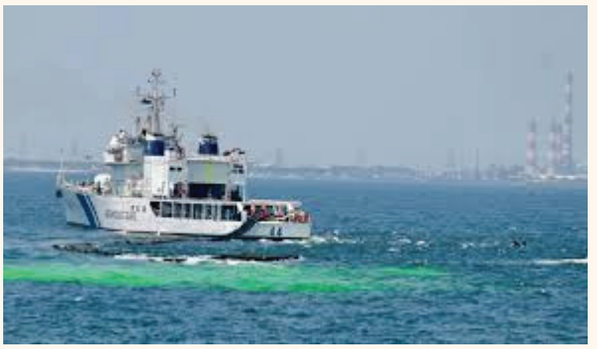
- **Both countries coordinate within key regional platforms:**
- **IORA** – UK (Dialogue Partner), India (Member).
- **IONS** – Both are members.
- **IPOI** – India and UK co-lead the **Maritime Security Pillar**.

**Constraints**

- Britain aspires to become **Europe's leading Indo-Pacific power by 2030**, but its financial and military limitations and NATO commitments constrain capacity.
- Despite pledges to raise defence spending to **2.5% of GDP**, the UK remains focused on Russia and Euro-Atlantic security, having contributed over £12.8 billion in aid to Ukraine.
- This dual focus could lead to Indo-Pacific being deprioritised in British foreign policy.

## NATPOLREX-X

**Context:** The Indian Coast Guard (ICG) conducted the 10th National Level Pollution Response Exercise (NATPOLREX-X) along with the 27th National Oil Spill Disaster Contingency Plan (NOSDCP) & Preparedness Meeting off the coast of Chennai, Tamil Nadu.



**About NATPOLREX-X**

- NATPOLREX stands for National Level Pollution Response Exercise.
- It is a biennial flagship exercise conducted by the Indian Coast Guard under the National Oil Spill Disaster Contingency Plan (NOSDCP).
- **Objective:** The exercise aims to assess and strengthen India's national preparedness for responding to marine oil spill incidents and to test inter-agency coordination under the NOSDCP framework.
- Demonstrations included that of firefighting and oil spill dispersant methods by Pollution Control Vessels, aerial surveillance and pollution response by Chetak and Dornier aircraft, and containment and recovery exercises by Offshore Patrol Vessels and Fast Patrol Vessels.
- NATPOLREX-X 2025 reaffirms **India's commitment to marine environmental protection,** reflecting the nation's broader vision of sustainable development and ecological responsibility.

## Operation HAECHI-VI

**Context:** The International Operations Division of CBI arrested eight offenders and identified 45 suspects under operation HAECHI-VI.

About Operation HAECHI-VI

- **Launched by: INTERPOL** (International Criminal Police Organization).
- **Objective:** To **combat and dismantle transnational cyber-enabled financial crimes** through coordinated international action.
- **Participating Agencies:** India's **Central Bureau of Investigation (CBI)** participated along with the **FBI (U.S.)**, **U.S. Department of Justice**, **German authorities**, and other INTERPOL member countries.

**Major Crackdowns:**

**1. New Delhi & Amritsar:** Busted illegal call centres targeting **U.S. nationals** through fake tech-support scams.

**2. Siliguri, Darjeeling:** Dismantled another network defrauding **German citizens** under similar pretenses.

**3. Child Protection:** Apprehended two offenders exploiting **minor U.S. girls online** through coercion for obscene content.

**Significance**

- Strengthened India's global cybercrime cooperation through direct coordination with INTERPOL, FBI, and German police.
- Demonstrated **India's capacity for rapid intelligence-sharing and joint operations**.

**INTERPOL (International Criminal Police Organization)**

- **Founded:** 7 September 1923, Vienna, Austria
- **HQ:** Lyon, France
- **Members:** 196 countries (India is a member)
- **Purpose:** It is an inter-governmental law enforcement organisation, helps **coordinate cooperation among law enforcement agencies** across its member countries.

## SAKSHAM (Situational Awareness for Kinetic Soft and Hard Kill Assets Management)

**Context:** The Indian Army has initiated the procurement of the indigenous "SAKSHAM".

**About SAKSHAM**

- It is a **Counter-Unmanned Aerial System (UAS) Grid** designed to **detect, track, identify, and neutralize enemy drones in real time**.
- **Developed indigenously** by the **Indian Army** in collaboration with **Bharat Electronics Limited (BEL), Ghaziabad**.

- **Features:**
  - Functions through the **secure Army Data Network (ADN)**.
  - Offers a unified **Recognised UAS Picture (RUP)** across the **Tactical Battlefield Space (TBS)** — airspace extending up to **3,000 metres (10,000 feet)** above ground.
  - Integrates **radars, electro-optical sensors**, and **other detection systems**.
  - Employs **AI-driven threat analysis** for faster, automated decision-making.
  - Capable of coordinating both **soft-kill (jamming, spoofing)** and **hard-kill (kinetic destruction**) responses.

## Operation Golden Sweep

**Context:** The Directorate of Revenue Intelligence, Mumbai, has recently arrested 13 people for smuggling gold under the 'Operation Golden Sweep.'

**About Directorate of Revenue Intelligence**

- **Apex anti-smuggling intelligence and enforcement agency**
- **Under:** Central Board of Indirect Taxes and Customs (CBIC), Ministry of Finance.
- **Established in:** 1957
- **Headquarters:** New Delhi
  - **Zonal Units:** Located in **major cities** (Delhi, Mumbai, Chennai, Kolkata, Ahmedabad, Lucknow, Guwahati, etc.).
- **Mandate:**
  - Detects and prevents **smuggling of goods**, **narcotics**, **fake Indian currency**, **gold**, **arms**, **antiquities**, and **wildlife items**.
  - Collects, analyses, and disseminates intelligence on **customs duty evasion** and **commercial frauds**.
  - Investigates **misdeclaration**, **undervaluation**, **overvaluation**, and **illegal foreign exchange transactions**.
  - Works closely with **CBIC**, **CBI**, **ED**, **NIA**, **INTERPOL**, and **foreign customs agencies**.
  - Initiates cases under the **Customs Act, 1962** and coordinates court proceedings.
    - » Also assists in enforcing provisions of the **NDPS Act**, **Wildlife (Protection) Act**, and **Foreign Trade (Development and Regulation) Act** when relevant.
  - Trains customs and enforcement officers in modern investigation and intelligence techniques.

## Project Seabird IIA

**Context:** Chief of the Naval Staff, inaugurated new residential accommodation for Senior Sailors and Defence Civilians of the Indian Navy at Naval Base Karwar, Karnataka, as part of Project Seabird Phase IIA.

About Project Seabird

- It is the Indian Navy's **largest infrastructure development project.**
- **Phases of Development:**
  - **Phase I (Commissioned in 2005):** Established basic operational facilities; **INS Kadamba** commissioned by PM Manmohan Singh.
  - **Phase IIA (Ongoing):** Expands berthing capacity, builds **Naval Dockyard**, **dual-use air base**, and new **residential complexes**.
  - **Future Phases:** Aim to make Karwar the **largest naval base in Asi**a.

## TOMAHAWKS Missile

**Context:** US President Donald Trump has hinted at the possibility of supplying Tomahawk cruise missiles to Ukraine.

**About it**

- It is a **long-range, subsonic (nearly 70% of the speed of sound) cruise missile**.
- It is designed for **precision strikes** on land targets from ships or submarines.
- Launched using a **solid-fuel rocket booster.**
- It also flies low, literally hugging the contours of land, making it harder to detect and intercept.
- Uses GPS, terrain-matching radar, and onboard navigation systems for pinpoint accuracy.
  - Known for its **"fire-and-forget"** capability — once launched, it independently navigates to the target.
- **Previous Use:** first time they had been used at Iraqi defenses in 1991 in the opening three days of Operation Desert Storm. It has also been used for precision strikes in the Balkans, Afghanistan in 1998, Yemen, Libya and Syria.
- **Why Ukraine needs it**: Tomahawks would help Kyiv's long-range attacks inside Russia. "strengthen Ukraine and force the Russians to sober up a little (and) sit down at the negotiating table.

## SAMUDRA-SHAKTI Exercise

**Context:** The Indian Navy is conducting the 5th edition of the Bilateral Maritime Exercise 'Samudra Shakti – 2025'.

About it

- **Countries involved:** India & Indonesia It began in 2018.
- **Objective:** The exercise is designed to improve interoperability and cooperation between the two navies through joint drills and professional exchanges.
- This year's exercise involves **INS Kavaratti**, an Anti-Submarine Warfare Corvette & **Indonesian Navy Ship KRI John Lie**, a Corvette equipped with a helicopter.

**Defence and Strategic Cooperation between India and Indonesia:**

- **Joint Military Exercises:** Exercises like Garuda Shakti (Army), Samudra Shakti(Navy) and coordinated patrols (IND-INDO CORPAT).
- **Strategic Significance**: Indonesia, as a large archipelagic state with thousands of islands, serves as a bridge between the Indian and Pacific Oceans.
- **Sea Lines of Communication (SLOCs)**: Indonesian waters are crucial for global trade between East Asia, India, Africa, and Europe.
- **Defense Industry Collaboration:** The inaugural India-Indonesia Defense Industry Exhibition in 2024.
- **Indo-Pacific Collaboration**:
  - Indonesia has aligned its **ASEAN Outlook on the Indo-Pacific (AOIP)** with India's **Indo-Pacific Oceans Initiative (IPOI**).
  - Both nations are working together on maritime resources under the IPOI framework.

**India-Indonesia Defence Cooperation**

| Cooperation Area | Description |
|---|---|
| Joint Military Exercises | Garuda Shakti, Samudra Shakti, IND-INDO CORPAT |
| Strategic Significance | Bridge between Indian and Pacific Oceans |
| Sea Lines of Communication (SLOCs) | Crucial for global trade routes |
| Defense Industry Collaboration | India-Indonesia Defense Industry Exhibition 2024 |
| Indo-Pacific Collaboration | AOIP aligned with IPOI, maritime resources |

## Operation Aaghat

**Context:** The **Delhi Police's Southeast District** launched **"Operation Aaghat 2.0"**

About the Operation

- Operation Aaghat aimed at **dismantling organised criminal networks**, curbing **street crime**, and ensuring **citizen safety** through proactive policing.
- **Impact:** The initiative has led to **hundreds of arrests**, recovery of **illegal arms, liquor, and narcotics**, and a **20% drop in PCR call**s related to street crime — reflecting its success in deterring habitual and organised criminals.

## Japan–India Maritime Exercise (JAIMEX) 2025

**Context:** Indian Naval Ship (INS) Sahyadri participated in the Sea phase of JAIMEX-25.

**About**

- **Type:** Bilateral naval exercise between **Indian Navy (IN)** and **Japan Maritime Self-Defense Force (JMSDF)**
- **First Held: 2012**
- **Frequency:** Biennial (every two years)
- **Objective:** To enhance interoperability, cooperation, and mutual understanding between the two navies in maritime operations.

**Strategic Cooperation:**

- J**oint military exercises**: particularly naval exercises like MILAN and the Malabar series
- **Co-development** of Unified Complex Radio Antenna (UNICORN) masts for Indian Navy ships
- **Acquisition and Cross-Servicing Agreement (ACSA):** signed in 2020, allows for the reciprocal provision of supplies and services between both forces
- Cooperation in Science & Technology missions: E.g., ISRO and JAXA are working on a joint Lunar Polar Exploration Mission (LUPEX)
- India-Japan Clean Energy Partnership (CEP) was announced in 2022

## Operation Fire-Trail

The Directorate of Revenue Intelligence (DRI) has busted a major smuggling racket under its ongoing operation "Operation Fire Trail."

About the Operation Fire Trail

- **Objective:** To **detect, prevent, and dismantle smuggling networks** involved in the **illegal import of foreign-origin fireworks and firecrackers**, particularly from **China**.
- **Purpose of Operation:** To **safeguard public safety** and **national security**,
  - Prevent **illegal hazardous imports**, and
  - Protect **critical port infrastructure and the trade ecosystem** from potential risks.

**Restriction on Import of Fire Crackers**:

The import of firecrackers is 'Restricted' under the ITC (HS) Classification of the Foreign Trade Policy and requires valid licences from both the Directorate General of Foreign Trade (DGFT) and the Petroleum and Explosives Safety Organization (PESO) under the Explosives Rules, 2008.

## Mahe

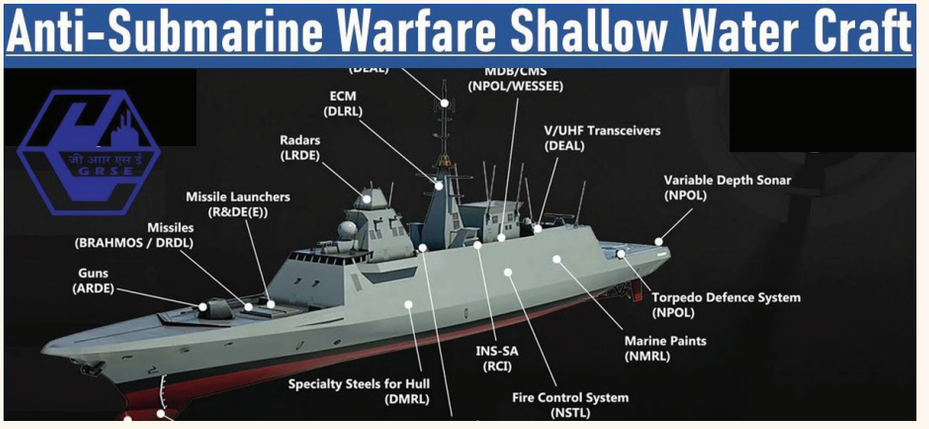
**Context:** 'Mahe', the first of eight Anti-Submarine Warfare Shallow Water Crafts (ASW SWC) being built by **Cochin Shipyard Limited (CSL), Kochi**, was delivered to Indian Navy

About Mahe

- 'Mahe', named after the historic port town in the Union Territory of Puducherry, symbolises India's rich maritime heritage.
- **Constructed by: Cochin Shipyard Limited (CSL), Kochi**
- **Indigenisation: Over 80%** of the ship's components are **indigenously developed,** including design, systems, and equipment.
- **Capabilities:**
  - **Anti-Submarine Warfare Systems:** Equipped with **torpedoes** and **anti-submarine rocket launchers** capable of neutralizing underwater threats.
    - » Features **advanced sonar and radar systems** for **precise detection and tracking of submarines**
  - **Operational Roles: Underwater surveillance** and **submarine tracking**. **Mine-laying operations** when required.
    - » Supports **Low Intensity Maritime Operations (LIMO)**, such as coastal patrols and area denial missions.
  - **Sensors and Electronics:** Multi-functional radar for surface and air surveillance.
    - » Integrated combat management system for real-time threat assessment and response.
- **Significance:** Induction of ASW SWCs will significantly augment the Indian Navy's ASW capability, enhancing maritime security in the littorals.

**Note:**

- India is building a total of 16 Anti-Submarine Warfare Shallow Water Craft (ASW-SWC) vessels for the Indian Navy, with eight being built by **Garden Reach Shipbuilders and Engineers (GRSE)** and the other eight by **Cochin Shipyard Limited (CSL).**
- **'Arnala'**, the first of the eight **ASW SWCs** indigenously designed and built **by Garden Reach Shipbuilders and Engineers (GRSE), Kolkata**, was delivered to the Indian Navy i**n May 2**5




## Radar Mounted Drones

**Context:** The Border Security Force (BSF) with the help of the Indian Space Research Organisation (ISRO) is developing drone mounted radar systems.

What are Radar-Mounted Drones?

- Drones equipped with **miniaturized radar systems**.
- Provide **real-time aerial surveillance** without crossing borders.
- Can detect **movement of intruders, vehicles, or smugglers** in all terrains and weather conditions.
- **Key Advantages:**
  - **Enhance daily vigilance:** Continuous coverage of wide areas – especially difficult terrain and remote sections
  - **Surveillance in night and during bad weather:** Radar can track even when visual sensors are not working
  - **Fast-track alerts/triggers:** Helps deploy forces quickly as it gives real-time alerts
  - **Integrated sensor fusion:** Combining radar, infrared, high-resolution cameras and ground sensors can provide better detection
  - **Mobility and Scalability:** Deployment in small areas – In times of crisis, deploying more drones to provide increased coverage

## Drone Wall

**Context:** The European Union will proceed with plans to build a "drone wall" after several violations of NATO airspace by unmanned aerial systems.

**What is a Drone Wall?**

- It is **not a physical wall**, but a **coordinated defense network** along the EU's eastern borders to **detect, track, and neutralize unauthorized drones** before they reach sensitive areas.
- **Components:**
  - **Detection:** Radars, electro-optical sensors.
  - **Electronic warfare:** Jamming systems.

  - **Active defense:** Kinetic interceptors / counter-drones.
  - **Command & Control:** Integrated systems to share real-time data across nations.
- Functions like a missile defense shield (e.g. Israel's Iron Dome) but tailored to **smaller, cheaper, and proliferating UAVs**.
- Initiated by **Baltic states (Estonia, Lithuania)**, strongly backed by **Poland**, now supported by the **EU and NATO**.

### Exercise Ocean Sky

**Context:** Indian Air Force participates in multinational exercise Ocean Sky 2025 in Spain.

About Exercise Ocean Sky

- It is an **annual multinational air combat training exercise** conducted by the **Spanish Air Force (Ejército del Aire)**.
- It marks a significant development in India-Spain defence cooperation, demonstrating the operational reach and combat proficiency of the Indian Air Force.
- The drill aims to **enhance interoperability**, **improve air-combat proficiency**, and **strengthen defence cooperation** among participating nations.
- **First held in 2004** as a **bilateral exercise between Spain and the United States**.
  - Over the years, it has evolved into a **multilateral event**, drawing participation from various allied air forces.

**Growing India-Spain Defence Partnership:** India procured 56 C-295 military transport aircraft from Airbus, a Spanish company, under a USD 2.5 billion deal signed in 2021

- It will **replace** the **aging Avro-748 fleet** of the Indian Air Force (IAF).
- It is designed for missions ranging from **troop and cargo transport, maritime patrol, airborne warning, surveillance and reconnaissance**, to signals intelligence, armed close air support, medical evacuation, VIP transport and airborne firefighting.

# POLITY & GOVERNANCE

## Topics for Mains

### RTI turns 20: Balancing Right to Know and Right to Privacy

*Syllabus Mapping: GS-Paper 2, Significant provisions of the Indian Constitution*

#### Context

In 2025, as the RTI Act turns 20, it finds itself at a turning point as it has helped uncover major scams and empowered millions of citizens. However, its core purpose has been steadily weakened by court rulings, poor implementation, and recent changes in the law.

As per the **2nd ARC** report, **'RTI is the master key for good governance'**

#### Background of the RTI Movement

- **Grassroots:** Emerged from the **Mazdoor Kisan Shakti Sangathan (MKSS)** in Rajasthan in the early 1990s, led by **Aruna Roy**, **Nikhil Dey**.
- **Public Hearings (1994–95):** Public hearings ("jan sunwais") organized in Rajasthan exposed large-scale corruption in government works like Jawahar Rozgar Yojana and Indira Awas Yojana.
- **State-Level Precedents: Tamil Nadu (1997)** became the first state to enact a RTI Act.
  - By 2001, Goa, Rajasthan, Maharashtra, Karnataka, and Delhi had similar laws.
- **National Campaign for People's RTI (NCPRI)**: Founded in 1996, played a key role in lobbying for a national law.
- **Framing the legislation**: After a decade of advocacy, the **RTI Act was passed on 12 May 2005** and came into effect on **12 October 2005**.

**Key Sections of the RTI Act**

- **Section 3:** Provides that **every citizen has the right to information** under the Act.
- **Section 8:** Lists **exemptions** under which information can be denied.
  - **Section 8(1)(j)**: Exempts disclosure of personal information unless it is in **larger public interest** or unless the same information would be provided to **Parliament or State Legislature**.
- **Section 19:** Provides for a **two-tier appellate mechanism**:
  - **First appeal** to the senior officer in the public authority.
  - **Second appeal** to the **Central or State Information Commission**.

#### RTI as a powerful tool

- **Democratic empowerment:** The Right to Information Act, 2005 empowered ordinary citizens to act as "vigilant stakeholders" in democracy. It transformed governance from a culture of secrecy to a culture of openness.
- **Citizens as rulers:** By operationalising citizens' right to know, the RTI Act recognized people as ultimate sovereigns - an extension of the constitutional idea that "in a democracy, the people are the masters."
- **Instrument of clean governance:** The World Bank (2005) and Transparency International (TI India) have highlighted that corruption thrives in secrecy. RTI, by mandating disclosure, helps curb rent-seeking behaviour.
- **Empirical evidence:** According to a 2019 study by the **Commonwealth Human Rights Initiative (CHRI),** around 40% of RTI applications filed at the central level pertain to corruption, misuse of funds, and irregularities in service delivery - showing citizens' reliance on RTI as an anti-corruption tool.
  - **Eg: Transparency International's Corruption Perceptions Index (CPI)** improvements for India (ranking improved post-2005) have been partly attributed to institutional reforms like RTI.
- **Constitutional backing:** The Supreme Court in **Raj Narain v. State of U.P. (1975) and S.P. Gupta v. Union of India (1982)** held that the right to know is implicit under Article 19(1)(a) - freedom of speech and expression.
- **Good governance linkages:** The 2nd ARC identified RTI as a "master key to good governance" by promoting openness, transparency, and citizen-centric administration.
  - Eg: RTI has improved service delivery by enabling citizens to monitor welfare schemes like MGNREGA, PMAY, and PDS, making officials answerable for lapses.
- **Institutional design:** The Central Information Commission (CIC) and State Information Commissions (SICs) act as quasi-judicial appellate bodies when information is denied or delayed.
  - Eg: As of 2024, there is 1 Central and 29 State Commissions, hearing over 3 lakh appeals annually **(as per CHRI Status Report 2023)**
- **UNDP and World Bank recognition:** The UNDP Human Development Report (2003) identified access to information as a key component of human development and participatory governance.
  - Eg: India's RTI law is often ranked among the top 5 transparency laws globally (as per the **Global Right to Information Rating, 2022)**

#### Ineffectiveness of the RTI Act

- **Bureaucratic Resistance:** Initially, **most Information Commissioners** appointed were **retired bureaucrats**, who had spent their careers working within the system.
  - Many commissioners treated their roles as **post-retirement sinecures**, working only for **a few hours a day** instead of actively enforcing transparency.
- **Timeline Issues:** As per the RTI Act:
  - Public authorities must **respond within 30 days** to an RTI request.
  - First appellate authorities must also **decide within 30 days**.
  - However, **no strict time limit was set for Information Commissioners**, leading to **delays of over a year** in several cases.
- **Weakening RTI:** Courts played a **critical role** in diluting the effectiveness of RTI through **controversial judgments**.
  - **CBSE & Anr. vs Aditya Bandopadhyay & Ors. (2011)**

» The Supreme Court ruled that **Section 8 exemptions should not be interpreted too strictly**.

» The judgment stated that **excessive RTI requests could obstruct national development**, which provided a **justification for restricting information**.

- **Legislative Dilution of RTI:** The **Digital Personal Data Protection Act (DPDPA), 2023**, amended the RTI Act by restricting access to **personal data**.
  - This amendment further **weakened RTI**, allowing the government to **withhold information on vague grounds of privacy**.

## Case Laws

| Case Name | Year | Key Ruling | Impact |
|---|---|---|---|
| **Union of India vs Association for Democratic Reforms** | 2002 | Citizens have the right to know about the **criminal records, assets, and liabilities** of election candidates. | Strengthened RTI by recognizing **right to information as part of Article 19(1)(a)**. |
| **CBSE vs Aditya Bandopadhyay** | 2011 | Section 8 should not be interpreted **too narrowly**; RTI should not obstruct governance. | Allowed **bureaucratic reluctance** in sharing information, weakening RTI enforcement. |
| **Girish Ramchandra Deshpande vs CIC** | 2012 | Personal information cannot be disclosed under **Section 8(1)(j)**. | Became the **precedent for denying information** on public officials' conduct. |
| **RBI vs Jayantilal N. Mistry** | 2015 | RBI must disclose information about **wilful defaulters** and **banking irregularities**. | Strengthened financial transparency under RTI. |
| **Subhash Chandra Agarwal vs CPIO, Supreme Court** | 2019 | The Office of the **Chief Justice of India (CJI)** is under RTI. | Increased **judicial transparency**. |

## Digital Personal Data Protection (DPDP) Act, 2023 and the RTI Act

The DPDP Act, 2023, seeks to safeguard personal data in an era of massive digitisation and cyber threats. However, its amendment to Section 8(1)(j) of the RTI Act by removing the "**larger public interest" test** has sparked concerns over a dilution of transparency, potentially altering the delicate balance between privacy and the people's right to know.

### Changes introduced in RTI Act by DPDP Act

- **Section 44(3) of the DPDP Act** amends **Section 8(1)(j)** of the RTI Act.
  - This amendment allows public authorities to **deny access to "personal information"** without any consideration of public interest.
  - The DPDP Act **replaces** this clause with a broader exemption that **simply states that any "personal information" is exempt from disclosure**, **removing the "larger public interest" test**.
- **Original RTI Provision:**
  - **Section 8(1)(j)** of the RTI Act permits withholding of **personal information** only if:
    - » Disclosure would **invade privacy**.
    - » It is **not related to public activity** or interest.
  - **Safeguard Clause**: Even such personal information can be disclosed **if larger public interest justifies it**.
    - » **Eg: caste certificates or educational degrees** of public servants.

### Implications of the amendment on Transparency and Accountability in governance

- **Reduced Public Scrutiny of Officials:** Without the public interest clause, information about officials' assets, income, and service records can be denied.
  - Eg: RTI queries exposing disproportionate assets of civil servants (Eg: **Karnataka Lokayukta case, 2011**) may now face outright rejection.
- **Undermining Anti-Corruption Efforts:** Many corruption cases were unearthed by accessing personal records in public interest.
  - Eg: Disclosure of ration card beneficiary lists in Bihar under RTI exposed thousands of fake entries.
  - With the amendment, such disclosures could be blocked as "personal information."
- **Impact on Precedent-Driven Decisions:** Past CIC rulings that relied on the public interest clause—such as revealing MPs' and MLAs' attendance or utilisation of MPLADS funds—lose legal force.
  - Eg: CIC's 2013 order making MPs' attendance public was justified on public interest grounds; under the new regime, it could be denied.
- **Erosion of Citizens' Participatory Role:** RTI empowered citizens to monitor government schemes like MGNREGA or PMAY by accessing beneficiary data.
  - Eg: Social audits in Andhra Pradesh relied on RTI to get worker wage lists, such data could be classified as personal and withheld.
- **Shift in Power Dynamics Towards the State**: Removing the discretion for disclosure strengthens the executive's control over information.
  - **Eg: In the Girish Ramchandra Deshpande (2012) case,** SC upheld privacy but allowed disclosure in public interest—now, such balancing is legislatively removed.

## Balancing Right to Privacy and Right to Information

- **Restore Public Interest Override:** Reintroduce the clause allowing disclosure if it serves a greater public good.
  - **Eg: In Canada, privacy exemptions yield to public interest** when necessary to protect public health or safety.

- **Tiered Access to Sensitive Data:** Allowing independent bodies like Information Commissions to determine access on a case-by-case basis.
  - **Eg: New Zealand's Ombudsman** balances competing rights by weighing harm against transparency benefits.
- **Strengthen Suo Moto Disclosures**: Enforce **Section 4 of the RTI Act** for proactive publication of high-demand public data, reducing the need for individual requests.
  - **Eg: Delhi Government's online posting of school budgets and teacher attendance** improves transparency without privacy intrusions.
- **Data Anonymisation Techniques:** Share aggregate or masked data to protect privacy while enabling scrutiny.
  - **Eg: Publishing DBT beneficiary numbers without revealing personal identifiers** ensures scheme monitoring without privacy breach.
- **Legislative Harmonisation:** Draft an integrated framework ensuring DPDP and RTI operate in harmony, avoiding one law overriding another.
  - **Eg: The EU's GDPR** coexists with member states' access-to-information laws by incorporating public interest exceptions.


**Committee recommendations**

- **Justice A.P. Shah Committee (2012):** Warned against allowing privacy laws to override transparency laws.
- **Justice B.N. Srikrishna Committee (2018):** Recommended narrow, harm-based exemptions, not blanket bans.
- **2nd ARC:** Strengthen proactive disclosure; digitise records; empower information commissions; penalise habitual defaulters.
- **Parliamentary Standing Committee (2018):** Ensure transparent and independent appointments to CIC/SIC; provide adequate staff and budgets.
- **Law Commission (Report 272):** Harmonise RTI provisions with privacy laws without diluting citizens' rights.
- **Civil Society:** PRS Legislative Research and RTI activists fear the amendment reverses the gains of RTI by creating excessive opacity.

## Way forward

- **To fill Vacancies in Information Commissions**: Many State Information Commissions (SICs) and the Central Information Commission (CIC) face delays due to vacant posts. Appointing commissioners promptly and ensuring they are independent and competent can speed up the resolution of appeals and complaints.
- **Strict Timelines:** To enforce deadlines for Public Information Officers (PIOs) to respond to requests and for commissions to adjudicate appeals, with penalties for non-compliance.
- **Public Education Campaigns:** There needs to be increased awareness about RTI among citizens, especially in rural areas, through campaigns in local languages, workshops, and digital platforms. NGOs and civil society can play a key role here.
- **Simplify the Process:** Public outreach to file RTI requests can be easier by expanding online portals, ensuring they are user-friendly, and providing support for those without internet access (via post offices or local government offices)
- **Whistleblower Protection:** RTI activists often face harassment, threats, or violence. Enacting and enforcing a strong whistleblower protection law, along with fast-tracking investigations into attacks on activists, would bolster their safety.
- **Narrow Ambiguity:** Section 8 of the RTI Act lists exemptions (Such as national security, personal privacy). Clear guidelines and judicial oversight can prevent PIOs from overusing these exemptions to deny legitimate requests.

# Constitutional Morality: The spirit of India's democracy

*Syllabus Mapping: GS-Paper 2, Significant provisions of the Indian Constitution*

## Context

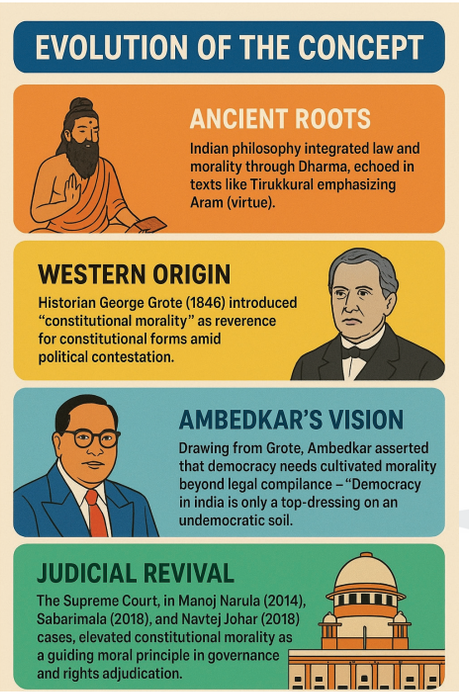
Justice Govind Mathur, former chief justice of Allahabad High court mentioned that Constitutional morality is supreme and urged people to combat social evils through it.

## Introduction

Constitutional morality is the **guiding principle that ensures governance and societal conduct remain anchored to the ideals of the Constitution.** For civil servants, it serves as an ethical compass to ensure decisions align with constitutional values rather than personal, political or populist interests.

In the **Government of NCT of Delhi v. Union of India (2018)**, the apex court stressed that constitutional morality requires all constitutional functionaries to act within the bounds of the Constitution, upholding democratic values and the rule of law. Hence acting as an essential check upon high functionaries and citizens alike.

"Constitutional morality is not a natural sentiment. It has to be cultivated. We must realize that our people have yet to learn it". **- Dr. B.R. Ambedkar**





## Constitutional Morality In India's Constitution

- **Preamble:** The values of **justice, liberty, equality, and fraternity** form the foundational principles of our democracy and reflect the essence of constitutional morality
- **Fundamental Rights (Part-III)**: They protect the rights of individuals and are all rooted in the principles of **constitutional morality.**
  - **Eg: In Navtej Singh Johar Case (2018),** the Supreme Court recognized the right to dignity, liberty, and privacy of LGBTQ+ individuals.
- **Directive Principles (Part IV)**: These principles reflect the aspirations of the people of India and seek to create a just, equal, and humane society.
- **Fundamental Duties (Part IV-A)**: These duties are grounded in the principles of **constitutional morality** and seek to promote a sense of civic responsibility among citizens.
- **Separation of powers**: This separation of powers serves as a check on the arbitrary exercise of power by any one branch of government, ensuring that the rule of law is upheld.

## Constitutional morality as an essential check upon high functionaries and citizens alike

- **Check on arbitrary power**: Acts as a restraint on the executive, legislature and the judiciary, preventing misuse of power.
  - **Eg: Indira Gandhi vs Raj Narain (1975)** nullified the Prime Minister's election due to misuse of state machinery, invoking constitutional morality.
- **Upholding social justice:** Protects the rights of individuals and are all rooted in the principles of **constitutional morality.**
  - **Eg: In Navtej Singh Johar Case (2018), t**he Supreme Court recognized the right to dignity, liberty, and privacy of LGBTQ+ individuals.
- **Ethical governance**: Constitutional morality ensures rule of law, ethical conduct and accountability in public life.
  - **Eg: Prakash Singh case (2006)** mandated police reforms to prevent political interference.
  - **Eg: In Nabam Rebia v. Deputy Speaker (2016),** the Court restrained arbitrary actions by a state governor, upholding democratic accountability
- **Protecting democratic integrity:** In the ADR v. UOI case (2024), the Supreme court struck down the Electoral bonds scheme, citing violations of voters' right to information and principles of transparency which is fundamental to constitutional morality.
  - **Eg: In the State of Tamil Nadu V. Governor of Tamil Nadu case (2025),** the court ruled that the Governor cannot exercise a pocket or absolute veto on bills passed by legislature. The judgement enforces

## Constitutional morality as a product of civil education and rule of law

**Civil education**

- **Moral socialisation**: Civil education inculcates values like constitutional ethics, civic duty and a democratic spirit in citizens.
- **Empowering citizens**: Educated citizens act as ethical stakeholders, questioning arbitrary actions of State authorities.
  - **Eg: Programmes such as SVEEP by the Election commission** promote constitutional values like political participation and informed voting.

**Rule of Law**

- **Legal framework for ethical conduct:** The rule of law ensures that governance functions within the limits of the Constitution, preventing arbitrary actions.
- **Judicial interpretation:** Courts interpret the Constitution in light of **constitutional morality** to protect fundamental rights.
  - **Eg: In the Navtej Singh Johar V. UOI case (2018),** the Supreme court decriminalised consensual same-sex relations, upholding constitutional morality over societal prejudices.

## Significance of Constitutional morality for public servants

### In promoting good governance

- **Adheres to Integrity and impartiality**: Public servants must ensure all actions are within the ambit of law, avoiding arbitrariness.
  - **Eg: In Kesavananda Bharati case (1973),** the Supreme Court upheld the Basic Structure Doctrine, ensuring that public institutions function within constitutional limits
- **Ensures Social justice and inclusivity**: Constitutional morality ensures that governance is inclusive, protecting marginalized groups from discriminatory practices in public spaces.
  - **Eg: In Sabrimala case (2018),** the Supreme Court allowed entry of women of all ages into the Sabarimala temple, holding that exclusion based on menstruation violated Articles 14, 15, and 25.
- **Upholds probity:** Constitutional morality discourages nepotism, corruption, and opacity, ensuring public trust.
  - **Eg: The Right to Information Act (2005)** operationalizes Article 19(1)(a) and compels public servants to maintain records ethically and transparently.
- **Safeguards democratic values:** Public servants act as guardians of constitutional ethos during crises like communal violence or misuse of authority by political executives.
  - **Eg: During the Model Code of Conduct in elections,** civil servants uphold impartiality, preventing misuse of public office for political gains.

### In ensuring accountability in public administration

- **Maintains transparency:** Constitutional morality strengthens **accountability mechanisms** like **RTI Act, social audits, and CAG reports**. A civil servant inspired by these principles would proactively disclose information rather than conceal it.
  - **Eg: Implementation of MGNREGA social audits in Andhra Pradesh** demonstrates how institutionalizing transparency enhances public trust and reduces
- **Resistance and Integrity**: Constitutional morality demands probity in public life and adherence to an ethical leadership demonstrates how adherence to principles enhances efficiency and public trust.
  - **Eg: S. Sreedharan (Metro man)** resisted undue influence and delivered projects with honesty, embodying accountability rooted in constitutional values.
- **Prevents majoritarianism:** Public servants, as custodians of the Constitution, must ensure **secularism and neutrality** in administration.
  - **Eg:** During communal tensions, officers upholding constitutional morality prevent biased decisions that could undermine equality before law.

### AWARD WINNERS

**Justice (Retd.) Jagdish Singh Khehar (Padma Vibhushan Awardee)**

*First Sikh Chief Justice of india*

**Key Highlights**

- Served as the 44th Chief Justice of India from January 4, 2017, to August 27, 2017 — symbolizing inclusivity and representation in the judiciary.
- Landmark Judgments:
  - Right to Privacy Case (2017): Declared privacy as a fundamental right, reinforcing individual liberty and dignity.
  - Triple Talaq Case: Authored the minority opinion emphasizing constitutional morality and judicial restraint while addressing gender justice.
  - NJAC Verdict: Played a key role in striking down the NJAC Act, thereby upholding the independence of the judiciary.
  - Sahara Case: Ordered strict enforcement of judicial directions, ensuring accountability and rule of law.

**Ethical themes reflected**

| Ethical Theme | Explanation / Example |
|---|---|
| Integrity & Judicial Independence | Upheld the sanctity of the judiciary by striking down the NJAC Act, resisting external interference. |
| Commitment to Justice | Ensured fairness, equality, and constitutional rights in landmark rulings like Right to Privacy and Triple Talaq. |
| Courage & Moral Conviction | Demonstrated moral courage in delivering judgments that strengthened citizens' rights, even under political pressure. |
| Impartiality & Objectivity | Maintained neutrality and fairness in all judicial decisions, guided by the rule of law rather than popular sentiment. |
| Commitment to Constitutional Morality | Advocated for decisions based on constitutional principles rather than personal or religious considerations. |

## Challenges to Constitutional Morality in the Present Context

- **Rise of majoritarian morality:** Populist politics and religious majoritarianism often override constitutional principles of pluralism, equality, and secularism (Article 25–28)
  - Eg: Mob lynchings and hate speeches justified in the name of religion or nationalism.
- **Erosion of Institutional Independence:** Increasing executive interference in institutions like the Election Commission, CBI, and Governors' offices dilutes constitutional checks and balances.
  - **Eg: CBI termed a "caged parrot"** (SC observation in Vineet Narain v. Union of India case)
- **Weak political ethics:** Criminalization of politics and misuse of constitutional offices undermine moral governance.
  - **Eg: Over 40% of MPs (2024) have criminal charges (ADR data)**
  - **Eg: Defections and horse-trading** despite the anti-defection law (Tenth Schedule)
- **Public apathy and limited Constitutional literacy**: Citizens' weak grasp of constitutional values enables manipulation by populist leaders.
  - Eg: Limited awareness of Fundamental Duties (Article 51A) and civic responsibilities.
  - Eg: Lack of civic education in school curriculum
- Polarization and Misinformation: Social media often amplifies communal narratives and prejudices, eroding rational public discourse.
  - **Eg: Fake news** during elections shaping majoritarian narratives.
  - **Eg: Echo chambers** reinforcing divisive morality over constitutional ideals of liberty and fraternity

## Way Forward

- **Civic education:** Introduce constitutional values in school and university curricula to build constitutional citizenship.
- **Institutional restraint:** Strengthen autonomy and ethical conduct of institutions like EC, CAG, Judiciary.
- **Political accountability:** Enforce moral standards in candidate selection and public office.
- **Judicial clarity:** Develop clear jurisprudence on when constitutional morality should override societal norms.
- **Public discourse:** Encourage informed debate on constitutional values over populist narratives.
- **Leadership by example:** Lawmakers and judges must embody constitutional virtues in decision-making and conduct.

## Conclusion

Therefore, **Constitutional morality, as B.R. Ambedkar stated**, must be cultivated to uphold justice. It ensures judicial independence, as seen in **Keshavananda Bharati (1973)**, while mandating accountability, highlighted in **Justice Ramaswami's case (1993).** By aligning judicial conduct with constitutional values, it sustains public trust, balancing autonomy with responsibility and safeguarding the judiciary as the guardian of India's democratic ethos.

# A comparative lens on India and Japan's Constitutional identities

*Syllabus Mapping: GS-Paper 2, Comparison of Indian Constitution with other countries*

## Context

Recently Japan has elected **Sanae Takaichi as its first female Prime Minister**, marking a significant step toward greater inclusivity and gender parity in the nation's political landscape.

## Introduction

As **stated by our former PM Nehru**, '**The Constitution should not be so rigid that it cannot be adapted to the changing needs of national development and strength'**. Hence the **Constitution under Article-368** provided the Parliament with powers to amend the Constitution. However, such power is limited by certain constitutional provisions. On the other hand, Japan holds the record of having the oldest unamended Constitution in the world.

## The Indian Constitution's amendment process being adaptive to evolving societal needs

- **Ensuring social justice:** The amendments to the Constitution have focused on advancing social justice and equality over time.
  - **Eg:** Through the **105th amendment act of 2021,** the State governments got the power to identify Socially and Economically Backward classes (SEBCs)
- **Political reforms:** Amendments to the constitution have time and again aimed at strengthening the democratic institutions and related processes.
  - **Eg: The 73rd and 74th Amendment Acts of 1992** provided Constitutional status to the Panchayati Raj Institutions and empowered Urban local bodies as institutions of grassroot democracy.
- **Economic reforms:** Various economic developments have prompted constitutional reforms.
  - **Eg: The 101st amendment act of 2016** introduced a comprehensive and unified Goods and Service tax which aimed at economic integration of the country.

## Japan's oldest unamended Constitution

- **Post war Constitution:** Japan's Constitution was enacted in 1947 following World War 2 and is indeed the oldest unamended constitutions in the world.
- **Amendment to Article 9:** The article is the cornerstone of Japan's commitment to pacifism since the end of World War 2. Therefore, it is ingrained in Japan's foreign policy and the society as a whole.
- **Consensus politics:** Japanese politics is driven by a stakeholder approach and consensus building where major decisions like constitutional amendments are in question.

## Amendment procedure of Indian and Japanese Constitutions

| Amendment procedure | Indian Constitution | Japanese Constitution |
|---|---|---|
| **Process** | Amendments can be initiated in either house of the Parliament with a special majority for its passage. | Amendments must be initiated by a two-thirds majority in both the houses of the National diet (Parliament). |
| **Referendum** | No explicit mention of a referendum for a proposed amendment. | The proposed amendment is sent to a national referendum, where it is approved by a simple majority of voters. |
| **Threshold** | The nature of the amendment decides its threshold. Some amendments require a special majority or a simple majority of both the houses. When the federal provision is under question, the amendment also requires an additional ratification by the state legislatures. | Constitutional amendments are more rigid as the initiation of the process of amendment requires a two-third majority in both houses of the National diet. |
| **Scope of amendments** | The Indian Constitution has had a total of 106 amendments (2025). Provisions of fundamental rights, duties, DPSP amongst others have been amended time and again. | There has not been a single amendment since the adoption of the Constitution, however discussion for amending certain provisions of Article 9 have taken place, but the pacifist stance of the Constitution had led to its continuity and stability. |

## Similarities between the political systems of India and Japan

### Constitutional Framework

- **Written Constitutions:** Both India (1950) and Japan (1947) have written constitutions that explicitly define the organization of the state, distribution of powers, and citizens' rights.
  - Eg: The Indian Constitution is the longest in the world, while Japan's post-war Constitution (drafted under Allied supervision) is concise but comprehensive.
- **Parliamentary Sovereignty**: India's Parliament and Japan's National Diet function as the supreme legislative authorities within their respective frameworks. Both embody representative democracy.
  - Eg: The Lok Sabha and the House of Representatives control the executive through confidence motions.
- **Bicameralism**: In both systems, the lower house holds greater power, especially in budget and confidence matters. Both countries have bicameral legislatures-
  - India: Lok Sabha (Lower House) and Rajya Sabha (Upper House).
  - Japan: House of Representatives and House of Councillors.
  - In both systems, the lower house holds greater power, especially in budget and confidence matters.
- **Dissolution of Lower House:** The lower house can be dissolved early in both systems-
  - India: Article 85 empowers the President to dissolve the Lok Sabha.
  - Japan: Article 7 empowers the Emperor to dissolve the House of Representatives on the advice of the Cabinet.

### Legislature–Executive Relations

- **Money Bills**: In both systems, the upper house can only delay, not veto, money bills.
  - India: Article 109 restricts Rajya Sabha's powers on Money Bills.
  - Japan: Article 60 gives similar precedence to the House of Representatives in financial legislation.
- **Prime Minister's Membership**: The Prime Minister can be a member of either house in both countries.
  - India: Article 75 allows PM from either Lok Sabha or Rajya Sabha.
  - Japan: Article 67 does the same.
- **Collective Responsibility**: The Council of Ministers is collectively responsible only to the lower house.
  - India: Article 75(3).
  - Japan: Article 66(3).
  - In both systems, loss of majority in the lower house leads to the government's resignation.
- **Tenure of Upper House Members:**
  - India: Rajya Sabha members serve six years; one-third retire every two years (Article 83).
  - Japan: Councillors serve six years; half retire every three years (Article 46)

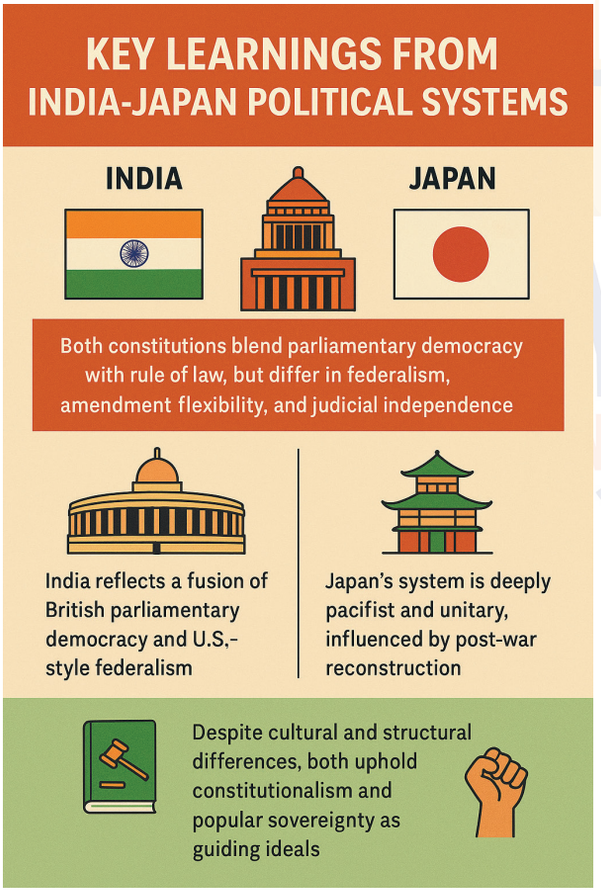
### Judiciary

- **Appointment of Chief Justice**: Both have constitutional heads appointing the Chief Justice.
  - India: President (Article 124)
  - Japan: Emperor (Article 6), a ceremonial role acting on advice of the Cabinet.
- **Removal of Judges:** Higher judges can be removed only through parliamentary impeachment.
  - India: Article 124(4) – impeachment by both Houses.
  - Japan: Article 78 – judges removed by a judicial impeachment court.
- **Procedure Established by Law**: The phrase "**procedure established by law**" in Article 21 of India's Constitution was borrowed from Article 31 of Japan's Constitution, ensuring protection of life and liberty only by valid law.
  - Eg: Expanded by the Supreme Court in **Maneka Gandhi v. Union of India (1978)** to include **"due process".**
- **Judicial Tenure and Retirement**: Both enforce mandatory retirement ages for judges-
  - India: 65 years (Supreme Court).
  - Japan: 70 years (Supreme Court).

## Differences between the political systems of India and Japan

### Constitutional Structure

- **System of Government:**
  - India: Federal Republic with a dual polity where there exists a Union and states and an elected President as constitutional head (Article 54)
  - Japan: Unitary State with a **Constitutional Monarchy,** where the Emperor is a symbolic head without political power.
- **Amendment Process:**
  - India: Amendments require a special majority in Parliament, and for certain provisions, ratification by half the states (Article 368). Subject to the Basic Structure Doctrine (Kesavananda Bharati, 1973).
  - Japan: Requires a two-thirds majority in both Houses and approval by a national referendum (Article 96).
    - » Eg: Japan's Constitution has never been amended since 1947; India's about 106 amendments.




### Legislature–Executive Relations

- **Appointment of Cabinet Ministers:**
  - India: Ministers are appointed by the President on the Prime Minister's advice (Article 75).
  - Japan: Ministers are appointed directly by the Prime Minister (Article 68), reflecting a stronger PM-centric structure.
- **Election of Prime Minister:**
  - India: The President appoints the PM, generally the leader of the majority party in Lok Sabha.
  - Japan: The Diet elects the PM directly through a vote (Article 67), ensuring immediate legislative legitimacy.

### Judiciary

- **Appointment Process:**
  - India: Supreme Court judges are appointed through a Collegium System, independent of political control, evolved through judicial interpretation (Third Judges Case, 1998).
  - Japan: Supreme Court judges (except Chief Justice) are appointed by the Cabinet (Article 79) and later subjected to popular review in national elections.

### Conclusion

India and Japan, though rooted in shared democratic ideals, represent two contrasting constitutional journeys. India's dynamic and adaptive framework ensures responsiveness to societal change, while Japan's rigid yet enduring Constitution embodies stability and pacifist continuity. Together, they showcase that **democratic resilience can thrive through both evolution and preservation.**

## The invisible hand of justice: Judicial appointments in India

*Syllabus Mapping: GS2: Judiciary*

### Context

Recently CJI B.R. Gavai recommended the name of his Supreme Court colleague and the senior-most judge after him, **Justice Surya Kant,** as his successor for the post of Chief Justice of India. CJI Gavai sent the letter of recommendation to the Union law ministry.

## Appointment of the Chief Justice of India and Supreme Court Judges

### Constitutional Basis

- Governed by **Article 124(2)** of the Constitution.
- The President of India appoints the Chief Justice of India (CJI) and other judges of the Supreme Court (SC).
- The process is detailed in the **Memorandum of Procedure (MoP)**, which lays down the guidelines and consultative framework for appointments.

### Appointment of the Chief Justice of India (CJI)

- **Seniority Principle:** Traditionally, the senior-most judge of the Supreme Court is elevated as the Chief Justice of India, maintaining continuity and institutional respect.
- **Initiation by Government:** The Union Government requests the outgoing CJI to recommend a successor about a month before retirement.
- **Recommendation by CJI:** The CJI formally recommends the name of the senior-most eligible judge to the Ministry of Law and Justice.
- **Executive Approval:** The recommendation is examined and approved by the Prime Minister, following which it is submitted to the President.

- **Presidential Appointment:** The President issues the warrant of appointment, officially designating the new CJI.
  - Eg: In 2022, Justice D.Y. Chandrachud was appointed as CJI following the recommendation of outgoing CJI U.U. Lalit.

## Appointment of Other Supreme Court Judges

- **Collegium Recommendation**: Other SC judges are appointed by the President based on recommendations from the Supreme Court Collegium, comprising:
  - **CJI + Four senior-most judges of the Supreme Court.**
- **Consultation Process:** The Collegium evaluates candidates on merit, integrity, seniority, and regional representation before forwarding names to the Government.
- **Government Scrutiny:** The Ministry of Law processes the recommendations and forwards them to the Prime Minister for advice to the President.
- **Final Appointment:** The President issues the appointment warrants after due process.

## Collegium system

The Collegium System governs the appointment and transfer of judges in India. It is not based on any constitutional provision or legislation passed by Parliament but has evolved through a series of landmark Supreme Court judgments. The Supreme Court Collegium is led by the Chief Justice of India (CJI) and includes the four senior-most judges of the Court.

- The Collegium system is a **judicial innovation** evolved through SC judgements in the Second and Third Judges Cases.
- The Collegium for appointing judges in the SC includes **CJI and the four senior most judges**.
- For appointing judges in the High courts, it includes the **CJI and the two most senior judges.**

## Arguments in favour of the Collegium system

- **Protects Independence of Judiciary:** The Collegium system **helps preserve judicial independence such as appointment and removal of SC judges under Article 124** by reducing the influence of the executive and legislature in judicial appointments/removal.
- **Expertise and Experience-based Appointments:** The Collegium system ensures that judges with extensive expertise and experience are appointed to the higher judiciary.
- **Protection against Political Interference:** It acts as a safeguard against political interference in the appointment of judges.
  - **Eg: Appointing CJI by superseding** the senior most SC Judge during Emergency.
- **Flexibility for Reforms and Improvements:** Over time the Supreme Court has acknowledged and ensured greater transparency in the appointment process, indicating that the system can be further improved over time.
  - **Eg: Reforms in Memorandum of Procedure,** Bringing office of CJI under RTI

## Evolution of the Collegium System

- **1950:** Initially, the President appointed the Chief Justice of India (CJI) and other Supreme Court judges after consulting the CJI.
- **Early Practice:** Senior-most Supreme Court justices were typically chosen as the next CJI, although notable exceptions, such as Justice AN Ray's appointment in 1973 led to conflicts.

### JUDGEMENT

- **First Judges Case (1981)- S.P. Gupta vs. Union of India:** Defined "consultation" as not requiring the government's concurrence making CJI's advice non-binding.
- **Second Judges Case (1993)- Advocates-on-Record Association vs. Union of India:** Changed the interpretation to "concurrence" making the CJI's advice binding, with the advice formulated through a collegium of senior judges.
- **Third Judges Case (1998):** Established the collegium structure for SC and HCs
  - Supreme Court: CJI and 4 senior-most judges
  - High Court: CJI and 2 senior-most judges with consultation from other senior Supreme Court judges experienced in the High Court.
- **Fourth Judges Case (2015)- Supreme Court Advocates on Record Association Case:** Declared NJAC unconstitutional emphasising the judiciary's primacy in appointments.
  - The 99th Constitutional Amendment aimed to replace the Collegium with the NJAC including the Union Law Minister, eminent individuals, the CJI and two senior Supreme Court judges.

## Flaws with Collegium System

- **Lack of Transparency:** The decisions made by the Collegium are not subject to public scrutiny, and there are **no clear guidelines or criteria for the selection of judges**.
  - **Uncle-Judge Syndrome** is highly prevalent in Indian Judiciary due to concerns of favouritism and nepotism in the appointment process.
- **Absence of Accountability**:
  - **Eg:** Right To Information Act **is not applicable to discussions** of the collegium.
  - **Dr. B.R. Ambedkar** was against the idea of Judges appointing Judges as it would create an **'imperium in imperio'** (Sovereignty within Sovereignty).
- **Lack of Diversity:** The Collegium system has faced a lot of criticism for **its limited representation of diverse perspectives.**
  - **Eg:** Collegium got its first woman member **(Justice R Bhanumathi)** in 2019 after a gap of 13 years.
- **Potential for Judicial Collusion**: Various critics argue that the absence of external voices in the decision-making process can create an environment where judges are hesitant to challenge the status quo, potentially stifling the growth and evolution of the judiciary.
  - **Eg: Master of Roster issue** highlighted by SC judges in a **rare press conference.**

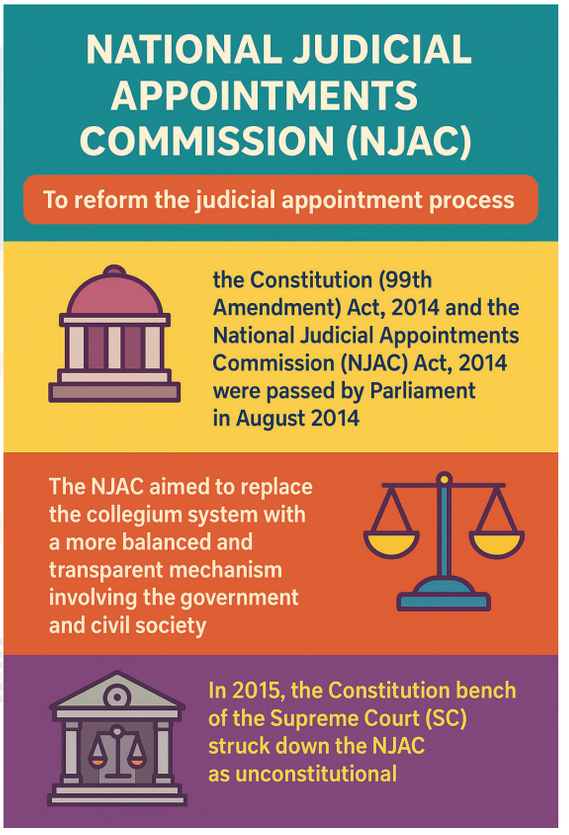
## Impact of Structural Opacity and confidentiality in the Collegium System on Judicial Appointments

The opaque and secretive functioning of the Collegium system affects the evaluation of judicial candidates in several ways:

- **Exclusion of the Executive:** By completely excluding the executive from the appointment process, the system has evolved into one where a few senior judges appoint others, often in secrecy.
- **Bias and Government Displeasure**: Collegiums have occasionally avoided recommending candidates who may be perceived as unfavourable by the government, raising concerns over political considerations.
- **Lack of Accountability**: With no institutional oversight, there is a risk of unsuitable candidates being recommended while meritorious ones are overlooked.
- **No Appointments of Distinguished Jurists**: Although Article 124 permits the appointment of 'distinguished jurists' to the Supreme Court, no such appointment has taken place, limiting diversity in judicial backgrounds.
- **Restricted to Judiciary**: Appointments largely come from the High Courts, with very few selected from the Bar, reinforcing the perception that higher judiciary positions are reserved for judges alone.
- **Lack of Institutional Mechanism**: The absence of an official secretariat or documented procedures contributes to a perception of arbitrariness, as there is no clarity on when meetings are held or how decisions are made.
- **Opaque Decision-Making**: Collegium meetings are held behind closed doors, with no official minutes, further reducing transparency and public trust.

## Consequences for Judicial Independence

- **Risk of Favouritism and Nepotism**: The lack of objective and publicly known criteria in appointments creates opportunities for favoritism and familial bias.
- **Transparency Deficit:** A non-transparent system diminishes public confidence in the judiciary and undermines the legitimacy of its independence.
- **Lack of Checks and Balances:** The exclusion of voices from outside the judiciary, such as the executive or the Bar, compromises the principle of institutional checks and balances.
- **Neglect of Talent:** Capable junior judges and advocates are often overlooked due to the insular nature of the selection process.
- **Poor Representation:** There is a significant gender imbalance in the higher judiciary, with women being under-represented and no woman ever having served as Chief Justice of India.




## NJAC as an alternate model for judges appointment

- **Judicial Independence vs Executive Oversight:**
  - **Article 124** originally vested the power of appointing Supreme Court judges in the **President**, acting on the advice of the **Council of Ministers** after consultation with the **Chief Justice of India (CJI)**
  - The shift from "**consultation**" to **"concurrence"** (through the Second and Third Judges Cases) gave the **judiciary dominance over judicial appointments**, sidelining the executive.
  - NJAC was an attempt to restore balance by introducing a **multi-stakeholder mechanism** in appointment of judges involving the government and eminent persons.

- **Lack of Accountability in Collegium System:**
  - **Decision making behind closed doors**: No clear criteria exists for selection or rejection of judges.
  - **Lack of public accountability**: No formal records of deliberations or reasons for appointments/rejections are published.
  - **Allegations of favoritism**: Judges being appointed based on personal connections rather than merit.
    - » The Collegium system is infamous for the **Uncle-Judge syndrome.**
- **Judicial overreach over NJAC:** NJAC was passed and approved in **Parliament** and ratified by 16 state legislatures with only one dissenting vote (Advocate Ram Jethmalani)
  - Striking down such a widely supported constitutional amendment raised concerns about the **judiciary overstepping its authority.**
- **Stakeholder approach:** NJAC included a mix of stakeholders:
  - » Chief Justice of India + two senior-most Supreme Court judges → **ensured judicial independence.**
  - » Union Law Minister → **represented the government's role** in appointments.
  - » Two eminent persons → brought in non-political perspectives with technical qualifications.
  - The system aimed to balance the independence of the judiciary with democratic accountability — a more holistic and transparent process.
- **Dissatisfaction within Judiciary:** Justice Kurian Joseph later regretted his role in striking down NJAC, acknowledging that the collegium system's continued failings justified revisiting the decision.

## All India Judicial Service (AIJS)

- The President of India on Constitution day (26 November 2023) called for an **"All-India judicial service"** to recruit judges.
  - **Aim**: To make the judiciary diverse by increasing representation from marginalised social groups.
- **Inclusivity:** The judiciary is controlled by a small group of elite families, with minimal representation from marginalized groups and women. Implementing a nationwide examination would create opportunities for qualified candidates from diverse backgrounds.
- **Merit-Based Selection:** A well-defined, competitive recruitment system would prioritize judges' knowledge, skills, and ethical standards, shifting the focus from personal networks to individual merit.
- **Transparent Selection Process:** In contrast to the opaque Collegium discussions, the AIJS recruitment would operate openly and accountably, curbing favoritism.
- **Standardized Training:** Newly selected judges could receive comprehensive training across legal domains, promoting consistent judicial expertise throughout the court system.
- **Insulation from Executive Interference:** Judicial independence can be preserved by setting selection criteria internally while delegating the recruitment process to an impartial external entity, such as the UPSC.

### Global best practices for judges appointment

- **Canada**: Federal Minister of Justice initiates appointments, evaluated by the Canadian Bar Association.
- **Germany**: Collaborative appointment process between executive and legislative branches.
- **USA**: Presidential nominations are confirmed by the Senate.
- **France**: Judicial appointments involve the High Council of the Judiciary and the Minister of Justice.
- **UK**: Appointments made by a commission including Supreme Court representatives.

## Way forward

- To uphold public faith in the judicial system, transparency in the selection process of the Judiciary requires reforms.
- The Collegium system on one hand upholds the independence of judiciary, but its lack of transparency raises concerns of favouritism.
- NJAC, though struck down, can be re-considered with certain safeguards to prevent executive overreach.
- On the other hand, establishment of an All India Judicial Service could further ensure fairness, merit-based judicial appointments and above all uphold public faith in the judiciary.

## Conclusion

The Collegium System if improved with adequate reforms can help balance Independence of Judiciary with highest standards of transparency and accountability. There is need for reforms like devising an objective criterion for consideration of candidates, having a **separate selection commission like in U.K, encouraging diversity in appointments** and **reforming Memorandum of Procedure.**

# Urban growth, Fiscal gaps: Paradox in India's urban governance

*Syllabus Mapping: GS2: Powers, Finances, Challenges at local level*

## Context

India's cities drive over 66% of GDP and house about 35% of the population (2021), a figure set to exceed 40% by 2035. Yet, the paradox is stark - while urban India drives economic growth, its municipal bodies control less than 1% of the country's tax revenue.

## Introduction

The 74th Constitutional Amendment Act of 1992 was enacted to promote democratic decentralisation and strengthen Urban Local Bodies (ULBs), granting constitutional recognition to these institutions. Despite this, ULBs continue to grapple with persistent challenges related to funds, functions, functionaries, and overall functionality.

The **World Bank Group report (2025)**: **"Unlocking Subnational Finance: Overcoming Barriers to Finance for Municipalities in Low- and Middle-Income Countries"**, investment needs in urban infrastructure amount to 2–4% of GDP annually. Yet actual spending is far below this benchmark: in India, for example, urban infrastructure investment is just 0.7% of GDP.



### Key Constitutional Provisions for ULBs

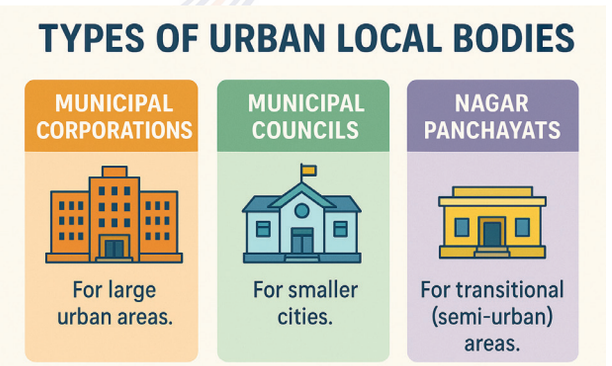
| Article / Schedule | Provision |
|---|---|
| **Article 243P–243ZG** | Define structure, composition, and powers of ULBs |
| **12th Schedule** | Lists **18 functional items** (e.g. water supply, waste management, roads, planning, urban forestry) |
| **Article 243X** | Authorizes State Legislatures to assign taxes, duties, tolls, and fees to municipalities |
| **Article 243Y** | Provides for **State Finance Commissions (SFCs)** to recommend devolution of funds to ULBs |

## Sources of Revenue for Urban Local Bodies

- **Own Sources:** Property tax, profession tax, advertisement tax, user charges, fees, and rents from municipal assets.
- **Assigned Revenue:** Taxes collected by the State but shared with municipalities (e.g., entertainment tax, motor vehicle tax).
- **Intergovernmental Transfers:** Grants from the State Finance Commission (SFC) and Central Finance Commission (CFC).
- **Loans and Borrowings:** From banks, state governments, or via municipal bonds.

## How Urban Bodies lost their revenue authority

- **Impact of GST and Tax Centralisation:**
  - Before GST (2017), cities collected octroi, entry tax, and local surcharges, which were major own-revenue sources.
  - Post-GST, these local taxes were subsumed into the national tax system.
  - As per **RBI estimates,** ULBs lost around 19% of their revenue sources after GST introduction.
- **Lack of Compensation:**
  - Promised compensatory transfers for local bodies never materialized adequately.
  - While States and the Centre benefited from GST pools, municipalities were left outside the revenue-sharing mechanism.
- **Dependence on Grants and Schemes:**
  - Municipalities now rely on Central and State grants under schemes like Smart Cities Mission and AMRUT - funds that are often tied and conditional, limiting local flexibility.




## Associated challenges with Urban Local Bodies

### Financial Constraints

- **Inadequate Revenue Mobilization**: In 2023–24, urban local bodies (ULBs) contributed only 0.6% of GDP, in contrast to the central government's 9.2% and state governments' 14.6%, reflecting a severe fiscal shortfall for urban development.
  - **Composition of Receipts:**
    - » **Tax revenue**: 30% of total receipts

  - » **Grants, contributions, and subsidies**: 24.9%
  - » **Fees and user charges:** 20.2%
  - – **Property Tax Collection Efficiency:** As per CAG data, Municipal Corporations in 18 states collect only 56% of the property tax demand, indicating poor compliance and administrative inefficiency.
- **High Dependence on Fiscal Transfers**: Municipalities remain financially dependent on state and central governments. In 2022–23, grants rose by 24.9% (central) and 20.4% (state), yet delays and unpredictability persist.
- **Rising Debt and Limited Market Access:**
  - – **Municipal borrowings increased:** From ₹2,886 crore (2019–20) to ₹13,364 crore (2023–24), now comprising 5.2% of total receipts.
  - – **Municipal bonds remain underutilized:** Totaling just ₹4,204 crore (0.09% of corporate bonds), mostly via private placements, restricting wider market participation.
- **Green Bonds**: Though emerging, the green bond ecosystem is still at an early stage. Issuance involves high compliance costs like green audits and ongoing KPI monitoring, limiting scalability
- **Delayed Implementation:** Many states delay or inadequately act on State finance commission (SFC) recommendations, undermining predictable fiscal devolution.
  - – **Eg**: Telangana's SFC was announced in 2015 but constituted only in 2018.

## Governance Deficiencies

- **Incomplete Devolution of Powers**: Despite the 74th Constitutional Amendment, many state governments retain key functions like urban planning and land-use regulation, stifling local autonomy.
- **Weak State Election Commissions (SECs)**: Delayed and irregular municipal elections due to underpowered SECs erode democratic accountability.
  - – **Eg**: Elections to the **Bruhat Bengaluru Mahanagara Palike (BBMP)** have been pending since 2020.
- **Human Resource Shortages:** High vacancy rates and inadequate training hinder effective municipal service delivery.
  - – **Eg**: CAG data shows an average 37% vacancy across 18 states, with some ULBs experiencing 30–40% workforce shortages.
- **Ineffective Urban Planning & Service Delivery:** A substantial portion of municipal budgets is spent on non-developmental activities.
  - – **Eg**: As per the CAG report, 29% of municipal expenditure is not linked to infrastructure or urban development, hampering long-term city planning
- **Lack of Autonomy:** ULBs across the country lack autonomy in city management and several city-level functions are managed by parastatals (managed by and accountable to the state).
  - – **Eg:** In Bengaluru, the Bengaluru Development Authority is responsible for land regulation and the Karnataka Slum Clearance Board is responsible for slum rehabilitation.
- **Marginalization of Mayoral Office:** Mayoral office in India remains largely ceremonial, especially in megacities like Delhi, Mumbai, and Bengaluru. They lack both the authority and visibility they deserve as leaders at the first mile.
  - – **Eg: According to the CAG**, urban local governments (ULGs) headed by mayors on average have no control over 75 per cent of the powers constitutionally devolved to them.

### RBI Report on Municipal Finances (2024)

The **RBI Report on Municipal Finances** analyzes **201 municipal corporations (MCs)**, highlighting **alternative financing sources** amid **inadequate infrastructure** and **financial constraints**.

**Major Findings of the Report:**

- **Inadequate Infrastructure**: **Rapid urbanization** outpaces **urban infrastructure** development.
- **Limited Financing**: MCs rely on **bank loans, government loans** due to an **underdeveloped municipal bond market**.
- **Limited Capital Expenditure**: Rising **setup, administrative, interest costs** restrict **capital investments**.
- **Lack of Financial Autonomy**: Budgets lack **balance sheet/cash flow management**, causing inefficiencies.
- **Revenue Stagnation**: Municipal revenues/expenditures at **1% of GDP** (vs **7.4% Brazil, 6% South Africa**

## Way Forward for Strengthening Municipal Finances

- **Boost own revenue generation**: Implement valuation-based property tax systems, leverage GIS mapping, and promote digital payment solutions to enhance compliance and reduce revenue leakage.
- **Enhance Non-Tax Income**: Revise user charges for services such as water supply, sanitation, and waste management to reflect actual costs. Leverage technology and awareness campaigns to improve fee collection efficiency.
- **Ensure Timely Fiscal Transfers**: Institutionalize formula-based, inflation-adjusted, and growth-sensitive transfers from State governments to Urban Local Bodies (ULBs)
- **Diversify Funding Sources**: Expand the use of municipal bonds and explore alternative financing mechanisms to fund infrastructure projects.
  - – **Eg: Financial pooling across** municipalities for large-scale urban development and tap into global climate finance mechanisms to support green infrastructure and sustainable energy initiatives.
- **Strengthen Transparency**: Enforce the adoption of the **National Municipal Accounting Manual (NMAM, 2004)** for uniform and transparent financial reporting.
  - – **Eg: Link state-level fiscal support** to compliance with accounting standards and invest in training municipal personnel to enhance financial accountability.
- **Need of coordinated approach:** The **14th Finance Commission** recommended measures to augment the Consolidated Fund of States to supplement the resources of Panchayats and Municipalities, based on the recommendations of State Finance Commissions (SFCs)

### 2nd ARC recommendation

- Setting up **State Finance Commissions to synchronize with the Central Finance Commission**
- **Action Taken Report** on the recommendations of the SFC must compulsorily be placed in the concerned State Legislature within six months of submission

### Municipal Bonds: The New Frontier of Urban Finance

**What are Municipal Bonds?**

- Debt instruments issued by ULBs to raise money from capital markets for urban infrastructure (water supply, roads, waste management, etc.).
- Investors receive fixed interest payments, and cities repay principal from future revenues.

**Potential Benefits**

- **Long-Term Financing:** Helps fund large infrastructure projects without depending on grants.
- **Financial Discipline:** Encourages better accounting, transparency, and creditworthiness.
- **Diversified Revenue:** Reduces dependence on higher governments.
- **Civic Accountability:** Creates pressure for improved governance to maintain investor trust.

**Issues with Municipal Bonds in India**

- **Low Creditworthiness:** Rating agencies assess cities narrowly based on their own revenues, ignoring steady transfers.
- **Regulatory Complexity:** Approval from multiple agencies (RBI, SEBI, state government) creates procedural hurdles.
- **Weak Financial Records:** Most ULBs lack credible audits, making investors wary.
- **Poor Market Appetite:** Only a few large cities (Pune, Ahmedabad, Indore) have successfully issued bonds.
- **Ignoring Grants in Assessment:** When grants are treated as "non-recurring," it underestimates cities' real fiscal capacity.

**Way Forward**

- **Enhance Revenue Capacity**: Improve **property taxes, user fees**; explore **grants, PPPs**.
- **Expand Financing**: Access **capital markets, pooled finance**.
- **Credit Rating for ULBs**: Boost **investor confidence** in bonds.
- **Improve Financial Management**: Adopt **sound budgeting/accounting** practices.
- **Strengthen Regulatory Framework**: Ensure **transparent, fair regulations**.
- **Capacity Building**: Provide **training/technical assistance** for financial management.

### Conclusion

India's urban paradox lies in cities that power growth but lack fiscal muscle. Without empowered, well-financed local bodies, urban governance remains fragile. Bridging fiscal gaps through autonomy, accountability, and innovative financing is vital. Strengthening ULBs isn't just decentralization but lays the foundation for sustainable, inclusive, and resilient urban transformation.

## Topics for Prelims

## Union Public Service Commission (UPSC)

### Context

On October 1, 2025, the Union Public Service Commission (UPSC) marked 100 years of its establishment.

**About Union Public Service Commission (UPSC)**


**Type**
Constitutional body.

**Function**
Authorised to conduct various competitive exams such as Civil Services, Defence Services, Engineering Services, and Medical Services.
- It also examines the → Statistical Service,
  → Economic Service, and
  → The Police Forces in the country.

**Appointed by:**
The Chairman and other members of the UPSC are appointed by the **President of India.**

**Term**
**6 years or till the age of 65 years,** whichever is earlier

**Salaries, Allowances and Pensions:**
Charged on the Consolidated Fund of India.

### About UPSC

- **1919 GOI Act**: First provided for a Public Service Commission.
- **1926**: Public Service Commission set up under British rule, following **Lee Commission (1924)** recommendations.
- **1935 GOI Act**: Became the **Federal Public Service Commission**.
- **1950**: With the Constitution, assumed its present status as the **UPSC**.

**Recent Reforms:**

- **Digitalisation** of applications and processes.
- **Face-recognition technology** to curb impersonation.
- **PRATIBHA Setu Initiative:** helping candidates who reached interviews but did not make the final list to find other employment opportunities.

## New Amnesty Scheme 2025

### Context

Employees' State Insurance Corporation (ESIC) has issued detailed guidelines for the new Amnesty Scheme 2025.

### About New Amnesty Scheme 2025

- It is a **one-time dispute resolution / settlement window** to help employers (and insured persons) resolve pending legal disputes, claims, and litigation under the ESI Act, 1948.
- The scheme runs from **1 October 2025 to 30 September 2026**.
- Its aim is to **reduce litigation**, provide relief to employers, promote compliance, and clear backlog of disputes under the ESI framework.
- **Key Features:**
  - Cases involving damages, interest, and coverage disputes under the ESI Act (Sections 45A / 45AA, Sections 75, 82, 84, 85, 85A, and writs under Article 226)

- Regional Directors may withdraw cases where contributions and interest have already been paid.
- Cases filed against insured persons over 5 years ago (where no notices were issued) may also be withdrawn.
- Cases that involve only damages (penalties) may be withdrawable provided a portion (e.g., 10%) of damages is paid.
- Disputes filed up to 31 March 2025 are eligible under this scheme.
- Even cases pending in courts (or under writs) may be settled via out-of-court settlement with court's permission.

## Draft Promotion and Regulation of Online Gaming Rules, 2025

### Context

The Ministry of Electronics and IT draft rules aim to operationalize the Promotion and Regulation of Online Gaming Act, 2025.

### Key Provisions

- **Ban on Online Money Games:** All forms of online money-based games (e.g., poker, fantasy sports) are prohibited.Only **e-sports** and **social games** are permitted.
- **Online Gaming Authority of India (OGAI):** A statutory authority to regulate the sector.
  - Functions: registration of games, deciding legality, maintaining registry, imposing penalties.
  - Composition: **Chairperson + 5 members** drawn from different ministries.
- **Registration of Games** All e-sports and social games must register with OGAI.
  - A **Certificate of Registration** is mandatory for legal operation.
- **Grievance Redressal Mechanism (3-Tiered):** Every registered provider must set up an internal grievance cell.
  - Appeals can move to the **Grievance Appellate Committee**, and finally to the **OGAI**.
- **Violation and Penalties:** Breach of rules will be treated as a **non-bailable offence**.
  - Entire company staff can be held liable for facilitating violations.

### Other Related Measures

- **IT Act, 2000 (Sec. 69A):** Used to block illegal online gaming sites/apps (1,524 blocked between 2022–25).
- **Bharatiya Nyaya Sanhita, 2023:** Provides penal provisions against unlawful gaming and cybercrimes (Secs. 111, 112).
- **IGST Act, 2017:** Regulates offshore and illegal gaming platforms.
- **Consumer Protection Act, 2019:** Prohibits misleading or surrogate advertisements by gaming companies.

## Central Consumer Protection Authority (CCPA)

### Context

The Central Consumer Protection Authority (CCPA) has imposed a ₹5 lakh penalty on Drishti IAS (VDK Eduventures Pvt. Ltd.) for publishing misleading advertisements.

### About Central Consumer Protection Authority (CCPA)

- Set up under **Section 10 of the Consumer Protection Act, 2019**.
- **Nodal Ministry**: Ministry of Consumer Affairs, Food & Public Distribution.
- **Functions & Powers:**
  - Protects and enforces the **rights of consumers as a class**.
  - Prevents **unfair trade practices** and checks **false/misleading advertisements**.
  - Ensures that **no misleading advertisements** are published or promoted.
  - Can initiate **class-action suits** (including product recalls, refunds, or cancellation of licenses).
  - Conducts **inquiries and investigations** through its **Investigation Wing** (headed by a Director-General).
- **Section 21:** Power of CCPA to issue directions and impose penalties against false or misleading advertisements.

## Tort of Alienation of Affection

### Context

The Delhi High Court's ruling in Shelly Mahajan vs. Bhanushree Bahl marks a legal evolution in India by recognising Alienation of Affection as a potential civil tort.

### What is Alienation of Affection (AoA)?

- AoA is a **common law "heart-balm" tort** that allows one spouse to sue a **third party** (usually a lover) for **intentionally and wrongfully interfering** in their marriage, leading to **loss of affection, companionship, or consortium**.
- **Legal Basis in India:**
  - **Not codified** or specifically prohibited in Indian law.
  - Hindu Marriage Act, 1955 (HMA) governs matrimonial remedies between spouses only, has no provision for action against a third party
  - However, in **Pinakin Mahipatray Rawal vs. State of Gujarat (2013)**, the Supreme Court recognised that **"alienation of affection by a stranger, if proved, is an intentional tort.**
  - In **Indra Sarma vs. V.K.V. Sarma**, the Court even noted that **children** might have a cause of action if a third party alienates the affection of a parent.

### Joseph Shine vs. Union of India (2018)

- The case challenged **Section 497 of the IPC**, which criminalised adultery, punishing only men and exempting women, reflecting a patriarchal view of women as property.
- **Supreme Court Verdict:** A **five-judge Constitution Bench** led by **CJI Dipak Misra** struck down Section 497 as **unconstitutional**, holding that:
  - **Adultery is not a crime**, as it violates the **right to privacy and autonomy** under Article 21.
  - Marriage does not mean the **subjugation of women's sexual choices**.
  - Adultery remains, however, a **civil wrong** and a **valid ground for divorce** under matrimonial laws.

## U.S. Courts' View on Alienation of Affection

### Origin

- Originated in 19th-century Anglo-American law as a 'heart-balm' tort allowing wronged spouses to seek damages for loss of affection due to a third party's interference.

### Current Status

- Most U.S. states have abolished AoA suits, viewing them as outdated, prone to misuse, or incompatible with modern notions of marital privacy and autonomy.
- However, a few states still retain the tort — notably Hawaii, Mississippi, New Mexico, North Carolina, South Dakota, and Utah

### Elements of Proof (in states where AoA exists)

1. Existence of genuine love and affection in the marriage
2. Loss of that affection due to interference
3. Malicious or intentional conduct by the third party causing that loss

### Delhi High Court Verdict

- The Court **overruled objections** to the maintainability of such a suit and **issued summons**, holding that **spouses may claim civil damages** from third parties who **maliciously interfere in a marriage and cause its breakdown**.
- The HC held that civil courts can hear AoA cases since Family Courts only have jurisdiction over disputes **between spouses** (divorce, custody, maintenance, etc.).
- AoA, being a **tort claim against a third party**, lies within **civil court jurisdiction**.
- **Conditions for Claim (Three-fold Test):**
  - **Intentional & wrongful conduct** by the third party directed at disrupting the marriage.
  - **Causation:** A clear link between the third party's conduct and the **marital breakdown**.
  - **Measurable loss:** The aggrieved spouse must prove a **recognisable injury**, such as mental distress, humiliation, or loss of companionship.

## NAKSHA Programme

### Context

The Lal Bahadur Shastri National Academy of Administration (LBSNAA), in collaboration with the Department of Land Resources (DoLR), Ministry of Rural Development, inaugurated a two-day National Training-cum-Workshop on the NAKSHA Programme.

### What is the NAKSHA Programme?

- It is a one-year pilot initiative.
- It aims to bring **transparency, efficiency, and accessibility** to **urban land governance** through the use of **advanced geospatial mapping, GNSS (Global Navigation Satellite System), and Web-GIS tools**.
- The programme seeks to **digitally map and authenticate every parcel of urban land**, eliminate **ambiguities in land ownership**, streamline **property taxation**, and strengthen the foundation for **urban planning and governance** — moving India closer to the vision of **"One Nation, One Land Record."**

## District Judge Appointment

### Context

The Supreme Court held that judicial officers with 7 years in the Bar before their recruitment to the subordinate judicial service are entitled to be appointed as District or Additional District Judges.

### Procedure for Appointment of District Judge

- The **appointment, posting, and promotion of District Judges** are governed by **Article 233** of the **Constitution of India**.
- The power to appoint District Judges lies with the **Governor of the State**, but only **in consultation with the High Court** of that State.
- **Article (233 (2)) of the Indian Constitution:** A person must have been an advocate for at least 7 years to be eligible for appointment as a district judge if they are not already in the service of the Union or a State.
  - Recent Supreme Court ruling has clarified that both **advocates and in-service candidates** be appointed as District Judges and extended the **criteria of 7 years' practice to judicial officers as well**.

## Preventive Detention

### Context

Climate Activist Sonam Wangchuk was detained under the National Security Act (NSA), 1980.

### What is Preventive Detention?

- When a person is detained/taken into custody without any trial & conviction by a court.
- It is only a precautionary measure and is based on suspicion.
- **Purpose:**
  - Not to punish a person for a past offence but to prevent him from committing an offence in the near future.
  - To protect the state's security & maintain Public Order.

### Rights available to a Detainee under Article-22

- **Period of detention:** No Preventive detention law shall authorise detention for **more than 3 months.**
  - To detain an individual beyond the period of three months authorisation is needed by an **Advisory Board.**
  - **Advisory Board Consists** of a judge of a high court, among other members.
- **Rights of detenu:**
  - The **grounds of detention** should be communicated to the detenu.
    - » **Exception:** Facts considered to be against the public interest need not be disclosed.

- He should be afforded an opportunity **to make representation against the detention order.**

**Who has the power to make laws related to Preventive Detention?**

- **Under the 7th Schedule** this power has been divided between the Parliament and the state legislatures.
- **Exclusive power of Parliament:** To make a law of preventive detention for reasons connected with:
  - Defence
  - Foreign Affairs
  - Security of India
- **Concurrent power:** Both the Parliament as well as the state legislatures can concurrently make a law of preventive detention for reasons connected with:
  - Security of a state
  - Maintenance of public order
  - Maintenance of supplies and services essential to the community
- **Preventive detention laws by states:** Goondas Act,1982 (Tamil Nadu), Gujarat Prevention of Anti-Social Activities Act, 1985 (PASA)

**Supreme Court on Preventive Detention**

- **Ameena Begum vs State of Telangana (2023):** The Supreme Court held that **preventive detention is an exceptional measure**, meant only for **emergency situations**, and must not be invoked as a routine tool.
- **Rekha vs State of Tamil Nadu (2011):** The Court ruled that **preventive detention is an exception to Article 21 (Right to Life and Personal Liberty)** and should be used **sparingly and only in rare cases**.
- **Anukul Chandra Pradhan v. Union of India (1997):** Emphasized that the **purpose of preventive detention is preventive, not punitive**, i.e., to **avert threats to state securi**ty, not to punish individuals.

## National Security Act (NSA)

### Context

Climate activist Sonam Wangchuk was detained under NSA.

### About NSA

- Enacted in **1980**.
- A **preventive detention law** (not punitive) – allows detention of individuals to **prevent possible threats** to public order and national security.
- Successor to earlier laws like the **Preventive Detention Act, 1950** and the **Maintenance of Internal Security Act (MISA), 1971** (which was notorious during Emergency, repealed in 1978).
- **Key Provisions:**
  - **Purpose of Detention:** Prevent acts "prejudicial to the defence of India, security of India, relations with foreign powers, public order, or essential supplies/services."
  - **Who Can Detain:** Central or State Governments,
    - » District Magistrates (DMs) and Police Commissioners when authorised.
  - **Duration of Detention:** Up to **12 months** (can be revoked earlier).
    - » Detainees must be informed of grounds within **5 days** (extendable to 15 days).
  - **Review Mechanism:** An Advisory Board of High Court judges reviews cases within **3 weeks**.
    - » If the Board finds no sufficient cause, the detainee must be released.
  - **Rights of Detainee:** Right to representation to the government.
    - » But **no right to legal representation** before the Advisory Board.
    - » The government may withhold facts "in public interest."

## Article 304 (a)

### Context

The Supreme Court struck down a **2007 Rajasthan VAT exemption** that favoured asbestos sheets and bricks made within Rajasthan, held that it **violates Article 304(a)**.

### More in News

- The Court clarified:
  - Incentives for backward areas, if temporary and non-hostile, may be allowed.
  - But here, Rajasthan's notification gave **preferential treatment** only to local manufacturers → unconstitutional.

### What is Article 304(a)?

- A State can tax goods imported from other States **only if**:
  - The same tax applies to **similar goods produced within the State**,
  - And there is **no discrimination** between imported and local goods.

## Foreign Contribution Regulation Act (FCRA) Licence

### Context

The Union Home Ministry cancelled the FCRA (Foreign Contribution Regulation Act) licence of the Students Educational and Cultural Movement of Ladakh (SECMOL), founded by climate activist Sonam Wangchuk.

### About FCRA

- Enactment: First passed in 1976 during Emergency; revised as FCRA, 2010.
- Implementing Authority: Ministry of Home Affairs (MHA).
- Purpose: Regulates receipt and use of foreign contributions by individuals, associations, and companies to safeguard national security and sovereignty.
- Who cannot receive foreign contributions?
  - Election candidates
  - Members of legislature
  - Political parties & office-bearers
  - Judges
  - Government servants
  - Media persons of specified categories (e.g. editors, publishers, owners of newspapers/periodicals, correspondents, etc.)

- Exception: Donations from NRIs through normal banking channels are not foreign contributions.

### Key Amendments

- 2020 Amendment:
  - NGOs cannot transfer foreign funds to other NGOs.
  - Cap on administrative expenses reduced from 50% → 20%.
  - Mandatory to receive funds in SBI Main Branch, New Delhi.
  - Aadhaar mandatory for office-bearers.
- Recent Rule Updates (2024–25):
  - Mandatory detailed disclosures in FC forms (activity-wise spending).
  - CA must certify compliance with FCRA.
  - NGOs in the publications sector must submit additional undertakings.
  - Unspent admin expenses (20% cap) can be carried forward with justification.

### Grounds for Cancellation (Sec. 14, FCRA 2010)

- False Information: The NGO obtained registration by furnishing false or misleading information.
- Violation of Conditions: The NGO has violated any terms and conditions of registration or provisions of FCRA, 2010.
- Public Interest: The NGO has acted against the sovereignty and integrity of India, public interest, harmony between groups, or friendly relations with foreign states.
  - E.g., SECMOL's receipt of ₹4.93 lakh from Swedish NGO Framtidsjorden in 2021–22 for research on migration, food security, and sovereignty was deemed a violation.
- Non-Operational: The NGO has not been active for two consecutive years in carrying out its activities.
- Diversion of Funds: Foreign contributions are being misused or diverted for purposes other than those permitted.

## Legal Information Management and Briefing System (LIMBS)

### Context

Union Minister of State for Law and Justice inaugurated the Live Cases Dashboard of Legal Information Management and Briefing System (LIMBS)

### About LIMBS

- It is an online platform developed by the **Department of Legal Affairs**, Ministry of Law and Justice, Government of India.
- It aims to **digitally manage, monitor, and streamline government litigation** by creating a **centralized database of all legal cases** involving government departments and agencies.
- **Features:**
  - Provides a **real-time dashboard** for tracking ongoing and pending cases.
  - Enables **uploading of case documents**, court orders, and legal opinions.
  - Allows **inter-departmental coordination** among ministries, advocates, and nodal officers.
  - Offers **analytics and reporting tools** for better decision-making and performance monitoring.
- **Coverage and Users:** Covers cases from the **Supreme Court, High Courts, District Courts, and various Tribunals**.
  - Used by **Central Ministries, Departments, PSUs, Advocates, and Nodal Officers** handling litigation.
  - Facilitates **automatic updates** of case status and hearing dates through integration with **eCourts**.
- **Benefits:**
  - Promotes **transparency and accountability** in government litigation.
  - Reduces **duplication of efforts** and **delays** in communication.
  - Helps in **identifying repetitive cases** and formulating strategies to minimize litigation.
  - Enhances **data-driven policymaking** and **faster decision-making** in legal matters.

## Execution Petitions

### Context

The Supreme Court of India recently expressed serious concern over the state of pending execution petitions in lower courts.

**Facts**

- Despite 3.38 lakh cases being resolved after the March order, **8.82 lakh execution petitions remain pending**.
- **Bombay High Court** (Maharashtra, Goa, Daman & Diu, Dadra & Nagar Haveli) topped the list with **3.4 lakh pending cases**, followed by **Madras (86,000)** and **Kerala (83,000)**.

### What is an Execution Petition?

- After a **civil case is decided**, the court issues a **decree** declaring the rights and liabilities of the parties (e.g., payment of money, possession of property, etc.).
- However, winning a decree doesn't automatically result in its enforcement.
- An **Execution Petition** is a **formal request by the winning party (decree-holder)** asking the court to **enforce the decree** against the losing party (judgment-debtor).
- It is the **final and crucial stage** of a civil case — the process of "**reaping the fruits of the decree**."
- The court ensures that the order is implemented, such as by recovering money, transferring possession of property, or ensuring compliance with the judgment.

### Why Are Execution Petitions Languishing?

- **Procedural Delays under Civil Procedure Code (CPC):** Even at the execution stage, the losing party must be **notified and allowed to raise objections**.
  - This process can take **2–3 years or more**, with multiple hearings and adjournments.
- **Systemic Inefficiencies:** According to the **National Judicial Data Grid (NJDG)**, an average civil suit takes **4.9 years**, while an execution petition takes **another 3.9 years** — almost **nine years in total** for justice delivery.

- **Causes of Delay (NJDG Data):**
  - **Lawyers unavailable:** 38.9% of pending cases.
  - **Proceedings stayed by higher courts:** 17%.
  - **Awaiting documents or records:** 12%.
- **Lack of Specific Data:** Experts note that the judiciary lacks **granular data** to identify where exactly execution processes are getting stuck (e.g., property attachment, sale, etc.).
- **Regional Disparities:** States like **Maharashtra** and **Tamil Nadu** have disproportionately high pendency, pointing to local infrastructure and workload issues.

## Schedule M Norms

### Context

Amid concerns over the quality of cough syrups, the Union Health Ministry underlined the need for all drug manufacturers to comply with the Revised Schedule M.

### About Schedule M Norms

- It lays down the **minimum standards of manufacturing facilities and practices** required for producing drugs and pharmaceuticals in India.
- It is part of the **Drugs and Cosmetics Act, 1940** introduced by the **1982 amendment** in the act.
- It enforces **Good Manufacturing Practices (GMP)** for the Indian pharmaceutical industry.
  - GMP are regulatory norms and standards defined by the Central Drugs Standard Control Organisation (CDSCO) and the World Health Organisation (WHO).
- The **Union Health Ministry (2023)** notified a **revised Schedule M**, tightening GMP standards to align India's norms with **WHO-GMP guidelines**.
  - **New deadlines:** Large manufacturers – 6 months to comply, MSME manufacturers – 12 months to comply.

#### Drugs and Cosmetics Act, 1940

- Enacted in **1940**, came into force in **1947**.
- **Purpose: To regulate the import, manufacture, distribution, and sale of drugs and cosmetics** in India.
- **Aim:** To ensure that **drugs and cosmetics are safe, effective, and conform to prescribed quality standards**.
- **Covers:** Import, manufacture, distribution, and sale of drugs and cosmetics
- **Authorities:**
  - **Central Drugs Standard Control Organisation (CDSCO)** under the **Directorate General of Health Services (DGHS)** implements the Act.
  - **Drugs Controller General of India (DCGI)** is the apex regulatory authority.
  - **State Drug Control Authorities** regulate manufacture and sale within states.
  - **Central Drugs Laboratory (CDL)** in **Kolkata** for quality testing.

## SC Latest Observation on Surrogacy Act

### Context

The Court held that the **age restriction will not apply retrospectively** to couples who had **already started** the surrogacy process **before the Surrogacy (Regulation) Act, 2021 came into effect** on January 25, 2022.

### About Surrogacy (Regulation) Act, 2021

- **Permissibility:** The Surrogacy (Regulation) Act 2021 allows surrogacy **only for altruistic purposes**.
  - It is permitted for **couples with proven infertility or disease**.
  - **Commercial surrogacy is banned**.
    - » The Surrogacy Act **prohibits "buying or trading the services" of surrogate mothers,** meaning **no payment or reward is allowed** apart from covering medical expenses and providing insurance.
- **Eligibility Requirements for Couples:** Couples must be **married for a minimum of 5 years**.
  - The **wife's age** should be between **25-50 years**, and the **husband's age** between **26-55 years.**
  - The couple should **not have any living child,** whether biological, adopted, or from previous surrogacy, **except in cases of children with disabilities or life-threatening conditions.**
- **Criteria for Surrogate Mothers:** The surrogate must be a close relative of the intended parents.
  - She must be married and have **at least one child of her own.**
  - Her age should be between **25-35 years**, and she can only be a surrogate once in her life.
- **Parental Status at Birth:** The child born through surrogacy is legally recognized as the biological child of the intended parents.
  - Any **abortion of the foetus requires consent** from both the surrogate mother and relevant authorities, according to the **Medical Termination of Pregnancy Act**.

## Sahyog Portal

### Context

The Karnataka High Court has dismissed X Corp's petition against the Union government's Sahyog portal, said foreign platforms cannot claim Article 19 rights.

### What is the Sahyog Portal?

- **Launched:** October 2024 by the **Union Ministry of Home Affairs (MHA)**.
- **Operated by:** Indian Cybercrime Coordination Centre (I4C).
- **Purpose:** A **centralised platform** to send **takedown notices** to internet intermediaries (social media companies, ISPs, telecom operators, web-hosting services).
  - Enforces **Section 79 of the IT Act, 2000** → gives intermediaries **"safe harbour" protection** (they are not liable for user content unless they ignore unlawful content notices).
- **How it works:** If government agencies flag unlawful content, intermediaries **must remove/disable access quickly**.
  - Failure = loss of **safe harbour immunity**.
- **Special features:** Automates and speeds up takedown orders.

- Aimed at **real-time coordination** between law enforcement and platforms, especially in **time-sensitive cases** like missing persons or harmful viral content.

### X Corp's Censorship Challenge

- **"Parallel censorship regime":** Claimed the government was using **Section 79(3)(b)** (safe harbour removal) to bypass **Section 69A** (blocking of content with stricter checks).
- **Section 69A safeguards:** Requires written orders, committee review, limited to Article 19(2) grounds (sovereignty, public order, etc.).
  - Provides scope for **judicial review**.
- **Shreya Singhal Case (2015):** Supreme Court had held that takedowns under Section 79 need a **court order or formal government notification**.
  - Without safeguards, Sahyog allows **thousands of officials** to issue takedown notices → risk of arbitrary censorship.
- **Impact on free press:** Supported by **DigiPub (92 digital news outlets)** → argued Sahyog notices often target critical reporting on ministers/government.
- **"Censorship portal":** X argued Sahyog bypassed due process and gave the government unchecked power to silence political criticism.

## Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021

### Context

The Electronics and Information Technology Ministry released a draft amendment to the Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021.

### Key Amendments

- Introduce **additional safeguards** under Rule 3(1)(d) of IT Rules, 2021to ensure removal of unlawful content by intermediaries is carried out in a transparent, proportionate and accountable manner.
  - **Rule 3(1)(d) of IT Rules, 2021:** States that intermediaries are required to remove unlawful information upon receiving actual knowledge either through a court order or notification from the Appropriate Government
- Proposed **mandatory disclosure and labelling** of artificial intelligence (AI)-generated "synthetic" content on social media platforms which will cover **10% of the content's area.**

### Key features of IT Rules (Intermediary Guidelines & Digital Media Ethics) Amendment Rules, 2025

| | |
|---|---|
| **Senior Level Authorisation** | Intimation to intermediaries for removal of unlawful information to be issued by:<br>• By a senior officer **not below the rank of Joint Secretary or equivalent**, or where such rank is not appointed, a Director or an officer equivalent in rank.<br>• Where so authorised acting through a single corresponding officer in its authorised agency, where such agency is so appointed.<br>• For police authorities, officers not below the rank of Deputy Inspector General of Police (DIG) who is especially authorised. |
| **Reasoned Intimation with Specific Details** | Intimation to clearly specify the legal basis & statutory provisions; nature of unlawful act; specific URL/identifier or other electronic location of information, data or communication link (content) to be removed. |
| **Periodic Review Mechanism** | All intimations issued under Rule 3(1)(d) to be subject to monthly review by an officer not below the rank of Secretary of Appropriate Government. |

## Scheme for Innovation and Technology Association with Aadhaar

### Context

UIDAI has recently introduced SITAA to enhance Aadhaar authentication security and combat threats such as deepfakes, spoofing, and biometric fraud.

### About Scheme for Innovation and Technology Association with Aadhaar (SITAA)

- SITAA is an innovation-driven collaboration program that unites startups, academia, and industry to strengthen Aadhaar authentication systems against deepfakes, spoofing, and biometric fraud.
- **Objectives:**
  - Enhance the security of India's digital identity ecosystem.
  - Promote indigenous R&D in biometrics, AI, and cybersecurity.
  - Align Aadhaar innovation with Atmanirbhar Bharat and global data protection standards.

**Key Features:**

- **Collaborative Model:** Joint development of scalable Aadhaar solutions by research institutions and industry.
- **Face Liveness Detection:** AI tools to detect spoofing via photos or videos.
- **Presentation Attack Detection (PAD):** AI/ML systems to identify fake biometric inputs.
- **Contactless Fingerprint Authentication:** Secure fingerprint verification using smartphones or low-cost devices.

## Seniority Dispute in Higher Judicial Services (HJS)

### Context

The Supreme Court has begun hearing a major case to decide how seniority should be determined in the Higher Judicial Service (District Judge cadre).

### What is the Current Seniority & Promotion System in Higher Judicial Services?

- District Judges enter HJS through two streams:

- Either through promotion (75%) from lower ranks
  - » Merit-cum-seniority promotions + suitability test (50%)
  - » Limited Departmental Competitive Examination (LDCE) (25%)
- By direct recruitment (25%) from the bar.
  - » Eligibility service for LDCE reduced **from 5 years to 3 years** (2025 Judgement).

### What is a 40-Point Roster System?

- It is a rotation-based seniority system where 40 fixed slots are pre-assigned to promoters, LDCE candidates, and direct recruits in a set order.
- When officers join, they are placed in these slots, and **seniority is decided by roster position, not just date of entry.**

### Issues With Current System

- Promotees enter later than direct recruits → less time at senior posts
- Delayed promotions → many reach District Judge level near retirement
- Roster sequencing often benefits direct recruits → dominance at top seniority positions
- Inconsistent roster implementation across High Courts → uneven career progression

## Rehabilitation Council of India

### Context

Rehabilitation Council of India (RCI) has announced a set of reforms designed to bring transparency, efficiency and inclusivity to the rehabilitation ecosystem.

**United Nations Convention on the Rights of Persons with Disabilities (UNCRPD)**

- **International human rights treaty** adopted by the UN in **2006**, in force from **2008**
- Aims to **protect and promote the rights and dignity** of persons with disabilities (PwDs)
- India **signed in 2007** and **ratified it in 2008.**
- **India's Implementation:**
  - Enacted **Rights of Persons with Disabilities Act, 2016 (RPwD Act)** to align with UNCRPD
  - Expanded number of recognized disabilities from **7 to 21**.

### About RCI

- **Statutory body** under the **Rehabilitation Council of India Act, 1992**
- Works under the **Ministry of Social Justice and Empowerment.**
- **Purpose:** Acts as the national authority for training, education, and certification of professionals working in rehabilitation and special education.
- **Mandate:**
  - Ensure that services provided to persons with disabilities are professional, ethical, and meet prescribed standards.
  - Develop and enforce uniform curriculum and minimum qualification standards for rehabilitation and special education programmes across the country.
  - Maintain the Central Rehabilitation Register (CRR).
    - » It is the **national database of all qualified and registered rehabilitation professionals** in India.

## Appointment Procedure of CJI

### Context

Chief Justice of India **B.R. Gavai** has recommended **Justice Surya Kant**, the **senior-most judge of the Supreme Court**, as his **successor** and the **53rd CJI**.

### Procedure

- As per **Article 124(2)**, the **President of India appoints** the CJI.
- The **Union Law Ministry** seeks the **recommendation of the outgoing CJI**.
- The **recommendation is forwarded to the Prime Minister**, who advises the **President** on the appointment.
- **Conventionally**, the **senior-most judge** of the Supreme Court is appointed as the next CJI.
  - However, this convention has been **broken 3 times** till date.

## Drugs and Magic Remedies (Objectionable Advertisements) Act (DMRA), 1954

### Context

Many big tech platforms continue to host unverified health claims for herbal, ayurvedic, and homeopathic products which violate DMRA provisions.

### About DMRA, 1954

- It was enacted to **prohibit misleading or false advertisements** related to drugs and magical remedies that claim to cure certain diseases or enhance bodily functions.
- Applies to **all forms of advertisements** — print, broadcast, and digital.
- Covers both **approved and unapproved drugs.**
- This law prohibits any advertisements of any drugs, whether approved or not by the regulator, for a list of **54 medical conditions.**
  - **E.g., Treatment of diabetes**, regardless of whether its efficacy has been clinically established.

## 8th Central Pay Commission

### Context

The Government announced composition and terms of reference for 8th Pay Commission.

### About Central Pay Commission

- It is a **government-appointed body** set up periodically by the **Government of India** to review and recommend changes to the **salary structure, allowances, and pension** of **Central Government employees** and **defence personnel**.
- The **first CPC** was established in **1946**, and since then, **8 commissions** have been constituted — the last one was **7th Central Pay Commission (2014)**.
- Usually constituted **every 10 years**.

- **Composition:**
  - **Chairperson**, usually a retired judge or senior bureaucrat.
    - **8th CPC: Justice Ranjana Prakash Desai**, former Supreme Court Judge and current Chairperson of the Press Council of India.
  - **Member:** Part Time Member of 8th CPC is **Prof. Pulak Ghosh**, Professor, IIM Bangalore
  - **Member-Secretary**, responsible for coordinating and managing the functioning of the Commission.
    - **8th CPC: Pankaj Jain**, Secretary, Ministry of Petroleum and Natural Gas.
- **Terms of Reference** means what the **Commission is mandated to study and recommend.**
  - **8th CPC TOR:**
    - Examine pension revisions for retired government employees.
    - Recommend measures for improved pay parity and rationalisation of pay scales.
    - Suggest changes to allowances and benefits.
    - Review and recommend changes in the salary structure of Central Government employees.
    - Evaluate working conditions and compare them with PSUs and private sector compensation.
    - Factor in the economic condition of the country and fiscal prudence.
    - Evaluate the financial impact on state governments, many of which follow CPC recommendations.

## NCRB Report- 2023

### Context

The National Crime Records Bureau (NCRB) report titled Crime in India – 2023 recently released.

### What are the Key Findings of the Report?

- **Overall Crime Trends:**
  - **Indian Penal Code (IPC) cases:** 37,63,102 (**60.3% of total** and **↑5.7%** from 2022).
  - **Special and Local Laws (SLL) cases:** 24,78,467 (**39.7% of total** and **↑9.5%** from 2022**)**.
  - **Total cognizable cases (IPC + SLL):** 62,41,569 cases in 2023 **(↑7.2% from 2022)**.
  - **Crime rate:** Rose from **422.2 (2022)** to **448.3 (2023)** per lakh population.
- **Types of Cases Seeing Big Rise**
  - **Obstruction on public way (Sec 283 IPC):** ↑ from 93,548 (2022) → 1,51,469 (2023).
  - **Theft cases:** ↑ from 6,52,731 → 6,89,580.
  - **Motor Vehicle Act violations (SLL):** Almost doubled, from 94,450 → 1,91,828.
- **Investigation & Charge-Sheeting:** Police handled 53.6 lakh IPC cases (including pending & reopened) disposed of 37.8 lakh, and charge-sheeted 27.5 lakh, giving a charge-sheeting rate of 72.7%.
- **Crimes Against the Human Body:**
  - **Total:** 11.85 lakh cases (31.5% of all IPC crimes).
    - Hurt: **6.36 lakh (53.7%)**.
    - Death by negligence: **1.65 lakh (14%)**.
    - Kidnapping & abduction: **1.13 lakh (9.6%)**.
  - **Murder: ↓2.8%** (27,721 cases).
    - Major motives: Disputes (9,209), personal vendetta (3,458), gain (1,890).
  - **Kidnapping/Abduction:** ↑5.6%; majority victims were children (70.5%).
- **Crimes Against Public Tranquillity:**
  - **Total:** 58,247 cases.
  - **Rioting:** 39,260 cases (67.4% of total).
- **Crimes Against Women:**
  - **Total:** 4.48 lakh cases (↑0.7%).
  - **Top offences:**
    - Cruelty by husband/relatives: **1.33 lakh (29.8%)**.
    - Kidnapping/abduction: **88,605 (19.8%)**.
    - Assault on modesty: **83,891 (18.7%)**.
  - **Crime rate:** Stable at 66.2 per lakh women population.
- **Crimes Against Children:**
  - **Total:** 1.77 lakh cases (↑9.2%).
    - Kidnapping/abduction: **79,884 (45%)**.
    - POCSO Act offences: **67,694 (38.2%)**.
- **Crimes Against Senior Citizens:**
  - **Total:** 27,886 cases (↓2.3%).
  - **Leading offences:** Simple hurt (27.3%), Theft (14.8%), Fraud (12.5%).
- **Cybercrime:**
  - **Cases:** 86,420 (↑31.2%).
  - **Crime rate:** 6.2 per lakh population (↑ from 4.8).
    - Fraud: 59,526 (69%).
    - Sexual exploitation: 4,199.
    - Extortion: 3,326.
- **Crimes Against Vulnerable Groups:**
  - **Scheduled Tribes (STs):**
    - **Cases:** 12,960 (↑28.8%).
    - **Top offences:** Simple hurt (21.3%), riots (13.2%), rape (9.2%).
  - **Scheduled Castes (SCs):**
    - **Cases:** 57,789 (almost unchanged).
    - **Top offences:** Simple hurt (31.9%), intimidation (7.8%), offences under SC/ST Act (7.5%).

# ECONOMY AND AGRICULTURE

## Topics for Mains

### Indian capital must refocus on domestic investment

*Syllabus Mapping: GS Paper -3: Indian Economy, Investment*

#### Context

As global trade faces instability from protectionism, supply chain shifts, and tariff wars, India must reorient its growth model. Long-term stability now depends on Indian private capital aligning with national priorities. Despite record-high profits, domestic investment remains low, making reinvestment within the country more crucial than ever.

**Indian capital investment: Rethinking growth and demand**

- **Economic growth foundation:**

Sustainable growth depends on expanding the supply side while ensuring strong and inclusive domestic demand.

- **Historical drivers of global capitalism:**
  - Formation of a **wage-labour class**.
  - **Productivity improvements** driven by industrial mass production.
  - **Rising aggregate demand** supported by increasing incomes.
- **Modern context:**
  - In today's globalized economy, aggregate demand is shaped by both **domestic consumption** and **external (export) demand**.
- **India's way forward:**
  - Shift focus **inward** to boost **domestic demand**.
  - Encourage **capital investment** and **innovation-led productivity**.
  - Ensure **fair wage growth** to enhance purchasing power.
  - Recognize that **global uncertainties** may limit export-driven growth, making domestic investment even more crucial.

#### The Global economic background - A New age of uncertainty

The global economy is undergoing a structural transition. The post-globalization boom that drove growth for three decades is now facing major headwinds:

- **Rising protectionism and tariffs:** The U.S.-China trade war and renewed industrial nationalism have disrupted global supply chains.
- **Slowing world trade:** Global merchandise trade growth fell from **5.6% in 2017** to **below 1% in 2023**.
- **Geopolitical tensions:** Conflicts in Europe and the Middle East, and tensions in the Indo-Pacific, have increased input costs and disrupted logistics.
- **Reorientation toward domestic markets:** Many countries are shifting focus inward - prioritizing **resilience, self-reliance, and domestic demand** over export dependency.

**Evolution of Indian capitalism**

- **Pre-Liberalisation Era (1947–1991): Protection and Patronage**
  - Indian businesses thrived under a highly protected, inward-looking economy.
  - Heavy licensing, tariff barriers, and State control led to limited competition and supernormal profits.
- **Post-Liberalisation Era (1991–2010): Global integration**
  - The 1991 reforms opened India's economy, deregulated industry, and integrated it into global markets.
  - Indian firms began **investing abroad**, acquiring global brands, and entering competitive export sectors (e.g., IT, pharma, auto components).
- **The Present Phase (2010–2025): Global uncertainty and domestic hesitation**
  - Global volatility - from financial crises to COVID-19 and trade disruptions - has made export markets unstable.
  - Despite **record corporate profits**, domestic private investment remains stagnant.
  - Indian capital is increasingly **flowing outward**: outward FDI from India grew at **12.6% CAGR (2018–2023)**, compared to the global average of 3.9%.

This paradox of **profits rising but domestic investment falling** highlights the need for Indian capital to realign with India's developmental priorities.

#### Why Indian capital should reinvest in India

- **Reviving private investment for growth:**
  - India's **public capital expenditure** has surged from **₹3.4 lakh crore in FY20** to **₹10.2 lakh crore in FY25** - a **25% CAGR** - but **private investment has stagnated**.
  - The Finance Ministry (June 2025 review) warned that "slow credit growth and private investment appetite may restrict acceleration in economic momentum."
  - Without robust private participation, **public spending alone cannot sustain long-term growth**.
- **Strengthening domestic demand through wages:**
  - The Economic Survey 2024–25 noted rising corporate profits but stagnant wage growth.
  - Real wage growth is projected to decline to 6.5% in FY26 from 7% in FY25.
  - For demand-driven growth, Indian firms must **ensure fair and moderate wage increases**, strengthening domestic purchasing power and boosting aggregate demand.
- **Investing in Innovation and R&D:**
  - India spends only **0.64% of GDP on R&D**, far lower than China (2.1%), Japan (3.4%), and South Korea (4.9%).
  - Private sector contribution to R&D in India is **only 36%**, compared to over 70% in advanced economies.
  - To achieve Atmanirbhar Bharat and global competitiveness, Indian businesses must **expand domestic R&D, focusing on deep technology, manufacturing, and sustainability.**
- **Reducing external dependence:**
  - With **global trade uncertainty**, relying on exports as the main growth driver is risky.
  - Domestic capital investment in infrastructure, manufacturing, and services can **stabilize growth** against external shocks.

– A strong domestic economy will also help India **leverage its demographic dividend and strengthen supply chain resilience.**

**Role of Government**

The government has done much to create a business-friendly ecosystem:

- **Simplified regulations** and tax structures.
- **Infrastructure push** under Gati Shakti and National Infrastructure Pipeline.
- **Production-Linked Incentive (PLI) schemes** to promote manufacturing.
- **Public investment** driving growth momentum.

However, **public investment alone cannot sustain growth indefinitely**.

The private sector must now **complement the State's efforts** through domestic reinvestment and alignment with developmental goals.

## Way Forward

- **Reignite domestic private investment:**
  - Encourage Indian corporations to channel retained earnings into domestic projects through fiscal incentives and credit facilitation.
  - Link incentives with **domestic job creation, innovation, and sustainability outcomes**.
- **Promote wage-led growth:** Foster labour reforms that ensure **fair wage increases** while maintaining productivity.
- **Strengthen R&D and technological capability:**
  - Establish public-private innovation clusters to drive technology development.
  - Provide tax breaks and co-funding mechanisms for private R&D in critical sectors like energy storage, green tech, and advanced manufacturing.
- **Align private capital with national goals:**
  - Encourage **responsible capitalism** - where profit maximization coexists with long-term national development.
  - Integrate ESG (Environmental, Social, Governance) principles and sustainability into business models.
- **Enhance coordination between State and Industry:**
  - Institutionalize a Government–Industry Growth Council to regularly assess sectoral bottlenecks and coordinate policies.
  - Promote joint strategies for **exports, investment, and skill development.**

## Conclusion

Amid global uncertainty, India's growth must be driven from within. Private capital should reinvest domestically, boost wages, and promote innovation to complement public efforts. Aligning **profits with national priorities** will ensure **resilient, inclusive, and self-reliant growth.**

# Green Transition of Indian Railways

*Syllabus Mapping: GS Paper -3: Indian Economy*

## Context

The **July 2025 trial of India's first hydrogen-powered coach at the Integral Coach Factory** marks a milestone in Indian Railways' green transition, advancing its goal of **net-zero carbon emissions by 2030**, four decades ahead of the national target.

**Status of Indian Railways' Green Transition**

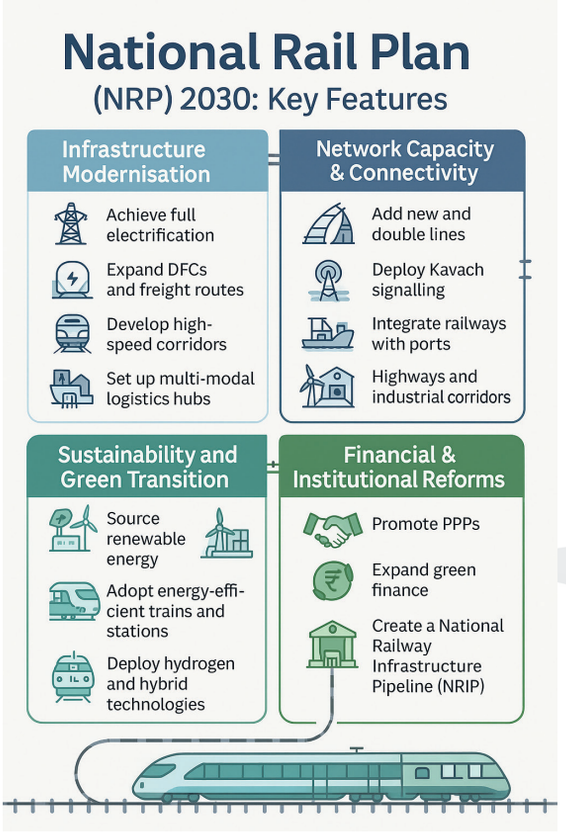
- **Electrification drive:**
  - Nearly **45,000 km of broad-gauge track** has been electrified in the past 10 years.
  - **Over 98% of the broad-gauge network** is electrified (as of 2025).
- **Renewable Energy adoption:**
  - Installed capacity: **553 MW solar, 103 MW wind, and 100 MW hybrid - total 756 MW of green energy.**
  - More than **2,000 railway stations** and service buildings are **solar powered**.
  - Several railway zones, such as the **Northeast Frontier Railway**, have received **Bureau of Energy Efficiency's "Shunya" net-zero certification**.
- **Hydrogen traction revolution:** Successful trial of India's **first hydrogen-powered coach** at ICF in **July 2025**.

## Key Initiatives Driving the Green Transition

The green transition of Indian Railways is being driven through **five major pillars - Energy, Mobility, Infrastructure, Waste, and Finance.**

- **Clean Energy and Electrification:**
  - **Target:** 100% electrification of the broad-gauge network by 2025–26.
  - **Green Energy Procurement:** Railways aim to source 30-35% of its power directly from renewables through long-term solar and wind contracts.
  - **Solar Mission:** Solar panels installed on trains, stations, and railway land (goal: 20 GW solar capacity).
- **Hydrogen and Biofuel Adoption:**
  - **Hydrogen for Heritage Project:** Hydrogen fuel-cell trains to operate on heritage and branch lines to replace diesel traction.
  - **Biofuel Integration:** Introduction of **5-20% biofuel blending** in locomotives, reducing lifecycle carbon emissions.
  - **Green Diesel Policy:** Mandates cleaner fuel usage for remaining non-electrified segments.
- **Modal Shift and Freight Corridors:**
  - **Dedicated Freight Corridors (DFCs):**
    - » Western and Eastern DFCs operational, reducing travel time by 50%.
    - » Expected to **avert 457 million tonnes of $CO_2$ emissions** over 30 years.
  - **Freight Policy 2030:** Increase rail's freight modal share from **27% to 45%** by 2030.
  - **Gati Shakti Terminals** being developed as integrated logistics hubs powered by clean energy.
- **Energy-Efficient Infrastructure:**
  - **Net-Zero railway stations:** New stations designed to meet **green building standards** with energy-efficient lighting, rainwater harvesting, and waste recycling.
  - **Smart coaches:** AI-driven predictive maintenance and regenerative braking systems to optimise traction energy use.

– **Electrified signalling and digital interlock systems** to minimise idle energy losses.




### How transition is being financed

- **Green Financing:** The Railways has emerged as a key beneficiary of sovereign green bonds, supporting projects in clean traction, energy-efficient stations, and multi-modal terminals.
- **Institutional strength:** The Indian Railway Finance Corporation (IRFC) has deepened its climate-aligned borrowing, while long-term power purchase agreements with public utilities ensure renewable energy supply and reduce price volatility.
- **Digital and operational efficiency:** Implementation of smart metering, energy management systems, and optimized timetabling helps maximize efficiency and derive greater service output from every unit of electricity consumed.

### Benefits of the Green Transition

- **Environmental:**
  - Achieving **net-zero by 2030** could prevent **60 million tonnes of $CO_2$ emissions annually**, equivalent to removing **13 million cars** from roads.
  - Improves **air quality** in urban rail corridors and reduces **noise pollution**.
- **Economic:**
  - Projected **fuel savings of over ₹1 lakh crore by 2030.**
  - Reduced dependence on imported fossil fuels, enhancing **energy security**.
  - Creation of **green jobs** in renewable energy, manufacturing, and maintenance sectors.
- **Strategic:**
  - Enhances India's **global climate credentials** under its **Paris Agreement commitments**.
  - Strengthens **industrial self-reliance (Atmanirbharta)** through domestic clean technology innovation.
  - Boosts **modal competitiveness** by making rail cheaper and cleaner than road transport.

## Areas of Improvement

- **Source of electricity:**
  - Electrification alone doesn't ensure decarbonisation if power is drawn from **coal-heavy grids**.
  - Need for direct renewable power purchase agreements (PPAs) to ensure "green trains run on green power."
- **Last-Mile emission linkages:**
  - Stations must be turned into multi-modal green hubs connecting with electric buses, bicycles, and pedestrian routes.
  - For freight, **first- and last-mile** connectivity must shift to **electric or LNG trucks**, or hydrogen-based vehicles.
- **Rolling stock innovation:** Need to adopt lightweight materials, aerodynamic designs, and AI-based traction optimisation.
- **Institutional coordination:** Stronger synergy needed between the Ministry of Railways, NTPC, MNRE, and state electricity regulators for renewable procurement and grid integration.
- **Public and behavioural engagement:** Passenger awareness through carbon labelling of trains and green ticketing initiatives can encourage sustainable choices.


## Challenges in the Green Transition

- **Financial sustainability:** Green infrastructure is capital-intensive; balancing investments with operational efficiency is crucial.
- **Grid decarbonisation**: Without renewable-sourced traction power, emissions simply shift from diesel to coal-fired electricity.
- **Technological maturity**: Hydrogen fuel, battery storage, and smart traction systems are still at nascent stages in India.
- **Institutional fragmentation**: Multiple agencies (IRFC, NTPC, MNRE, States) have overlapping responsibilities, creating coordination challenges.
- **Behavioural and cultural barriers**: Resistance to operational changes and lack of awareness among users and employees hinder progress.

- **Waste and lifecycle management:** Solar panel and battery waste disposal can become future environmental issues.

## Way Forward

- **Green power procurement:** Enter **long-term renewable PPAs** for traction power & Deploy **solar and wind farms** on unused railway land and rooftops.
- **Integrated mobility approach:** Develop **multi-modal green transport ecosystems** around major stations.
- **Innovation & R&D:** Encourage **public-private partnerships (PPP)** in hydrogen, battery, and AI-based traction technologies. Establish a **National Railway Green Tech Mission**.
- **Financing reforms:** Expand **green bonds** and create a **Rail Climate Fund**. Incentivise **private sector investment** through tax benefits and green credit mechanisms.
- **Strengthen Monitoring & Governance:** Independent **Green Audit Mechanism** for sustainability reporting&Transparent **carbon accounting** for each operational division.
- **People's Participation(Jan Bhagidari):** Engage passengers, freight customers, and employees through green certification and awareness campaigns.

## Conclusion

The hydrogen-powered coach trial reflects India's strong climate ambition and technological capability. It demonstrates how Indian Railways can reinvent itself as the green backbone of national mobility. With **coordinated policies, financial innovation, and public participation**, Indian Railways has the potential to become a **global benchmark in sustainable transport transformation.**

# Fiscal space for the States

*Syllabus Mapping: GS Paper -3: Indian Economy*

## Context

The **GST (2017) unified India's indirect tax system** but also centralised taxation powers, limiting States' fiscal flexibility. The abolition of GST compensation cess (2025) has reignited debates over fiscal autonomy and cooperative federalism.

## Changing fiscal dynamics in India

- **India's Fiscal structure**: Multi-tiered governance system where Centre and States share taxation powers and expenditure duties.
- **Shift to centralisation**: Balance tilting towards the Centre, especially post-2017 GST implementation.
- **GST benefits and drawbacks**: Simplified indirect taxes and enhanced efficiency, but reduced States' resource independence.
- **End of GST compensation**: Five-year cess mechanism abolished, guaranteeing States reimbursement for revenue shortfalls; its removal sparks concerns over diminished State fiscal autonomy.
- **2025 GST slab changes**: Anticipated restructuring to deliver **over Rs. 2 lakh crore** in consumer tax relief, putting additional pressure on State budgets.
- **States' concerns**: Potential indirect gains in consumption and revenue, but lack of accurate revenue loss assessments and no compensation leave States exposed to fiscal risks.

### Background: Fiscal Federalism and the GST Transformation

**Constitutional Framework**

- Fiscal relations in India are guided by the **Constitution**, which delineates taxation and expenditure responsibilities between the **Union and States**:
  - **Articles 246 & 246A**: Define legislative competence and taxation powers; the **101st Amendment introduced Article 246A** to enable concurrent powers for GST.
  - **Articles 268-293**: Lay down the framework for Centre–State financial relations.
  - **Article 280**: Provides for the Finance Commission, which recommends principles of tax sharing and grants.
- Historically, India followed a **quasi-federal fiscal model** - centralising resource mobilisation for efficiency, while decentralising expenditure responsibilities to ensure accountability and service delivery.

## Erosion of States' Fiscal Autonomy

- **Centralisation under GST:**
  - States lost the power to levy independent taxes like VAT and entry tax.
  - The **GST Council**, dominated by the Centre, now decides rates and exemptions.
- **End of GST Compensation**:
  - The 5-year compensation (2017–2022) for revenue loss has ended.
  - States face **uncertainty in revenue** and **limited flexibility** in fiscal planning.
- **Rise of Cesses and Surcharges**:
  - Cesses (e.g., infrastructure, education) are **not shareable** with States.
  - They form nearly **₹4.23 lakh crore (BE 2025–26)**, reducing States' actual tax share.
- **Loss of Policy Freedom**:
  - States can no longer adjust tax rates for local priorities.
  - Fiscal policy autonomy has been replaced by uniform centralised control.

## Fiscal Dependence and Asymmetry

- **Dependence on Central Transfers:** On average, **44% of States' revenue** comes from the Centre.
  - **E.g.: Bihar (72%)** highly dependent; **Haryana (20%)** and **Tamil Nadu (31%)** relatively independent.
- **Expenditure burden rising**: States spend more than half of total government expenditure (≈52%) on welfare and development. Yet, their **tax collection powers are shrinking**.
- **Unequal treatment**: High-performing States feel **penalised** for efficiency & Poorer States remain **dependent**, perpetuating fiscal imbalance.
- **Political frictions:** Opposition-ruled States often allege biased fund release and policy centralisation.

### Role of the Finance Commission

- **Mandate**: Recommends how **Central taxes** and **grants** are shared between the Centre and States (Article 280).
- **Evolution of Devolution**: 11th FC (2000–05): 29.5% → 14th FC: 42% → 15th FC: 41%.

  - Despite higher recommendations, **actual devolution** is lower due to non-shareable cesses/surcharges.
- **Concerns with FC Mechanism**:
  - **Arbitrary changes** in weightage given to criteria such as population, income distance, and fiscal discipline.
  - **Perceived penalisation** of progressive States with strong tax bases.
  - Lack of transparency in how grants and CSS funds are distributed.

## Key Issues in Fiscal Federalism

- **Centralised resource control:** Centre collects ~67% of taxes; States only ~33%.
- **Mismatch between resources and responsibilities**: States handle welfare and service delivery but have limited revenues.
- **Falling Tax autonomy**: GST and cesses have reduced independent fiscal space.
- **Limited borrowing freedom**: Fiscal deficit limits under FRBM Acts constrain State investments.
- **Unpredictable transfers:** Delayed GST payments and ad-hoc grants disrupt liquidity management.

## Need to restore Fiscal space

- **Share Personal Income Tax (PIT) Base:** Allow States a share in PIT collections, similar to GST, to align revenue with regional growth.
- **Permit State 'Top-Up' Taxation**: Let States levy a small surcharge on PIT (like in Canada), enhancing fiscal flexibility.
- **Merge cesses and surcharges with divisible pool**: Ensures fair distribution and transparency.
- **Reform Centrally Sponsored Schemes (CSS)**: Give States freedom to design and implement schemes suited to local needs.
- **Reform GST Council**: Increase States' representation and voting parity; ensure transparency in decision-making.
- **Institutionalise Fiscal Dialogue**: Create a **Centre–State Fiscal Council** for coordination, dispute resolution, and fiscal monitoring.

## Challenges in Achieving Fiscal Space

- **Centre–State political differences:** Consensus on tax reforms is often hindered by partisanship.
- **Uneven economic capacity**: Richer States may benefit more, widening regional inequality.
- **Data and transparency deficit**: Lack of reliable fiscal data hampers evidence-based decision-making.
- **Rising debt and deficits**: High State borrowings reduce capacity for capital expenditure.
- **Institutional overlaps:** Finance Commission, GST Council, and NITI Aayog often work in silos.

## Way Forward

- **Revisit Fiscal devolution formula:** Ensure equitable distribution based on need, efficiency, and population equity.
- **Institutional reform:** Establish a **Permanent Centre–State Fiscal Council** to coordinate fiscal policies, monitor transfers, and resolve disputes.
- **Enhance States' revenue powers**: Allow limited flexibility to impose local taxes or surcharges.
- **Bring all Cesses/Surcharges into a divisible pool**: Increase transparency and States' share of national taxes.
- **Strengthen cooperative federalism**: Promote continuous fiscal dialogue and joint decision-making.
- **Encourage Fiscal responsibility and innovation**: Reward States for efficiency, fiscal prudence, and innovation in resource mobilisation.
- **Adopt data-driven Fiscal management:** Use real-time GSTN and AI-based analytics for accurate revenue forecasting.

### Comparative Perspective: Learning from Federal Models

- **Canada:** Subnational governments collect **54% of tax revenue** and undertake **60% of public spending**, enabling greater fiscal flexibility.
- India: Centre collects **67% of tax revenue**, but States account for **52% of total expenditure**, leading to chronic imbalance.

## Conclusion

India's fiscal federalism faces growing centralisation post-GST, eroding States' autonomy amid rising expenditure burdens. Restoring balance demands equitable tax-sharing, flexible revenue tools, and stronger cooperative institutions to ensure sustainable growth and regional equity.

# Weaponisation of Global Trade

*Syllabus Mapping: GS Paper -3: Indian Economy*

## Context

- At the **Kautilya Economic Conclave, External Affairs Minister S. Jaishankar** noted that globalisation has faced significant social and political resistance over the last 25 years.
- He pointed out that **trade has become not just globalised but also weaponised**, leading countries to assess economic deals through a national security perspective.
- Consequently, nations like India have turned to protectionist steps, including anti-dumping duties, especially against Chinese imports.

## Key tools for trade weaponisation

- **Selective import/export bans:** For instance, the US CAATSA sanctions aimed at Iran, Russia, and North Korea.
- **Leveraging economic reliance:** China dominates 60% of global production and 85% of processing for 20 key minerals, enabling export curbs or price controls to influence geopolitical stances like the One China Policy.
- **Non-tariff hurdles:** Delays in customs, stringent environmental, biosecurity, or IP rules; e.g., EU's rigorous labeling and certification standards that hinder Indian agricultural exports.
- **Currency devaluation tactics:** China accused of keeping the yuan artificially low to boost export competitiveness.
- **Advancing domestic priorities:** China cut trade with Norway after activist Liu Xiaobo won the 2010 Nobel Peace Prize; relations normalized only after the Norwegian king's 2018 visit to China, following Liu's death in 2017.

**Trade Weaponisation: Meaning**

- **Trade weaponization** simply means using trade as a foreign policy instrument instead of purely for economic gains.
- It involves strategically applying trade policies to force a partner country to modify its actions in any area (economic or diplomatic) by targeting its economic weaknesses and trade imbalances.
- International trade, while typically boosting welfare, creates asymmetric dependencies where one party faces greater losses if ties are cut off.
- **Example:** In 1973, Arab countries enforced an oil embargo on the US and its allies to protest the US providing $2.2 billion in military aid to Israel, pressuring changes in security alignments.

**Current scenario**

- **Globalisation in reverse:** The US, EU, and China - once the pillars of globalisation, have now become its biggest disruptors.
- **WTO Order under strain:** The rules-based trade order created under the WTO is eroding as countries increasingly use trade as a tool of geopolitical power.
- **New Trade Weaponisation:**
  - **US:** Uses market access and tariffs as pressure instruments.
  - **EU:** Uses green and environmental regulations to restrict imports.
  - **China:** Uses industrial dominance and control over supply chains for political leverage.

## United States: From Free trade champion to economic nationalist

- US, traditionally a promoter of free trade, now uses tariffs and sanctions as political weapons.
- Under President Donald Trump's "**Liberation Day Tariffs (2025)**," sweeping duties were imposed on steel, aluminium, and electronics imports, violating WTO rules.
- **Result:** India's exports to the US fell by 37% between May and September 2025.

**Weaponisation through Energy Policy**

- The US is pushing allies to replace **Russian oil** with **US shale crude**, securing long-term energy contracts.
- The EU pledged **$250 billion annually** for US energy imports.
- India, however, faces **penalisation for importing discounted Russian crude**, despite its energy needs.
- **Implication:** Washington is using its **market access and energy exports** as **strategic leverage**.
- **Contradictions in US Policy:**
  - The US remains a **net oil importer** ($60 billion deficit in 2024).
  - Forcing buyers toward US supplies risks artificial shortages and price spikes.

## European Union: Green Protectionism under a Climate Cloak

- The EU's Carbon Border Adjustment Mechanism (CBAM) and Deforestation Regulation (EUDR) are being implemented as non-tariff barriers.
- **Carbon Border Adjustment Mechanism (CBAM):**
  - To start charging for embedded carbon from **2026** on imports like steel, cement, and aluminium.
  - Expected to generate billions for the EU **without genuine climate benefits**.
  - India's **steel and aluminium exports to the EU fell 24% (FY 2025)** even before implementation.
- **EU Deforestation Regulation (EUDR):**
  - Restricts imports of **coffee, leather, palm oil, and wood** unless proven deforestation-free post-2020.
  - Likely to expand to all agricultural and industrial imports within a decade
- **Implication:** The EU is effectively using **environmental standards** as a **disguised form of protectionism**, threatening exports from emerging economies like India.

## China: Industrial Dominance and Supply Chain Control

- China has turned its **manufacturing supremacy** into a **geopolitical weapon**.
- It produces over 50 million vehicles annually - 55% of global demand and dominates solar cells, EVs, semiconductors, and APIs.
- Its subsidised exports are flooding markets, forcing factory shutdowns in the US, EU, and even India.
- **Control of Critical Minerals:**
  - China refines ~70% of the world's rare earths, essential for defence and clean energy.
  - In October 2025, Beijing restricted rare earth exports, prompting US retaliation with 100% tariffs on Chinese goods.
- **Implication:** China's **economic coercion** through resource control is deepening global dependence, driving other nations to diversify supply chains.

**The Emerging challenge: End of rules-based trade**

- The combined effect of these shifts is a **fractured global trade system**:
  - WTO mechanisms are increasingly **ignored or undermined**.
  - Tariffs, climate rules, and export bans are being **used for strategic advantage**, not economic fairness.
  - Supply chains are **fragmenting** into geopolitical blocs - the **US-led West**, **China-led Eurasia**, and the **Global South** seeking autonomy.
- This new order is pushing the world toward a **"VUCA"** environment - **Volatile, Uncertain, Complex, and Ambiguous**.

## Challenges for India

- **Declining Export Competitiveness:** Indian exports to the US and EU are falling due to tariffs and green barriers. Exporters face compliance costs, carbon accounting, and certification burdens.
- **Energy Vulnerability:** India imports over **85% of its crude oil**; US pressure to reduce Russian oil purchases risks **raising energy costs**.
- **Dependence on Chinese Imports:** Despite tensions, India imports over $100 billion worth of goods from China, including machinery, APIs, and electronics - deepening its trade deficit.
- **Non-Tariff Barriers and Regulatory Asymmetry:** Western environmental and labour standards often disadvantage Indian MSMEs, limiting market access.

- **Technological Gaps:** India's share in **high-value global manufacturing** remains limited; dependence on foreign semiconductors and components persists.

**Trade weaponisation used against India**

- Western nations attempted to coerce India by targeting its economic and tech weaknesses, yet India transformed pressures into strengths.
- **Food security achievement:** India entered a 1954 US food aid pact under PL 480; aid halted in late 1960s when India rejected US demands for policy shifts like privatization.
- **Response**: Under C Subramaniam's vision, the Green Revolution was launched, turning India into a net food grain exporter.
- **Nuclear sector**: Western sanctions post-1974 and 1998 nuclear tests, plus scarce domestic uranium, prompted India to pioneer a three-stage nuclear program leveraging abundant thorium reserves.

## Way Forward - Three Pillars of India's Trade Strategy

- **Strengthening domestic manufacturing**
  - Focus on **electronics, defence, renewable energy**, and **semiconductors**.
  - Attract "anchor investments" like Apple and Suzuki to create global supply ecosystems.
  - Reduce production costs: currently **25% higher than China due to expensive power, credit, and inputs.**
- **Safeguarding strategic autonomy**
  - Avoid one-sided FTAs that compromise market access.
  - Balance ties with all major powers - **US, EU, Russia, China, and Gulf states.**
- **Securing supply chains**
  - Diversify sourcing of **critical minerals and technology components**.
  - Collaborate with trusted partners like **Australia, Japan, and France** for mineral and tech cooperation.

## Conclusion

As trade weaponisation fragments global commerce, India must fortify domestic manufacturing, safeguard strategic autonomy, and diversify supply chains to thrive in a **VUCA world- Volatile (rapid shifts), Uncertain (unpredictable outcomes), Complex (interlinked risks), and Ambiguous (blurred rules) of geopolitical trade battles.**

# Expected Credit Loss (ECL) Framework

*Syllabus Mapping: GS Paper -3: Indian Economy, Banking*

## Context

The Reserve Bank of India (RBI) has proposed a transition from the incurred-loss model to an Expected Credit Loss (ECL)-based provisioning framework. The move is part of India's effort to align with global accounting standards (IFRS 9) and promote early recognition of credit risk, thereby strengthening the resilience and transparency of the banking system.

## What is Expected Credit Loss (ECL)?

- ECL is a forward-looking approach to estimating potential losses from loans and other credit exposures.
- Under this model, banks must **anticipate and provision for future credit losses** - even before there is objective evidence of default - based on statistical estimates of the likelihood and severity of borrower distress.
- **Key Parameters Used in ECL Models - (ECL = PD × LGD × EAD)**
  - **Probability of Default (PD):** The likelihood that a borrower will default within a given time horizon.
  - **Loss Given Default (LGD):** The percentage of exposure the bank expects to lose if default occurs.
  - **Exposure at Default (EAD):** The total outstanding amount at the time of default.

## Key Concerns with Direct Adoption of ECL in India

- **Structural differences in credit portfolios:**
  - Indian banks are mandated to allocate **40% of credit to the Priority Sector** (agriculture, MSMEs, retail, housing).
  - These sectors are **granular and less correlated**, showing relatively stable repayment and recovery patterns.
  - ECL frameworks, designed primarily for **corporate-heavy balance sheets** in Western countries, may **overestimate default risk** in these segments, leading to **excessive provisioning**.
- **Legal and Institutional recovery frameworks:**
  - India's debt recovery mechanisms - SARFAESI Act (2002), Debt Recovery Tribunals (DRTs), and the Insolvency and Bankruptcy Code (IBC, 2016) - ensure structured recoveries, affecting both timing and magnitude of loss realization.
  - Western ECL assumptions, based on slower or uncertain recoveries, may overstate Loss Given Default (LGD) in the Indian context.
- **Risk of over-provisioning and Capital strain:**
  - Higher provisions could reduce banks' profitability and lending capacity, especially among small and regional banks with limited capital buffers.
  - This may **constrain credit flow** to priority sectors, undermining financial inclusion and economic growth.
- **One-size-fits-all Model:**
  - Indian banking is **heterogeneous**, ranging from large PSBs and private sector giants to cooperative and regional rural banks.
  - A uniform ECL approach ignores this diversity, creating **disproportionate compliance costs** for smaller institutions.
- **Limited data history:**
  - Reliable, long-term credit performance data - crucial for estimating Probability of Default (PD) is **fragmented or inconsistent** in many Indian banks, particularly for MSME and agricultural loans.

## Operational challenges for banks

- **Data gaps:** Banks need detailed historical data on defaults, recoveries, and collateral values. Many lack consistent and standardised data, especially for retail and MSME loans.
- **Limited modelling skills:** ECL requires advanced risk models and scenario analysis. Smaller banks often lack skilled experts and modern analytical tools.
- **System integration issues:** Core Banking Systems must link ECL models with loan and risk management modules. Upgrading systems is costly and time-consuming.

- **High compliance burden:** Regular model validations and independent audits make compliance complex.
- **Credit flow disruptions:** Focus on system upgrades can delay loan approvals and monitoring in smaller banks.

## Proposed Measures for a Balanced ECL Rollout

- **Portfolio-Specific Calibration:**
  - Apply ECL only to corporate, project, and market-linked exposures, where risk sensitivity adds value.
  - Continue using existing **prudential provisioning norms** for granular, low-correlation retail and priority sector loans.
- **Phased Implementation:**
  - Begin with **pilot projects** in select large banks and specific portfolios.
  - Use pilot outcomes to refine parameters (PD, LGD, EAD) and identify operational gaps before full rollout.
- **Capacity Building and Shared Resources:**
  - Establish a **national data repository** for credit history, recovery rates, and default statistics to strengthen PD and LGD modelling.
  - Develop **training modules and modelling toolkits** for smaller banks through RBI or IBA (Indian Banks' Association).
- **Regulatory impact assessment:** RBI should conduct and publish a **quantitative impact study** of ECL adoption on capital adequacy, provisioning, and profitability.
- **Coordination with Accounting Standards:**Align ECL implementation timelines with **Ind AS (Indian Accounting Standards)** for seamless financial reporting and audit integration.
- **Minimise capital shocks:** Allow transitional arrangements for provisioning adjustments over 3–5 years to avoid sudden hits to profitability or capital ratios.

## Conclusion

India's shift to ECL provisioning aligns with global standards but risks over-provisioning and operational challenges. A phased, portfolio-specific rollout with capacity building and transitional measures can ensure resilience without hampering financial inclusion or growth.

# India's Export Surge

*Syllabus Mapping: GS Paper -3: Indian Economy, Balance of Trade*

## Context

Despite global trade uncertainties, India's **total exports (goods and services) rose by 5.19% in April-August 2025, reaching USD 346.10 billion,** compared to **USD 329.03 billion in the same period of 2024.**

### Current Status of India's Exports

- **Total exports (Apr–Aug 2025):** USD **346.10 billion**, up **5.19% YoY**.
- **Merchandise exports:** USD **183.74 billion**, up **2.31%**.
- **Services exports:** Grew by **8.65%**, reflecting strong digital and business service growth.
- **Trade composition:** Merchandise forms **53%**, services **47%** of total exports.
- **Export share in GDP:** Increased from **19.8% (2015)** to **21.2% (2024)** (World Bank).

**Major sectors driving India's Export growth**

- **Electronics & Mobile Manufacturing:** India is now the 2nd-largest mobile manufacturer globally, driven by PLI and Make in India.
- **Engineering Goods:** Major markets: USA, UAE, Germany, UK.
  - **Key items:** machinery, engines, valves, boilers, food-processing equipment.
- **Pharmaceuticals & Chemicals**: India continues as the "Pharmacy of the World", exporting to US, UK, Brazil, Africa.
- **Agriculture & Allied Products -** Top markets: UAE, Bangladesh, Sri Lanka, Iraq, USA.
- **Textiles & Garments:** India is 6th largest textile exporter (4.1% global share).
- **Services Sector:** Services exports up 8.65%; trade surplus USD 79.97 billion.

## Government Schemes and Policy Measures driving Export growth

- **Foreign Trade Policy (FTP) 2023:**
  - Focuses on **remission of duties**, **ease of doing business**, and **digitalization**.
  - Encourages **collaboration with districts** to make them active trade hubs.
- **Production Linked Incentive (PLI) Scheme:**
  - Covers 14 sectors (electronics, pharma, textiles, etc.).
  - Generated ₹16.5 lakh crore output, attracted ₹1.76 lakh crore investments, created 12 lakh jobs (as of Mar 2025).
- **RoDTEP (Remission of Duties and Taxes on Exported Products):** Refunds embedded taxes not covered under other schemes.
- **Districts as Export Hubs (DEH):** Promotes local products like "One District One Product" for global exposure. 734 districts identified; 590 have District Export Action Plans (DEAPs).
- **Trade Infrastructure for Export Scheme (TIES):** Funds creation of testing labs, warehouses, and cargo facilities to reduce logistics bottlenecks.
- **PM GatiShakti & National Logistics Policy:** Enhances multimodal connectivity; India's logistics ranking improved from **44 (2018)** to **38 (2023)**.
- **Digital Export Facilitation:** ICEGATE, National Single Window System, E-commerce Export Hubs, and Trade Connect e-platform have simplified compliance and market access.
- **New Reforms (2025):**
  - **90% provisional GST refunds** for zero-rated supplies.
  - **GST cuts** on packaging materials and logistics (trucks/vans) to reduce costs.
  - **Export Promotion Mission (₹2,250 crore)** for MSME export credit and market expansion.

## Challenges still persists

- **Logistics & infrastructure gaps:** Port congestion, high freight costs, and inadequate cold chain facilities affect competitiveness.
- **High compliance costs:** Fragmented taxation and slow refund systems impact exporters' working capital.

- **Limited product diversification:** Heavy reliance on a few commodities (engineering, electronics, gems) makes India vulnerable to price fluctuations.
- **Global trade headwinds:** Protectionism, tariff wars (especially in US–China context), and slowing global demand affect India's exports.
- **Skewed participation:** A handful of large firms and states dominate exports; MSMEs still face barriers in credit, technology, and market access.
- **Services vulnerability:** Outsourcing and visa restrictions in Western markets could affect IT and business service exports.

**Why Exports originate from certain states**

**Regional Concentration**

- Over **70% of India's exports** originate from a handful of **industrialized and coastal states** - Maharashtra, Gujarat, Tamil Nadu, Karnataka, Uttar Pradesh, and Telangana.

**Reasons for Concentration**

- **Port access & infrastructure:** States with strong port networks (Gujarat, Maharashtra, Tamil Nadu) enjoy logistical advantages.
- **Industrial clusters:** Presence of **automobile, electronics, pharma, and textile hubs**.
- **Policy ecosystem:** Progressive state policies and export promotion councils.
- **Skilled manpower:** Southern states dominate services and technology exports due to talent concentration.
- **MSME networks:** Western and Southern states have dense MSME linkages with global supply chains.

**Emerging exporters**

- States like **Odisha, Chhattisgarh, and Assam** are now entering the export map through **District Export Hub** and **Krishi Export Zones**, diversifying India's export geography.

## Way Forward

- **Diversify Export Basket:** Promote high-value manufacturing (electronics, EVs, green tech) and sunrise sectors (aerospace, defence, AI).
- **Boost MSME Participation:** Expand credit availability, digitize supply chains, and integrate MSMEs with global e-commerce platforms.
- **Enhance Infrastructure & Logistics:** Accelerate projects under PM GatiShakti; establish **export corridors** connecting ports, airports, and industrial parks.
- **Sustain Services Leadership:** Encourage global delivery centres, creative industries, and digital exports through **Startup India and Digital India**.
- **Strengthen Trade Diplomacy:** Speed up FTAs with major partners (EU, UK, Australia); diversify into Africa, Latin America, and ASEAN.
- **Quality & Sustainability Standards:** Focus on **traceability, certification, and green production**, aligning with global ESG requirements.
- **State-Level Empowerment:** Encourage **export-specific state targets** and **district-level branding** to ensure balanced growth.

## Conclusion

India's exports rose 5·19% in April–August 2025, led by electronics, pharma, and services, fueled by PLI and FTP 2023. Challenges like logistics gaps and regional concentration remain. Diversifying products, empowering MSMEs, improving infrastructure, and strengthening trade diplomacy are crucial for sustained growth.

# Transforming India's SMEs with Artificial Intelligence

*Syllabus Mapping: GS Paper -3: Indian Economy, Manufacturing*

## Context

Recently, the Ministry of Electronics and Information Technology (MeitY), in collaboration with the Office of the Principal Scientific Adviser to the Government of India and BCG X, released an insight report titled **"An AI Playbook for India's SMEs."**

## What are SMEs (Small and Medium Enterprises)?

- In India, MSMEs (Micro, Small and Medium Enterprises) are defined under the Micro, Small and Medium Enterprises Development (MSMED) Act, 2006, as amended in 2020, based on two parameters:
  - **Investment** in plant and machinery or equipment,
  - **Annual Turnover** of the enterprise.
- India has over **63 million MSMEs,** including about **3.36 lakh small enterprises and 5,000 medium enterprises.**
- **Sectoral Composition: Manufacturing:** 31% of total MSMEs, **Services:** 33%, **Trade:** 36%.
- Categories of MSME in India:

| Category | Investment Limit | Annual Turnover Limit |
|---|---|---|
| **Micro** | ≤ ₹2.5 crore | ≤ ₹10 crore |
| **Small** | ≤ ₹25 crore | ≤ ₹100 crore |
| **Medium** | ≤ ₹125 crore | ≤ ₹500 crore |

## Significance of SMEs in India's Development

- **Economic Growth:** Contribute 30% to GDP; support India's $7-trillion economy goal by 2030,
- **Employment:** 230 million people employed; key to inclusive job creation.
- **Exports:** Nearly half of total exports, especially in textiles, engineering, and pharma.
- **Regional Development**: Promote non-farm employment in rural/semi-urban areas.
  - **E.g:** Many enterprises are located in semi-urban and rural areas, helping reduce regional income disparities.
- **Entrepreneurship:** Encourage innovation, local enterprise, and self-employment.
- **Social Inclusion:** Women, youth, and informal workers get opportunities in small-scale setups.
  - **E.g:** MSMEs employ 45 million women, highlighting their role in women's empowerment.

## Potential of AI for India's MSME Ecosystem

According to the **World Economic Forum (2025),** AI adoption in MSMEs could unlock $490–685 billion in economic value by 2030 - a potential 45–62% boost over current levels.

- **Productivity Enhancement:**
  - AI-based automation, predictive analytics, and process optimization can raise productivity by **15–20%**.
  - Translating this into an added **$160–215 billion** in economic output.
- **Cost Reduction:** AI-driven logistics, resource optimization, and supply chain automation can cut costs by **20–30%**, unlocking **$200–300 billion** in savings.
- **Financial Inclusion:**
  - Formal credit meets only **19% of MSME demand**, leaving a **$530 billion credit gap**.
  - AI-based credit scoring and alternative data models can bridge this gap, unlocking **$130–170 billion** in value.
- **Business-Level Impact:**
  - Labour productivity can increase by 30–40%;
  - Energy efficiency can rise up to 59%;
  - Defect rates can drop by 99%;
  - Loan processing time can be reduced from days to hours.

## Key Challenges in AI Adoption in MSMEs

- **Knowledge and awareness Gaps:** Limited understanding of AI's business value & Absence of mentors or local champions demonstrating AI's benefits.
- **Data and Digital Readiness:**
  - Most MSMEs are still in early stages of digitalization - using paper ledgers or Excel.
  - Weak data systems, limited IoT/sensor integration, and cybersecurity concerns.
  - Fear of regulatory exposure discourages data sharing.
- **Accessibility and Affordability of AI Solutions:**
  - Majority of AI products are designed for large enterprises , also SMEs lack testing environments and plug-and-play AI tools.
- **Talent and Workforce capability:**
  - MSME owners have **low AI literacy** and depend on traditional methods.
  - Limited training programs and high attrition among workers.
- **Ecosystem-Level Issues:**
  - Absence of AI marketplaces for SMEs.
  - Fragmented innovation ecosystem and low collaboration between academia, startups, and small businesses.

## Broader Challenges Facing MSMEs in India

- **Financial constraints:** High cost of capital (12–14%) vs 8–10% for large firms.
- **Regulatory complexity:** Overlapping compliance requirements and lack of single-window systems.
- **Market access issues:** Poor integration with global supply chains.
- **Technological backwardness:** Low adoption of ERP and automation tools.
- **Infrastructure gaps:** High logistics and energy costs.
- **Informality:** Around 85% of microenterprises are unregistered, limiting access to incentives and finance.

## Government Interventions for MSMEs in India

- **CGTMSE (2000)**: Provides collateral-free loans up to ₹5 crore for MSEs with up to 85% guarantee cover. (Nodal: SIDBI & MSME Ministry)
- **PMEGP (2008)**: Credit-linked subsidy (15–35%) for new micro/small enterprises; implemented by **KVIC**; generated **70+ lakh jobs**.
- **PM MUDRA Yojana (2015)**: Collateral-free loans up to ₹10 lakh under **Shishu, Kishor, Tarun** categories; over **₹22 lakh crore** disbursed.
- **MSME Champions (2021)**: Focus on **competitiveness, tech-upgradation, and sustainability** through components like **ZED**, **Design Clinic**, **Digital MSME**.
- **RAMP Scheme (2022)**: ₹6,000 crore World Bank-assisted program to boost **productivity, digitization, and innovation** in MSME clusters.
- **MSE-Cluster Development Programme**: Builds Common Facility Centres (CFCs) for shared design, testing, and quality infrastructure.
- **ZED Certification Scheme:** Promotes high-quality, eco-friendly manufacturing, aligned with Make in India and Atmanirbhar Bharat.
- **Digital MSME & Technology Centres**: Encourages AI, IoT, and automation adoption; 100 tech centres for digital upskilling and innovation.
- **TReDS & GeM Platforms**: Facilitate early invoice payments and direct government procurement, ensuring transparency and liquidity.
- **IndiaAI Mission (2024)**: AI for MSMEs initiative to enhance productivity, automation, and credit access via AI hubs and sandboxes.

### How to Accelerate AI Adoption in MSMEs

The **WEF's IMPACT AI Framework provides a structured three-pillar strategy** to drive inclusive AI adoption:

- **Creating Awareness:**
  - **AI Experience Centres** in industrial clusters to demonstrate real-world use cases.
  - **AI Sandboxes** for co-development and testing of affordable solutions.
  - **Capacity-building programmes** for MSME owners and workers.
- **Inspiring Action: DNA – Data, Network, Application:**
  - Launch an **AI Maturity Index** (linked to Udyam portal) to assess MSME digital readiness.
  - Develop an **AI Marketplace Platform** (linked with ONDC) for plug-and-play solutions, user reviews, and transparent pricing.
  - Create **Alternative Financing Models**, such as CSR-supported "AI for SMEs" partnerships, Cluster-based funding mechanisms etc.
- **Receiving Recognition:**
  - Introduce a "SME AI Pioneer" Programme to recognize early adopters and cluster leaders.
  - Align with WEF's MINDS initiative for global recognition of Indian AI-enabled SMEs.

## Way Forward - Transforming India's MSME Sector

- **Strengthen Access to Finance:**
  - Expand CGTMSE coverage and simplify loan procedures.
  - Enforce **timely payment norms** under the MSMED Act and scale up **TReDS platforms** for invoice discounting.
- **Promote Technology and Digital Transformation:**
  - Establish **AI Experience Centres and Sandboxes** under the **IndiaAI Mission** for cluster-based digital adoption.
  - Encourage **AI-as-a-Service** and affordable cloud ERP tools for MSMEs.
- **Build Infrastructure and Cluster Ecosystems:**
  - Develop **MSME parks** with shared utilities, logistics, and design facilities.
  - Link clusters to **industrial corridors** and **ULIP** for efficient supply chains.
- **Simplify Regulations and Strengthen Governance:**
  - Create a **single-window digital portal** integrating Udyam, GST, GeM, and TReDS services.
  - Establish a **National MSME Council** for coordinated policymaking across ministries.
- **Enhance Market Access and Global Integration:**
  - Strengthen Public Procurement Policy (25% govt purchases from MSEs).
  - Facilitate **exports through MSME hubs**, branding support, and ZED certification.
- **Institutional Coordination and Data-Driven Policy:**
  - Use **real-time MSME dashboards** for performance monitoring via Udyam Assist.
  - Encourage **state-level MSME competitiveness rankings** to drive reforms.

## Conclusion

India's MSMEs, contributing 30% to GDP and 50% to exports, could unlock $490–685 billion by 2030 via AI adoption. Despite challenges like data gaps and low AI literacy, initiatives like IndiaAI Mission and CGTMSE, with WEF's IMPACT AI Framework, can drive growth.

# NITI Aayog's Roadmap to Position India as a Global Advanced Manufacturing Hub

*Syllabus Mapping: GS Paper -3: Indian Economy, Manufacturing*

## Context

Recently, NITI Aayog unveiled the Frontier Tech Hub (2025) report, outlining a decisive roadmap to transform India into a global leader in advanced manufacturing by 2035 through the integration of frontier technologies such as AI, robotics, digital twins, and advanced materials.

## India's Manufacturing Sector

### Current Status

- **Contribution to GDP:** Around **15–17%** of India's GDP (FY 2024).
- **Employment:** Over **100 million people**, second only to agriculture.
- **Export Share:** Roughly **45% of merchandise exports**.
- **Sectoral Distribution:** Auto components, textiles, electronics, pharmaceuticals, and chemicals dominate.
- **Target:** Raise manufacturing share to **25% of GDP by 2035**, generating **100 million new skilled jobs**.

### Significance

- **Economic Growth:** Key to achieving the $7 trillion economy target.
- **Employment:** Provides large-scale, quality, non-farm jobs.
- **Export Competitiveness:** Enhances India's role in global supply chains.
- **Regional Balance:** Drives industrialization beyond metro regions.
- **Technological Sovereignty:** Reduces dependence on imports in strategic sectors.
- **Geopolitical Leverage:** Strengthens India's position as a "trusted manufacturing partner" amid global realignments.

**What is Advanced Manufacturing?**

- Advanced Manufacturing refers to the use of innovative technologies, digital tools, and automation to improve the design, production, and performance of products and processes.
- Manufacturing is about making products & Advanced Manufacturing is about making products intelligently - using data, automation, and innovation.

**Key Features of Advanced Manufacturing**

- **Technology-driven:** Relies on digital and cyber-physical systems.
- **Precision and Customization:** Produces high-quality, hyper-personalized products.
- **Sustainability:** Reduces waste and carbon footprint through circular practices.
- **Integration:** Seamless connection between design, production, supply chains, and data analytics.
- **Resilience:** Builds flexible, globally competitive production ecosystems.

## India's Potential in Advanced Manufacturing

- **Demographic Dividend:** Young, trainable workforce adaptable to new technologies.
- **Massive Domestic Market:** Rising consumption supports demand-driven industrialization.
- **Global Supply Chain Realignment:** Shift from China to India amid "China + 1" diversification.
- **Government Support:** Production Linked Incentive (PLI) schemes, Make in India, and National Industrial Corridors.
- **Tech Startup Ecosystem:** India hosts **over 3,000 deep-tech startups** driving industrial innovation.
- **Sustainability Leadership:** Push for green, circular, and low-carbon manufacturing aligned with global ESG standards.

If harnessed strategically, India can emerge as a top 3 global manufacturing hub by 2035, with advanced, AI-driven, sustainable production ecosystems.

## How Frontier Technologies can be used as Transformation Engines

NITI Aayog identifies **four frontier technologies** that will revolutionize Indian manufacturing by driving efficiency, sustainability, and innovation:

| Technology | Core Functions | Impact Areas |
|---|---|---|
| **Artificial Intelligence (AI) & Machine Learning (ML)** | Predictive analytics, quality control, energy optimization | Productivity, defect reduction, design automation |
| **Advanced Materials** | Bioengineered, lightweight, high-performance materials | Defence, aerospace, green manufacturing |
| **Digital Twins** | Real-time digital replicas of physical systems | R&D efficiency, predictive maintenance |
| **Robotics** | Smart automation and collaborative human–machine operations | Precision, speed, and worker safety. |

**Economic Impact**

Could add $270 billion to GDP by 2035 and $1 trillion by 2047.

Without adoption, India risks losing 1.1 trillion USD in potential manufacturing GDP and global competitiveness.

## Strategic Roadmap to Integrate AI and Frontier Tech in Manufacturing

**Phase 1 (2026–2028): Ecosystem Building**

- **National Manufacturing Mission (NMM)** with an **Advanced Manufacturing Pillar**.
- **Global Frontier Technology Institute (GFTI):** Centre of Excellence for R&D and certification.
- **Skilling Missions:** Modular, sector-specific training (e.g., Robotics Mission in Tamil Nadu).
- **Technology Access Platforms:** Shared AI, simulation, and data tools for MSMEs.
- **Champion Enterprises:** Large firms mentor clusters and MSMEs in adopting frontier tech.
- **Frontier Tech Supply Chains:** Blockchain-based traceability and IoT visibility.
- **20 "Plug-and-Play Frontier Tech Parks"** across priority sectors.

**Phase 2 (2029–2031): Acceleration**

- **Servicification of Manufacturing:** Combining physical goods with AI-based services (remote diagnostics, pay-per-use models).
- **Integration of Global Capability Centres (GCCs)** focusing on frontier tech collaboration.

**Phase 3 (2032–2035): Sustenance**

- **Continuous Monitoring:** Evaluate frontier tech maturity and ensure global leadership.
- **Self-reliance and Exports:** Develop indigenous IP and export frontier manufacturing solutions.

## Bottlenecks in India's Manufacturing Sector

- **Low R&D and Innovation:**
  - India invests less than **1% of GDP in R&D**, far behind China (2.4%) and South Korea (4.5%).
  - Weak industry–academia collaboration limits innovation commercialization.
- **Infrastructure and Logistics Deficits:**
  - High logistics costs (~13–14% of GDP) compared to 8–9% in developed economies.
  - Power supply reliability and last-mile connectivity remain inconsistent.
- **Skill and Productivity Gaps:**
  - Only **4.7% of the workforce** is formally skilled.
  - Productivity in Indian factories is 2–3 times lower than East Asian peers.
- **MSME Technology Divide:**
  - MSMEs form **99% of industrial units**, but most lack access to automation, AI tools, or digital supply chains.
  - Limited financial capacity restricts modernization.
- **Fragmented Value Chains:**
  - Weak backward–forward integration and low adoption of **Industry 4.0 standards**.
  - Heavy reliance on imported components in electronics, semiconductors, and defence.
- **Regulatory and Institutional Challenges:** Complex approval processes, overlapping jurisdictions, and inconsistent standards across states hinder scale and speed.

## Government Schemes and Policy Support in Manufacturing Sector

| Scheme/Initiative | Focus Area |
|---|---|
| **Make in India (2014)** | Boost domestic manufacturing, ease of doing business |
| **Production Linked Incentive (PLI) Schemes** | Encourage large-scale manufacturing in 14 key sectors (Electronics, Pharma, Auto, etc.) |
| **National Manufacturing Policy (NMP)** | Target 25% GDP share and 100M jobs |
| **Digital India and IndiaAI Mission (2024)** | Promote AI and digital tech adoption |
| **SAMARTH Udyog Bharat 4.0** | Upgrading manufacturing units with Industry 4.0 tools |
| **RAMP Scheme (2022)** | Enhance MSME competitiveness through digitalization |
| **National Industrial Corridor Development Programme (NICDP)** | World-class industrial and logistics infrastructure |
| **Skill India Mission & PMKVY** | Develop future-ready technical workforce |
| **Green Manufacturing and ZED Scheme** | Promote energy efficiency and ESG-compliant industries |

## Way Forward

- **Policy and Governance:**
  - Institutionalize **Advanced Manufacturing under NMM** as a national priority.
  - Simplify regulations for AI and automation deployment & Fast-track IP protection and patent approvals.
- **Technology Adoption**
  - Incentivize early adopters of AI, robotics, and digital twins through tax benefits.
  - Develop **cluster-based AI sandboxes** for safe experimentation.
  - Promote **AI-as-a-Service** for MSMEs via shared platforms.
- **Skilling and Workforce Transformation:**
  - Integrate **AI, robotics, and material science** into vocational and engineering curricula.
  - Launch **Frontier Tech Missions** at state levels & Strengthen industry–academia collaboration for R&D apprenticeships.
- **Infrastructure and Investment:**
  - Establish **public–private venture funds** for deep-tech manufacturing startups.
  - Prioritize **green energy and nuclear SMRs** for reliable power supply to industrial clusters.
- **MSME Enablement:**
  - Digital onboarding of MSMEs to **AI-based productivity platforms**.
  - Promote **shared R&D labs, design copilots, and cloud-based simulation tools**.
- **Global Partnerships:**
  - Collaborate with Japan, South Korea, Germany, and the U.S. for technology exchange.
  - Leverage India's G20 role to attract supply chain relocations.

## Conclusion

India's manufacturing, at **15–17% of GDP,** can lead globally by 2035 with AI, robotics, and digital twins, adding $270 billion. Despite R&D, skill, and infrastructure gaps, PLI, Make in India, and the Frontier Tech Hub roadmap can drive **25% GDP share and 100 million jobs through MSME enablement, skilling, and global partnerships.**

# Topics for Prelims (Economy)

## Payments Regulatory Board

### Context

RBI constitutes a 6-member Payments Regulatory Board.

### About Payment Regulatory Board

- Established under the **Payment and Settlement Systems Act, 2007**.
- It is the **highest decision-making body for regulation and supervision of payment systems** in India.
- It **replaces** the earlier **Board for Regulation and Supervision of Payment and Settlement Systems (BPSS)**, which was also housed within RBI.
- **Composition (Section 3 of PSS Act, 2007):**
  - **Governor of RBI → Ex-officio Chairperson**.
  - **Deputy Governor of RBI (in-charge of Payment and Settlement Systems) → Ex-officio member**.
  - **One officer of RBI**, nominated by the Central Board of RBI **→ Ex-officio member**.
  - **Three members nominated by the Central Government**, who are experts in:
    - » Payment systems, Information technology, Cybersecurity, Law.
- **Tenure:** 4 years, **non-renewable**, Members can resign with **6 weeks' notice**.
- **Disqualification:** Age >70 years.
  - Insolvency.
  - Criminal conviction (imprisonment ≥180 days).
  - Holding political office (MPs/MLAs).
- **Functioning:**
  - **Principal Legal Adviser of RBI** → permanent invitee.
  - RBI can also invite experts (permanent or ad hoc) to meetings.
  - **Meetings**: At least **twice a year**.
  - **Quorum**: Minimum 3 members, including Chairperson (or Deputy Governor in absence) and one Govt.-nominated member.
  - **Decision-making**: By **majority vote** of members present.
    - » Chairperson (or Deputy Governor in absence) has a **casting vote** in case of tie

**Payment and Settlement Systems Act, 2007**

- **Enacted in**: 2007; came into effect in **August 2008**.
- **Objective**: To regulate and supervise **payment systems in India** and designate the **Reserve Bank of India (RBI)** as the authority for this purpose.

## Presumptive Taxation Plan

### Context

The **NITI Aayog** (India's government think tank) has proposed introducing an **optional presumptive taxation scheme** for **foreign companies** operating in India.

### What is Presumptive Taxation?

- Presumptive taxation means taxing income based on a presumed or estimated profit rate, rather than on actual profits shown in detailed books of accounts.
- **In simpler terms:**
  - Instead of maintaining and auditing detailed books,
  - The taxpayer declares income at a **fixed percentage (prescribed rate)** of turnover or revenue,
  - And pays tax on that presumed income.

### What is the Presumptive Tax Plan Proposed by NITI Aayog?

- **Key Features**:
  - **Optional Scheme for Foreign Companies:** Foreign firms can choose to declare income at a **prescribed profit rate**.

» In return, they will not need to maintain detailed books or face audits.

– **Simplifies Permanent Establishment (PE) Rules:** The scheme would help resolve disputes over whether a foreign company has a "permanent establishment" (taxable presence) in India.
  » It would **codify PE and attribution principles** clearly in law, aligning with global norms.
– **Different Profit Rates for Sectors:** Various industries (like digital, manufacturing, etc.) may have **different deemed profit rates** under the scheme.
– **Certainty and Safe Harbour:** Tax authorities would **not litigate PE existence** separately, providing a "safe harbour" to foreign firms.
– **Voluntary Participation:** Companies can **opt in** for simplicity, or **opt out** and file regular returns based on actual accounts.
– **Policy Impact:** It aims to transform India's tax regime from a **"minefield"** (litigation-heavy) into a **"well-lit path"** (predictable and stable).
  » Expected to improve India's **global business rankings** and **foreign investment appeal**.

## Measures to boost Banking system proposed by RBI

### Context

Reserve Bank of India (RBI) proposes four big measures to boost India's banking system

### What are the measures?

| Key Reform | About the Reform |
|---|---|
| **Introduction of Risk-Based Premium Framework for Deposit Insurance** | • Move from the current **flat-rate deposit insurance premium** to a **risk-based system**.<br>• Under this, **better-rated banks** will pay **lower premiums**, while riskier banks will pay higher ones<br>• Implemented through **Deposit Insurance and Credit Guarantee Corporation (DICGC)**. |
| **Expected Credit Loss (ECL) Provisioning Framework** | • Application of **Expected Credit Loss (ECL)** model to **all Scheduled Commercial Banks** (excluding SFBs, Payment Banks, and RRBs) and **All India Financial Institutions (AIFIs)** from **April 1, 2027**.<br>• Requires banks to **provision based on expected losses** instead of realized defaults. |
| **Revised Basel III Capital Adequacy Norms** | • Implementation of **revised Basel III norms** using the **Standardised Approach for Credit Risk** from **April 2027**<br>• Includes **lower risk weights** for certain sectors such as **MSMEs and home loans**. |
| **Broadening the Scope for Capital Market Lending by Banks** | • Banks allowed to **finance acquisitions by Indian corporates.• Enhanced limits** for lending against **shares, REITs, and InvITs**.<br>• **Regulatory ceilings removed** on lending against **listed debt securities**. |

## National Payments Corporation of India (NPCI)

### Context

At the Global Fintech Festival (GFF) 2025, National Payments Corporation of India (NPCI) launched new digital payment initiatives.

| Initiatives | Description |
|---|---|
| **On-Device Biometric Authentication for UPI** | Enables users to authenticate UPI payments using the smartphone's built-in biometric (fingerprint/face) instead of entering a PIN. |
| **Aadhaar-based Face Authentication for UPI PIN** | Allows users to set or reset their UPI PIN within UPI apps using Aadhaar-based facial verification (via UIDAI's FaceRD app) rather than OTP or card details. |
| **UPI Cash Withdrawal via Micro-ATMs at BCs** | Introduces UPI as a mode for cash withdrawal: users can scan a QR at Business Correspondent (BC) outlets/micro-ATMs and withdraw cash, advancing financial inclusion. |
| **UPI Reserve Pay** | Lets users "lock" a portion of their credit card limit or pre-sanctioned credit for future UPI payments (makes credit use via UPI smoother). |
| **AI-Powered UPI HELP** | An AI-based support system (using NPCI's Small Language Model) for UPI: to check transaction status, raise & track complaints, manage mandates. |
| **IoT Payments with UPI** | Enables UPI payments via Internet-of-Things devices (e.g., connected cars, smart TVs, wearables) without needing a phone each time. |
| **Banking Connect (Inter-operable Net-Banking)** | A platform that allows banks/payment aggregators to integrate via one common system, simplifying net-banking payments across banks and merchants. |

### Other Key Highlights

- **NPCI Tech Solutions Limited (NTSL)**: It will be the **4th subsidiary of NPCI** responsible for **experimental and next-generation fintech innovation** within the digital payments ecosystem.
  – **Other 3 subsidiaries of NPCI:** NPCI BHIM Services Limited, NPCI International Payments Limited (NIPL) and NPCI Bharat BillPay Limited (NBBL).

- **Interoperable Payments:** NPCI reiterated its strategy to expand the global acceptance of UPI and the RuPay/payment-stack, focusing especially on the Global South

### About NPCI

- An initiative of **Reserve Bank of India (RBI) and Indian Banks' Association (IBA)** under the provisions of the **Payment and Settlement Systems Act, 2007.**
- **Type:** Not-for-profit company under **Section 8 of Companies Act, 2013**
- **Purpose:** To operate retail payment and settlement systems in India.
- **NPCI Operates:** UPI, IMPS, RuPay card network, National Automated Clearing House (NACH), Aadhaar enabled Payment System (AePS), National Financial Switch (NFS), NETC FASTag, Aadhaar Payment Bridge (APB) System, Bharat Bill Payment System (BBPS).

## PM GATI Shakti National Master Plan (NMP)

### Context

The government launched and unveiled several key initiatives during the commemoration of 4 years of PM Gati Shakti NMP.

### What are the Initiatives?

| Initiative | Purpose |
|---|---|
| **Query-Based Analytics Mechanism for Private Sector** (opening NMP platform) | Gives private sector access to PM GatiShakti NMP data & geospatial analytics |
| **PM GatiShakti Compendium Volume-3** | Showcases best practices & real case studies of GatiShakti implementation |
| **PMGS NMP Dashboard** | Multi-sector reporting & monitoring dashboard for integrated infra planning |
| **Knowledge Management System (KMS)** | Cross-learning & knowledge-sharing platform for Centre, States, UTs |
| **PM GatiShakti – Offshore Platform** | Digital platform for integrated planning of offshore infrastructure (wind energy, cable networks, maritime infra etc.) |
| **Data Uploading & Management System (DUMS)** | Enables decentralized, real-time data updating and accountability |
| **PMGS District Master Plan (DMP) for 112 Aspirational Districts** | District-level integrated infrastructure planning across key sectors |
| **LEAPS 2025** (Logistics Excellence & Performance Shield) | Recognition framework to reward excellence in logistics ecosystem |

### About PM GATI Shakti NMP

- **Launched on:** 13 October 2021
- **Objective:** To provide seamless, multi-modal infrastructure connectivity (roads, rail, ports, waterways, aviation, mass transport, logistics) by integrating planning across Ministries/ Departments and States/UTs.
- **Achievements:**
  - **More than 600 infrastructure projects** have been identified and integrated on the PM GatiShakti digital platform for coordinated planning and execution.
  - The Network Planning Group (NPG) has reviewed and assessed over 300 key infrastructure proposals to ensure seamless connectivity and efficient implementation.
  - **All 36 States and Union Territories** have prepared their **State Master Plan (SMP) portals**, fully aligned with the national-level PM GatiShakti framework.
  - DPIIT has signed Memoranda of Understanding **(MoUs) with GatiShakti Vishwavidyalaya and the Korea Transport Institute (KOTI)** to foster skill development, cross-learning, and technical assistance in infrastructure and logistics planning.

## Securities Transaction Tax

### Context

The Supreme Court of India has agreed to examine a plea challenging the constitutional validity of the Securities Transaction Tax (STT).

### What is the Securities Transaction Tax (STT)?

- **Introduced:** In **2004** under the **Finance Act, 2004**.
- A **direct tax** levied on **transactions in securities** (such as shares, derivatives, and equity-oriented mutual funds) conducted through a **recognized stock exchange**.
- **Objective:**
  - To **curb tax evasion** in capital market transactions.
  - To ensure **transparency** and **ease of tax collection** at the source (collected by the stock exchange).

### How STT Works

- It is **imposed on both buyers and sellers** of securities at the time of transaction.
- The **rate of STT** varies depending on the **type of security** and **transaction nature** (delivery-based equity, intraday, futures, or options).
- Collected by the **stock exchange** and remitted to the **Central Government**.

## UPI Launched in Qatar

### Context

Union Minister of Commerce and Industry Piyush Goyal launched India's Unified Payments Interface (UPI) in Doha.

### About Unified Payment Interface (UPI)

- It is a **real-time payment system** developed by the **National Payments Corporation of India (NPCI)** that facilitates instant money transfers between bank accounts via smartphones.
- **Launched** in 2016.
- **Regulated by:** Reserve Bank of India (RBI)
- **Features:**
  - **Leveraging Existing Systems:** Such as Immediate Payment Service (IMPS) and Aadhaar Enabled Payment System (AEPS).

  - **Interoperability:** Works across different banks and apps.
  - **No need for bank details:** Just mobile number or UPI ID.
  - **Supports both push & pull transactions.**
  - **Multiple Use Cases:**
    - » Person-to-Person (P2P) transfers
    - » Person-to-Merchant (P2M) payments
    - » Utility bill payments, ticket booking, QR code payments, etc.
- **Growth & Adoption:**
  - It accounts for **85% of all digital transactions in India** & nearly 50% globally.
  - It handles 640+million transactions every day, ahead of Visa.
  - Operational in **8 countries (earlier 7)** - **Bhutan** (1st country to adopt 2021), **France, Mauritius, Nepal, Singapore, Sri Lanka, UAE, and Qatar.**

- **UPI123Pay:** Enables feature phone users to make UPI payments without internet through an IVR (Interactive Voice Response) system, launched in 2022.
- **UPI Lite:** Facilitates quick offline payments for small-value transactions up to ₹500.

## India's Gold Reserve

### Context

India's gold reserves have risen to $102.3 billion, according to the latest RBI data which accounts for 14.7% (nearly 15%) of total forex reserves.

### What are the Reasons Behind it?

- **Portfolio Diversification:** Strengthens reserve composition by reducing over-dependence on the US dollar and other fiat currencies.
- **Currency Risk Buffer:** Helps mitigate risks from exchange-rate fluctuations and valuation swings in foreign currency assets.
- **Inflation Hedge:** Gold protects the purchasing power of reserves during periods of global inflation.
- **Safe-Haven Asset:** Provides protection during global uncertainty, financial crises, and geopolitical shocks.

### Risks/Concerns of Higher Gold Share

- **Lower Liquidity:** Converting gold into usable foreign currency takes time and involves costs.
- **No Interest Earnings:** Unlike foreign currency deposits or government bonds, gold does not generate interest.
- **Storage & Security Costs:** Maintaining physical gold reserves involves significant vaulting, insurance, and security expenses.

### Major Components of India's Forex Reserves

- **Foreign Currency Assets (FCA):** The **largest component** of India's forex reserves. Includes currencies like the **US Dollar, Euro, and British Pound**.
- **Gold Reserves:** Serve as a **hedge against inflation** and provide security during crises.
- **Special Drawing Rights (SDRs):** An international reserve asset created by the International Monetary Fund (IMF) in 1969.
  - They are not a currency, but a potential claim on freely usable currencies of IMF member countries.
- **Reserve Tranche Position (RTP):** it is the portion of a country's quota with the IMF that it can access without conditions or borrowing arrangements.

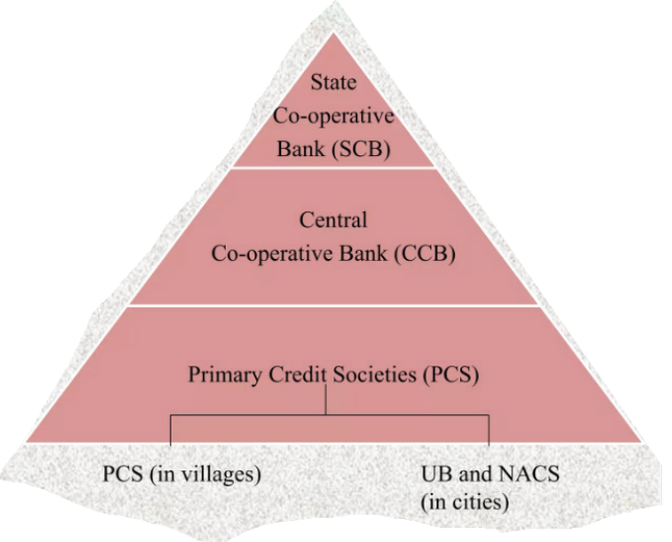
## Reserve Bank - Integrated Ombudsman Scheme, 2021 (RB-IOS, 2021)

### Context

State co-operative banks and central co-operative banks will come under the ambit of the Reserve Bank Integrated Ombudsman Scheme, 2021.

### What is RB-IOS, 2021?

- It consolidates (merges) three earlier RBI Ombudsman schemes:
  - Banking Ombudsman Scheme, 2006
  - Ombudsman Scheme for NBFCs, 2018
  - Ombudsman Scheme for Digital Transactions, 2019
- The aim is to provide a **single, unified grievance redressal mechanism** for customers of institutions regulated by RBI, instead of having multiple schemes with overlapping jurisdictions.
- It is part of RBI's **Alternate Grievance Redress (AGR) Framework**, which includes (i) the Ombudsman mechanism, (ii) Consumer Education & Protection Cells (CEPCs) for entities outside the scheme's immediate ambit, and (iii) the appeals mechanism.
- **Coverage:**
  - All commercial banks, regional rural banks, state co-operative banks, central co-operative banks, scheduled primary (urban) co-operative banks, and non-scheduled primary (urban) co-operative banks with a deposit size of Rs 50 crore.
  - All non-banking financial companies (excluding housing finance companies), which are authorised to accept deposits or have a customer interface, with an asset size of Rs 100 crore and above - are covered under the scheme.
  - Credit information companies are also covered under the scheme.



### What are Cooperative Banks?

- A co-operative bank is a financial entity which belongs to its members, who are at the same time the owners and the customers of their bank.
- Co-operative banks are often created by persons belonging to the same local or professional community or sharing a common interest.
- Co-operative banks generally provide their members with a wide range of banking and financial services (loans, deposits, banking accounts).
- They are registered under the **Co-operative Societies Act, 1912**, and governed by the **Banking Regulation Act, 1949** and **Banking Laws (Co-operative Societies) Act, 1965**.
- They function with the rule of one member, one vote.

## Foreign Currency Settlement System (FCSS)

### Context

Union Finance Minister Nirmala Sitharaman launched a Foreign Currency Settlement System (FCSS) at the International Financial Services Centre (IFSC) in Gujarat International Finance Tec-City (GIFT City).

### What is FCSS?

- It is a mechanism that enables **clearing and settlement of international (foreign currency) transactions within India**, rather than relying on overseas banking networks.
- It allows **Indian banks operating in GIFT City (Gujarat International Finance Tec-City IFSC)** to **settle trades in major global currencies** — such as the **US Dollar (USD)**, **Euro (EUR)**, and **Japanese Yen (JPY)** — **domestically**.
- The system provides the **infrastructure for payment-versus-payment (PvP)** settlement — meaning one currency is paid only if the other is received, ensuring safety and reducing risk.
- **Need:**
  - Before FCSS banks in **GIFT City** depended on **foreign correspondent banks abroad** to process cross-currency transactions.
  - Settlements were done through **Nostro accounts** (accounts that Indian banks hold in foreign banks).
  - This caused:
    - » **High transaction costs**,
    - » **Delays** (settlement lag of 36–48 hours), and
    - » **Dependence on overseas jurisdictions** for trade settlement.

## Draft "National Labour & Employment Policy - Shram Shakti Niti 2025

### Context

The Ministry of Labour and Employment, has released the draft National Labour & Employment Policy - Shram Shakti Niti 2025 for public consultation.

### What are the Key Provisions?

- **Universal and Portable Social Security:** Creation of a **Universal Social Security Account** integrating:
  - **EPFO, ESIC, PM-JAY, e-SHRAM, and State Welfare Boards.**
  - Aims for **"One Nation, Integrated Workforce"** ensuring portability of benefits across states and sectors.
  - Focus on **universal worker registration** and **social protection coverage**.
- **Occupational Safety and Health: Implementation of the OSH Code** with: **Risk-based inspections**, **Gender-sensitive standards**, and **AI-enabled safety systems**.
  - Goal: Achieve **near-zero workplace fatalities**.
- **Women and Youth Empowerment: Increase female labour force participation** to **35% by 2030**.
  - Promote **entrepreneurship**, **career guidance**, and **skill-based employment** for youth.
  - Introduce **gender-sensitive policies** and **safe workplaces**.
- **Digital Transformation and Governance:** Development of a **single-window digital compliance system** for MSMEs with **self-certification** and **simplified returns**.
  - Establishment of a **unified national labour data architecture** for **real-time monitoring** and **inter-ministerial coherence**.
  - Integration of **AI-driven labour governance capacity** across all States.
- **Skill Development and Employment Facilitation: Convergence of skill schemes** under a unified framework.
  - Creation of **district-level Employment Facilitation Cells** for job linkages.
  - Introduction of **skill-credit systems** supporting lifelong learning.
  - The **National Career Service (NCS)** will serve as **India's Digital Public Infrastructure (DPI) for Employment**.
- **Green and Decent Jobs:** Promotion of **green employment** and **just transition pathways** for workers affected by climate or technological changes.
  - Support for **sustainable industries** and **environmentally responsible enterprises**.

## Base Year Revision of IIP

### Context

The Ministry of Statistics and Programme Implementation (MoSPI) has proposed a base year revision of the All-India Index of Industrial Production (IIP) to 2022–23.

### What is the IIP (Index of Industrial Production)?

- It measures the **change in the volume of industrial output** in the economy over time.
- It serves as a **key indicator of industrial growth**, tracking performance across three major sectors — **Mining, Manufacturing, and Electricity**.
- It also acts as an **input for estimating quarterly Gross Value Added (GVA)** in national accounts.
- The compilation of IIP in India began with a **base year of 1937 with the current year being 2011-12**, and has undergone **nine revisions**.

### Why the IIP Base Year Needed Revision

- **Reflecting Structural and Technological Changes:** Many products included earlier (like **kerosene, fluorescent lamps, printing machinery**) have become obsolete, while **new-age products** (like **laptops, vaccines, LED bulbs, aircraft components**) need to be represented.
- **Expanding Coverage:** The new IIP will include **minor minerals, gas supply**, and **new data from key producing states**, in line with **International Recommendations for the Index of Industrial Production (IRIIP) 2010**.
- **Enhancing Analytical Relevance:** The revision will introduce a **seasonally adjusted series**, allowing for more accurate **trend analysis and forecasting**, following international practices.
- **Integration with Modern Data Systems:** The integration of GST data and increased digital adoption will strengthen the reliability and timeliness of industrial statistics.

## National Household Income Survey (NHIS), 2026

### Context

The Ministry of Statistics & Programme Implementation (MoSPI) plans to launch the National Household Income Survey (NHIS) in February 2026.

### About NHIS 2026

- This will be India's **first-ever pan-India household income survey**, marking a major milestone in the country's socio-economic data collection framework.
- It aims to fill a critical data gap by enabling **accurate inter-personal income comparisons** and a **detailed assessment of income sources** across households.
- **Key Objectives:**
  - **Comprehensive Data Collection:** To capture information on **living conditions**, **income**, and **expenditure patterns** of Indian households.
  - **Policy and Statistical Relevance:** The survey will provide essential inputs for:
    - » **Rebasing the Consumer Price Index (CPI)**
    - » **Preparing National Accounts**
    - » **Conducting poverty and hardship assessments**
  - **Evidence-Based Policymaking:** By providing reliable and granular data, NHIS 2026 will strengthen the foundation for **targeted welfare policies** and **inclusive growth strategies**.
- Many countries such as the **United States, Canada, the United Kingdom, Sri Lanka, Bangladesh, China, and Malaysia** already conduct similar household income surveys.
- With NHIS 2026, **India will align with international best practices** in socio-economic data collection and analysis.

## Golden Jubilee of Regional Rural Banks

### Context

The year 2025 marks 50 years of establishment of Regional Rural Banks (RRBs) in India.

### About Regional Rural Banks (RRBs)

- **RRBs** are aimed at **providing banking services in rural areas**, particularly to small farmers, artisans, rural entrepreneurs and weaker sections of society.
- Established under the **RRB Act of 1976**, on recommendation of **Narasimham Committee on Rural Credit.**
- **Ownership structure:** Central Government (50%), State Government (15%), and Sponsor Bank (35%).
- **Regulation:** Regulated by Reserve Bank of India (RBI) and supervised by NABARD.
- **First RRB of India** - Pratham Grameen Bank. It was established on **October 2, 1975.**
- **Priority Sector Lending (PSL)Target of RRB - 75%.**

**Facts**

- Presently there are **28 RRBs** functioning in India.
- **Sponsorship:** All public sector banks, except Punjab & Sind Bank, sponsor at least one RRB. J&K Bank is the only private sector bank sponsoring an RRB.
- **PSL of RRBs:** Over 89% of their loans are directed towards these sectors.

## State Mining Readiness Index (SMRI)

### Context

The Ministry of Mines released the State Mining Readiness Index (SMRI) and corresponding State ranking

### About SMRI

- It evaluates States' **readiness and efficiency** in facilitating **non-coal mineral mining reforms.**
- **Key Evaluation Parameters:**
  - **Auction Performance:** Efficiency in conducting transparent and timely mineral block auctions.
  - **Early Mine Operationalisation**: Speed and effectiveness in making auctioned mines operational.
  - **Exploration Focus**: Efforts towards discovering new mineral resources and reserves.
  - **Sustainable Mining Practices**: Environmental compliance, community welfare, and resource conservation.
  - **Ease of Doing Mining Business**: Policy clarity, digital governance, and investor facilitation mechanisms.

### State Rankings

| Category | Description | Top Performers (2025) |
|---|---|---|
| **Category A** | Mineral-rich States | 1. Madhya Pradesh,<br>2. Rajasthan,<br>3. Gujarat |
| **Category B** | Moderate mineral endowment | 1. Goa,<br>2. Uttar Pradesh,<br>3. Assam |
| **Category C** | Lesser mineral endowment | 1. Punjab,<br>2. Uttarakhand,<br>3. Tripura |

## Authorised Economic Operator (AEO) Programme

### Context

India's Authorised Economic Operator (AEO) Programme has received global appreciation at the World Trade Organisation.

### About AEO Programme

- **Authorised Economic Operator (AEO)** refers to a **trusted business entity** in the international supply chain that has been certified by customs authorities as **compliant, secure, and reliable**.
- The programme is a part of the **World Customs Organization (WCO) SAFE Framework of Standards**.
- It aims to **enhance international supply chain security** and **facilitate legitimate trade**.
- **Introduced in India: 2011** (initially as part of the SAFE Framework implementation).
  - **Revised Comprehensive Guidelines** issued in **2016** to streamline procedures and expand coverage.
- **Implemented by:** Directorate of International Customs, under Central Board of Indirect Taxes and Customs (CBIC) (Ministry of Finance).
- **Eligibility:** Open to **all entities** involved in international supply chain operations, such as:
  - Importers & Exporters
  - Logistics providers
  - Custodians or Terminal Operators
  - Customs Brokers
  - Warehouse Operators
- **Major Benefits: Faster customs clearance** through **Green Channel** treatment.
  - **Reduced examination and inspection** at ports.
  - **Deferred duty payment** (for T2 and T3).
  - **Direct port delivery (DPD) / Direct port entry (DPE)** privileges.
  - **Self-sealing of containers** and **waiver of bank guarantees**.
  - **Recognition under Mutual Recognition Agreements (MRA)** with other countries.

### Types of AEO Certificates

| Type | For | Key Benefits |
|---|---|---|
| **AEO-T1** | Indian entities with basic compliance record | Faster clearance, lower document scrutiny |
| **AEO-T2** | More compliant entities with site verification | Reduced examination & deferred payment benefits |
| **AEO-T3** | Highly trusted entities (3-year compliance record) | Mutual Recognition benefits, faster dispute resolution |
| **AEO-LO** | Logistics operators (custodians, transporters, etc.) | Priority in processing and clearance |

**Related Term**

- **Mutual Recognition Agreements (MRA):** MRAs ensure that **AEOs recognized in one country** receive **reciprocal facilitation** in partner countries.
  - India has signed **MRAs** with countries such as South Korea, UAE, Taiwan, Australia and Malaysia.

## Unified Market Interface (UMI)

### Context

Reserve Bank of India (RBI) announced the creation of a Unified Market Interface in India.

### About UMI

- Under UMI, financial assets like **government securities, corporate bonds, and other market instruments** can be **tokenized and settled instantly** using the **wholesale Central Bank Digital Currency (CBDC-W)**.
- **Significance of UMI:**
  - **Market Modernization:** Brings **digitization and standardization** to India's fragmented financial markets, similar to the UPI model in payments.
  - **Instant and Risk-Free Settlement:** Reduces settlement time from T+1/T+2 to **real-time**, lowering **counterparty and liquidity risks**.
  - **Boost to Financial Inclusion:** Simplified digital access allows **smaller institutions, fintechs, and investors** to participate more efficiently in capital markets.
  - **Global Competitiveness:** Aligns India's market infrastructure with **global best practices** in tokenized trading and digital asset settlement.
  - **Support for CBDC Adoption:** Acts as a **practical use-case for wholesale CBDC**, accelerating the RBI's digital rupee ecosystem.
  - **Cost and Time Efficiency:** Minimizes reliance on intermediaries, **reducing transaction costs and administrative delays**.
  - **Transparency and Security:** Every transaction is **digitally traceable and immutable**, improving market integrity and investor confidence.

## Municipal Bonds

### Context

The finance ministry allowed the use of municipal bonds as security for repo and reverse repo transactions.

### What is a Municipal Bond?

- It is like a loan taken by Urban Local Bodies (ULBs) from investors, which it promises to repay with interest after a specific period.
- **Purpose:** To **mobilize long-term capital** without depending entirely on state or central government grant.
- **Regulated by: Securities and Exchange Board of India (SEBI)** under the **SEBI (Issue and Listing of Municipal Debt Securities) Regulations, 2015**.
- **Ahmedabad** was the **first Indian city** to issue municipal bonds in **1998**.

### Eligible Securities for Repo

- Government Securities (G-Secs)
- Listed corporate bonds and debentures (subject to conditions such as not borrowing against one's own securities or those of a related entity)

- Commercial Papers (CPs) and Certificates of Deposit (CDs).
- Units of Debt Exchange-Traded Funds (ETFs).

## Financial Intelligence Unit- India (FIU-IND)

### Context

The Department of Telecommunications (DoT) and the Financial Intelligence Unit (FIU) signed an MoU to enhance **information sharing and coordination** against misuse of telecom resources in cyber-crimes and financial frauds.

### Key Highlights of the Partnership

- **Enhanced Data Sharing:** Real-time sharing of **Financial Fraud Risk Indicator (FRI)** data on mobile numbers.
  - DoT to share **Mobile Number Revocation List (MNRL)** with FIU-IND.
  - FIU-IND to share mobile numbers linked to **Suspicious Transaction Reports (STRs)**.
  - Secure exchange through DoT's **Digital Intelligence Platform (DIP)** and FIU's **Finnex 2.0** portal.
- **Strengthening Telecom–Financial Cybersecurity:** Combines **telecom intelligence + financial intelligence** for fraud detection.
  - Enables **proactive fraud prevention** rather than reactive action.
  - Shared FRI data helps banks/FIs flag risky mobile numbers during transactions.
- **Impact So Far: 2.84 crore fraudulent mobile connections** disconnected under **Sanchar Saathi**.
  - FRI helped banks prevent/decline **48 lakh transactions**, saving **₹140 crore**.
  - DIP platform already connects **700+ stakeholders** (36 State/UT Police, SEBI, NPCI, FIU-IND, 650 banks/FIs).

#### About FIU-IND

- **Established:** 18 November 2004.
- **Head:** Director, FIU-IND (rank equivalent to Additional Secretary, GoI).
- **Parent Body:** Ministry of Finance, Department of Revenue.
- Functions as an **independent body** reporting directly to the **Economic Intelligence Council (EIC)** headed by the **Finance Minister**.
- Derives power from Prevention of Money Laundering Act, 2002.
- **Functions:**
  - Uses advanced analytics to detect patterns, networks, and links to **money laundering, terror financing, cyber frauds**.
  - Works with regulators like RBI, SEBI, IRDAI, PFRDA, law enforcement, and international bodies.
  - Supports India's obligations under **FATF (Financial Action Task Force).**

## Goods and Services Tax Appellate Tribunal (GSTAT)

### Context

The Union Finance Minister formally launched the GSTAT.

### About GSTAT

- **Statutory Body** established under the **CGST Act, 2017**.
- Hears **appeals against orders** passed by Appellate or Revisional Authorities.
- Provides a **specialized, independent forum** → improves credibility, orderliness, and predictability of GST laws.
- **Objectives:**
  - Create a **single, unified appellate forum** ("One Nation, One Forum").
  - Ensure **timely resolution of disputes** → better cash flow and business certainty.
  - Deliver **citizen-centric governance** with simplified formats, plain-language decisions, checklists, and **virtual hearings**.
  - Aligned with **Next-Gen GST reforms** and principle of **"Nagarik Devo Bhava."**
- **Structure:**
  - **Principal Bench:** New Delhi.
  - **31 State Benches** across **45 locations** for nationwide reach.
  - **Bench Composition:**
    - 2 Judicial Members
    - 1 Central Technical Member
    - 1 State Technical Member
- **Function:**
  - **Three S's Approach:**
    - **Structure:** Judicial + technical expertise.
    - **Scale:** Multiple state benches; single-member benches for simple cases.
    - **Synergy:** Integration of technology, process, and human expertise.
- **e-Courts Portal:** Online filing, case tracking, and virtual hearings.

## Appointment of RBI Deputy Governor

### Context

The Indian government appointed Satish Chandra Murmu as the new RBI deputy governor.

### About Deputy Governor of RBI

- The Central Bank has 4 Deputy Governors **appointed by the Central Government**.
- **Qualifications:**
  - A person must have at least 25 years of work experience in Public Administration including experience at the level of Secretary or equivalent in the Government of India;
  - or At least 25 years of work experience in an Indian or International Public Financial Institution.
- **Tenure:** 3 years (Eligible for reappointment).
- **Participation in a meeting of the Central Board**: A Deputy Governor, if nominated, may attend any meeting of the Central Board of RBI and take part in its deliberations but is **not entitled to vote.**
- **Salaries and allowances** are determined by the Central Board, with approval of the Central Government.
- **Removal:** By the Central Government.

**Financial Sector Regulatory Appointments Search Committee (FSRASC)**

- FSRASC is the final authority to recommend nomination of Governor and Deputy Governor of RBI.
- It is headed by the **Cabinet Secretary.** The other members of the committee include the Secretary Department of Financial Services, RBI Governor and 3 outside experts.

| News in Short | Description |
|---|---|
| e-Bank Guarantees | **News:** The National e-Governance Division (NeGD) under the Ministry of Electronics and IT (MeitY) and the National E-Governance Services Limited (NeSL) have signed a Memorandum of Understanding (MoU) to integrate digital document execution for electronic Bank Guarantees (e-BGs).<br>What are Bank guarantees?<br>• It is a **promise made by a bank** to **cover losses** if a borrower or business **fails to meet contractual obligations**.<br>• It acts as a **safety net for the beneficiary (lender or business partner)** by assuring payment in case of default by the applicant.<br>• **E.g.** A contractor provides a **bank guarantee** to a government agency to assure performance of a project.<br>– If the contractor defaults, the **bank pays the guaranteed amount** to the agency.<br>What are e-Bank Guarantees (e-BGs)?<br>• **e-BGs** are **digitally executed and stored versions of traditional paper-based bank guarantees**.<br>• They are processed entirely **online through NeSL's Digital Document Execution (DDE) system**, making them **secure, fast, and legally enforceable**.<br>• Beneficiaries can **access and verify** e-BGs directly through **NeGD's Entity Locker** integrated with the **NeSL repository**. |
| Skilling for AI Readiness (SOAR) Programme | News: This year the Union government launched the Skilling for AI Readiness (SOAR) programme under the Skill India Mission.<br>What is the SOAR Programme?<br>• **Implemented by: Ministry of Skill Development and Entrepreneurship (MSDE)**<br>– In collaboration with the **Ministry of Education (MoE)**<br>• **Purpose:** To **introduce Artificial Intelligence (AI) education and training** in school curricula.<br>– To make students and teachers **AI-literate** and **industry-ready** for future careers in technology.<br>• **Target Group: Students (Classes 6–12), Educators/Teachers** across India<br>• **Objectives:**<br>– Build **AI awareness and skills** among youth.<br>– **Bridge the digital divide** between rural and urban learners.<br>– Promote **ethical and responsible AI use**.<br>– Support India's vision of **Atmanirbhar Bharat** and **Digital India**.<br>• **Key Features:**<br>– **AI Learning Modules:** 3 basic modules (for students) + 1 advanced module (for teachers).<br>– **Ethical AI Training:** Focus on responsible and transparent use of AI.<br>– **Centre of Excellence:** ₹500 crore set aside to establish a **Centre for AI in Education**.<br>– **Industry Partnerships:** Collaboration with **IITs, AICTE, and private tech firms**.<br>– **Digital Access:** Courses available through the **Skill India Digital Hub (SIDH)**. |

# Topics for Mains (Agriculture)

## Organic Farming in India

*Syllabus Mapping: GS 3: Indian Economy, Agriculture*

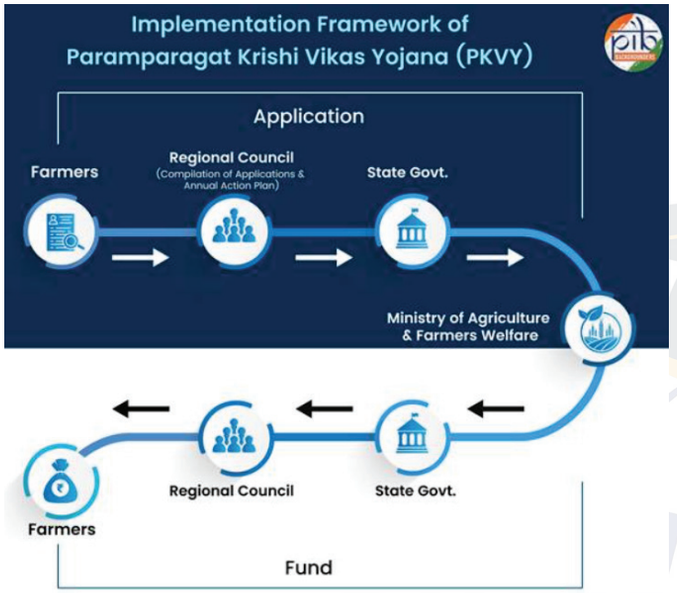
### Context

To promote chemical-free, sustainable farming and reduce the ecological imbalance from input-intensive agriculture, the Union Government launched PKVY in 2015 under the National Mission for Sustainable Agriculture (NMSA). It has since become a flagship programme for mainstreaming organic farming and empowering rural communities.

### About Organic Farming

- According to FAO, **"Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity."**
- It avoids synthetic fertilizers, pesticides, GMOs, and growth regulators, relying instead on natural inputs and biological processes.
- **Core Principles:**
  - **Health:** Sustain and enhance the health of soil, plants, animals, and humans.
  - **Ecology:** Work with natural ecosystems rather than dominating them.
  - **Fairness:** Build equitable relationships among producers and consumers.
  - **Care:** Manage agriculture responsibly for future generations.

- **Types of Organic Farming:**
  - **Pure Organic Farming**: No use of synthetic inputs; only bio-fertilizers, green manures, compost, and natural pest control methods.
  - **Integrated Organic Farming**: Combines crops, livestock, aquaculture, and agroforestry in a sustainable nutrient cycle.
  - **Natural Farming:** Minimal human intervention; relies on natural processes (e.g., Zero Budget Natural Farming, Subhash Palekar's model).
  - **Biodynamic Farming**: Follows holistic methods using lunar cycles and natural compost preparations.




### Current Status of Organic Farming

**Global Scenario**

- According to **FiBL-IFOAM 2023 report**, about **76 million hectares** are under organic cultivation worldwide.
- **Top countries by area:** Australia (35.7 million ha), Argentina (4.4 million ha), and India (2.9 million ha).
- **Global organic market:** valued at over **USD 135 billion**, led by the U.S. and European Union.

**India's Scenario**

- India ranks **5th in terms of area** and **1st in the number of organic producers** globally.
- As of **2025**, about **15 lakh hectares** are under organic certification, involving **25.3 lakh farmers (under PKVY).**
- States like **Sikkim, Uttarakhand, Madhya Pradesh, Chhattisgarh, and Maharashtra** lead in certified areas.
- **Sikkim became the world's first fully organic state in 2016.**
- India's organic exports (2023–24): worth **₹8,000 crore,** major products being oilseeds, cereals, pulses, tea, spices, and cotton.

## Paramparagat Krishi Vikas Yojana (PKVY)

- It was launched in **2015** under the National Mission for Sustainable Agriculture (NMSA) to revive traditional, chemical-free farming and restore ecological balance.
- Over a decade, PKVY has become a key driver of India's organic farming revolution, blending traditional wisdom with modern systems to promote sustainability, empower farmers, and strengthen rural economies.
- **Objectives:**
  - Promote **cluster-based organic farming** using traditional knowledge.
  - Reduce dependence on chemical fertilizers and pesticides.
  - Improve **soil health**, biodiversity, and productivity.
  - Support **certification, branding, and marketing** of organic products.
  - Empower **farmer collectives** and ensure sustainable livelihoods.
- **Cluster-Based Approach:** The PKVY model is built on cluster-based organic farming
  - Farmers are grouped into **clusters of 20 hectares** to adopt organic practices collectively.
  - This encourages **resource sharing**, **peer learning**, and **uniform organic standards**.
  - So far, India has formed **52,289 clusters**, covering around **15 lakh hectares**, benefitting **over 25.30 lakh farmers** across states like Chhattisgarh, Odisha, Sikkim, Maharashtra, and Assam.

### Certification Framework

Certification is the backbone of PKVY, ensuring trust and market access:

- **Third-Party Certification (NPOP):**
  - Managed under the **National Programme for Organic Production (Ministry of Commerce)**.
  - Enables farmers to meet **international organic standards** for export markets.
  - Covers the entire value chain - production, processing, and trade.
- **Participatory Guarantee System (PGS-India):**
  - **Community-based certification** under the Ministry of Agriculture.
  - Farmers collectively conduct **peer verification** of organic practices.
  - Focused on **domestic markets**, low-cost and inclusive.
- **Large Area Certification (LAC) (Introduced 2020–21):**
  - Targets regions with **no history of chemical farming** (tribal belts, islands).
  - Reduces certification time from 2–3 years to a few months.
  - Boosts export readiness and income generation in remote areas.

## Other Government Initiatives for Organic Farming

- **Mission Organic Value Chain Development for North Eastern Region (MOVCDNER) –** Focuses on organic clusters, value addition, and export infrastructure.
- **National Mission on Natural Farming (NMNF)** – Encourages natural and regenerative farming models.
- **Bharatiya Prakritik Krishi Padhati (BPKP)** – A sub-scheme of PKVY promoting traditional inputs like cow dung, jeevamrut, and mulching.

- **Rashtriya Krishi Vikas Yojana (RKVY)** – Provides support for organic value chain development.
- **National Centre of Organic Farming (NCOF)** – Coordinates organic input production and training.
- **Organic e-Marketplace: Jaivik Kheti Portal –** Digital platform linking organic farmers directly with buyers.

**Note:**

**Impacts of PKVY**

- Increased awareness and adoption of organic practices.
- Improved soil health and reduced chemical contamination.
- Enhanced market access through certification and branding.
- Boosted incomes via reduced input costs and organic premiums.
- Created eco-friendly employment opportunities in rural areas.

**Limitations**

- Limited market penetration and branding support.
- Certification delays and high costs for smallholders.
- Inadequate post-harvest and cold-chain infrastructure.
- Low productivity in the transition period.
- Weak consumer awareness in domestic markets.

## Challenges in Organic Farming in India

- **Low Productivity:** Organic yields are often 15–25% lower during transition periods.
- **Lack of Market Infrastructure:** Absence of dedicated organic markets and procurement agencies.
- **Certification Complexity:** Time-consuming and costly process for small farmers.
- **Limited Awareness:** Both farmers and consumers lack knowledge about organic standards.
- **Input Constraints:** Shortage of bio-fertilizers, compost, and organic seeds.
- **Price Premium Uncertainty:** Inconsistent market demand affects profitability.
- **Logistics and Cold Chain Gaps:** Poor storage and transport reduce shelf life.
- **Policy Fragmentation:** Overlap between schemes and lack of state coordination.
- **Research Deficit:** Limited R&D on organic pest management and region-specific crop systems.
- **Export Bottlenecks:** Complicated export certification and lack of branding in international markets.

## Way Forward

- **Integrated Policy Framework:** Align PKVY, NMNF, MOVCDNER, and state missions under one coordinated policy.
- **Market Development:** Establish organic mandis, branding hubs, and MSP-like mechanisms for certified organic produce.
- **Digital Certification:** Simplify PGS and NPOP systems using blockchain and digital traceability.
- **R&D Investment:** Strengthen ICAR and SAUs to research bio-inputs, pest control, and productivity enhancement.
- **Public Procurement:** Include organic food in mid-day meals, hospitals, and public institutions.
- **Capacity Building:** Expand training for FPOs, SHGs, and local entrepreneurs in value addition and e-commerce.
- **Consumer Awareness:** Promote national organic branding and awareness campaigns.

## Conclusion

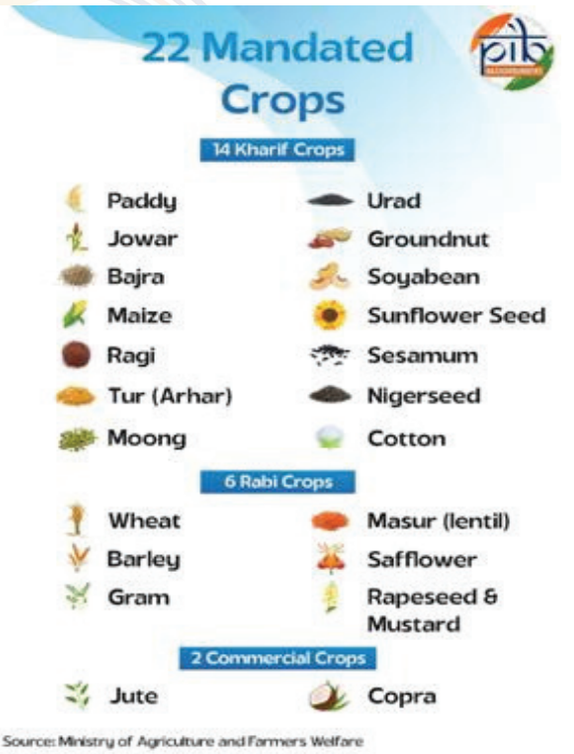
PKVY has propelled India's organic farming revolution, covering 15 lakh hectares and empowering 25·3 lakh farmers with sustainable practices. Despite boosting soil health, incomes, and exports, challenges like low yields, certification delays, and weak market infrastructure persist. A unified policy, enhanced R&D, digital certification, and robust market development can strengthen India's position as a global organic leader.

# Minimum Support Price (MSP): From Safety Net to Self-Sufficiency

*Syllabus Mapping: GS 3: Indian Economy, Agriculture*

## Context

The Union Cabinet recently declared the Minimum Support Prices (MSP) for rabi crops for the marketing season 2026-27, increasing them for all mandated crops. Over time, MSP has evolved from a crisis-management mechanism to a strategic policy instrument, promoting food security, farmer welfare, and national self-sufficiency in key crops.




Source: Ministry of Agriculture and Farmers Welfare

## What is MSP and How it is Fixed

- MSP is the price at which the government promises to procure crops from farmers, ensuring they receive a fair return even if market prices fall below cost.
- **Legal and Institutional Framework:**
  - MSPs are announced annually by the **Government of India** for **22 mandated crops** (plus toria and de-husked coconut).

  - Recommendations are made by the **Commission for Agricultural Costs and Prices (CACP)**, established in 1965.
  - MSPs are approved by the **Cabinet Committee on Economic Affairs (CCEA)**.
- **Factors considered by CACP:** Cost of production (A2 + FL + C2 formula), Domestic and international price trends, Inter-crop price parity, Terms of trade between agriculture and non-agriculture sectors, Demand-supply situation and impact on inflation & At least 50% margin over production cost.
- **Cost formula components:**
  - **A2:** Actual paid-out costs (inputs, labour, fuel, rent, etc.)
  - **FL:** Imputed value of family labour
  - **C2:** Comprehensive cost = A2 + FL + imputed rent and interest on owned lan
  - Thus, MSP = C2 + 50% (minimum margin).

**Procurement & implementing agencies**

- **Food Corporation of India (FCI)** and designated State agencies procure cereals/coarse cereals.
- **NAFED** and **NCCF** implement the **Price Support Scheme (PSS)** under **PM-AASHA** for pulses, oilseeds and copra.
- **Cotton Corporation of India (CCI)** and **Jute Corporation of India (JCI)** handle cotton and jute procurement.

Major Schemes Under MSP

- **Pradhan Mantri Annadata Aay Sanrakshan Abhiyan (PM-AASHA):** Umbrella scheme to ensure remunerative prices for farmers. It includes:
  - **Price Support Scheme (PSS):** Direct procurement of pulses, oilseeds, copra by NAFED/NCCF.
  - **Price Deficiency Payment Scheme (PDPS):** Farmers receive the difference between MSP and market price (pilot basis).
  - **Private Procurement & Stockist Scheme (PPSS):** Involving private players in procurement.
- **Pulses Self-Sufficiency Initiative:** Government to procure 100% of state production of tur, urad, masoor till 2028–29.
  - **Goal:** India to become **self-reliant in pulses by 2027**.

**Digital and Administrative Reforms in MSP Procurement**

- **e-Samriddhi & e-Samyukti Platforms:** Enable **online farmer registration**, slot booking, real-time procurement tracking, and **direct digital payments** (DBT).
  - Developed by NAFED and NCCF under PSS.
- **Kapas Kisan App:** Facilitates cotton farmer registration, payment tracking, and multilingual communication.
  - Developed by **Cotton Corporation of India**.
- **Real-Time Data & Transparency:** GPS-enabled purchase centres and integrated dashboards enhance monitoring, transparency, and fraud prevention.

These reforms have **eliminated intermediaries**, ensured **timely payments**, and enhanced **efficiency and farmer trust**.

## Impact and Achievements of MSP

- **Enhanced Farmer Income:**
  - MSP payments to farmers **tripled** from **₹1.06 lakh crore (2014–15)** to **₹3.33 lakh crore (2024–25)**.
  - Farmer participation expanded from **1.63 crore (2021–22)** to **1.84 crore (2024–25)**.
- **Growth in Procurement:**
  - **Foodgrain procurement** rose from **761 LMT to 1,175 LMT (2014–25)**.
  - **Paddy procurement** rose from **4,590 LMT (2004–14)** to **7,608 LMT (2014–25)**.
  - **Wheat procurement** reached **266 LMT in RMS 2024–25**, benefitting **22 lakh farmers**.
- **Pulses Revolution:** Pulses procurement surged **7,350%** — from **1.52 LMT (2009–14)** to **82.98 LMT (2020–25)**.
  - Oilseeds procurement rose **1,500%** in the same period.
  - Import dependency on pulses has significantly declined.
- **Food Security and Price Stability:** Strengthened **Public Distribution System (PDS)** and **buffer stocks**, ensuring food security during crises like COVID-19.
- **Crop Diversification efforts:** Higher MSPs for pulses, oilseeds, and nutri-cereals encourage farmers to **shift from water-intensive paddy and wheat**, aligning with sustainability goals.

## Challenges of the MSP System

- **Fiscal Burden on Government:**
  - Rising procurement volumes have **tripled MSP expenditure** over a decade, straining the exchequer.
  - Storage, transport, and wastage costs burden FCI finances (annual food subsidy ~₹2.2 lakh crore in 2024–25).
- **Regional and Crop Imbalance:**
  - Procurement remains **concentrated in a few states (Punjab, Haryana, MP)** and **limited to wheat and paddy**, neglecting other crops.
  - Encourages **monocropping**, harming soil fertility and depleting groundwater.
- **Market Distortion:**
  - Artificially high MSPs discourage private traders and disrupt market price discovery.
  - Excessive stockpiling leads to wastage and food inflation.
- **Exclusion of Small Farmers:** Most small and marginal farmers **sell below MSP** due to limited access to procurement centres.
- **Environmental Stress:** Over-cultivation of rice and wheat under MSP incentive contributes to groundwater depletion, stubble burning, and loss of biodiversity.
- **WTO and International Pressure:**
  - Under WTO's **Agreement on Agriculture**, India faces scrutiny for breaching the **10% limit on product-specific subsidies** (as per Amber Box norms).
  - MSP-based procurement, if deemed a trade-distorting subsidy, risks **WTO disputes** and curbs on exports.

**The MSP Conundrum**

India's MSP system sits at the crossroads of **social welfare** and **market efficiency**.

- For farmers, it ensures survival;
- For economists, it distorts markets;
- For the government, it's both a **political compulsion** and a **fiscal liability**.

The challenge lies in balancing **income assurance with sustainability and fiscal prudence**, especially amid WTO constraints and climate pressures.

## Way Forward

- **Diversify MSP Coverage:** Expand procurement for **pulses, oilseeds, and nutri-cereals** across more states to reduce regional bias.
- **Shift from Price Support to Income Support:** Gradually complement MSP with **Direct Income Transfers** or **Price Deficiency Payments (PDPS)** to reduce fiscal stress.
- **Link MSP to Market Reforms:** Strengthen **e-NAM**, **Farmer Producer Organisations (FPOs)**, and **contract farming models** to integrate farmers into value chains.
- **Sustainability and resource Management:** Incentivise eco-friendly crops under **Climate-Resilient MSP Framework** (e.g., pulses and millets instead of paddy).
- **Enhance Digital Procurement Infrastructure:** Nationwide integration of **e-Samriddhi**, **geo-tagging**, and **AI-based quality checks** to ensure transparent procurement.
- **WTO-Compliant Strategy:** Advocate for **developing-country flexibility** in domestic support limits;
  - Reclassify MSP as a **public stockholding measure for food security**, not trade distortion.
- **Periodic Review:** Establish an **independent MSP Review Commission** to rationalise costs, ensure inclusivity, and align with fiscal realities.

## Conclusion

India's MSP system has bolstered farmer incomes, food security, and pulses self-sufficiency, with procurement rising significantly and digital reforms enhancing efficiency. However, challenges like fiscal strain, regional imbalances, and environmental stress persist. Expanding crop coverage, shifting to income support, promoting sustainable crops, and aligning with WTO norms can ensure MSP evolves into a balanced tool for farmer welfare and national self-sufficiency.

# India's Tea Sector - Opportunities & Challenges

*Syllabus Mapping: GS 3: Indian Economy, Agriculture*

## Context

India is the second-largest producer and consumer of tea and the third-largest exporter. With strategic reforms, India has the potential to emerge as a superpower in the global tea industry, strengthening both its economy and soft power.

## Potential of India as a Tea Industry Superpower

- **Production Scale:** India has one of the largest tea-growing areas, with strong traditional hubs like Assam, Darjeeling, Nilgiris, and Kangra.
- **Large Domestic Market:** Rising middle class and changing consumer preferences for premium teas.
- **Export Opportunity:** Potential to expand into South America, Africa, and Central Asia.
- **Brand Value:** Iconic global recognition of "**Darjeeling Tea**" (first GI tag of India), Assam and Nilgiri teas.
- **Employment and Livelihoods:** Provides direct and indirect employment to over 1.2 million workers, many of them women.
- **Soft Power:** Tea diplomacy (e.g., "Chai Pe Charcha") can enhance India's cultural influence abroad.

### India's Tea Industry: Key Statistics

- **Global Tea Production (2024):** 7.074 billion kg.
  - **Top Producing Countries:** (1) China (2) India (3) Kenya (4) Sri-Lanka
- **Global Consumption:** 6.97 billion kg.
- **India's Contribution (2024):**
  - **Production:** 1.303 billion kg (≈18% of global output).
  - **Consumption:** 1.22 billion kg (≈17% of global demand).
  - **Exports:** 255 million kg valued at **$800 million**.
  - **Top Tea Producing States:** (1) Assam (2) West Bengal (3) Tamil Nadu (4) Kerala (5)Karnataka.
    - **Other Tea producing states:** Tripura, Arunachal Pradesh, Himachal Pradesh, Meghalaya, Mizoram, Sikkim, Manipur and Nagaland.
- **Comparisons:**
  - **Kenya:** Largest exporter, exports almost all its production.
  - **China:** Major producer, but consumes much domestically.
  - **Sri Lanka:** Exported 245 million kg, worth **$1.4 billion** - highlighting higher value realisation than India.
- **Per Capita Consumption:**
  - India: 840 g/year.
  - Turkey: 3 kg/year (highest globally).
  - Even a small rise to **1 kg/year in India** could absorb the entire domestic production.

## Challenges in the Tea Sector

- **Low Export Value Realisation:** India exports more volume than Sri Lanka but earns less due to lack of branding, packaging, and value addition.
- **Over-reliance on Bulk CTC Tea:** Limited focus on high-value specialty teas (green, white, organic, flavoured).
- **Productivity Issues:** Ageing tea bushes, low mechanisation, and outdated practices reduce yields.
- **Price Stagnation and Labour Costs:** Small tea growers (STGs) face low margins. Labour-intensive production raises costs.
- **Climate Change:** Erratic rainfall and rising temperatures affect quality, particularly in Darjeeling and Assam.
- **Market Competition:** Kenya offers cheaper teas, while Sri Lanka and China dominate the premium tea market.
- **Domestic Consumption Gap:** Per capita consumption remains relatively low compared to global standards.

### Government Initiatives

- **Tea Board of India:** Oversees development, quality certification, and promotion of Indian tea.
- **Tea Development and Promotion Scheme (2021–26):** Focus on tea promotion, market access, productivity improvement, and workers' welfare. With a Budget of ₹967 crore.
- **GI Tags and Certification:**
  - "Darjeeling Tea" was India's first GI tag (2004).
  - Certification marks like "Assam Orthodox" and "Nilgiri Tea."
- **Market Diversification Efforts:** Promotion of Indian tea in West Asia, CIS countries, and Europe.
- **Worker Welfare Measures:** Schemes for housing, healthcare, and education for plantation workers.

## Way Forward

- **Focus on Quality and Branding:**
  - Shift from bulk exports to value-added, branded, and specialty teas.
  - Encourage premium segments like organic, herbal, and flavoured teas.
- **Diversify Export Markets:** Target emerging consumer bases in Africa, South America, and East Asia.
- **Boost Domestic Consumption:** Promote tea culture within India to raise per capita consumption beyond 1 kg/year.
- **Support Small Tea Growers (STGs):** Provide training, access to finance, and support for branding.
- **Climate Adaptation:** Invest in climate-resilient tea varieties and promote sustainable farming practices.
- **Research & Innovation:** Encourage R&D in tea processing, packaging, and mechanisation.
- **Strengthen Global Image:** Position India as a premium tea exporter with strong GI-based branding.
- **Public–Private Partnerships:** Collaborate with industry players for marketing campaigns, tea tourism, and global trade fairs.

## Conclusion

India's tea industry, a key economic and cultural asset, produces **1.303 billion kg** and employs millions but faces challenges like **low export value, climate impacts, and competition.** With initiatives like the **Tea Development Scheme and GI tags, India can boost quality, branding, and market diversification** to become a global tea superpower, leveraging its vast production, domestic market, and soft power potential.

# Regenerative Agriculture

*Syllabus Mapping: GS 3: Indian Economy, Agriculture*

## Context

On October 16, 2025, World Food Day was observed, marking the 80th anniversary of the Food and Agriculture Organization (FAO). The focus this year is on regenerative agriculture - a holistic approach that restores soil health, enhances biodiversity, builds climate resilience, and promotes nutritional security - aligning with SDG 2 (Zero Hunger) and SDG 13 (Climate Action).

## The Global Context: Strain on Food and Ecosystems

- Humanity's growth trajectory has put unprecedented pressure on natural resources:
  - It took **3,00,000 years** to reach 1 billion people (1804) but less than **a century to reach 8.2 billion**.
  - Only **29% of Earth's surface** is land, and just **10.7%** is under cultivation.
- Intensive farming, overuse of fertilisers, and pollution have degraded soil and water systems globally.

### India's Challenge

- India's **52% of land is arable,** yet soil fertility, water tables, and biodiversity are rapidly declining.
- Agriculture still employs **46% of India's workforce**, making sustainability a socio-economic necessity.
- The country faces the twin challenge of feeding its population while restoring its ecosystems.

## India's Soil Health Crisis

- **Declining Soil Organic Carbon (SOC):** India's average SOC content is below 0.3%, against the recommended 1% threshold by soil scientists like Rattan Lal and R.S. Paroda.
  - SOC is the key determinant of soil fertility, nutrient retention, and water-holding capacity.
  - Its depletion has led to yield stagnation and reduced climate resilience.
- **Nutrient Imbalance:** Excessive reliance on nitrogenous fertilisers, driven by subsidy distortions, has disrupted the N:P:K balance.
- **Microbial Depletion:** Overuse of chemicals and continuous monocropping has destroyed beneficial soil microorganisms, reducing natural nutrient cycling.
- **Groundwater and Chemical Contamination:** Fertiliser leaching and pesticide runoff have contaminated aquifers, causing **nitrate pollution** and harming human health.
- **Regional Variations:**
  - The Indo-Gangetic plains face **soil compaction** and waterlogging.
  - Dryland areas struggle with **desertification and loss of topsoil.**

## Causes of the Soil and Environmental Crisis

- **Legacy of the Green Revolution:** While the **Green Revolution** (1960s–70s) saved millions from famine, its intensive input-driven approach created long-term ecological distortions:
  - Monocropping of **rice and wheat** replaced traditional crop diversity.
  - Excessive irrigation led to **groundwater depletion**.
  - Dependence on **synthetic fertilisers and pesticides** degraded soil health.
  - Mechanisation increased **residue burning**, worsening air quality.
- **Distorted Subsidy Structure:** Heavy subsidies on urea made nitrogen cheap, leading to imbalanced fertiliser use.
- **Policy and Market Bias:** MSP and procurement policies have consistently favoured water-intensive cereals, discouraging pulses, oilseeds, and millets that enrich soil.
- **Lack of Awareness and R&D:** Poor extension services have limited farmer knowledge of sustainable practices.
- **Climate Change Impacts:** Erratic rainfall, rising temperatures, and droughts exacerbate soil erosion, salinisation, and nutrient loss.

## Regenerative Agriculture: A New Paradigm

### What is Regenerative Agriculture?

- Regenerative agriculture is a holistic system of farming that focuses on restoring and enhancing the health of soil, water, and biodiversity.
- It goes beyond "sustainability" - not just maintaining current conditions, but actively regenerating degraded ecosystems.

- **Key Features:**
  - **Soil regeneration:** Enhances Soil Organic Carbon (SOC) and microbial life.
  - **Crop diversity:** Encourages mixed cropping and crop rotation.
  - **Reduced chemical dependency:** Minimises synthetic fertiliser and pesticide use.
  - **Carbon sequestration:** Captures carbon dioxide in soils to mitigate climate change.
  - **Biodiversity enhancement:** Revives pollinators and natural predators.
  - **Water efficiency:** Promotes rainwater harvesting and reduced tillage for moisture retention.

### Significance for India

- **Economic Benefits:** Reduces dependence on costly chemical inputs & Restores soil fertility, ensuring yield stability and farm income security.
- **Environmental Benefits:**
  - Mitigates GHG emissions and enhances carbon sinks.
  - Revives pollinators and improves biodiversity.
  - Prevents groundwater contamination and soil erosion.
- **Social and Nutritional Gains:**
  - Encourages cultivation of **pulses, millets, and oilseeds**, improving national nutrition.
  - Reduces farmer vulnerability to input price shocks.
- **Alignment with National Missions:**
  - **Mission for Aatmanirbharta in Pulses (2025–31):** ₹11,440 crore initiative to achieve self-sufficiency in pulses through soil-enriching crops.
  - **National Mission on Natural Farming (2022):** Focuses on organic inputs and soil restoration.
  - **Paramparagat Krishi Vikas Yojana (PKVY):** Promotes organic and regenerative practices.

### Global Context

- Countries like the **US, Australia, and Kenya** have adopted regenerative models through carbon farming and eco-certification.
- The FAO and UNFCCC recognise regenerative agriculture as a key pathway to meet **Paris Climate Goals.**

**Way Forward - "4 Ps" Framework for Agricultural Transformation**

- **Policies:** Science-based, inclusive, and incentive-neutral reforms to promote sustainable crops and resource use.
- **Products:** New technologies, seeds, and innovations for climate-smart agriculture.
- **Practices:** Regenerative, soil-friendly, and low-input farming techniques.
- **Partnerships:** Collaboration among governments, academia, industry, and farmers for scaling innovations.

## Topic for Prelims (Agriculture)

### Mission for Atmanirbharta in Pulses (Self Reliance in Pulses Mission)

#### Context

PM Narendra Modi will launch two major initiatives — the 'PM Dhan-Dhaanya Krishi Yojana' and the Self-Reliance in Pulses Mission at PUSA, New Delhi.

#### About Mission for Atmanirbharta in Pulses

- **Time Period:** 6 Years (2025-26 to 2030-31).
- **Financial Outlay:** Rs 11,440 crore.
- **Aim:** To **expand** the total pulse cultivation area from 27.5 million hectares to 31 million hectares by 2030-31, and to raise production from 24.2 million tonnes to 35 million tonnes.
  - **Productivity** is targeted to increase from 880 kg per hectare to 1,130 kg per hectare.
- **Focus:**
  - **Crops:** Tur/Arhar (pigeon pea); Urad (black gram) & Masoor (red lentil).
  - **Developing** high-yielding, pest-resistant, and climate-resilient varieties and ensuring their timely delivery to farmers.
  - **High-quality seeds** will be distributed through "**mini kits**," with 1.26 crore quintals of certified seeds and 88 lakh free seed kits to be provided to farmers.
  - 1,000 processing units will be established in pulse-growing regions to ensure better prices for farmers and promote local value addition.
    - » Each unit will receive a government subsidy of ₹25 lakh.
  - The entire agriculture machinery — in partnership with state governments — will function under the vision of '**One Nation, One Agriculture, One Team**'.
- **Procurement:** National Agricultural Cooperative Marketing Federation of India (NAFED) & National Cooperative Consumers' Federation of India Ltd (NCCF) will procure 100% of registered farmers' produce at the Minimum Support Price (MSP) over the next 4 years.
- **Need?:** India is the largest producer of Pulses in the world, contributing 28% of total pulses production.
  - Despite being the top producer, India remains the **biggest importer of pulses** to match the pace of domestic demand, having imported a record **72.56 lakh tonnes worth $5.48 billion** in **2024–25.**

**Related Information**

- The largest pulse-producing states are Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, and Karnataka.

#### About PM Dhan-Dhaanya Krishi Yojana

- To **address agricultural productivity disparity** across states (even among districts within the same state), the government will identify **100 low-productivity districts** across India to improve overall agricultural performance.
- **Aim:** To **enhance farmers' income** through comprehensive agricultural development.

- **Key Features:**
  - Ensures **irrigation facilities for every farm**, reducing dependence on rainfall.
  - Encourages **diversification of crops** to enhance productivity and resilience.
  - Facilitates **easy access to credit and modern storage facilities** for farmers.
  - Integrates and **converges multiple government programmes** for effective implementation.

## National Digital Livestock Mission

### Context

A workshop on the National Digital Livestock Mission (NDLM) was held at the Pusa, New Delhi.

### About National Livestock Digital Mission

- It aims to create a **farmer-centric, technology-enabled ecosystem** for livestock management, allowing better income realization through informed decisions.
- It builds upon the existing **Information Network for Animal Productivity & Health (INAPH)** platform.
- **Under: Department of Animal Husbandry & Dairying (DAHD)** in collaboration with **NDDB** (National Dairy Development Board).
- **Stakeholders:** Include farmers, veterinarians, extension workers, industry players, dairy cooperatives, labs, etc.
- **Key Features:**
  - **Unique Identification (Tagging & Traceability):** Each livestock animal is assigned a unique 12-digit Tag ID.
    - » A **"Bharat Pashudhan" database** is maintained to store and manage all tagged animal data.
    - » The database logs activities including breeding, artificial insemination, health services, vaccinations, treatments, etc.
  - **Digital Platform & Integration**: It supports **market access**, **service linkage**, and **product traceability** modules through digital interfaces

## Speciality Fertiliser

### Context

China has **suspended exports of urea and specialty fertilisers** from **October 15, 2025**, until further notice.

### What are Speciality Fertilisers?

- They are **high-performance, customised fertilisers** designed to **release nutrients in a controlled or targeted manner**, improving crop yield and nutrient efficiency.
- **Key Features:**
  - Provide **precise nutrient delivery** as per crop and soil needs.
  - Minimise **nutrient losses** due to leaching, volatilisation, or runoff.
  - Often **water-soluble** and compatible with **drip irrigation or foliar application**.
- **Examples:**
  - **TMAP (Technical Monoammonium Phosphate)** – a water-soluble source of nitrogen and phosphorus.
  - **AdBlue (Urea-solution)** – used both in agriculture and as a **diesel exhaust fluid** for emission control.
  - **Chelated micronutrient fertilisers, controlled-release urea**, and **liquid fertilisers**.

### Issues For India After China's Ban

- **Import Dependence:** India imports **around 95% of its specialty fertilisers** from China, so the ban disrupts a major supply source.
- **Price Rise:** Fertiliser prices may **increase by 10–15%**, raising input costs for farmers and affecting profitability.
- **Rabi Season Impact:** The ban coincides with the **crucial rabi crop season**, risking timely availability of key nutrients for crops.
- **Limited Alternatives:** Other suppliers like **South Africa, Chile, and Croatia** can meet only a small portion of India's needs.
- **Threat to Self-Reliance:** The situation exposes India's **vulnerability in fertiliser supply** and highlights the need for **domestic production and diversification** under Atmanirbhar Bharat.

## Pokkali rice

### Context

Pokali rice was recently harvested in Kerala and transported to different locations.

### About Pokali Rice

- Pokkali is a system in which the **farming alternates between rice and prawn**; the fields are used alternately for rice farming and prawn and shrimp cultivation.
- **Key Features of Pokkali Rice:**
  - **Salt-Tolerant Variety:** Pokkali rice is **highly resistant to saline and brackish water**, making it ideal for coastal and flood-prone regions.
  - **Single-Season Crop:** It is cultivated **once a year**, typically between **June and November**, and does not require chemical fertilizers or pesticides.
  - **Tall Stature:** The crop grows up to **130–150 cm**, allowing it to withstand tidal fluctuations and deep-water conditions.
- **Organic and Nutrient-Rich:** Pokkali rice is cultivated **without synthetic inputs**, and the fields are naturally fertilized by **aquatic organisms** and **tidal sediments**.
  - **Nutritional Benefits:**
    - » Rich in **antioxidants**, **iron**, and **micronutrients**.
    - » Has **low carbohydrate content** and a **distinct nutty flavor**.
    - » Considered **beneficial for diabetic and health-conscious consumers**.
  - **Climate Resilience:** The rice's adaptability to **salinity, flooding, and climatic stress** makes it a model for **climate-resilient agriculture**.

  - **Recognition:** Received the **Geographical Indication (GI) tag in 2008**,
- **Varieties Cultivated under the Pokkali System:** Chettivirippu, Vyttila 1, Vyttila 2, Vyttila 3, Vyttila 4, Vyttila 5.

**Other Rice Varieties of South India:** Kuruva, Kattuyanam, Jyothi and Uma.

## Desert Solidification Technology

### Context

Wheat has been successfully grown in arid land of Rajasthan's Thar desert (Ajmer district) using desert 'soilification' technology.

### About Desert Solidification Technology

- It is a biotechnological innovation that converts barren desert sand into **soil-like material** capable of supporting agriculture.
- **Developed By: Central University of Rajasthan (CUoR)**, with support from **Krishi Vigyan Kendra (KVK)** and the **State Horticulture Department**.
- Aims to **combat desertification**, improve productivity in arid regions, and promote **sustainable land use**.
- Technology: Uses **bioformulations** (with microbes) and **natural polymers**.
  - These bind loose sand particles, improve soil texture, and allow better water retention.
- **How it Works:**
  - **Polymer + Microbes:** Natural polymers and microbial solutions are applied to sandy soil.
  - **Binding Effect:** Polymers cross-link sand grains, creating a soil-like matrix.
  - **Water Holding:** The new structure traps water, cuts irrigation needs, and slows seepage through sand.
  - **Microbial Support:** Beneficial microbes improve fertility, promote plant growth, and increase crop resilience.
  - **Soil-like Qualities:** Modified sand behaves like fertile soil, holding nutrients, supporting microbes, and sustaining crops.

| News in short | Description |
|---|---|
| Sustainable Aquaculture in Mangrove Ecosystems (SAIME) | **News:** A model of SAIME developed by the Nature Environment and Wildlife Society (NEWS) in West Bengal's Sundarbans has been conferred Global Technical Recognition by the Food and Agriculture Organization (FAO).<br>About SAIME<br>• It is a **Multi-Stakeholder Partnership (MSP)** designed to strengthen **sustainable and transformative processes** in the **shrimp trade**, with a focus on protecting **mangrove ecosystems** in **South Asia**.<br>• **Key Features:**<br>– Encourages **Integrated Mangrove Aquaculture (IMA)** — extensive shrimp farming with **low stocking densities** and **no external feed inputs**.<br>– Integrates **mangroves as natural carbon sinks**, helping to **reduce blue carbon emissions**.<br>– Focuses on **improving market access** through farmer institutions, **branding, certification**, and **fair trade practices**.<br>– Supports **inclusive economic growth** for coastal communities. |

# SOCIETY AND SOCIAL JUSTICE

## Topics for Mains

### Urbanisation in India: Towards Future-Ready, Inclusive, and Climate-Resilient Cities

*Syllabus Mapping: GS-Paper I, Urbanisation, Problems and Remedies.*

#### Context

As India aspires to become a $30-trillion economy by 2047 under the Viksit Bharat vision, cities will be central to this transformation. However, most Indian cities still follow colonial-era, land-use–based planning models, which are inadequate for today's economic, demographic, and environmental realities.

**Current Status of Indian Cities**

- **Rapid Urbanization:** India's urban population stands at over 480 million (2025) - nearly 36% of the total population.
  - By **2047**, this share is expected to reach **50%**, with over **850 million people** living in cities.
- **Economic Contribution:** Urban areas contribute around 65% of India's GDP, expected to rise to 75% by 2047.
- **Infrastructure Deficit:** Despite their economic weight, most cities face severe shortages in housing, water supply, sanitation, transport, and waste management.
  - **Eg:** The Ministry of Housing and Urban Affairs estimates a housing shortage of 29 million units, mainly for the urban poor.
- **Governance and Planning:** Only about 500 cities have notified Master Plans, and most are outdated or lack legal enforceability.

#### Why Cities Are Critical for India's Future

- **Engines of Economic Growth:** Cities generate employment, attract investment, and promote innovation key for a $30-trillion economy vision.
- **Demographic Dividend Utilization:** With nearly 65% of Indians under 35 years, cities must absorb millions of new workers annually through jobs in manufacturing and services.
- **Climate and Sustainability Commitments:** To achieve Net Zero by 2070 and reduce emissions by 2030, urban centres must pioneer green infrastructure, renewable energy, and sustainable mobility.
- **Centers of Innovation:** Cities host the startup ecosystem, digital infrastructure, and knowledge clusters driving India's technological rise.
- **Social Transformation:** Urban areas are also laboratories of social change, gender empowerment, and human development.

#### Challenges Facing Indian Cities

- **Inadequate Infrastructure:**
  - Poor water supply, drainage, solid waste management, and congested roads.
  - Rapid expansion without adequate transport or housing has led to urban sprawl and informal settlements.
- **Urban Inequality and Slums:**
  - Nearly one in four urban residents lives in slums or informal housing.
  - Sharp divides between elite enclaves and informal settlements create socio-economic polarization.
- **Environmental Degradation:**
  - Severe air pollution in cities like Delhi, Lucknow, and Patna.
  - Groundwater depletion, heat islands, and waste mismanagement worsen the ecological footprint.
- **Weak Urban Governance:**
  - Urban local bodies depend on higher governments for funding and lack technical and human resources.
  - Municipal revenues form only 0.75% of GDP, among the lowest globally.
- **Inadequate Disaster and Climate Preparedness:**
  - Urban flooding (e.g., Chennai 2015, Bengaluru 2022) and heatwaves expose the poor resilience of city infrastructure.

**Migrant Crisis and Urban Poverty**

- **COVID-19 Exposed the Urban Divide:** The 2020 lockdown triggered an unprecedented reverse migration, exposing the fragile livelihoods and housing insecurity of migrant workers.
- **Informal Economy Dominance:** Around 80-85% of urban workers are employed in the informal sector, with little job security or social protection.
- **Inadequate Housing and Services:** Migrants often live in unauthorized colonies or slums, lacking water, sanitation, and health facilities.
- **Policy Gaps:** Weak implementation of Inter-State Migrant Workmen Act, 1979 and limited access to PDS, healthcare, and welfare schemes due to lack of portability.
- **Urban Poverty Trap:** Low wages, rising living costs, and insecure housing perpetuate intergenerational poverty cycles.

**Limitations of Current Urban Planning Models**

- **Colonial Legacy of Land-use Planning:** Current master plans, modeled after 19th-century public health systems, focus mainly on land use and zoning, not economic or environmental objectives.
- **Static and Rigid Planning:** Master plans often ignore economic drivers, migration trends, and climate risks.
- **Administrative Fragmentation:** Planning stops at municipal boundaries, even though most urban growth occurs in peri-urban regions.
- **Lack of Economic and Resource Linkages:** No integration of natural resource budgeting, carrying capacity, or job creation potential in city planning.
- **Slow Regulatory Reforms:** Lengthy approval processes discourage innovative urban redevelopment.

#### Government Interventions and Policy Initiatives

- **Smart Cities Mission:**
  - Aims to promote **technology-based governance and urban infrastructure** in 100 cities.
  - Focus on integrated command centers, data analytics, and e-governance.
- **AMRUT 2.0 (Atal Mission for Rejuvenation and Urban Transformation):** Focus on universal water supply and sewage coverage, green spaces, and non-motorized transport.
- **PM Awas Yojana (Urban):** Targeting housing for all, aiming to construct over 1.2 crore houses for low-income households.

- **Swachh Bharat Mission (Urban):**
  - Addresses solid waste management, sanitation, and open defecation-free (ODF) status.
  - Encouraged waste segregation, composting, and recycling practices.
- **National Urban Livelihood Mission (NULM):** Provides skill development, microcredit, and entrepreneurship support for the urban poor.
- **National Transit-Oriented Development (TOD) Policy:** Encourages compact, walkable, and public transport-oriented cities to reduce congestion and pollution.
- **Climate and Resilience Programs:** Climate Smart Cities Assessment Framework and CITIIS 2.0 aim to make cities low-carbon and disaster-resilient.

## Way Forward: Building Future-Ready and Inclusive Indian Cities

- **Reimagining Urban Planning:**
  - Shift from **land-use planning to economic vision-based planning** that identifies future industries and employment clusters.
  - Integrate **natural resource budgeting**, **climate resilience**, and **disaster management** into master plans.
  - Extend planning beyond municipal boundaries to **metropolitan and regional levels**.
- **Empowering Local Governments:**
  - Implement 74th Constitutional Amendment in true spirit to devolve funds, functions, and functionaries.
  - Build capacity in municipal finance, digital governance, and planning.
- **Inclusive Urban Development:**
  - Establish portable social protection systems for migrants (linked with Aadhaar & One Nation One Ration Card).
  - Promote rental housing, urban employment guarantees, and slum upgrading.
- **Sustainable Infrastructure and Green Mobility:**
  - Promote electric buses, cycling infrastructure, and metro expansion.
  - Adopt climate-smart building codes, waste-to-energy systems, and rainwater harvesting.
- **Strengthening Data-Driven Governance:**
  - Use GIS, AI, and IoT for urban analytics and real-time decision-making.
  - Develop Urban Data Observatories for evidence-based planning.
- **Promoting Smaller Cities and Regional Balance:**
  - Invest in Tier-2 and Tier-3 cities as manufacturing and logistics hubs.
  - Promote urban-rural linkages for balanced regional growth.

India's future will be written in its cities - the smarter, greener, and more inclusive they become, the stronger the nation's journey to prosperity.

# From Migration to Mobility: Reimagining Rural Education for Inclusive Growth

*Syllabus Mapping: GS-Paper I&II, Urbanisation, Education*

## Context

Rural-to-urban migration in India often reflects economic distress and lack of local opportunities. By strengthening rural education, skills, and entrepreneurship, India can transform migration from a necessity into an empowered choice -promoting inclusive and sustainable rural growth.

### Understanding Migration

- Migration refers to the movement of individuals or groups from one place to another, often across geographical boundaries, with the intention of settling temporarily or permanently in the new location.
- This movement can be motivated by various factors such as economic opportunities, social factors, political circumstances, environmental conditions or personal reasons.
- **Internal migration in India is primarily of two types:**
  - **Long term Migration,** resulting in the relocation of an individual or household.
  - **Short term Migration,** involving back and forth movement between a source and destination.

**Migration Trends and Data in India**

- **Key Source States:** Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh, Andhra Pradesh, Chhattisgarh.
- **Key Destination States:** Delhi, Maharashtra, Gujarat, Haryana, Punjab and Karnataka.
- **Employing Sectors:** Migrants are mostly employed in subsectors like construction, domestic work, textile, brick-kilns, transportation, mines, quarries, and agriculture.
- **Scale of Migration:**
  - According to PLFS 2020–21, 29% of India's population were migrants, and 89% originated from rural areas.
  - Over 50% of migrants are aged 15–25 years, meaning India's most productive workforce is leaving villages.
  - Nearly 40 million workers returned home in 2020 due to Pandemic Lockdown. (RBI, 2020)
- **Gender Patterns:**
  - **Men** migrate primarily for **employment** and income.
  - **Women** migrate mostly due to **marriage (86.8%)**, with limited labour participation after migration.
- **Caste and Class Dimensions:**
  - Scheduled Castes (SCs) and Other Backward Classes (OBCs) record higher migration rates due to structural inequalities.
  - Households dependent on **casual labour** or belonging to the lowest **MPCE (Monthly Per Capita Expenditure)** categories show **higher migration rates**.

## Why Rural-to-Urban Migration is so Prevalent

Migration from villages to cities is driven by both "push" factors (rural distress) and "pull" factors (urban opportunity).

### Push Factors (Rural Distress)

- **Agrarian Stress:** Low productivity, small landholdings, and monsoon dependency limit agricultural income.
- **Lack of Non-Farm Jobs:** Villages offer limited industrial or service employment.

- **Educational-Employment Mismatch:** Education fails to align with local job opportunities.
- **Poor Infrastructure:** Limited access to reliable electricity, digital connectivity, and healthcare.
- **Climate Change:** Crop losses, water stress, and land degradation push youth out of agriculture.

### Pull Factors (Urban Attraction)

- Higher Wages and Better Livelihood Options.
- Access to Education, Health, and Social Mobility.
- **Perceived Social Status:** City jobs are viewed as symbols of success.
- **Network Effects:** Migrant chains encourage others to move.

## Impact of Migration

| Positive | Negative |
|---|---|
| • **Demographic Balance:** Migration helps address ageing population issues by providing young workers.<br>• **Better Quality of Life:** Creates employment opportunities, improving living standards.<br>• **Social Remittances:** Promotes cultural exchange, tolerance, and social harmony.<br>• **Food & Nutrition Security:** FAO (2018) notes migration improves migrants' food and nutrition security.<br>• **Labour Market Balance:** Fills labour gaps and allocates workforce efficiently.<br>• **Skill Development:** Exposure abroad enhances awareness and skills of migrants. | • **Political Exclusion:** Migrants often face barriers in exercising voting rights.<br>• **Population Pressure:** Influx of workers increases competition for jobs and resources.<br>• **Human Rights Abuses:** Irregular migration leads to exploitation and trafficking risks.<br>• **Urban Slums:** Mass migration expands slum areas lacking basic amenities.<br>• **Cultural Shock:** Migrants struggle to adapt to new urban lifestyles and cultures. |

### Why Education Fails to Retain Rural Youth

- **Theoretical Learning, Limited Job Relevance:** Rural education remains disconnected from local job markets, leading graduates to migrate in search of suitable work.
- **Lack of Skill-Based Training:** Absence of vocational, technical, and digital courses leaves youth unprepared for jobs in agri-business, rural industries, or renewable energy.
- **Poor Quality and Infrastructure:** Teacher shortages, weak infrastructure, and outdated curricula reduce employability and lead to high dropout rates.
- **Urban Aspiration and Migration:** Rising aspirations and lack of local opportunities drive educated youth to cities, where migration is seen as a path to progress and dignity.

## Role of Rural Education in Addressing Migration

- **Linking Education to Livelihoods:**
  - Traditional rural education focuses on literacy, not employability.
  - Education must include **vocational skills**, **entrepreneurship**, and **digital literacy** aligned with local industries.
- **Cluster-Based Learning:** Educational institutions in rural areas should integrate with local economies:
  - Dairy management in Gujarat, textile design in Tamil Nadu, bamboo crafts in the Northeast, etc.
- **Digital and Vocational Convergence:** Rural Digital Hubs can provide online learning in coding, AI, design, and marketing, enabling youth to access global gig work from villages.
- **Women's Education and Empowerment:** Promoting female entrepreneurship, cooperatives, and financial literacy ensures gender-balanced rural progress.
- **Value Education:** Rural education should rebuild social pride and dismantle the stigma that associates "staying back in villages" with failure.

## Rethinking Rural Employment: Beyond Agriculture

**Emerging Sectors and Opportunities**

- **Agri-Business and Food Processing:** Expansion of cold chains, farmer-producer organizations (FPOs), and value addition industries.
  - Creates skilled jobs for youth in packaging, logistics, and marketing.
- **Renewable Energy Services:** Solar panel maintenance, microgrid operations, and biofuel units.
  - Aligns with India's green growth and energy transition goals.
- **Rural Logistics and E-Commerce:** Expansion of digital marketplaces (ONDC, Amazon Saheli) linking artisans and producers to national markets.
- **Handicrafts and Local Industries:** Revival of crafts through digital branding and global e-commerce.
- **Agri-Tourism and Eco-Tourism:** Leveraging India's biodiversity and culture for sustainable tourism.
- **Rural BPOs and Digital Gig Work:** Enabled by BharatNet and Digital India, allowing remote jobs in IT services, design, and data management.

**Lessons from Reverse Migration during COVID-19**

The COVID-19 lockdowns (2020) triggered one of India's largest reverse migrations. Nearly 40 million workers returned home, exposing the vulnerabilities of migrant life - but also revealing new possibilities.

- **Agricultural Resilience:**
  - Agriculture became a **shock absorber**, showing unexpected strength.
  - The Ministry of Agriculture reported a **39% increase in sown area** in 2020 due to returning labour.
- **Rural Revival Success Stories:**
  - Balaram Mahadev Bandagale (Raigad, Maharashtra): Shifted from factory work to mango orchards using irrigation schemes.
  - Chandrakant Pawar: Returned to dairy farming and became village Sarpanch.
- **Policy Insight:** Reverse migration demonstrated that rural economies can be revitalized - if supported by infrastructure, skilling, and entrepreneurship ecosystems.

## Government Schemes to Support Rural Enterprise and Reduce Migration

| Scheme / Initiative | Objective |
|---|---|
| **Pradhan Mantri Mudra Yojana (PMMY)** | Collateral-free loans for micro and small enterprises. |
| **Prime Minister's Employment Generation Programme (PMEGP)** | Credit-linked subsidy for rural self-employment. |
| **Start-up India / Stand-up India** | Promotes entrepreneurship and innovation in semi-urban & rural areas. |
| **Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY)** | Rural youth skill training linked with placement. |
| **Digital India / BharatNet** | Expanding broadband connectivity to villages for e-commerce and online jobs. |
| **FPO Scheme & Agri Infrastructure Fund (AIF)** | Promotes collective farming and agri-logistics infrastructure. |
| **Rural Industrial Parks (under DAY-NRLM)** | Converts panchayats into micro-enterprise hubs. |
| **Green Energy and Renewable Schemes** | Jobs in decentralized solar, wind, and bioenergy sectors. |
| **One District One Product (ODOP)** | Promotes local specializations for rural export competitiveness. |

## Way Forward

- **Transform Rural Education Systems:** Integrate skills, entrepreneurship, and sustainability in school curricula.
- **Develop Rural Start-up Ecosystems:** Set up incubation centres in Tier-3 towns for agri-tech, handicrafts, and renewable sectors.
- **Bridge Urban–Rural Divide:** Improve rural infrastructure - connectivity, logistics, internet, and healthcare - to attract industries and talent.
- **Strengthen Rural–Urban Partnerships:** Develop peri-urban growth corridors where rural youth can work without migrating far.
- **Portable Social Protection:** Make healthcare, pension, and skill certification portable across states for seasonal migrants.
- **Public Perception Shift:** Highlight success stories of rural entrepreneurs and reverse migrants to inspire confidence in village livelihoods.

# Missing Daughters of India: Causes, Consequences, and the Challenge of Son Preference

*Syllabus Mapping: GS-Paper I, Social empowerment; Population issues; Gender inequality.*

## Context

Recent crackdowns across Karnataka–Andhra Pradesh, Haryana–Uttar Pradesh, Gujarat, and Delhi have uncovered cross-border sex-determination rackets, highlighting persistent violations even after three decades of the PCPNDT Act (1994).

## Understanding Son Meta Preference and Sex-Selective Practices

**What is Son Meta Preference?**

- The term "son meta preference" refers to a strong desire among parents to have at least one male child, even if they do not resort to sex determination or foeticide. This preference manifests through:
  - Continued childbearing until a son is born, or
  - Elimination of female foetuses through prenatal sex determination, leading to sex-selective abortions.
- Thus, son meta preference includes both fertility behaviour and sex selection, resulting in the phenomenon of "missing women" in India's population.

## Historical Roots: How It Began

**Pre-modern and Colonial Period**

- Patriarchal kinship structures and the dowry system entrenched son preference.
- Sons were seen as heirs, breadwinners, and religious successors performing funeral rites.
- Daughters were viewed as economic liabilities due to dowry and perceived "paraya dhan" (someone else's property).

**Post-1970s Technological Turn**

- **Amniocentesis (1970s):** Initially introduced for genetic testing, quickly misused for sex determination.
- **Ultrasound (1980s onward):** Made sex determination cheaper, faster, and widespread.
- **IVF and Non-Invasive Prenatal Testing (2000s–present):** Newer reproductive technologies are now being misused for embryo sex selection.

- The nexus between medical commercialization and patriarchal demand led to mass-scale sex-selective abortions.

**Current Trends and Data**

- **Sample Registration System (SRS) 2021–23:**
  - **Sex Ratio at Birth (SRB):** 917 girls per 1,000 boys (up from 904 in 2017–19).
  - Still below the **natural biological ratio of 952**.
- **NFHS-5 (2019–21):** Sex ratio at birth improved slightly to **929**, but skewed ratios persist in north-western states like Haryana, Punjab, Gujarat, and Uttar Pradesh.
- **Extent of "Missing Girls":** According to UNFPA's State of World Population Report (2023), India accounts for nearly one-third of the world's missing girls at birth, amounting to about 45 million women over decades.

**Recent Patterns**

- Sex determination networks are shifting from cities to rural and border districts (e.g., Karnataka–Andhra, Haryana–UP).
- Illegal prenatal clinics and home-based abortions are on the rise.
- Sex selection has also globalized - Indian-origin communities in the U.S., U.K., and Canada show similar skewed ratios.

## Causes Behind Sex-Selective Practices

### Social and Cultural Causes

- **Patriarchal Family Structures:** Sons carry the family lineage, while daughters "belong" to another household post-marriage.
- **Religious and Ritual Beliefs:** Hindu customs traditionally assign sons the duty of performing **shraddha** (last rites).
- **Marriage and Dowry:** Daughters are seen as financial burdens due to high marriage expenses.
- **Gender Norms:** Cultural bias that equates masculinity with protection, honour, and continuity of family name.
- **Social Pressure:** Women face stigma for "failing" to produce a son, even if decisions are made collectively by families.

### Economic Causes

- **Economic Utility of Sons:** Sons are viewed as financial supporters, especially in agrarian and informal economies.
- **Dowry as a Drain:** Rising dowry costs make daughters economically "expensive."
- **Property and Inheritance Laws:** Despite legal equality, daughters rarely inherit property, reinforcing the perception of sons as asset-holders.
- **Pension and Old-Age Security:** Absence of social welfare schemes makes parents dependent on sons for old-age care.

**Demographic and Technological Causes**

- **Small Family Norms:** With declining fertility, couples want to ensure at least one son — leading to selective abortion of female foetuses.
- **Medical Commercialization:** Diagnostic centres and IVF clinics exploit loopholes for profit.
- **Technology Access:** Widespread availability of portable ultrasounds and MTP drugs enables clandestine sex determination.

**Impacts of Sex-Selective Practices / Son Meta Preference**

- **Demographic Impact:**
  - Leads to skewed sex ratio at birth (SRB) and millions of "missing women" (about 45 million in India, UNFPA 2023).
  - Creates marriage squeeze and shortage of brides, resulting in trafficking and forced marriages.
- **Social Impact:**
  - Reinforces patriarchal norms and the belief that girls are less valuable.
  - Increases gender-based violence, domestic abuse, and social unrest.
  - Erodes women's dignity and equality, violating constitutional and moral principles.
- **Economic Impact:** Fewer women in the workforce reduces labour participation and economic growth potential.
- **Political & Governance Impact:** Undermines constitutional morality and India's commitments to gender equality (SDG-5).
- **Intergenerational Impact:** Passes on gender bias to future generations, creating a cycle of discrimination and demographic instability.
- **Ethical and Human Rights Dimensions:** Sex-selective practices represent a denial of the right to life and equality to the unborn girl child.

## Legal and Institutional Measures in India

| Law / Policy | Objective / Key Provisions |
|---|---|
| Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act - 1994 (amended 2003) | Prohibits sex selection before or after conception; regulates diagnostic techniques; mandates registration and monitoring of ultrasound centres. |
| Medical Termination of Pregnancy (MTP) Act - 1971, amended 2021 | Permits abortion under medical conditions but prohibits termination for sex selection. |
| Drugs and Cosmetics Act (1940) | Controls sale of abortion drugs; restricts unprescribed distribution. |
| Assisted Reproductive Technology (ART) Act (2021) | Regulates IVF and surrogacy; prohibits sex selection in embryo creation. |
| Beti Bachao Beti Padhao (BBBP) - 2015 | A social campaign for improving girl child survival and education; addresses declining CSR. |
| National & State Monitoring Committees (Under PCPNDT Act) | Ensure registration, inspection, and prosecution of violators. |

## Why Sex-Selective Practices Persist Despite Legal Measures

- **Weak Enforcement:**
  - **Low conviction rates:** Only 617 convictions in 25 years; many cases acquitted due to procedural lapses.
  - **Inactive committees:** District and State-level PCPNDT monitoring bodies often fail to meet regularly.
  - **Limited inspections:** Thousands of unregistered ultrasound and ART centres operate unchecked.
- **Corruption and Collusion:**
  - Local officials and medical professionals often **collude to evade the law**.
  - Political patronage and fear of antagonizing the medical lobby weaken enforcement.
- **Technological Evasion:** New methods like pre-implantation genetic diagnosis (PGD) and over-the-counter MTP kits bypass monitoring mechanisms.
- **Social Acceptance and Gender Norms:** Sex selection is often normalized as a "family decision", not a crime.
- **Fragmented Institutional Coordination:** PCPNDT, MTP, ART, and Drugs Acts operate **in silos**, leading to regulatory gaps.

**Case Study: Haryana – A Turnaround in Sex Ratio at Birth**

- **Background:** Haryana once had one of India's worst sex ratios at birth - 834 girls per 1,000 boys (2011 Census) driven by deep-rooted son preference, illegal sex determination, and patriarchal norms.
- **Interventions:**
  - **Strict Enforcement of PCPNDT Act:** Regular raids on ultrasound centres, cancellation of licenses, and decoy operations against illegal clinics.
  - **"Beti Bachao, Beti Padhao" Campaign (2015):** Launched first in Haryana districts like Panipat and Jhajjar.
    - » Combined awareness drives, community engagement, and rewards for families with girl children.
  - **Community and School-Level Initiatives:** Selfie with Daughter campaign, school enrolment drives, and honouring parents of girl achievers.
  - **Administrative Accountability:** District magistrates made personally responsible for monitoring sex ratio trends.
- **Impact:**
  - **Sex Ratio at Birth improved** from **834 (2011)** to **923 (2023, CRS data)**.
  - Decline in illegal ultrasound centres and rising girl enrolment rates in schools.

### Way Forward - Multi Pronged Strategy

- **Strengthen legal-administrative enforcement:**
  - Rigorous, regular inspections of ultrasound, MTP and ART centres; ensure ART clinics are registered and subject to PCPNDT obligations.
  - Tighten controls on sale and distribution of abortion drugs; stricter pharmacy audits and penalties.
- **Institutional reform:**
  - Reactivate and empower State/District PCPNDT committees; set measurable monitoring targets and public dashboards.
  - Capacity building for law-enforcement, judiciary, health inspectors and PSM (public health surveillance) officials.
- **Data, research and transparency:**
  - Mandate reporting on IVF births, prenatal testing outcomes, and ART clinic performance; central database under ICMR/MoHFW.
  - Use CRS and SRS data strategically to target high-risk districts and corridors.
- **Medical ethics and professional accountability:**
  - Enforce disciplinary action by medical councils for practitioners violating PCPNDT.
  - Integrate constitutional/ethical training in medical curricula.
- **Socio-economic and behavioural change:**
  - Accelerate gender-equality measures: inheritance reform awareness, women's property rights, pensions/support for girls, and livelihood incentives.
- **Political will and accountability:** Make SRB/CSR improvement a visible governance indicator; tie performance to administrative accountability.

## AI in Indian Classrooms: Transforming Teaching, Learning, and Educational Equity

*Syllabus Mapping: GS-Paper II, Issues relating to education and human resources*

### Context

Artificial Intelligence (AI) is rapidly redefining education across the world, and India is no exception. With initiatives like the India AI Mission, and global giants such as OpenAI, NVIDIA, Google, and Microsoft investing in India, classrooms are increasingly becoming sites of AI-assisted learning.

### AI and the Changing Pedagogical Landscape

AI is transforming teaching and learning in Indian classrooms through:

- **Personalised Learning:** AI-based systems can assess each student's pace, strengths, and weaknesses to design personalised learning plans.
- **Automated Assessment and Feedback:** Tools such as ChatGPT and adaptive testing platforms help teachers evaluate assignments, identify errors, and provide feedback faster.
- **Smart Content Creation:** Teachers use AI to create lesson plans, quizzes, and visual aids, enhancing classroom engagement and efficiency.
- **Virtual Classrooms and Tutoring:** AI-driven platforms enable interactive digital learning experiences and 24/7 student support.
- **Language and Accessibility Tools:** AI applications like speech-to-text, translation, and audio lessons improve inclusivity for differently-abled and linguistically diverse students.

A **Central Square Foundation report (2024)** found that nearly **70% of Indian teachers** now use AI tools to prepare teaching material, showing how deeply technology has penetrated pedagogy.

## Philosophical and Ethical Dimensions of AI in Education

Despite these advances, uncritical adoption of AI risks undermining the humanistic and ethical foundations of teaching.

- Education, as envisioned by thinkers like **Rabindranath Tagore** and **Bell Hooks**, is a **dialogue of empathy and critical thought**, not just information transfer.
- AI, if used mechanically, may reduce learning to **data-driven efficiency** rather than **intellectual curiosity and creativity**.
- According to the **Centre for Teacher Accreditation (CENTA)**, most teachers use AI primarily for administrative convenience, not to deepen learning.

### Ethical Concerns

- **Dependence and Dishonesty:** Students increasingly use AI for plagiarism or shortcuts, prompting the CBSE to ban tools like ChatGPT during exams.
- **Erosion of Teacher-Student Interaction:** Overuse of digital interfaces can reduce emotional and social connection in classrooms.
- **Bias and Privacy:** AI tools may reproduce societal biases or compromise data privacy if used without regulation.

Thus, while AI enhances efficiency, it must not replace the **dialogical and transformative spirit** of education.

**India's Policy Framework: The India AI Mission**

India's **National AI Mission** envisions building an ecosystem for **trusted, inclusive, and socially anchored AI**, with a strong focus on education.

**Key Pillars:**

- **India AI Compute Capacity:** Establishes national infrastructure for AI innovation.
- **India AI Future Skills:** Aims to train teachers, researchers, and students in AI literacy and application.
- **Centres of Excellence (CoEs):** To be set up in leading educational institutions to promote AI-based pedagogy, content creation, and ethics training.
- **Application Development Initiative:** Focused on designing context-specific AI solutions for socio-economic transformation, including education.

If implemented effectively, these initiatives can bridge the skill gap, make AI tools accessible, and promote digital inclusion.

## Benefits of AI Integration

When applied thoughtfully, AI offers immense potential:

| Dimension | AI Contribution |
|---|---|
| Personalization | Tailored lessons and adaptive learning paths |
| AI Accessibility | Multilingual support and assistive technologies for differently-abled learners |
| Efficiency | Automated grading, analytics, and real-time performance tracking. |
| Inclusivity | Online learning opportunities for remote students |
| Teacher Support | Reduces administrative burden, allowing focus on mentoring |

## Challenges in Integrating AI in Indian Classrooms

- **Digital Divide:**
  - The **National Sample Survey (2024)** shows that while Internet access has expanded, **meaningful digital participation** remains uneven.
  - Rural schools often lack infrastructure, power supply, and high-speed Internet.
  - This creates a "dual India" - one AI-driven, another digitally excluded.
- **Ethical and Pedagogical Issues:**
  - Teachers use AI for convenience rather than creativity.
  - Risk of **over-dependence on technology**, neglecting values like empathy, dialogue, and human judgment.
- **Lack of AI Literacy and Training:**
  - Teachers need in-service training to critically and responsibly integrate AI into pedagogy.
  - Without ethical orientation, AI could amplify inequalities or promote rote learning.
- **Inequality in Access:** Privileged urban schools adopt AI-based smart classrooms, while government schools struggle to provide digital infrastructure - reinforcing educational inequality.

## Way Forward

- **Human-Centred AI in Education:** AI should be viewed as a supplementary tool, not a substitute for teachers. The classroom must remain a space of empathy, creativity, and critical inquiry.
- **Strengthen Teacher Training:**
  - Introduce **AI ethics and pedagogy modules** in B.Ed and in-service training.
  - Promote capacity-building through **AI Centres of Excellence**.
- **Bridge the Digital Divide:**
  - Invest in infrastructure: electricity, broadband, and affordable devices in rural schools.
  - Promote **cloud-based learning solutions** accessible to all.
- **Promote Ethical AI Use:**
  - Establish regulatory frameworks to prevent misuse, plagiarism, and data exploitation.
  - Encourage **student awareness** about responsible AI usage.
- **Contextual and Inclusive Design:**
  - Develop **AI tools in Indian languages**, suited to diverse socio-cultural and regional contexts.
- **Foster Research and Innovation:** Encourage collaboration between academia, startups, and government for developing **India-specific AI solutions** in education.

# From Brain Drain to Brain Gain: India's Strategy to Attract Global Talent Home

*Syllabus Mapping: GS Paper II, Government policies for human resource development*

## Context

The Government of India is formulating a new initiative to encourage Indian-origin researchers and scientists in STEM fields to return from the United States, in response to the increasingly restrictive research policies introduced under the Trump administration.

## What is Brain Drain?

- Brain drain refers to the large-scale emigration of educated and skilled human resources (scientists, engineers, doctors, researchers, and technologists) from their home country to more developed nations seeking better education, research facilities, career prospects, or quality of life.
- **Reverse Brain Drain:** The opposite trend - when emigrated professionals return to their home country due to emerging opportunities, nationalistic motivations, or challenges abroad.

**Key Facts and Statistics**

- As per MEA estimates, 32 million Indians live abroad, forming the world's largest diaspora.
- India contributes a significant share of skilled professionals to global tech and research sectors - for instance, 36% of NASA scientists and 20% of Google engineers are of Indian origin.
- The World Bank (2023) reported that India received over $125 billion in remittances, but the loss of scientific and research talent remains a major concern.
- India spends only 0.65% of GDP on R&D, compared to 2.7% in China and 3.4% in the US, prompting many researchers to migrate.

## Factors Contributing to Reverse Brain Drain

**Push Factors from Abroad**

- **Restrictive immigration policies:** The Trump-era H-1B visa restrictions and tightened US immigration norms discouraged many foreign researchers and Indian professionals.
- **Academic and research uncertainty:** Post-pandemic budget cuts and job insecurity in Western universities have reduced long-term opportunities.
- **Discrimination and Visa Challenges:** Increasing racial bias and nationality-based visa scrutiny (especially for Chinese and Indian researchers).

**Pull Factors within India**

- **Rising opportunities in innovation and startups:** India's digital revolution, AI ecosystem, and space and biotech sectors have created world-class opportunities.
- **Government's talent attraction initiatives:** New schemes to integrate NRI and overseas Indian scientists into domestic research institutions.
- **Emotional and cultural connection:** Desire to "give back" to the motherland and contribute to India's global rise.
- **Improving global standing:** India's growing recognition as a major economic and scientific power boosts confidence among returnees.

## Government Initiatives to Attract and Absorb Talent

- **VAJRA (Visiting Advanced Joint Research Faculty) Scheme**
  - Implemented by the Department of Science and Technology (DST).
  - Allows overseas scientists to work with Indian institutions for 1-3 months per year.
  - Focuses on high-end collaborative research in frontier areas of science and engineering.
- **DST-SERB Overseas Visiting Doctoral Fellowship (OVDF):** Encourages young researchers and PhD scholars abroad to return for short-term collaborative projects.
- **GIAN (Global Initiative of Academic Networks):** Launched by the Ministry of Education, it brings eminent foreign faculty to teach and research in Indian universities.
- **INSPIRE and Ramanujan Fellowship:** Designed to attract young researchers of Indian origin back to India through fellowships and research grants.

**Proposed "Star Faculty" Scheme (2025)**

- The Union government has proposed a new scheme to attract "Indian-origin star faculty" in STEM fields to work full-time in India's premier research institutions such as IITs and national laboratories.
- **Features:**
  - Permanent faculty positions with tenure track.
  - **Substantial setup grants** for establishing laboratories.
  - Long-term research funding and autonomy.
  - Simplified re-entry and relocation procedures.
- The idea is to leverage US policy tightening as a push factor and India's growing opportunities as a pull factor.

**Schemes to Strengthen India's R&D Ecosystem**

- **National Research Foundation (NRF) (under ANRF Act, 2023):**
  - Aims to **fund, coordinate, and promote quality research** across universities and institutes.
  - Encourages **public-private partnerships** in R&D.
  - Budgeted outlay: **₹50,000 crore (2023–28)**.
- **PM Research Fellowship (PMRF):** Supports outstanding PhD candidates at IITs, IISc, and other top institutions with ₹70,000–80,000/month fellowships.
- **National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS):** Strengthens research in AI, robotics, and quantum computing, creating new job and innovation ecosystems.
- **Atal Innovation Mission (AIM)** and **Startup India:** Provide seed funding and incubation to startups emerging from research institutions.
- **PRISM (Promoting Innovations in Individuals, Startups and MSMEs):** Encourages grassroots and institutional innovations by providing early-stage R&D support.

## Challenges in Realizing Reverse Brain Drain

- **Bureaucratic Red Tape:**
  - Cumbersome tendering and approval systems delay procurement and project execution.
  - Researchers often face long administrative hurdles before accessing grants.
- **Institutional Rigidities:** Lack of academic freedom, rigid hierarchies, and centralized control discourage creative research.
- **Funding Limitations:** Low R&D expenditure (0.65% of GDP) constrains capacity-building and infrastructure development.
- **Cultural and Social Adjustment:** Returnees face difficulties adapting to bureaucratic and resource-limited work cultures.
- **Resentment among Resident Scientists:** Perceived "preferential treatment" for returnees can create friction within institutions.

- **Quality of Life Concerns:** Air pollution, urban congestion, and limited schooling options make relocation challenging.

## Way Forward: Building a Conducive Research and Talent Ecosystem

- **Structural Reforms:**
  - Implement "Ease of Doing Research" framework - simplify procurement, hiring, and grant disbursal.
  - Reduce bureaucratic control and allow institutional autonomy with accountability.
- **Increase R&D Spending:**
  - Raise R&D expenditure to 1.5–2% of GDP over the next decade.
  - Encourage private sector participation through tax breaks and collaborative platforms.
- **Broaden the Research Base:**
  - Strengthen state universities and regional research centers to distribute excellence beyond elite IITs.
  - Build research clusters around emerging industrial hubs.
- **Talent Integration Framework:**
  - Develop joint mentorship models where returnees collaborate with domestic scientists.
  - Establish returnee support cells offering relocation, housing, and school assistance.
- **Global Research Collaborations:**
  - Facilitate international joint projects, exchange programs, and mobility fellowships.
  - Build diaspora innovation networks linking NRIs with Indian startups and labs.

### Learning from the Chinese Example

- **China's "Thousand Talents Plan"** has successfully attracted thousands of top Chinese-origin researchers from the US and Europe.
- The scheme offers:
  - Lavish research grants,
  - Housing and family benefits, and
  - Simplified administrative processes.
- Returnees in China are colloquially called "sea turtles" (hai gui) - a pun on "return from overseas."

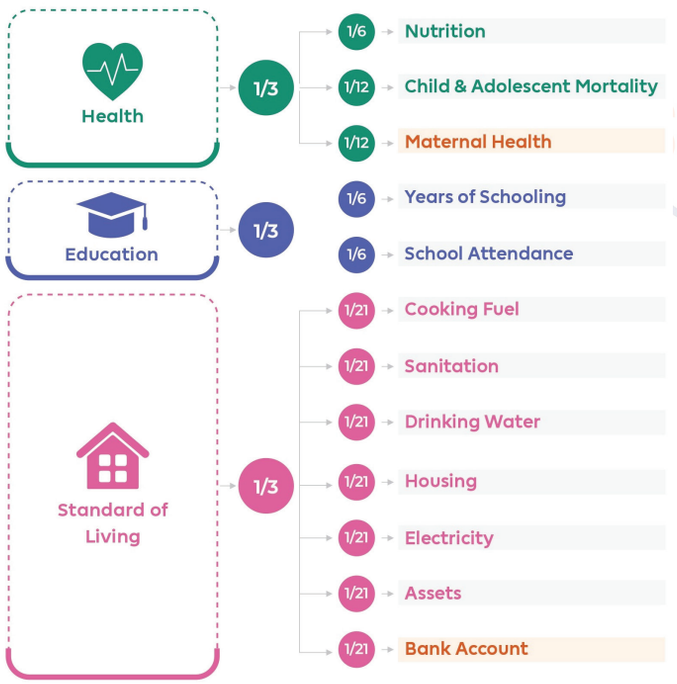
# Topics for Prelims

## Global Multidimensional Poverty Index

### Context

The Global Multidimensional Poverty Index (MPI) 2025 was recently released by UNDP & OPHI.

**Indicators and their weights**




### About Global Multidimensional Poverty Index

- MPI is a global measure of acute poverty that captures multiple deprivations - health, education, and standard of living; beyond income poverty.
- **Published by:** United Nations Development Programme (UNDP) and Oxford Poverty & Human Development Initiative (OPHI) annually since 2010.
- Global MPI was first introduced in the 2010 Human Development Report.
- The index is based on 3 dimensions with 10 indicators (refer infographic)

### Key Highlights of the Report

- Over 80% of the world's multidimensionally poor live in regions exposed to climate hazards.
- Double Burden of poverty and climate hazards: Over 80% live in climate hazard-prone regions.
  - South Asia has the highest number of poor in climate hazard areas.
- Climate change intensifies vulnerability - poor populations, largely dependent on agriculture and informal labour, are the most affected despite contributing little to emissions.
- The report warns that without strong climate action, extreme poverty could nearly double by 2050.
- **Multidimensional Poverty in India:** It has fallen to 16.4% (2019–2021) from 55.1% (2005-06), lifting approximately 414 million people out of poverty.

## Civil Registration System Report for 2023

### Context

The Registrar General of India (RGI) released the "Vital Statistics of India based on the Civil Registration System (CRS), 2023" report.

### Key Findings of CRS 2023

- **Birth Registration:**
  - Total births registered (2023): 2.52 crore→ About 2.32 lakh fewer than in 2022 (2.54 crore).

  - Overall registration coverage: 98.4% of estimated births.
  - Institutional births: 74.7% of total registered births.
- **Death Registration:** Total deaths registered (2023): 86.6 lakh→ Slight rise from 86.5 lakh in 2022.
- **Sex Ratio at Birth (Females per 1,000 males)**
  - **Lowest:** Jharkhand (899), Bihar (900), Telangana (906), Maharashtra (909), Gujarat (910), Haryana (911), Mizoram (911).
  - **Highest:** Arunachal Pradesh (1,085), Nagaland (1,007), Goa (973), Ladakh & Tripura (972), Kerala (967).

**About Registrar General of India (RGI)**

- It is responsible for conducting India's decennial Census, compiling demographic and population data and overseeing the Civil Registration System (CRS) nationwide.
- It operates under the Union Home Ministry.
- It has developed CRS mobile app for easing registration of birth & deaths.

**About CRS**

- It is a unified process for recording of vital events eg. births, deaths, and still births but not marriages and divorce.
- Under the Registration of Births and Deaths (RBD) Act, 1969 it is compulsory to report births and deaths to the Registrar of Births and Deaths.
- 2023 Amendment enabled digital registration , creation of national and state databases etc.

## International Purple Fest

### Context

The Chief Minister of Goa inaugurated the 3rd edition of the International Purple Fest – Celebrating Diversity.

### About International Purple Fest

- It is **India's largest inclusive festival** dedicated to celebrate the abilities, creativity, and achievements of persons with disabilities (PwDs).
- It is jointly organized by the State Commissioner for Persons with Disabilities, Goa, and the Department of Empowerment of Persons with Disabilities (DEPwD) under the Ministry of Social Justice and Empowerment.
- **Significance:**
  - Shifting the narrative from disability to ability and contribution.
  - It embodies India's vision of inclusive governance and aligns with the Accessible India Campaign (Sugamya Bharat Abhiyan).
  - Provides a platform for showcasing art, culture, technology, and innovation by and for persons with disabilities.

## The State of Social Justice - 2025

### Context

The International Labour Organization (ILO) recently released its landmark report The State of Social Justice: A Work in Progress (2025).

### About The State of Social Justice 2025 & Key Summary

- The report reviews 30 years of progress since the 1995 World Summit for Social Development, assessing how nations have advanced or fallen short, in ensuring justice, equality, and inclusion.
- The 1995 World Summit for Social Development was a major UN conference held in Copenhagen that brought world leaders together to address global social issues

#### Global Progress

- Extreme poverty reduced from 39% (1995) to 10% (2025).
- Child labour (5–14 years) declined from 250 million to 106 million.
- Working poverty fell from 28% to 7%.
- **Social protection coverage:** Over 50% of the global population now has access to some form of social safety net.

#### Persistent Inequalities

- The top 1% control 20% of global income and 38% of total wealth.
- **Gender wage gap:** Women earn 78% of men's wages; at current pace, parity may take 50–100 years.
- **Birth-based inequality:** About 55% of income inequality is determined by a person's country of birth.
- **Erosion of trust:** Confidence in governments, unions, and businesses has fallen steadily since the 1980s, reflecting perceptions of unfair systems and widening inequality.

**Four Foundational Pillars for advancing Social Justice**

- **Human Rights and Capabilities:** Ensuring basic freedoms, equality, and access to social protection for all.
- **Equal Access to Opportunities:** Removing systemic barriers to education, employment, and fair wages.
- **Fair Distribution:** Promoting equitable sharing of the benefits of economic growth.
- **Fair Transitions:** Managing environmental, digital, and demographic transitions in an inclusive way

### Trends and Progress in India

- **Poverty Reduction:** Multidimensional poverty dropped from 29% (2013–14) to 11% (2022–23), echoing global poverty reduction trends.
- **Education Gains:** Secondary school completion reached 79% (2024); female literacy rose to 77%, indicating strong progress in human capability development.
- **Social Protection:** Schemes like PM-KISAN, Ayushman Bharat, and e-Shram have expanded inclusion, covering over 55 crore unorganised workers.
- **Labour Market:** Despite reforms, over 80% of the workforce remains informal, mirroring global trends of limited job quality improvement.
- **Gender Gaps:** Female labour force participation is 37% (PLFS 2024–25), below the global average, underscoring persistent structural inequality.

## Siddi Tribal Community

### Context

President Droupadi Murmu recently interacted with members of the Siddi community in Gujarat.

### About Siddi Community

- They are a tribal-ethnic community in India, primarily found in Gujarat (Gir Forest region in Somnath district) as well as in small pockets of Karnataka and Maharashtra.
- They are believed to be descendants of the Bantu peoples of East Africa.
- **Culture & way of life:**
  - The Siddis in Gujarat live in or near the Gir forest region and maintain a close connection with nature and wildlife.
  - In sports they have shown physical prowess: the article mentions that in the late 1980s under a "Special Area Games" scheme the Siddis' physical build and stamina were seen as an advantage in athletics.
  - They speak the regional language (Gujarati in Gujarat) and are embedded in the local socio-linguistic milieu.

## Ollo Tribe

### Context

The Khonsa Battalion of Assam Rifles has launched a skill-based initiative to empower women of the Ollo tribe in Arunachal Pradesh.

### About Ollo Tribe

- Primarily inhabits the **Lazu (Laju) Circle of Tirap district**, **Arunachal Pradesh**, and adjoining areas of **Myanmar**.
- They are part of the larger **Naga ethnic group**, culturally related to the **Nocte and Wancho tribes**.
- Belonging to the **Tibeto-Burman family**.
- Traditional practices include **facial tattoos**, **dormitory systems**, and celebration of the **Woraang (Worang) Festival** after the jhum harvest.

## PM-SHRI scheme

### Context

Kerala announced to implement Pradhan Mantri Schools for Rising India (PM-SHRI) in the state.

### About PM SHRI Scheme

- It was **approved in 2022** by the Central Government.
- Union Ministry of Education is the nodal ministry of the scheme.
- Aims to **develop 14,500 existing schools** into **model institutions** that showcase the **key principles and practices of the National Education Policy (NEP) 2020**.
- Includes **existing elementary, secondary, and senior secondary schools** run by:
  - Central Government (like Kendriya Vidyalayas, Navodaya Vidyalayas),
  - State Governments, and
  - Local bodies across India.
- Implemented under a **Centrally Sponsored Scheme**.
- **Funding:**
  - **60:40** between the **Centre and States/UTs** (for most states),
  - **90:10** for **Northeast and Himalayan states**, and
  - **100%** for **UTs without legislatures**.
- **Related fact:**
  - Tamil Nadu and West Bengal are currently not implementing this scheme.
  - **School Quality Assessment Framework** is a **comprehensive evaluation tool** developed by the Ministry of Education to measure a school's progress under the PM-SHRI scheme.

## Model Youth Gram Sabha

### Context

The Ministry of Panchayati Raj, in partnership with the Ministry of Education and the Ministry of Tribal Affairs, has launched the Model Youth Gram Sabha (MYGS) Initiative.

### About Model Youth Gram Sabha

- It is an educational simulation of Gram Sabha (local assembly in villages).
- Similar to Model United Nations (MUN), but focused on village governance and development.
- **How it Works:**
  - Students from **classes 9–12** will enact roles like **Sarpanch, ward members, village secretary, Anganwadi worker, ANM (Auxiliary Nurse Midwife), and junior engineers**.
  - They will conduct **mock Gram Sabha meetings**, discuss local issues, prepare **village budgets** and **development plans**.
- **Implementation:**
  - Phase 1 (Oct 2025): To be launched in **600 Jawahar Navodaya Vidyalayas (JNVs)** and **200 Eklavya Model Residential Schools (EMRSs)**.
  - Also in selected **Zilla Parishad schools in Maharashtra and Karnataka**.
  - Later, expansion to other schools run by state governments.
  - About **1,100 schools** will be covered in the first phase.

## We Rise initiative

### Context

NITI Aayog's Women Entrepreneurship Platform and DP World launched 'We Rise' initiative.

### About the Initiative

- Part of **Women Entrepreneurship Platform's (WEP) "Award to Reward (ATR)"** initiative.
- **Objective:** To **empower women-led MSMEs** in India by helping them **scale globally** through: Trade facilitation, Mentorship, Strategic partnerships & Export-readiness support.

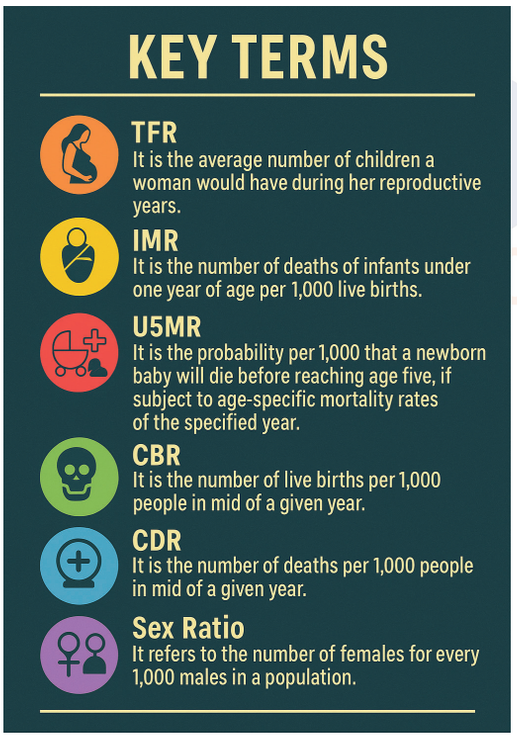
## Children in India 2025

### Context

The Ministry of Statistics and Programme Implementation (MoSPI) released the 4th issue of the Children in India 2025 Report.

### Key Highlights of Children in India 2025 Report

- **Infant Mortality Rate (IMR):** Declined from 44 (2011) to 25 (2023).
- **Under-Five Mortality Rate (U5MR):** Fell from 30 (2022) to 29 (2023).
- **Birth Rate (2023):** National - 18.4 per 1,000 population.
  - Rural: 20.3, Urban: 14.9.
- **School Dropout Rates (2022-23 → 2024-25):**
  - Preparatory stage: 8.7% → 2.3%.
  - Middle level: 8.1% → 3.5%.
  - Secondary level: 13.8% → 8.2%.
- **Child Marriage (Women 20–24 years married before 18):** Reduced from 26.8% (2015–16) to 23.3% (2019–21).
- **Adoption Trends:**
  - Total adoptions: 3,927 (2017-18) → 4,515 (2024-25).
  - In-country adoptions: 4,155.
  - Inter-country adoptions: 360–653 annually.
- **Gender Parity Index (GPI):** Parity achieved across all education stages (2024-25).




## Rotavirus Vaccine

### Context

Researchers found that the indigenous Rotavirus vaccine (Rotavac) has been effective in reducing rotavirus-related gastroenteritis and hospitalisations among Indian children.

### What is Rotavirus?

- Rotavirus is a highly contagious virus that causes severe diarrhoea and vomiting (gastroenteritis), especially in infants and young children.
- It spreads primarily through the fecal-oral route via contaminated hands, surfaces, food, or water.
- **Rotavirus Burden:**
  - In India, it causes around 128,500 child deaths annually (under age five).
  - Major contributor to paediatric hospitalisations due to diarrhoea.
- Rotavirus Vaccine (Rotavac) was included in the Universal Immunisation Programme (UIP) in the year 2016.

**About UIP**

- UIP launched in **1985** as part of India's National Health Mission (NHM) to protect children and pregnant women from vaccine-preventable diseases (VPDs) by providing **free vaccines** through government health facilities.
- **Other Vaccine Included:**
  - Pneumococcal Conjugate Vaccine (PCV) – 2017
  - Inactivated Polio Vaccine (IPV) – 2015–2016
  - Measles–Rubella (MR) Vaccine – 2017
  - Adult Japanese Encephalitis (JE) Vaccine – 2016

## Cancer Burden in India

### Context

A Lancet analysis (2025) by the Global Burden of Disease Cancer Collaborators shows a sharp global and Indian rise in cancer cases and deaths.

**Initiatives to curb cancer in India**

- The National Cancer Registry Programme (NCRP): under ICMR enabling evidence-based policy decisions.
- National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS): under the National Health Mission (NHM).
- **Union Budget 2025-26:** Day Care Cancer Centres in all district hospitals over the next three years.
- **Other Initiatives:** NexCAR19 therapy, National Cancer Grid (NCG), Quad Cancer Moonshot etc.

### Cancer Burden in India

- **Incidence (2023):** Estimated 5.43 million cases.
- **Incidence Rate (Age-standardised):**
  - 1990: 84.8 per lakh → 2023: 107.2 per lakh (↑26.4%).
- **Mortality Rate (Age-standardised):**
  - 1990: 71.7 per lakh → 2023: 86.9 per lakh (↑21.2%).
- **2022 Estimates:** 1.4 million cases, 910,000 deaths (as per National Cancer Grid).
- **Top cancers:**
  - **Women:** Breast, cervical, ovarian.
  - **Men:** Oral, lung, oesophagus.
  - **Overall:** Breast, lung, oesophagus, oral, cervical, stomach, colon cancers.

- **Risk factors (India):** Tobacco, poor diet, alcohol use, obesity, air pollution.

## Pradhan Mantri Ayushman Bharat Health Infrastructure Mission (PM-ABHIM)

### Context

Since its launch, PM-ABHIM has transformed India's health infrastructure landscape.

### About PM-ABHIM

- **Launched:** October 25, 2021
- **Nodal Ministry:** Ministry of Health and Family Welfare (MoHFW)
- **Objectives:**
  - To strengthen grass root public health institutions.
  - To expand and build an IT enabled disease surveillance system.
  - To expand research on COVID-19 and other infectious diseases and to develop the core capacity to deliver the One Health Approach.
- **Components:**
  - It consists of Centrally Sponsored Scheme Components [like Ayushman Bharat - Health & Wellness Centres (AB-HWCs) in rural and urban areas].
  - Some Central Sector Components (like Critical Care Hospital Blocks).

## Mission for Advancement in High-Impact Areas (MAHA) - MedTech Mission

### Context

The Anusandhan National Research Foundation (ANRF), in collaboration with the Indian Council of Medical Research (ICMR) and the Bill & Melinda Gates Foundation, has launched Mission for Advancement in High-Impact Areas (MAHA) – Medical Technology (MedTech).

### About MAHA- MedTech

- It is a **national mission** designed to accelerate innovation in India's **medical technology sector** for priority disease areas (e.g., TB, cancer, neonatal care)**., reduce reliance** on high-cost imports, and **promote equitable access** to affordable and high-quality medical technologies.
- Covers a wide range of **medical devices, implants, diagnostics, assistive technologies, and software-based healthcare solutions**.
- **Funding:**
  - Financial support for **Academic and R&D institutions, Startups, MSMEs, Hospitals, and Industry collaborations**.
  - **₹5–25 crore per project** (up to ₹50 crore for exceptional cases).
- **Supported by:** National initiatives such as:
  - **Patent Mitra** – for IP protection and technology transfer.
  - **MedTech Mitra** – for regulatory clearances and guidance.
  - **Clinical Trial Network** – for validation and evidence generation.
  - **Industry mentorship** for commercialization support.

# SCIENCE & TECHNOLOGY

## Topics for Mains

### Green Hydrogen and the Global Race

*Syllabus Mapping: GS-3 Alternate energy sources*

#### Context

China's growing dominance in the electrolyser market raises global concerns, but it also opens opportunities for India to build a competitive and resilient green hydrogen ecosystem.

#### Why are Green Hydrogen Technologies Rapidly Advancing?

- **Decarbonization of Industry:** Steel, cement, fertilizers, and chemicals cannot be easily electrified. Hydrogen offers a low-carbon substitute.
- **Falling Renewable Energy Costs:** Cheap solar and wind power has made electrolytic hydrogen more viable.
- **Climate Commitments:** Net-zero pledges by 2050–2070 are pushing governments to support hydrogen as part of their clean energy mix.
- **Technological Progress:** Improvements in electrolyser efficiency, durability, and scalability are bringing down costs.
- **Energy Security:** Countries want to reduce dependence on imported oil and gas, using hydrogen as a domestic energy source.
- **Policy Push:** National hydrogen missions in Europe, US, Japan, China, and India are driving R&D and deployment.

**What are Electrolysers?**

- **Electrolysers** are devices that use **electricity to split water ($H_2O$) into hydrogen ($H_2$) and oxygen ($O_2$)** through a process called **electrolysis**.
- If the electricity comes from **renewable energy sources** (solar, wind, hydro), the hydrogen produced is called **green hydrogen**.

#### Electrolysers in Commercial Use

Electrolysers are to hydrogen what solar modules are to solar power - the **core equipment**. Two types that dominate today are:

1. **Alkaline Electrolysers (ALK):**
   - Oldest and most mature technology.
   - Relatively cheap and robust.
   - Less efficient when powered by variable renewable energy (solar/wind).
   - Suited for large-scale continuous production.
2. **Proton Exchange Membrane (PEM) Electrolysers:**
   - Newer and more efficient technology.
   - Can handle fluctuating renewable loads.
   - Produces higher purity hydrogen.
   - Expensive due to reliance on precious metals (platinum, iridium).

#### China's Position

- By **2024**, China became the **world's largest hydrogen producer**:
  - **36.5 million tonnes** annual production (all hydrogen).
  - **1,20,000 tonnes of green hydrogen** – nearly **50% of global output**.
- **Electrolysers**: China controls **~85% of global manufacturing capacity of ALK electrolysers**.

**Why China May Struggle to Replicate its Solar Success with Electrolysers**

- **Critical Mineral Dependence:**
  - ALK electrolysers depend on nickel and steel (available in China). However, PEM electrolysers need platinum, iridium, titanium - **mostly imported.**
- **Integration Complexity:** Hydrogen systems vary by end-use (purity, storage, transport). Competing only on price is not enough.
- **National Security Concerns:** Unlike solar, hydrogen is seen as **strategic** by many countries. Imports from China may face restrictions.
- **Diversified Global Push:** EU, US, India, Japan, and Gulf countries have their own hydrogen missions to ensure domestic manufacturing.
- **Technological Edge Elsewhere:** Western firms lead in PEM and Solid Oxide Electrolysers (SOE), where China lags.

Thus, China may dominate **ALK electrolysers**, but achieving solar-like monopoly in the hydrogen sector will be harder. **This creates an opportunity for India in this sector**.

#### India's Approach to Green Hydrogen

##### Policy Initiatives

- **National Green Hydrogen Mission (2023):**
  - Outlay of ₹19,744 crore.
  - Targets **5 MMT annual green hydrogen production by 2030**. **Interim 1 MMT by 2025** goal announced in MNRE roadmap.
  - Incentives for domestic electrolyser manufacturing.
- **PLI Schemes & R&D Support:** Encouragement for companies to set up electrolyser plants.
- **Domestic Manufacturing Push:** Incentives for electrolyser manufacturing under **Strategic Interventions for Green Hydrogen Transition (SIGHT)** programme.
  - Reliance, Adani, Greenko, and L&T entering electrolyser production.
- **Hydrogen Hubs:**
  - **India's Emerging Hydrogen Valley Clusters** – Gujarat (Kandla), Rajasthan (Jaisalmer), Tamil Nadu (Tuticorin)."
  - E.g. Adani–Total JV and Reliance's Dhirubhai Ambani Green Energy Giga Complex are pioneering projects.
- **International Collaborations:** Partnerships with EU, Japan, and Gulf countries.

| Challenges for India | Opportunities for India |
|---|---|
| **High Cost of Electrolysers:** India currently imports most equipment. | **Abundant Renewable Energy:** India has one of the world's lowest solar/wind tariffs, making hydrogen cost-competitive. |
| **Technology Gap:** Indigenous PEM and advanced electrolyser manufacturing is limited. | **Export Potential:** Gulf, Japan, and EU are looking to import clean hydrogen. India can become a supplier. |

| Challenges for India | Opportunities for India |
|---|---|
| **Critical Minerals Dependence:** No domestic reserves of iridium, platinum, etc. | **Industrial Demand:** Fertilizer, steel, refineries in India are ready users. |
| **Infrastructure Gaps:** Lack of storage, transport pipelines, and refuelling networks. | **Geopolitical Edge:** Trusted partner for West Asia and Europe, unlike China. |
| **Financial Risks:** Huge upfront investments required, uncertain demand in early years. | **Innovation Drive:** Startups and public R&D can focus on low-cost electrolyser design. |
| **Competition from China:** Chinese low-cost ALK electrolysers could undercut Indian industry. | **Strategic Minerals Diplomacy:** Ties with Africa, Australia can secure critical minerals. |

## Way Forward

- **Scale Up Electrolyser Manufacturing:** Support domestic industry through PLI, subsidies, and joint ventures.
- **Secure Critical Minerals:** Build strategic partnerships with mineral-rich countries.
- **R&D Push:** Invest in next-gen technologies like PEM, Solid Oxide, and Anion Exchange Membrane (AEM) electrolysers.
- **Build Infrastructure:** Develop hydrogen pipelines, storage systems, and port facilities for exports.
- **Create Demand:** Mandate hydrogen blending in refineries and fertilizers.
- **International Cooperation:** Lead alliances like the International Solar Alliance but for hydrogen (India can champion a "Hydrogen Alliance").

# India's Indigenous 4G Stack: A Leap Towards Digital Self-Reliance

*Syllabus Mapping: GS-3 Digital India, Indigenization of Technology*

## Context

On BSNL's **25th anniversary (silver jubilee)**, PM Modi inaugurated India's **indigenously developed 4G stack**. This places India among a select group of nations (Denmark, Sweden, South Korea, China) with their own telecom equipment.

### What is the 4G Stack?

- A fusion of hardware and software that powers mobile communication - enabling calls, internet connectivity, and data flows.
- Traditionally sourced from global vendors, leaving India dependent on foreign technology.
- BSNL, supported by Indian institutions, built it from scratch during the Covid-19 pandemic.

## Key Achievements

- **Development in Record Time:** Built in **22 months** during the Covid-19 pandemic.
  - Collaboration between C-DOT (core network), Tejas Networks (radio access), and TCS (system integration).
- **Scale of Deployment:** Over 92,000 4G sites installed by BSNL.
  - Reached 22 million subscribers, including 2 million first-time internet users.
- **High-Capacity Network:** Capable of handling ~4 petabytes of data per day with high efficiency and security.
- **Global Recognition:** India becomes one of only five nations with end-to-end indigenous telecom stack capability.
  - Countries from Asia, Africa, and Latin America have expressed interest in adopting India's system.
- **Revival of BSNL:** After 17 years of losses, BSNL recorded consecutive profitable quarters, reflecting consumer trust in homegrown technology.

## Economic and Strategic Significance

**Economic**

- **Boost to Atmanirbhar Bharat:** Reduces reliance on foreign vendors (e.g., Nokia, Ericsson, Huawei).
- **Employment & Skills:** Generates jobs in manufacturing, R&D, and software engineering.
- **Ecosystem Growth:** Strengthens domestic telecom equipment industry and supplier chains.
- **Export Potential:** Opens a new frontier for India's **"Local to Global" strategy**, similar to UPI and space tech.

**Strategic**

- **Digital Sovereignty:** Secures telecom backbone from geopolitical risks and cyber vulnerabilities.
- **Strategic Autonomy:** Reduces dependence on Chinese equipment amid rising security concerns.
- **Soft Power:** Enhances India's global profile as a trusted digital partner, aligning with Vasudhaiva Kutumbakam.
- **Foundation for 5G/6G:** Creates indigenous capacity to scale into next-generation technologies.

### Government Initiatives

- **Atmanirbhar Bharat & PLI Scheme:** Incentives for telecom manufacturing and design in India.
- **Spectrum Policy:** Supporting BSNL's indigenous 4G rollout as a test bed for Indian technology.
- **C-DOT R&D Push:** Funding research for 4G/5G evolution, cybersecurity, and indigenous protocols.
- Global Promotion: Positioning Indian telecom stack as part of Digital Public Infrastructure (DPI) exports alongside UPI and Aadhaar tech.

## Challenges

- **Technology Upgradation:** Global telecom giants already moving to **5G and 6G**, while India is still scaling 4G.
- **Commercial Competitiveness:** Foreign vendors have global supply chains and economies of scale; Indian solutions must match on cost and reliability.
- **Ecosystem Constraints:** Dependence on imported components for semiconductors and high-end hardware.
- **Global Standards:** Ensuring compatibility with international telecom protocols and networks.

- **Private Sector Adoption:** Private telcos (Airtel, Jio, Vodafone) still rely heavily on foreign vendors.

## Way Forward

- **Scale Up 5G & 6G Readiness:** Accelerate R&D to ensure indigenous 5G stack is globally competitive.
- **Strengthen Supply Chains:** Develop domestic semiconductor and component manufacturing under India Semiconductor Mission.
- **Public–Private Partnerships:** Encourage private telecom operators to integrate indigenous stack gradually.
- **Export Strategy:** Use South-South cooperation and partnerships with Africa, ASEAN, and Latin America for telecom diplomacy.
- **Standards Leadership:** Engage with global telecom standard bodies to shape future protocols in India's favour.
- **Continuous Innovation:** Invest in cyber-resilience, AI-driven telecom networks, and quantum communication to stay ahead of emerging challenges.

# India's Electronics Leap: Driving Innovation, Growth, and Self-Reliance

*Syllabus Mapping: GS-3 Indigenization of Technology and Developing New Technology*

## Context

India's electronics sector has witnessed an **unprecedented transformation** over the past decade, evolving into one of the fastest-growing pillars of industrial and export growth. Between **2014–15 and 2024–25**, electronics production expanded nearly **six-fold** - from ₹1.9 lakh crore to ₹11.3 lakh crore.

**India's Electronics Production - Key Statistics:**

- **Electronics production** grew nearly **six times**, from ₹1.9 lakh crore in **2014–15** to ₹11.3 lakh crore in **2024–25**.
- **Electronics exports** surged **eight times**, from ₹38,000 crore to ₹3.27 lakh crore during the same period.
- Over **25 lakh jobs** have been created in electronics manufacturing in the last ten years.
- India attracted **$4 billion FDI** in the electronics sector since FY 2020–21, with **70%** coming under the **Production Linked Incentive (PLI)** scheme.
- **Top export destinations:** USA, UAE, Netherlands, United Kingdom, and Italy.

**India's Mobile Manufacturing Revolution - Key Highlights**

- Mobile phone production rose from ₹18,000 crore in 2014-15 to ₹5.45 lakh crore in 2024–25 - a **28-fold increase.**
- Exports surged 127 times, from ₹1,500 crore to ₹2 lakh crore in a decade.
- India now has over 300 mobile manufacturing units, compared to just **2 units in 2014**.
- **Domestic self-reliance:** imports have fallen from **78% in 2014–15** to near zero today.
- **Apple exports** crossed ₹1.1 lakh crore in FY 2024–25, while India overtook **China** as the top smartphone exporter to the U.S. in Q2 FY 2025–26.

## Impact of India's Electronics Boom

- **Economic Growth and Employment:**
  - Electronics manufacturing created **25 lakh direct jobs** and many more indirect ones.
  - Boosted **GDP contribution** from the manufacturing sector and diversified India's export basket.
- **Technological Self-Reliance:** India's electronics industry now supplies both **domestic and global markets**, reducing import dependence and strengthening **strategic autonomy**.
- **Digital Empowerment:** Affordable devices and expanding connectivity have powered the **Digital India** revolution - enabling e-learning, fintech, and governance access.
- **Global Recognition:**
  - India's success in mobile manufacturing has made it an **emerging global alternative to China**.
  - Attracted top brands like **Apple, Samsung, Foxconn, and Dixon Technologies** to invest and produce in India.

## Key Government Initiatives Driving Electronics Growth

- **Production-Linked Incentive (PLI) Scheme:** Incentivizes actual production and sales, not investment promises, Encourages large-scale manufacturing, global supply chain integration, and export competitiveness.
  - **Outlay:** ₹1.97 lakh crore (14 sectors, including electronics & IT hardware).
- **Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors (SPECS):** Offers 25% capital incentive to boost local component production and strengthen value chains.
- **Electronics Components Manufacturing Scheme (ECMS) – 2025:** Next-generation scheme to scale up component manufacturing, integrate MSMEs, and position India as a global sourcing hub - key step toward the $500 billion goal by 2030–31.
- **National Policy on Electronics (NPE) 2019:** Long-term framework to make India a global hub for Electronics System Design and Manufacturing (ESDM) through design-led innovation, R&D, and ecosystem development.
  - **Target:** $400 billion ESDM revenue by 2025.
- **Make in India & Digital India Initiatives:** Create an enabling environment for manufacturing and domestic demand.
  - Make in India – attracts global manufacturers and boosts industrial capacity.
  - Digital India – expands broadband and e-services, creating strong local demand for electronics.

## Challenges That Still Persist

- **Dependence on Imports for Components:**
  - Around **65–70% of electronic components**, especially **semiconductors**, are still imported - mostly from East Asia.
  - This limits value addition and exposes India to **supply chain vulnerabilities**.
- **Inadequate R&D and Design Capability:**
  - India's electronics ecosystem is largely **assembly-based**, not design-led.

  - Domestic investment in **R&D** remains below **0.64% of GDP**, much lower than China (2.1%) or South Korea (4.9%).
- **Infrastructure and Logistics Bottlenecks:** High power costs, port congestion, and transport delays raise production costs.
- **Skill Gaps:** The industry needs a **highly skilled workforce** for semiconductor fabrication, robotics, and chip design.
- **Limited Domestic Demand for High-End Electronics:** India's per capita electronics consumption remains modest compared to developed economies, limiting domestic market depth for advanced devices.

## Way Forward

- **Build Component-Level Self-Reliance:** Encourage **semiconductor fabrication**, **chip design**, and **component clusters** through fiscal incentives and public-private partnerships.
- **Invest in R&D and Innovation:** Boost **private sector R&D investment** through tax incentives and co-funding schemes & Promote **design-led manufacturing** to move up the global value chain.
- **Strengthen Skill Ecosystem:** Create specialized training programs under Skill India and PMKVY focused on electronics and semiconductor technologies.
- **Improve Infrastructure and Logistics:** Expand industrial corridors and electronic manufacturing clusters with plug-and-play facilities and efficient supply chains.
- **Deepen Global Integration:** Leverage **free trade agreements (FTAs)** and supply chain partnerships with the U.S., Japan, and EU to diversify export markets.

# Time to Prioritise Energy Storage in India

*Syllabus Mapping: GS-3 Alternate Energy Sources*

## Context

India's shift to renewable energy is gaining pace, but managing intermittency and peak demand remains a challenge. Recent developments in Andhra Pradesh and debates on power swapping have renewed focus on energy banking and storage as key to India's clean energy strategy.

## Understanding Power Swapping

- Power swapping refers to an agreement between two States or utilities to exchange electricity to manage fluctuations in supply and demand.
  - A **State with surplus electricity** during a particular season or time of day supplies power to another **State facing a shortage**.
  - Later, the process is reversed when the first State faces high demand.
  - This mechanism allows both to **save on high-cost short-term purchases** and ensure supply stability.
- **Advantages:**
  - Helps States avoid purchasing expensive electricity from spot markets.
  - Improves utilization of idle power generation capacity.
  - Enables short-term balancing of demand and supply.
- **Limitations:**
  - **Transmission Costs and Losses:** Inter-State power transfers attract transmission charges and energy losses, reducing cost efficiency.
  - **Short-Term Fix:** It addresses temporary supply gaps but does not solve long-term grid stability or renewable intermittency.
  - **Dependence on Other States:** Swapping relies on another State's surplus availability, which may not always coincide.
  - **No Support for Renewable Storage:** It doesn't address the **surplus solar or wind energy** that goes unutilized during off-peak hours.

Thus, while power swapping can help States manage seasonal electricity fluctuations, it cannot be the foundation of India's clean energy strategy.

## Energy Banking: The Sustainable Alternative

- Energy banking allows renewable energy producers to store surplus electricity in the grid or in a storage system for withdrawal during deficit periods.
- It acts as a financial and operational mechanism that:
  - Stabilizes the grid against renewable fluctuations,
  - Enables producers to earn better returns by selling power during peak demand, and
  - Reduces wastage of green energy.
- **Mechanism:**
  - During high generation (e.g., daytime solar surplus), electricity is "banked" with the grid.
  - It is then withdrawn at night or during peak hours when renewable generation drops.
  - States or Discoms can monetize this by trading banked energy under **capacity trading models**.
- **Key Technologies:**
  - **Battery Energy Storage Systems (BESS)** – lithium-ion and emerging sodium-ion batteries.
  - **Pumped Hydro Energy Storage (PHES)** – uses surplus energy to pump water uphill, releasing it to generate power later.
  - **Thermal Storage Systems** – store heat energy for use in power or industrial processes.
  - **Compressed Air Energy Storage (CAES)** – stores energy by compressing air in underground reservoirs.
- **Why Energy Storage is Crucial:**
  - Renewable sources like solar and wind are **intermittent** - they generate power when sunlight or wind is available, not necessarily when demand peaks.
  - Storage allows this power to be **captured and released when required**.
  - Without storage, surplus renewable power gets **curtailed or wasted**, undermining economic and environmental goals.

## Challenges in Energy Storage and Banking

- **High Capital Costs:** Battery storage costs remain high (~₹8–10 crore/MWh), limiting large-scale adoption.
- **Policy and Regulatory Gaps:** No uniform national policy governing inter-State energy banking.

- **Limited Indigenous Manufacturing:** Dependence on imported lithium, cobalt, and nickel increases costs and vulnerability to global supply disruptions.
- **Technological Uncertainty:** Rapid evolution of battery chemistries creates investment risks for developers.
- **Financial Health of Discoms:** Many Discoms are unable to invest in storage infrastructure due to poor financial conditions.
- **Land and Environmental Clearances:** Pumped hydro projects face long gestation periods and ecological concerns.

**Current Status of Energy Storage in India**

- India currently has **about 4.8 GW of operational pumped hydro capacity**, with several projects under construction (Maharashtra, Andhra Pradesh, MP).
- **Battery storage capacity** remains limited - around **400–500 MW installed**, mostly in pilot projects.
- The government's **National Electricity Plan (2023)** projects the need for **47 GW/236 GWh** of battery storage by 2032.
- Renewable-rich States like **Gujarat, Rajasthan, and Tamil Nadu** have initiated tenders for hybrid projects combining solar, wind, and storage.

## Way Forward

- **National Energy Banking Policy:** Establish a unified framework for inter-State renewable energy banking and capacity trading to efficiently utilize surplus power.
- **Accelerate Storage Deployment:** Integrate energy storage obligations with Renewable Purchase Obligations (RPOs) and provide **Viability Gap Funding (VGF)** for grid-scale projects.
- **Boost Domestic Manufacturing:** Expand **PLI schemes** and incentivize R&D in next-generation battery technologies (sodium-ion, flow, solid-state).
- **Promote Hybrid Projects:** Encourage **solar–wind–storage hybrids** for 24×7 renewable power through streamlined approvals and tariffs.
- **Strengthen Pumped Hydro Capacity:** Fast-track sustainable **Pumped Hydro Energy Storage (PHES)** projects using existing reservoirs to minimize environmental impact.
- **Improve Discom Finances:** Enhance payment discipline and financial health of Discoms to enable investment in modern storage infrastructure.

# AI in robotics: Revolutionising healthcare, agriculture, and industry in India

*Syllabus Mapping: GS-3 Robotics*

## Context

AI-driven robotics is transforming India's healthcare, agriculture, and manufacturing sectors by enhancing precision, efficiency, and sustainability, in line with the goals of 'AI for All' and the Digital India initiative.

## Applications of AI in Robotics Across Sectors

**Healthcare**

- **Robotic-assisted surgeries** use AI for micro-level accuracy, reducing errors and recovery time.
  - **Eg:** AI-integrated surgical robots in Indian hospitals like Apollo and AIIMS are being used for knee and spine surgeries, achieving better outcomes and quicker recovery.
- **Rehabilitation robots** assist patients with mobility impairments through adaptive learning systems.
- **Hospital service robots** handle disinfection, medicine delivery, and logistics, freeing up medical staff for patient care.
- **Elderly and Home Care Automation:** Service robots equipped with speech recognition and emotion detection assist the elderly in daily tasks, medication reminders, and remote health monitoring.

**Understanding AI in Robotics**

- AI in robotics refers to the **integration of machine learning algorithms, computer vision, and natural language processing** into robotic systems. This enables robots to:
  - Perceive their surroundings using sensors and cameras.
  - Make real-time decisions through data analysis and predictive modelling.
  - Learn from human input or past experiences (reinforcement learning).
  - Collaborate safely with humans (human–robot interaction).

In essence, **AI transforms robots from mechanical tools to adaptive partners**, capable of independent problem-solving and contextual decision-making.

**Agriculture**

- **Soil health and crop monitoring:** AI-powered drones and robots analyse soil nutrients, pest attacks, and water needs in real time.
- **Automated harvesting and planting:** Robots ensure uniform planting and efficient harvesting, reducing manual labour.
- **Predictive analytics:** Machine learning models forecast weather and disease outbreaks to prevent crop loss.
- **Eg:** Under **Telangana's "Saagu Baagu" initiative**, over **7,000 farmers** adopted AI-driven agritech tools for soil health monitoring and disease prediction - nearly **doubling productivity and income**.

**Logistics and E-Commerce: Intelligent Supply Chains**

- **Autonomous warehouse robots** optimise space use, track inventory, and manage fulfilment operations with human-like agility.
- **Self-driving delivery bots** and **AI route optimisers** are reducing turnaround times and costs in last-mile delivery.
- **Demand prediction algorithms** help e-commerce companies like Amazon, Flipkart, and Reliance Retail manage inventory more efficiently.
- **Eg:** Indian robotics startups like GreyOrange and Addverb deploy AI-based warehouse systems for major retailers, enhancing operational speed and accuracy.

**Manufacturing**

- In manufacturing, AI-enabled robots - or **"cobots" (collaborative robots)** - are redefining productivity:
  - They **learn** from human movements to adjust speed and precision dynamically, ensuring worker safety.

- Predictive AI models identify machine failures before they occur, minimising downtime.
- Automated quality checks with computer vision ensure product consistency.

### Emerging AI Trends in Robotics

| Trend | Description |
|---|---|
| Conversational GenAI & Voice-First Interfaces | Robots interact with humans using natural language, simplifying complex commands. |
| Domain-Specific LLMs | Tailored AI models for specific sectors (healthcare, defence, aviation) to improve precision and context. |
| AI Agents & AI Assistants | Intelligent robots act as decision-support partners, capable of handling dynamic challenges. |
| Composite AI & Lifecycle-Based Systems | Integration of multiple AI models ensures continuous learning and system evolution. |
| Sovereign & Secure AI | Focus on data privacy and localised AI ecosystems. India's initiatives like BharatGPT and IndiCASA dataset (IIT Madras) ensure AI sovereignty and contextual relevance. |
| Affordable AI | Open-source and no-code AI platforms are making robotics accessible to MSMEs and startups, democratising innovation. |

#### Significance for India

- **Economic Transformation:** AI-driven automation could add $500 billion to India's GDP by 2030.
- **Labour Productivity:** Intelligent machines can enhance efficiency in agriculture and manufacturing without displacing workers.
- **Make in India and Atmanirbhar Bharat:** Indigenous robotics and AI innovation can reduce import dependence in automation hardware.
- **National Security:** AI-powered drones and autonomous systems can support defence, border management, and disaster relief.
- **Social Impact:** Robotic healthcare and agri-solutions improve accessibility and inclusion in rural areas.

## Challenges and Concerns

- **Job Displacement Anxiety:** Misconceptions about AI replacing humans may hinder adoption.
- **Data Security:** Vulnerability to breaches and misuse of personal or industrial data.
- **Ethical Dilemmas:** Need for accountability when autonomous systems make critical decisions.
- **Skill Gaps:** Lack of AI–robotics expertise across developing economies.
- **Cost Barriers:** High initial investment for small businesses in developing countries.
- **Energy Footprint:** Increased computing demands could offset environmental gains if powered by non-renewable energy.

## Way Forward

- **Human-Centric Design:** Keep human welfare at the core of AI-robotics development.
- **AI Literacy & Workforce Training:** Integrate robotics education into mainstream curricula.
- **Ethical AI Frameworks:** Establish global norms for transparency, fairness, and accountability.
- **Green Robotics:** Use renewable energy and eco-design principles to reduce carbon footprint.
- **Public–Private Collaboration:** Encourage partnerships for scaling innovation responsibly.
- **Policy Reform:** Enact adaptive regulations that balance innovation with social safety nets.

# Wassenaar Arrangement: Need for Reform in the Cloud & AI Era

*Syllabus Mapping: GS-3 Dual use technology*

## Context

Recently protests erupted against Microsoft over claims that its Azure cloud services support Israeli military actions affecting Palestinians, highlighting gaps in the Wassenaar Arrangement. As cloud and AI technologies outpace traditional rules, the regime faces urgent calls for reform to curb misuse of dual-use tech.

#### Wassenaar Arrangement – Key Facts

- It was established in 1996 as the successor to the Cold War–era Coordinating Committee for Multilateral Export Controls (COCOM).
- **Headquarters:** Located in Vienna, Austria.
- **Membership:** Comprises 42 countries. India became a member in 2017. Includes most NATO and EU states, along with all UNSC P5 members **except China**.
- **Objective:** To enhance transparency, responsibility, and oversight in the transfer of conventional arms and dual-use goods and technologies.
- **Working Mechanism:** Operates through voluntary coordination—members share information, notify export license denials, and report controlled transfers.
- **Control Lists:**
  - **Munitions List:** Encompasses conventional weapons such as tanks, combat aircraft, UAVs, helicopters, missiles, and small arms.
  - **Dual-Use List:** Covers sensitive technologies and equipment with both civilian and military applications.
- **Technology Expansion:** In 2013, it expanded to cover **"intrusion software"** - showing adaptability to emerging threats.
- **Strategic Significance for India:** Membership gives India access to high-tech goods & Boosts India's image as a responsible technology power.

## Gaps in the Current Regime

- **Outdated Structure:** Originally designed for physical exports (hardware, chips, devices). Digital services like **cloud computing and SaaS** were never envisaged.
- **Cloud Services in Grey Area:** Remote access and API calls not clearly defined as "exports". It allows exploitation by regimes misusing global cloud providers for surveillance and repression.
- **Voluntary Nature:** Any member can block reforms. Implementation left to domestic laws → patchy and inconsistent across states.
- **Limited End-use Oversight:** Controls are framed around military/WMD proliferation, not mass human rights violations enabled by AI and surveillance.

- **Loopholes**
  - Exemptions for "defensive research" and intra-country transfers.
  - Services can slip through due to lack of consensus definitions.

## Reform Proposals

- **Expand Control Lists**
  - Include infrastructure/services enabling large-scale surveillance, profiling, and cross-border data policing.
  - Define thresholds for capacity and carve out strictly licensed defensive uses.
- **Redefine "Export"**
  - Treat remote enablement, authorisation, and granting admin rights as **equivalent to exports**.
  - Apply controls to SaaS and cloud transactions.
- **Embed End-use & Human Rights Controls**
  - Licensing to factor in: Identity of user, Jurisdiction & oversight regime& Potential for abuse
  - Align with UN Guiding Principles on Business and Human Rights.
- **Binding Framework**
  - Move from voluntary coordination to mandatory minimum standards.
  - Require denial of exports in atrocity-prone regions.
- **Institutional Agility**
  - Establish a **technical committee/secretariat** to fast-track controls on emerging tech (AI, cyber weapons, surveillance).
  - Introduce **sunset clauses** to review items periodically.
- **Enhanced Coordination**
  - Create **shared watchlists**, real-time red alerts, and interoperability standards among licensing authorities.

## Challenges in Reform

- **Political Resistance:** Some states may resist reforms, citing sovereignty, innovation, or commercial interests in exporting surveillance tools.
- **Consensus Requirement:** The arrangement works on unanimity, allowing even a few holdouts to block reforms.
- **Technical Complexity:** Defining exports in the **cloud era**, mapping software functions to control categories, and distinguishing benign from malign uses is intricate.
- **Industry Pushback:** Private tech companies may resist additional compliance burdens. Fear of stifling innovation in fast-moving domains like AI.
- **Differing National Priorities:** States vary in their ambition: the EU has stronger human rights controls, while others prioritise commercial and security interests.

## Way Forward

- **Broaden the Scope of Wassenaar:** Include digital technologies, AI, and cloud services in its ambit with clear definitions.
- **Shift to Binding Commitments:** Move from voluntary sharing to enforceable minimum global standards.
- **Integrate Human Rights into Export Controls:** Explicitly address misuse of technology for mass surveillance, repression, and discrimination.
- **Create Domain-Specific Control Regimes:** E.g., a specialised regime for **AI, cyber weapons, and digital surveillance**, aligned with Wassenaar but more agile.
- **India's Role**
  - As a relatively new member, India should push reforms reflecting **Global South concerns**.
  - Advocate for balanced rules that prevent misuse but also ensure technology access for development.

# Topics for Prelims

## Polar Geoengineering

### Context

A new study led by Martin Siegert (University of Exeter) published in Frontiers in Science (September 9, 2025) critically evaluated five prominent geoengineering proposals aimed at cooling Earth's polar regions.

### What is meant by Polar Engineering?

- It refers to **large-scale technological interventions** in the Earth's polar regions (Arctic and Antarctica) designed to **counter global warming, slow ice melt, and reduce sea-level rise**.
- **Techniques:**
  - **Stratospheric aerosol injection (SAI):** Releasing reflective particles (like sulphur dioxide) into the stratosphere to cool Earth by reflecting sunlight.
  - **Sea curtains/walls:** Sub-sea barriers built to block warm ocean currents from reaching and melting polar ice sheets.
    - » **E.g.**, Proposal of **placing curtains in the Amundsen Sea (West Antarctica)** to protect the Thwaites Glacier ("Doomsday Glacier")
  - **Sea-ice management (glass microbeads, seawater pumping):** Ideas like scattering reflective glass microbeads on Arctic ice or pumping seawater onto the surface
    - » **E.g., the Arctic Ice Project** aimed to deploy silica microspheres onto Arctic ice.
  - **Basal water removal:** Draining meltwater beneath glaciers to slow sliding
    - » **E.g.,** Proposals for **Antarctica's Pine Island Glacier,** where subglacial water flow accelerates ice loss.
  - **Ocean fertilisation (iron filings):** Sprinkling iron filings to boost phytoplankton growth and carbon capture
    - » **E.g.,** The **LOHAFEX experiment (2009, Southern Ocean)** led by India and Germany tested iron fertilisation but showed limited $CO_2$ absorption.

### What are the Issues Associated with these?

- **Limited Effectiveness**: Many methods (e.g., SAI in polar winters) simply don't work due to natural constraints.
- **Ecological Damage**: Microbeads, ocean fertilisation, or sea curtains could disrupt marine ecosystems, nutrient cycles, and food chains.

- **High Costs & Logistics**: Estimates run into billions annually; operations in remote, hostile polar regions are extremely difficult.
- **Global Side-Effects**: Interventions in one region can disrupt **global weather patterns**, agriculture, and security.
- **Moral Hazard**: May create a false sense of security and delay decarbonisation efforts ("technological cop-out").
- **Termination Shock Risk**: Sudden stop in projects like SAI could trigger rapid warming spikes.
- **Governance Gaps**: No international legal frameworks exist to regulate responsibility, liability, or funding.
- **Energy & Carbon Costs**: Some methods (like pumping seawater) consume massive energy, undermining climate goals.

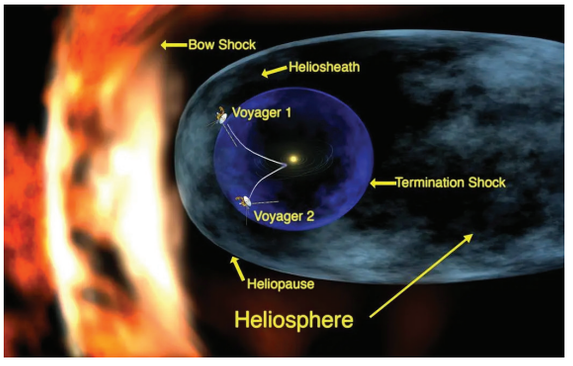
## Interstellar Mapping and Acceleration Probe (IMAP)

### Context

Recently, NASA launched the Interstellar Mapping and Acceleration Probe (IMAP).

### About IMAP

- It is aimed to map the heliosphere's boundary, trace energetic particles, and improve space weather forecasting that directly affects satellites, astronauts, and communication systems on Earth.
- **Key Features:**
  - **Equipped with 10 scientific instruments** including neutral-atom detectors (IMAP-Lo, IMAP-Hi, IMAP-Ultra), charged particle detectors, magnetic field sensors, and dust detectors.
  - Will operate from the **Sun-Earth Lagrange Point 1 (L1)**, about **1.6 million km from Earth**, ensuring stable and continuous observation.
  - Sends **near real-time data** for monitoring space weather.
  - Provides the **most detailed maps** of the heliosphere's boundary, showing how the solar wind collides with the interstellar medium.
  - IMAP-Lo has a specialised role: detecting **interstellar neutral hydrogen and deuterium** to study conditions at the heliopause (outermost heliosphere boundary).



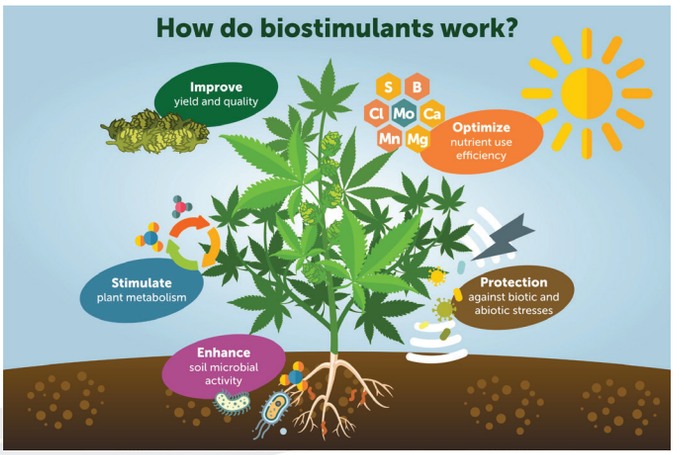

**What is a Heliosphere?**

It is a massive "bubble" of solar wind and magnetic fields that extends far beyond the planets of our solar system, acting as a protective shield against cosmic rays and other interstellar particles.

## Government revokes approval for 11 biostimulants

### Context

The **Union Agriculture Ministry** has **withdrawn approval** for **11 biostimulants** that were derived from **animal sources** (e.g., chicken feathers, pig tissue, bovine hide, cod scales).




### What are Biostimulants?

- Substances or microorganisms (or both) that stimulate natural plant processes to enhance:
  - Nutrient uptake
  - Crop yield
  - Quality of produce
  - Stress tolerance (heat, drought, salinity, etc.)
- **Difference from Fertilisers/Pesticides**:
  - They **do not supply nutrients directly** like fertilisers.
  - They **do not kill pests** like pesticides.
  - Instead, they **boost the plant's physiological efficiency**.
- **Forms**: Sprays, coatings, seed treatments.
- **Examples**: Seaweed extracts, humic substances, protein hydrolysates, microbial inoculants.
- **Regulation of Biostimulants in India:**
  - **Earlier status**: Operated in a **grey area**, with no clear law.
  - **Now regulated under**: **Fertiliser Control Order (FCO), 1985** (amended in 2021).
  - **Key rules (2021 Amendment)**:
    - » Biostimulants brought under a **regulatory framework**.
    - » Manufacturers must **register** products with the government.
    - » Safety & efficacy data, heavy metal analysis, and bio-efficacy trials required.
    - » Misbranding & spurious claims prohibited.
    - » Labels must carry **composition, claims, dosage, and precautions**.

## Diethylene Glycol (DEG)

### Context

Recently, over 14 children in Madhya Pradesh and Rajasthan have reportedly died after consuming cough syrups suspected to be contaminated with Diethylene Glycol (DEG).

### More in News

- Similar incidents have occurred in the past — notably in **Gambia (2022)** and **Uzbekistan**, where contaminated cough syrups from India were linked to multiple child deaths.

### What is Diethylene Glycol (DEG)?

- It is a **colorless, odorless, and toxic industrial chemical** used as an **industrial solvent**, **antifreeze**, and in the manufacture of **resins and plastics**.
- When **industrial-grade propylene glycol** (meant for non-medical use) is used instead of **pharma-grade**, it may contain **high levels of DEG or ethylene glycol**.
- **Potential causes for EG and DEG contamination:** Pharmaceutical diluents such as glycerin and propylene glycol are common excipients in cough syrups. EG and DEG are sometimes illegally used as contaminants in these diluents due to their similar physicochemical properties and low costs. This contamination often involves substituting glycerin and propylene glycol with toxic DEG, EG, or cheaper, DEG- or EG-tainted solvents
- When ingested, it can **damage kidneys, liver, and the central nervous system**, and can be **fatal**, especially for children.
- According to the **World Health Organization (WHO)**, the **acceptable limit** for DEG in pharmaceutical formulations is **less than 0.1%**.

## PM-KUSUM Scheme

### Context

International Solar Alliance (ISA) plans to replicate India's PM-KUSUM to power farms and rural homes in members countries

### About PM-KUSUM Scheme

- It stands for Prime Minister's Kisan Urja Suraksha Evam Utthan Mahabhiyan.
- It was launched in 2019 under the Ministry of New and Renewable Energy (MNRE).
- Aims: To add Solar capacity of about 34,800 MW by March 2026 with the total Central Financial support of Rs 34,422 crore.
- **Components:**
  - **Component A:** Setting up of 10,000 MW of Decentralised Ground/ Stilt Mounted Grid Connected Solar or other Renewable Energy based Power Plants by the farmers on their land
  - **Component B**: Installation of 14 Lakh Stand-alone Solar Agriculture Pumps
  - **Component C:** Solarisation of 35 Lakh Grid Connected Agriculture Pumps including Feeder Level Solarization
- **Eligibility:**
  - An individual farmer.
  - A group of farmers.
  - FPO or Farmer producer organisation.
  - Panchayat.
  - Co-operatives.
  - Water User Associations.

## Embryos from human skin DNA

### Context

US scientists made embryos from human skin DNA for the first time.

### More in News

- Offers potential solutions for individuals with irreversible infertility, including:
  - Women without viable eggs,
  - Men without functional sperm
  - Individuals with genetic or developmental reproductive disorders.

### About Research

- **Technique Used – In Vitro Gametogenesis (IVG): IVG** refers to the process of creating **functional gametes (sperm or eggs) in the laboratory** from a person's own **somatic or stem cells**.
  - The technique could allow individuals who are **infertile or lack viable gametes** to have **biologically related children**.
- **Methodology:** Researchers used **Somatic Cell Nuclear Transfer (SCNT)** — the same principle used in cloning.
  - **In this process**: The **nucleus of a skin cell** (which contains the person's DNA) was **inserted into a donor egg** whose own nucleus had been removed.
    - » This produced an **egg cell with the patient's genetic material**.
  - Researchers developed a technique called **"mitomeiosis"**, which **mimics natural meiosis to remove one set of 23 chromosomes from reprogrammed cells, ensuring the resulting egg-like cell has the correct haploid (23) chromosome number required for fertilization.**

## OPERA Land Surface Disturbance Alert (DIST-ALERT)

### Context

Researchers used OPERA Land Surface Disturbance Alert (DIST-ALERT) to find out Anthropogenic land use conversions in 2023.

### Key Findings

- **Total identified global land change (2023): ~1,943 Mha** (this includes short-term natural variability).
- **Natural variability (climatic/phenological events) within 4-year period: ~1,371 Mha** (≈70% of all detected change).
- **Anthropogenic land-use conversions (2023):** 28.6 megahectares (Mha), about **half of which replaced long-lived or secondary natural vegetation**.
- **Fires** resulting in land cover conversion totaled **14.9 Mha**
- **Combined dynamics ≈ 0.3% of global land area** (area comparable to California).

### What is OPERA DIST-ALERT Product

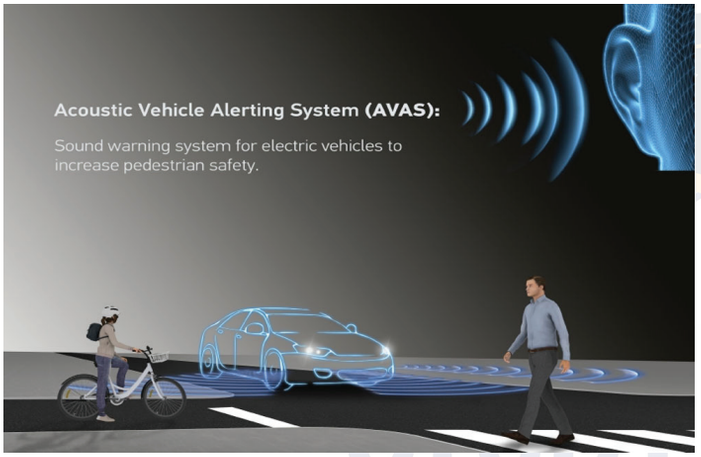
- The **OPERA Land Surface Disturbance Alert (DIST-ALERT)** is part of the **Observational Products for End-Users from Remote Sensing Analysis (OPERA)** program.

- It uses data from the **Harmonized Landsat Sentinel-2 (HLS)** product — Version 1.
- The system maps **vegetation disturbance alerts** detected through satellite observations.
- Data sources include:
  - **Landsat 8 and Landsat 9** – Operational Land Imager (OLI)
  - **Sentinel-2A, Sentinel-2B, and Sentinel-2C** – Multi-Spectral Instrument (MSI)
- A **vegetation disturbance alert** is triggered when a **decrease in vegetation cover** is detected within an **HLS pixel**.
- The alerts are generated at a **30-meter spatial resolution**.

## Acoustic Vehicle Alerting System (AVAS)

### Context

The Ministry of Road Transport and Highways (MoRTH) has proposed the introduction of an Acoustic Vehicle Alerting System (AVAS) for all electric cars, buses, and trucks.




### What is AVAS?

- **Working:** The system emits a low-level sound that mimics the noise of a conventional engine or another distinct tone to alert people nearby.
- **Purpose:** To **generate artificial sound** when the vehicle is moving slowly, usually **below 20 kmph**, so that **pedestrians and other road users** can hear the approaching vehicle.
- **Need:** Electric vehicles produce **minimal engine noise**, which increases the risk of accidents — especially for visually impaired individuals or in crowded areas.

## Indian Radio Software Architecture (IRSA)

### Context

Defence Research and Development Organisation (DRDO), in collaboration with the Integrated Defence Staff (IDS) and the Tri-Services, formally released Indian Radio Software Architecture (IRSA) 1.0.

### About IRSA

- It is a **comprehensive software architecture standard** for **Software Defined Radios (SDRs)** used by the Indian Armed Forces.
- It defines a **common software framework** that ensures:
  - **Interoperability** among SDR systems across the Army, Navy, and Air Force.
  - **Waveform portability**, allowing communication applications to run seamlessly on different radio hardware.
  - **Certification and conformance mechanisms** to maintain quality and compatibility.

## Maitri II

### Context

The Finance Ministry of India has approved the establishment of Maitri II, India's newest research station in Antarctica.

### About Maitri-II

- It is being built to replace the old Maitri station (1989), which has surpassed its original design life of 10 years and has issues like flawed waste management.
- **Location:** Eastern Antarctica, near the Schirmacher Oasis (same region as Maitri I).
- **Key Features of Maitri II:**
  - **Larger and greener** than Maitri I, designed as a **sustainable research base**.
  - **Renewable energy:** Solar power (summer) and wind energy (year-round) to reduce fossil fuel use.
  - **Automated instruments:** Will record and relay data to India even when unmanned.
  - **Improved infrastructure:** Better insulation, waste management, and living facilities.
  - It will be **built using prefabricated materials** to withstand extreme cold and storms.

### India's Research Stations in Antarctica

- Only **countries that are Consultative Parties to the Antarctic Treaty (1959)** can legally establish and operate permanent research stations in Antarctica.
- India joined the treaty in 1983.
- **India's Antarctic Research Programme Nodal Agency: National Centre for Polar and Ocean Research (NCPOR)**, Goa under the Ministry of Earth and Science (MoES).

| Station | Location | Established | Status |
|---|---|---|---|
| Dakshin Gangotri | Queen Maud Land | 1983 | Decommissioned (1990) |
| Maitri | Schirmacher Oasis, East Antarctica | 1989 | Active |
| Bharati | Larsemann Hills, East Antarctica | 2012 | Active |

#### About the Antarctica Treaty

- Signed in **Washington, D.C.** on **1 December 1959**.
- Entered into force on **23 June 1961**.
- **Members:** Initially signed by **12 countries** active during the **International Geophysical Year (1957–58)**.
  - The current number is **58**.

- **Objectives:**
  - Ensure **peaceful use** of Antarctica.
  - Promote **freedom of scientific investigation**.
  - Foster **international scientific cooperation**.
  - **Prohibit military activity, nuclear testing, and radioactive waste disposal**.
  - **Suspend new territorial claims** on the continent.
- **Environmental Frameworks Linked:**
  - **Madrid Protocol (1991)**: Declares Antarctica a **"natural reserve devoted to peace and science",** bans mineral exploitation.
  - **Convention for the Conservation of Antarctic Marine Living Resources (CAMLR-1980)**: Protects Antarctic marine living resources.

## True Random Numbers & Hack Proof Digital Security

### Context

An Indian research group has developed new quantum techniques to generate and certify truly random numbers.

### What are Truly Random Numbers?

- Truly random numbers are numbers generated from **completely unpredictable natural or physical processes**, **not by any algorithm or pattern**.
- These numbers arise from **inherently random quantum or natural phenomena**, such as radioactive decay, thermal noise in electrical circuits, quantum behaviour of particles (like photons or electrons).

**Pseudorandom numbers** are generated by **computer algorithms** — they **appear random** but are **deterministic** (i.e., predictable if you know the algorithm and initial seed).

**How they are helpful in Security:**

- **Unpredictable Keys:** Used to create encryption keys that **cannot be guessed or repeated**, keeping data safe.
- **Hack-Proof Encryption:** Even powerful computers or quantum computers **cannot break** codes made from truly random numbers.
- **Secure Communication:** Helps protect **messages, online banking, and defence data** from interception.
- **Safer Authentication:** Used in **OTPs, PINs, and digital tokens** so hackers can't predict the next code.

## Research Development and Innovation (RDI) Scheme

### Context

Anusandhan National Research Foundation (ANRF) approved the establishment of a special purpose fund (SPF) for the Research Development and Innovation (RDI) scheme.

### About RDI Scheme

- Approved by the Union Cabinet on **July 1, 2025**.
- This initiative seeks to **catalyze private sector participation** in high-impact R&D, **strengthen India's strategic technology capabilities**, and promote **technological self-reliance** in line with the **Atmanirbhar Bharat** vision.
- **2-tiered funding structure:**
  - **Special Purpose Fund (SPF):** It will be set up under the Anusandhan National Research Foundation (ANRF) which will act as the **custodian of the ₹1 lakh crore RDI corpus**.
    - » It will **not directly invest** in industries or startups.
    - » Instead, it will **channel funds** to second-level managers for deployment.
  - **Second-Level Fund Managers (SLFMs):** it may include Alternate Investment Funds (AIFs), Development Finance Institutions (DFIs), Non-Banking Financial Companies (NBFCs), other eligible entities such as Focused Research Organizations (FROs).
- **Modes of Financing:** Long-term loans at **low or zero interest rates, equity infusion**, especially for startups, contributions to **Deep-Tech Fund of Funds.**
  - **Exclusions: Grants and short-term loans** are not covered.
- **Coverage:** Financing may cover **up to 50% of the assessed project cost** for **transformative RDI projects** at **Technology Readiness Levels (TRLs) 4 and above**.

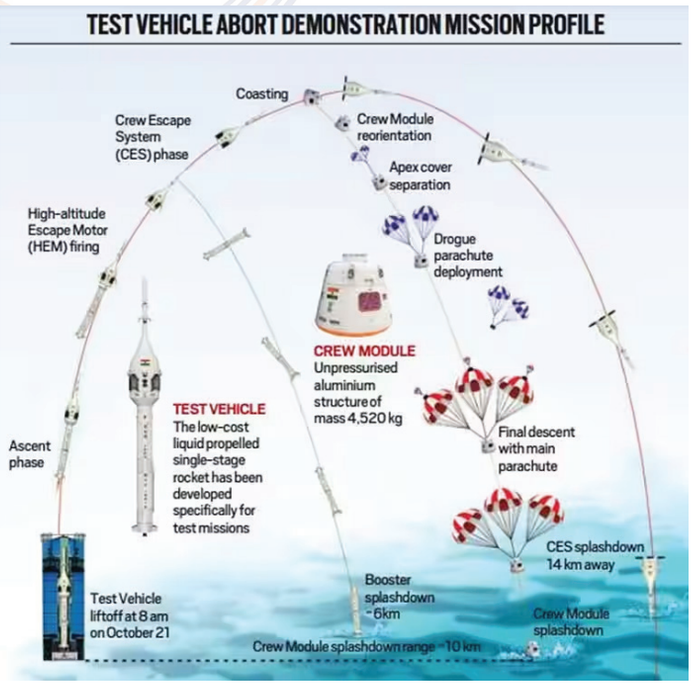
## Crew Escape System (CES)

### Context

Upcoming Crew Escape System tests (TV-D2, D3, and D4) of Gaganyaan mission will simulate a range of emergency scenarios under varying flight conditions.

### What is Crew Escape System (CES)

- It is a dedicated **safety mechanism** developed by Indian Space Research Organisation (ISRO) to **rapidly separate the crew module** (carrying astronauts) from the launch vehicle **in case of a critical malfunction** during the initial atmospheric phase of flight.



- **Working:**
  - The **CES pulls the crew module** away from the rocket using **high-thrust motors** that generate acceleration **up to 10 times gravity (10g)**.
  - After separation, a **multistage parachute system** gradually decelerates the module, ensuring a **safe splashdown at sea**.
  - The **Integrated Vehicle Health Management (IVHM) System**, comprising sensors and software, monitors system parameters and **automatically triggers the CES** during contingencies.
- **Types:**
  - **Puller Type** (Used in **Gaganyaan**): CES **pulls** the crew module away from the launch vehicle such as ISRO's LVM3-based Gaganyaan system.
  - **Pusher Type:** CES **pushes** the crew module away using **compact, high-thrust liquid engines** such as SpaceX Falcon 9 Crew Dragon.

## Mission Drishti

### Context

Space-tech start-up GalaxEye said it will launch the 'Mission Drishti' in 2026.

### What is Mission Drishti

- **World's first multi-sensor Earth Observation satellite mission** developed by **GalaxEye**, a Bengaluru-based space-tech startup.
- **Features:**
  - **SyncFused Opto-SAR Technology:** Combines **optical sensors** and **synthetic aperture radar (SAR)** in a single satellite.
    - » Enables **simultaneous optical and radar imaging** — a first for any Indian private satellite.
  - **All-Weather, All-Time Capability:** Captures high-quality images **day or night**, and **through clouds or adverse weather conditions**.
  - **High-Resolution Imaging:** Provides imagery with **1.5-metre spatial resolution**, suitable for detailed Earth observation tasks.
  - **Weight and Build:** Weighing about **160 kilograms**, it is India's **largest privately constructed satellite** to date.
- **Applications:**
  - **Government & Defence:** Border surveillance and national security monitoring.
    - » Strategic intelligence and infrastructure tracking.
  - **Disaster Management:** Rapid damage assessment and emergency response during floods, cyclones, or earthquakes.
  - **Infrastructure & Utilities:** Monitoring roads, bridges, and critical assets for **structural health and maintenance**.
  - **Agriculture & Environment:** Crop monitoring, soil moisture analysis, and **climate resilience planning**.
  - **Finance & Insurance:** Risk assessment, **asset tracking**, and disaster-loss evaluation for insurers and investors.

## Time Rondeau Crystal (TRC)

### Context

An **international team of scientists** has discovered a **new phase of matter** called the **Time Rondeau Crystal (TRC)**, a state that shows a **unique kind of order in time** rather than in space.

### What is Time Rondeau Crystal (TRC)?

- It is a new **phase of matter** that shows **both order and randomness in time**.
- **Key Properties:**
  - **Metastable Order**: The pattern lasted for **several seconds**, far longer than the normal timescale of atomic motion, but it eventually **faded** as the system heated up.
  - **Mixed Temporal Behavior:** irregular in the short term but returns to a predictable pattern over longer intervals**.**
  - **Non-Periodic Driving**: The system doesn't need perfectly timed energy inputs — it can form order even under **structured randomness.**
- **Applications:**
  - **Quantum information storage**: TRCs can be used to encode information in their time-based rhythmic patterns.
  - **Quantum sensing**: They can help develop sensors that detect or respond to specific frequencies with high precision.

- **Normal Crystals:** Atoms are arranged in a **repeating pattern in space**.
  - This means the structure looks the same after certain distances, showing spatial order.
  - **E.g.,** The repeating atomic pattern in a diamond lattice.
- **Liquids or gases**: Atoms are **randomly arranged**, showing no spatial order.
- **Time Crystals:** Instead of repeating in space, a time crystal repeats in **time**.
  - When energy is supplied to the system **periodically** (for example, a swing pushed regularly), the system responds at a **different rhythm** — oscillating in a **regular repeating pattern over time**, forming **temporal order**.
  - **E.g.,** The system "ticks" like a clock, but its rhythm breaks the expected time symmetry.

## PUNCH (Polarimeter to Unify the Corona and Heliosphere) Space Mission

### Context

Principal Investigator of the PUNCH mission provided insights of the mission in Indian Institute of Space Science and Technology (IIST) Thiruvananthapuram.

### What is PUNCH Space Mission?

- **Launch:** March 2025.
- **By**: NASA (National Aeronautics and Space Administration)
- **Purpose:** The mission seeks to make the invisible solar wind — the stream of charged particles flowing from the Sun — visible for the first time.

- **Consists of:**
  - **Four satellites** constellation to provide continuous, panoramic 3D imaging of the Sun–to–heliosphere region.
  - **Polarimetry**: measures polarized sunlight (like polarized sunglasses) to infer 3D structure and density of the corona and solar wind.
  - **Imagers**: three **Wide Field Imagers (WFIs)** to observe the outer solar wind + one **Narrow Field Imager (NFI)** to view the inner corona.
- The **PUNCH mission**, by imaging the faint outer solar atmosphere, is expected to significantly enhance our understanding of **space weather**, solar dynamics, and the Sun–Earth connection.

## Nanoparticles

### Context

Scientists from the **U.S. and South Korea** have developed a **new technique called "atomic stencilling"** to precisely **'paint' microscopic gold nanoparticles** with polymer patches.

**The process involves two main steps:**

- Atomic Masking: Iodide atoms are used as a microscopic stencil, as they selectively adhere to specific flat crystal faces of the gold nanoparticles, effectively "masking" those regions.
- Polymer Painting: Long-chain polymer molecules (the "paint") are introduced into the solution. These polymers attach only to the unmasked, exposed gold surfaces, forming precise patches.

The amount of the iodide "mask" can be adjusted to precisely control the pattern, size, and location of the polymer patches.

**Key Achievements and Applications**

- **Customization:** The method allows for the creation of over 20 different types of patchy nanoparticles with designs like corner, face, and web-like patches.
- **Self-Assembly:** The resulting highly uniform nanoparticles can spontaneously organize themselves into ordered, 3D crystalline structures (superlattices), a long-sought goal in nanomaterials science.
- **Versatility:** The technique is compatible with various materials (gold, silver, silica) and a range of polymer coatings, offering "limitless" potential for material combinations.
- **Potential Applications:** This level of precision is a crucial step toward creating advanced materials with unique properties not found in nature (metamaterials). Potential applications include:
  - Targeted drug delivery
  - Ultra-efficient catalysts
  - Next-generation electronics and smart materials
  - Materials with the potential for cloaking devices or advanced microscopes

## Telecommunications (Telecom Cyber Security) Amendment Rules, 2025

The **Union Government** has notified the **Telecommunications (Telecom Cyber Security) Amendment Rules, 2025** to strengthen cybersecurity and curb telecom-related fraud.

### Key Highlights of the Rules

- **Telecommunication Identifier User Entities (TIUEs):**A **new regulatory category** introduced for businesses that use **phone numbers to identify customers or deliver services**, excluding licensed telecom operators.
  - Brings **digital platforms** such as **Zomato, PhonePe, Paytm, Uber, and messaging services** under a **common cybersecurity framework** similar to that governing **Airtel and Jio**.
- **Mobile Number Verification (MNV) System:** The **Central Government** will establish an **MNV system** to verify whether a user's phone number is **authentic and linked to a legitimate telecom subscriber**.
  - Aims to **curb identity misuse** and strengthen **user authentication** in digital transactions.
- **Regulation of Telecom Equipment Use and Sale:** Manufacturers are directed **not to reuse existing IMEI numbers** and to maintain a **centralized database** of **tampered or blacklisted IMEIs**.
  - Ensures **traceability and accountability** in the supply and resale of mobile devices.

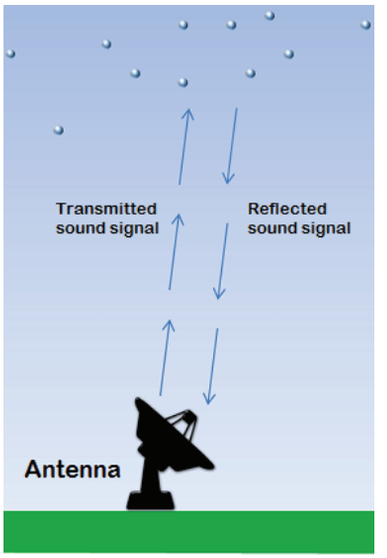
### Need?

- **Rising Cybersecurity Threats:** Cyber incidents surged from **10.29 lakh in 2022** to **22.68 lakh in 2024**, underscoring the need for a **robust telecom security framework**.
- **Enhanced Verification:** Enables **banks, financial institutions, and insurance companies** to cross-verify customer phone numbers while **opening new accounts**, preventing fraudulent use.
- **Addressing Emerging Digital Threats:** Tackles scams targeting systems like **Unified Payments Interface (UPI)**, where fraudsters exploit **compromised or cloned mobile numbers**.

## Sound Detection & Ranging System (SODAR)

### Context

CSIR–Advanced Materials and Processes Research Institute (AMPRI) designed & developed the SODAR system facility inaugurated at India Meteorological Department, (IMD), Delhi.



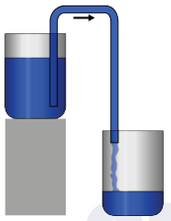
## What is the SODAR System?

- It is an **acoustic remote sensing system** that uses **sound waves** to study the **atmosphere**.
- Works on the principle of **radar**, but instead of radio waves, it uses **acoustic (sound) signals**.
- **Working:**
  - The system emits **acoustic pulses (sound signals)** vertically into the atmosphere.
  - These pulses are **scattered back** by small-scale **temperature and wind turbulence** in the air.
  - By analyzing the **time delay and frequency shift** of the returned sound signals, SODAR can measure:
    - » Wind speed
    - » Wind direction
    - » Turbulence characteristics of the lower atmosphere.

# Siphon-Powered Desalination Breakthrough

## Context

IISc scientists develop siphon-powered desalination breakthrough to turn seawater into drinking water

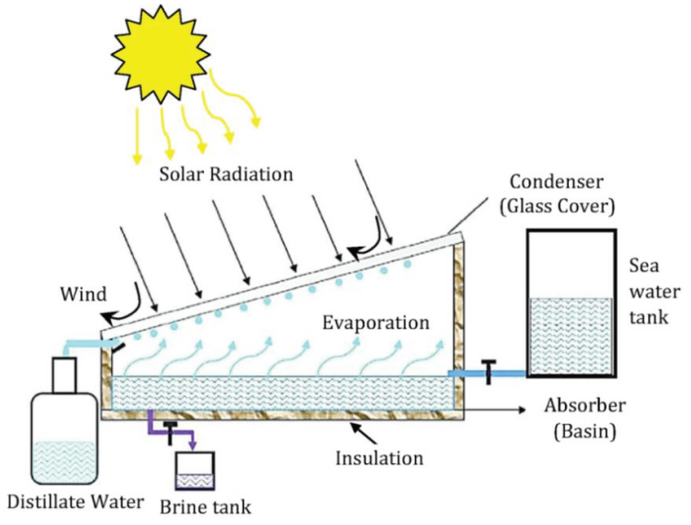


## What is the meaning of Siphon?

- A siphon is a simple device that allows a liquid to flow from a higher level to a lower level through a tube, even if the tube goes up and over an obstacle in between.
- The flow happens due to gravity and pressure difference, without requiring a pump.

## About Solar Stills

- A **solar still** is a device that uses the **heat of the sun** to purify water by mimicking nature's water cycle (evaporation → condensation → collection).




- It is mainly used to convert **salty, dirty, or contaminated water into drinkable fresh water**.

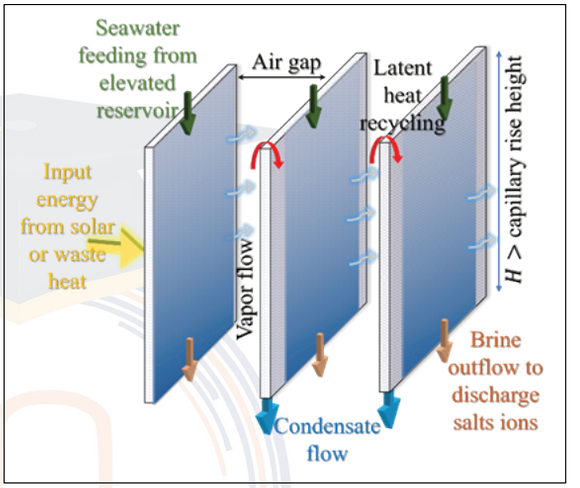
## What were the Issues Associated (Identified by IISc)

- Salt buildup, where crusts form on evaporator surfaces, blocking water flow.
- Scaling limits, as wicking materials can only lift water about 10–15 cm, restricting system size and output.

A wick is a strip of fabric or fibrous material (like cotton, cloth, or special synthetic fibers) that draws liquid upward through capillary action

## About the Siphon-Powered Desalinisation

- **Water Supply:** A wick(fabric) draws salty water from a tank.
  - Water flows smoothly over a **grooved metal plate** because of gravity.




- **Salt Handling:** In old systems, salt sticks to the surface and blocks water.
  - Here, the **flow keeps washing salt away**, so no blockage happens.
- **Evaporation;** Sun heats the thin film of water on the metal plate.
  - Water turns into vapor (salt is left behind).
- **Condensation:** Just **2 millimeters away**, a cooler surface collects the vapor as **fresh water droplets**.
- **Heat Recycling:** The system is made of **layers (like a stack)**.
  - Heat from one layer is reused in the next, so efficiency goes up.

# Nobel Prize in Physics-2025

## Context

The 2025 Nobel Prize in Physics has been awarded to John Clarke, Michel H. Devoret, and John M. Martinis - all working in the USA - "for the discovery of macroscopic quantum mechanical tunnelling and energy quantisation in an electric circuit."

### About Quantum Mechanical Effects

- Quantum mechanics is the branch of physics that explains how **very small particles** - such as electrons, atoms, and photons - behave.
- Unlike the predictable laws of classical physics, the quantum world operates on probabilities and unusual phenomena.

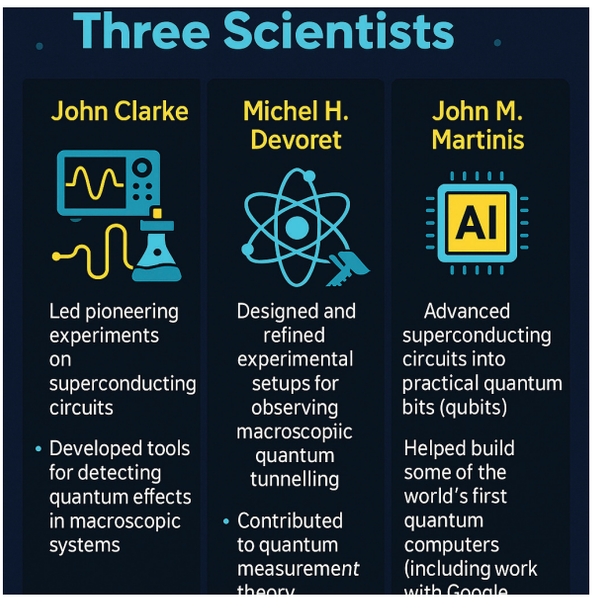
**Main Quantum Mechanical Effects:**

- **Quantum Tunnelling:**
  - In classical physics, if a ball doesn't have enough energy, it cannot cross a wall.
  - But in quantum physics, a particle can "tunnel" through a barrier even without enough energy - as if it magically appears on the other side.
  - This happens because of the **wave-like nature** of particles - there is always a small chance that the particle's wave "leaks" through the barrier.
- **Superposition:**
  - A quantum particle can exist in **multiple states at once**. **Eg:** an electron can spin both up and down simultaneously, or a photon can take two paths at once.
  - It only "decides" its state when measured.
- **Entanglement:**
  - When two particles interact, they can become **entangled**, meaning their properties are linked even if they are separated by large distances. Changing one instantly affects the other.
  - This phenomenon was the basis of the **2022 Nobel Prize in Physics**.
- **Energy Quantisation:**
  - In quantum systems, energy does not vary continuously. Instead, it exists in **discrete packets** called **quanta**.
  - For instance, an atom's electron cannot have any random energy value - it can only occupy fixed energy levels.

Normally, such quantum effects are visible only at the **atomic or subatomic scale**. The Nobel-winning work of Clarke, Devoret, and Martinis changed that belief.

## Nobel-Winning Discovery - Bringing Quantum Behaviour to the Macroscopic World

- In the **1980s**, the three scientists conducted a groundbreaking experiment showing that quantum mechanical effects can exist in larger, engineered systems - specifically in **superconducting electric circuits**.
- Their experiments used a **Josephson junction** (two superconductors separated by a thin insulator) to show **macroscopic quantum tunnelling** and **energy quantisation**.




- At near absolute-zero temperatures, they found that electric current could "tunnel" through the insulating barrier without sufficient classical energy - a purely **quantum phenomenon**.
- Their system demonstrated two quantum properties:
  - **Quantum Tunnelling** - the system switched between states as if passing through an energy barrier.
  - **Energy Quantisation** - it absorbed and emitted energy only in fixed quantities, not continuously.

### Key Achievements

- **Macroscopic Quantum Tunnelling:** Proved that quantum tunnelling isn't limited to microscopic particles - it can occur in engineered circuits visible to the human eye.
- **Energy Quantisation in Circuits:** Demonstrated that an electrical system can absorb and emit energy in discrete amounts, confirming the quantum nature of macroscopic systems.
- **Foundation for Quantum Technology:** Their experiments laid the groundwork for superconducting qubits - the building blocks of modern quantum computers.

### Significance of the Discovery

- **Bridging Two Worlds:**
  - This discovery showed that the boundary between the **quantum and classical worlds** is not as sharp as once thought.
  - It proved that quantum laws can govern even large, man-made systems.
- **Foundation of Quantum Computing:**
  - The work directly inspired the creation of **superconducting qubits**, used by companies like **Google, IBM, and Intel** in their quantum processors.
  - These qubits exploit **superposition** and **entanglement** to perform massive parallel calculations - far beyond what classical computers can handle.
- **Applications in Modern Technology:**
  - **Quantum computing:** Faster and more efficient problem-solving in cryptography, AI, materials science, and climate modelling.
  - **Quantum sensing:** Highly sensitive instruments for measuring magnetic fields, gravitational waves, and biological signals.
  - **Secure communication:** Quantum encryption systems that are nearly impossible to hack.
- **Global and Indian Context**
  - The discovery supports ongoing global efforts in **quantum technology research**.
  - In India, the National Mission on Quantum Technologies and Applications (2023) - aims to build indigenous capabilities in quantum computing, communication, and sensing.

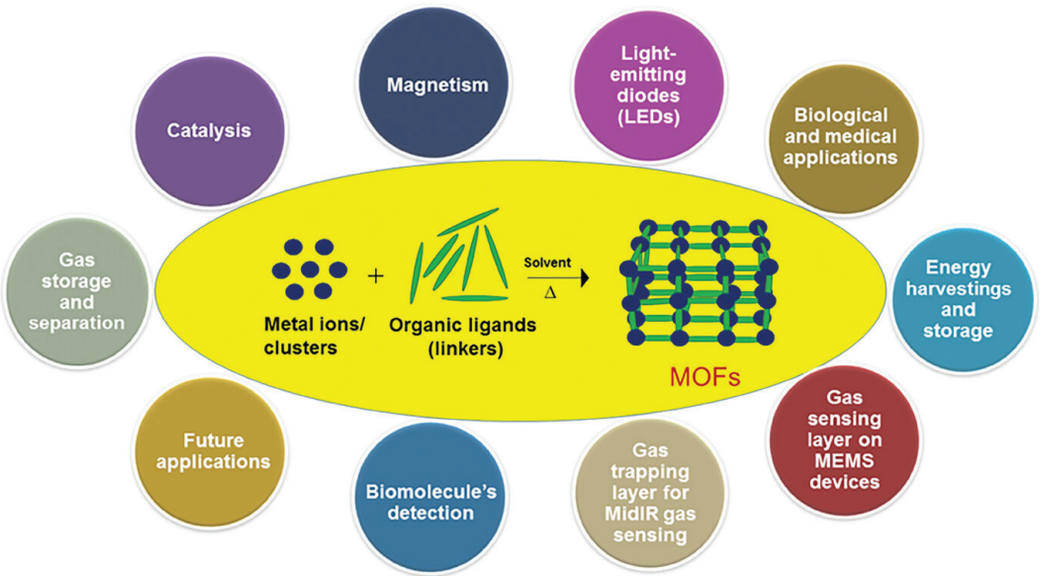
## Nobel Prize in Chemistry, 2025

### Context

Nobel prize in Chemistry 2025 honoured to Richard Robson, Susumu Kitagawa, and Omar Yaghi for developing metal–organic frameworks (MOFs).

## About Metal–Organic Frameworks (MOFs)

- They are a **class of materials composed of metal ions connected by organic molecules**, forming a **three-dimensional network** that contains **large, porous cavities**.
- This unique design allows **gases and liquids to flow through**, making MOFs **highly adaptable** for a variety of chemical and industrial applications.
- **Key Innovators:**
  - **Richard Robson (1970s):** Conceptualized linking atoms and molecules to form new molecular structures.
  - **Susumu Kitagawa:** Created **sturdier, porous frameworks** that allowed gases to pass through them.
  - **Omar Yaghi (1995):** Coined the term **Metal–Organic Framework (MOF)** and developed **thermally stable** MOFs that could "host" other molecules.
- **Applications:**
  - **Water harvesting:** MOFs can extract water from dry air, offering a potential solution for water-scarce regions.
  - **Pollutant Removal:** They can filter out harmful substances like PFAS from water, addressing environmental contamination.
  - **Carbon capture:** MOFs are effective in capturing carbon dioxide, aiding in efforts to mitigate climate change.
  - **Hydrogen storage:** Their porous nature allows for the safe storage of hydrogen, crucial for clean energy applications.




# 2025 Nobel Prize in Medicine

## Context

Mary E Brunkow, Fred Ramsdell, and Shimon Sakaguchi have been honoured with the Nobel prize for Physiology or Medicine for their work on the human immune system.

### What is the Discovery Related to the Human Immune System?

| Discovery | Scientist(s) | Significance |
|---|---|---|
| **Existence of Regulatory T cells (Tregs)** | Shimon Sakaguchi | • These cells, later called **regulatory T cells (Tregs)**, **prevent autoimmune reactions** by keeping other immune cells in check.<br>• Without these "peacekeeping" cells, the immune system can mistakenly attack healthy tissues, leading to autoimmune diseases. |
| **FOXP3 gene** | Mary Brunkow & Fred Ramsdell | • They traced the cause to a mutation in the FOXP3 gene, which was also responsible for a rare human autoimmune disease called IPEX (Immune dysregulation, Polyendocrinopathy, Enteropathy, X-linked syndrome).<br>• They discovered that **FOXP3 is the master gene** that **controls the development and function of regulatory T cells**. |
| **Integration of both findings** | All three jointly | • Established how the immune system maintains balance — attacking invaders but tolerating self-cells. |

## How Bats Learned to Fly

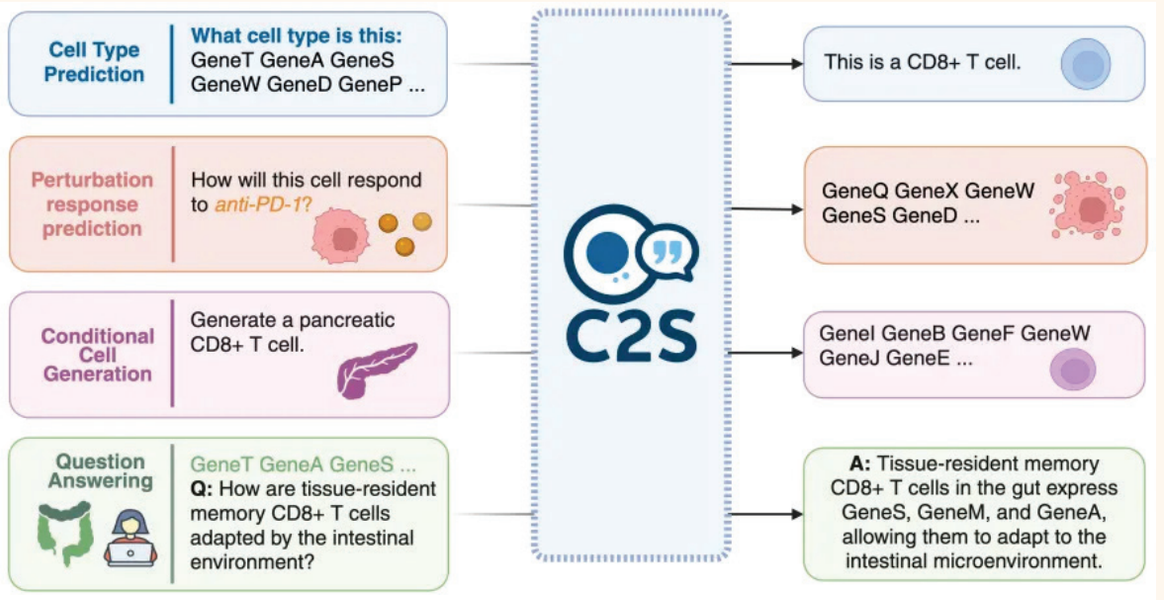
**Context:** A new study published in Nature Ecology & Evolution has uncovered how bats evolved the ability to fly, despite sharing the same five-fingered limb structure as other mammals.

**What are the Key Findings?**

- Their ability to fly comes not from new genes, but from **regulatory evolution** — changes in **when, where, and how** existing genes are activated during development.
- **Formation of the Wing Membrane (Chiropatagium):** The **chiropatagium** is the thin skin stretched between bat fingers that forms the wing surface.
  - In most mammals, this skin disappears before birth due to **apoptosis** (programmed cell death).
  - In bats, this process is **partly suppressed**, so the skin **remains** and stretches between the fingers to form the **wing membrane**.
- **Repurposing of Existing Cells:** Bats did not develop new kinds of cells for their wings.
  - Instead, **cells normally found near the shoulder** in other mammals were **used between the fingers** in bats.
  - This reuse of existing cells for a new purpose is called **evolutionary co-option**.
- **Role of Important Genes (MEIS2 and TBX3):**
  - Two genes — **MEIS2** and **TBX3** — stay active for longer in bats than in other mammals.
  - These genes help form the **connective tissue (Fibroblasts)** that keeps the skin between fingers, giving bats their wing shape.

## Cell2Sentence- Scale 27B

**Context:** Google's new AI model — Cell2Sentence-Scale 27B (C2S-Scale) generated a novel hypothesis & proposed a drug that will help to detect tumors in the early stage.




**About C2S-Scale**

- It is a **27-billion parameter foundation model**, designed to understand the **language of individual cells** — essentially, how genes and molecules "communicate" inside living systems.
- **Developer**: Google DeepMind and Google Research.
- Core Innovation: Cells That Speak:
  - The revolutionary insight behind C2S-Scale lies in the Cell2Sentence (C2S) framework, which transforms complex biological data into a format that language models can natively understand. Here's how it works:
- From Molecules to Sentences:
- **E.g.** Single-cell RNA sequencing measures how active thousands of genes are in each cell. The C2S method turns this complex data into "cell sentences," where gene names are arranged from the most active to the least active.
- **Purpose:** To decode cellular behavior, predict drug responses, and design new therapeutic strategies for diseases like cancer.
- **Significance:**
  - Offers a **new pathway for cancer therapy development**.
  - Demonstrates how **AI can participate in scientific discovery**, not just data analysis.
  - May help design **personalized cancer treatments** by understanding immune–tumor interactions in real time.
  - Represents a major milestone for **AI in biological and medical research**.

## Prussian Blue Capsules

**Context:** India supplied Prussian Blue capsules to Indonesia after its authorities detected Cesium-137 contamination in exported goods and facilities.

About Prussian Blue Capsules

- Prussian Blue (or **potassium ferric hexacyanoferrate**) is a **radiation countermeasure medicine** used in nuclear emergencies.
- **Function:**
  - It **binds radioactive cesium and thallium** in the intestines.
  - Prevents their **reabsorption into the bloodstream**.
  - Enables their **excretion through bowel movements**, thus **reducing radiation exposure**.
- **Global Recognition:** It is listed by the **World Health Organization (WHO)** as a **critical medicine** for **radiological and nuclear emergencies**.

About Cesium-137

- It is a **radioactive isotope** produced as a by-product of nuclear fission reactions.
- **Uses:** It is used in **medical therapy, industrial gauges, and scientific research**.
- **Health Risk: Long-term or repeated exposure**, even at low levels, can **increase the risk of cancer** and cause **cellular and organ damage** due to radiation.

## Atlas- Open AI

**Context:** OpenAI has launched its own AI-powered web browser called "Atlas."

What is a Web Browser?

- A **web browser** is a software application that allows users to access and navigate the **World Wide Web**.
- Examples include **Google Chrome, Safari, Firefox, and Microsoft Edge**.

Why AI Firms are Betting Big on Web Browsers

- **Direct Integration of AI Tools**: Browsers let companies embed AI assistants (like ChatGPT) directly into everyday internet use.
- **Control over User Data**: Owning a browser gives firms access to valuable browsing and search behavior data for improving AI models.
- **Monetization Opportunity**: Firms can earn through ads, subscriptions, and AI-powered search results — similar to Google's Chrome ecosystem.
- **AI-Driven Search Experience**: Replaces traditional link-based search with direct, conversational answers and summaries.
- **Personalized User Experience**: AI browsers can tailor content, recommendations, and actions to individual preferences.
- **Ecosystem Expansion**: Integrating browsers with existing AI tools (e.g., ChatGPT, Perplexity) strengthens user dependence on their platforms.
- **Competitive Edge Against Google**: Browsers are the gateway to the web; controlling them challenges Google's dominance in search and ads.

## CHACE-2 Payload

**Context:** The Indian Space Research Organisation (ISRO) announced that the Chandrayaan-2 orbiter's CHACE-2 (Chandra's Atmospheric Composition Explorer-2) payload has made the first-ever observation of the effect of the Sun's Coronal Mass Ejection (CME) on the lunar exosphere (the Moon's extremely thin outer atmosphere).

About CHACE- 2 Payload

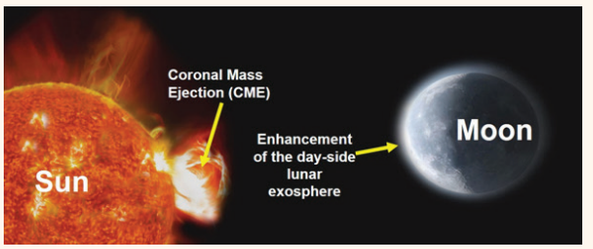
- **Purpose:** To study the **composition, density, and variations** of the **lunar exosphere**.
- It measures **neutral atoms and molecules** around the Moon.
- CHACE-2 provided the **first direct evidence** of CME-induced pressure enhancement on the lunar atmosphere.
- It is the **successor to CHACE-1**, which was part of **Chandrayaan-1 (2008)**.

**What are Coronal Mass Ejections (CMEs)?**

- CMEs are **massive eruptions of plasma and magnetic fields** from the Sun's corona.
- They consist of **charged particles (protons, electrons, ions)** and magnetic energy.
- When directed toward a planet or moon, CMEs can **impact their atmospheres or magnetic fields**.

**About the observation:**

- During a **rare solar event on 10 May 2024**, powerful CMEs struck the Moon, causing a sharp rise in the **dayside exospheric pressure** and increasing the **density of neutral atoms and molecules by over ten times**. This confirmed long-standing theoretical predictions about solar–lunar interactions that had never been directly observed before.
- Scientists noted that since the Moon lacks a **global magnetic field**, its exosphere is highly vulnerable to solar activity. The CMEs temporarily altered the Moon's atmospheric conditions by ejecting atoms from its surface.



## Nafithromycin


**Context:** India has developed its first indigenously discovered antibiotic — "Nafithromycin."

**About it**

- It is an **antibiotic** belonging to the **macrolide class** of antibacterial drugs.
- Designed to treat **resistant respiratory infections** caused by **antibiotic-resistant bacteria**.
- Especially beneficial for **cancer patients** and **poorly controlled diabetics**, who are prone to severe infections.

**What is Macrolide Class?**

- Stop bacteria from making proteins.
- **Example:** Azithromycin, Clarithromycin, Nafithromycin.
- **Used fo**r: Chest, throat, and sinus infections.

## High RRR Nb

**Context:** The Nuclear Fuel Complex (NFC), Hyderabad, has successfully developed the technology to produce high Residual Resistivity Ratio (high-RRR) Niobium (Nb) ingots and sheets.

What is High RRR Nb?

- "RRR" stands for **Residual Resistivity Ratio**, which measures the **purity and conductivity** of a metal (ratio of its resistivity at room temperature to that at near-zero temperature).
  - A **high RRR value** indicates **extremely pure and highly conductive metal**, essential for superconducting applications.
- **Niobium (Nb)** is a **transition metal** known for its **superconducting properties** when cooled to cryogenic temperatures.
  - It is used to make **superconducting radio frequency (SRF) cavities** in **particle accelerators**.
- **Application:**
  - Used in **advanced accelerator programs** such as **linear accelerators, synchrotrons, and fusion reactors**.
  - Plays a crucial role in **nuclear energy research, superconducting magnets**, and **medical imaging systems (MRI)**.

**Related Fact:**

- Only **six countries** in the world are currently known to have the **technology to produce high-RRR Niobium (Nb)**.
  - Brazil, United States (U.S.), Japan, Germany / Austria, China, Russia.

## Niti Aayog's Roadmap on AI for Inclusive Societal Development

**Context:** NITI Aayog has released the report "Roadmap on AI for Inclusive Societal Development."

Key Recommendations by Niti Aayog

- **Launch of "Digital Shram Setup Mission":** Establish a **national AI-driven platform** that integrates social security, skill development, and livelihood opportunities for informal sector workers.
- **Sector-Specific AI Applications:** Focus on **high-impact sectors** such as **agriculture, construction, retail, and logistics** to enhance **productivity through AI-based solutions**.
- **Vernacular and Voice-Enabled Access:** Develop **AI tools with voice-first and regional language interfaces** to **overcome literacy and accessibility barriers** among informal workers.
- **Strengthening Public–Private Partnerships (PPP):** Foster **collaboration between government ministries, startups, and tech companies** to **scale AI innovations** within the informal economy.
- **Ethical AI and Data Protection:** Introduce a **Responsible AI Charter** to ensure **transparency, privacy, and inclusivity** in the use of AI for social and economic development.
- **AI-Centric Skilling Ecosystem:** Implement **continuous upskilling programmes** with **modular AI-based courses and micro-credentials** under **Skill India 2.0**.
- **Robust Impact Assessment:** Develop a **data-driven evaluation framework** to measure **AI's impact on inclusion, income growth, and service delivery**, ensuring accountability and effectiveness.

# HISTORY, ART & CULTURE

## Topics for Mains

### Reimagining Heritage Conservation in India

*Syllabus Mapping: GS-Paper I, Culture and architecture*

#### Context

The Archaeological Survey of India (ASI), long the guardian of national heritage, now faces challenges of relevance and capacity. The government's move to involve corporates in heritage conservation through PPP marks a major shift-recognizing that safeguarding India's past needs fresh resources and innovation.

#### The Archaeological Survey of India: Background

- **Establishment and Purpose:**
  - Founded in **1861** under the **British Raj** as a counterpart to the Geographical Survey of India.
  - **Mission:** To identify, document, and protect India's architectural and archaeological heritage.
- **Key Figures and Early Development:**
  - **Alexander Cunningham** – first Director General; laid scientific foundations for archaeological research in India.
  - **Lord Curzon** – strengthened conservation policy and institutional framework.
- **Legal Framework:** Ancient Monuments Preservation Act, 1904 – first law empowering the ASI to protect and conserve monuments.
- **Post-Independence Evolution:**
  - Continued under the Ancient Monuments and Archaeological Sites and Remains Act, 1958.
  - Became India's **premier national agency** for archaeological research, excavation, and conservation.
- **Legacy:** Helped preserve **temples, forts, mosques, stupas, and cave complexes** across India. Remains a **symbol of India's cultural preservation** and historical continuity

#### From Glory to Neglect: What Went Wrong with the ASI

- **Bureaucratic Stagnation:**
  - Over-centralised and slow decision-making.
  - Low morale among junior officers due to poor career growth and limited resources.
  - There is minimal collaboration with conservation architects, historians, or communities.
- **Policy Neglect and Commercial Pressures:**
  - Cultural heritage has been overshadowed by the government's focus on tourism and real estate development.
  - Proposals to "rationalise" the number of ASI-protected monuments - effectively removing less-known sites from the protected list - threaten the very foundation of the institution.
- **Weak Urban Heritage Integration:** Institutions like Delhi Urban Art Commission (DUAC, 1974) failed to link heritage conservation with urban planning.
  - **Result:** heritage sites face encroachment, neglect, and poor urban coordination.
- **Poor Public Engagement:** ASI archives, maps, and photographs remain inaccessible to researchers and the public.

#### Reviving the ASI: Key Reforms

- **Institutional Reform:** Decentralise powers to regional offices & Create a **National Heritage Cadre** for specialised professional training
- **Collaboration and Innovation:** Partner with conservation architects, historians, and local communities.
- **Public Outreach:** Digitise archives and make records publicly accessible. Promote heritage education, awareness drives, and citizen engagement.
- **Workforce Motivation:** Provide training, exposure, and performance-linked incentives. Collaborate with **INTACH, UNESCO, and universities** for research and skill-building.

**Entry of Private Players in Conservation**

- The Centre has recently proposed to open conservation of protected monuments to private participation, ending the Archaeological Survey of India's (ASI) exclusive control over this domain.

**About the new Public–Private Partnership (PPP) Model for Conservation**

- **Purpose:** Supplements ASI's work by allowing private participation in conservation of heritage monuments.
- **Participants:** Corporates, PSUs, and philanthropic bodies may fund, execute, and monitor restoration projects under ASI supervision.
- **Funding Mechanism:** Routed through the National Culture Fund (NCF); donations qualify as CSR expenditure with 100% tax exemption.

**The Need for Private Participation**

- **Funding support** for restoration and maintenance of neglected sites.
- **Technology integration** - 3D scanning, digital mapping, AR/VR-based visitor experiences.
- **Professional management** with global benchmarks in curation and heritage interpretation.
- **Employment and skilling** opportunities for local communities.
- **Tourism development** - making heritage sites economically self-sustaining.

**Concerns and Drawbacks**

- **Commercialisation risk:** Monuments may be turned into profit-oriented venues, losing authenticity.
- **Exclusion of local communities:** Private players may sideline locals in management decisions.
- **Unequal focus:** Popular monuments attract corporate interest, while smaller, lesser-known sites remain neglected.
- **Accountability gaps:** Without clear MoUs and conservation standards, private entities may prioritise cosmetic restoration over authenticity.

**Case Study - Dr Bhau Daji Lad Museum**

- Restored through a **21-year PPP** between the **Mumbai Municipal Corporation, INTACH**, and **Jamnalal Bajaj Foundation**.
- Won the UNESCO Asia-Pacific Heritage Award for Conservation (2005).
- Today, it stands as a model of sustained partnership and professional management.

## Broader Challenges in India's Heritage Conservation Landscape

- **Fragmented Institutional Ecosystem:** Multiple agencies - ASI, State Archaeology Departments, INTACH, DUAC, and local bodies, operate without coordination or shared goals.
- **Lack of Skilled Manpower:** India faces an acute shortage of conservation architects, heritage engineers, and curators.
- **Inadequate Funding and Maintenance:** Most ASI-protected sites operate with limited staff and budgets. Many remain locked or poorly maintained.
- **Poor Integration with Urban Development:** Rapid urbanisation leads to encroachment and unregulated tourism near heritage zones. Heritage is still seen as a barrier, not an asset, in urban planning.
- **Absence of Long-Term Policy Vision:** India lacks a comprehensive National Heritage Management Policy that defines frameworks for PPPs, technology integration, and sustainable tourism.

## Way Forward

- **Strengthen the ASI through Reform:**
  - Modernise the ASI's mandate to focus on research, documentation, and regulation, while delegating day-to-day operations to autonomous bodies or PPPs.
  - Introduce a **National Heritage Fund** pooling CSR, tourism, and philanthropic contributions.
- **Establish a Heritage PPP Framework:** Create transparent **MoU templates** defining conservation principles, community roles, and corporate responsibilities.
- **Empower Conservation Professionals:** Expand training in heritage management, conservation science, and digital documentation through universities and technical institutes.
- **Engage Communities and Build Awareness:** Make heritage a living part of everyday urban life through cultural events, guided walks, and public art.
- **Digital and Green Heritage:** Use AI, 3D mapping, and remote sensing for continuous site monitoring.

# Preserving India's Linguistic Heritage

*Syllabus Mapping: GS-Paper I, Indian Culture, Literature*

## Context

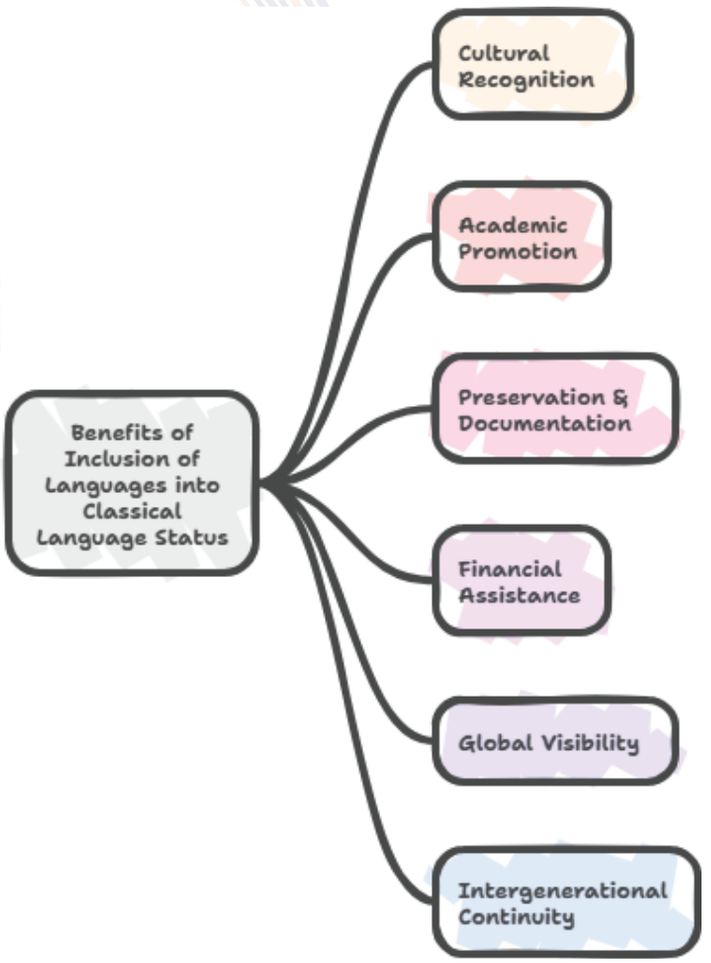
In recent times, the use of India's classical languages has declined due to modernisation and linguistic shifts. To revive and preserve this heritage, the government has launched several initiatives and granted Classical Language status to new languages to promote their study and cultural relevance.

## Classical Languages of India: Definition and Criteria

- The Government of India grants the status of Classical Language to languages that meet specific historical and literary benchmarks.
- As of **October 2025**, **11 languages** have been recognized as Classical.
- **Criteria for Declaring a Classical Language:**
  - **High antiquity**: Early texts or recorded history spanning at least **1,500–2,000 years**.
  - **Extensive body of ancient literature**: Considered a cultural heritage by successive generations.
  - **Rich textual evidence**: Including prose, poetry, epigraphy, and inscriptional records.
  - **Distinct classical phase:** showing continuity or a historical evolution separate from its modern form.


## Significance of Classical Languages

- **Custodians of India's Civilizational Knowledge:** Classical languages carry ancient wisdom in fields like philosophy, science, medicine, governance, and spirituality - seen in texts like the Rigveda, Thirukkural, Tipitaka, and Gathasaptasati.
- **Cultural Identity and National Integration:** They reflect India's composite cultural identity, where diverse linguistic traditions contribute to a shared sense of belonging and pride.



- **Preservation of Literary Heritage:** Classical texts, manuscripts, and oral traditions offer invaluable insights into India's artistic and intellectual evolution.
- **Promoting Regional and National Harmony:** Recognizing multiple Classical Languages ensures inclusivity, balancing regional pride with national unity.
- **Global Cultural Diplomacy:** Promoting Classical Languages enhances India's soft power, attracting global scholars and positioning India as a hub of linguistic and cultural research.
- **Educational and Research Value:** They enrich modern academia, providing linguistic roots for understanding the evolution of contemporary Indian languages.

**Integrating Technology and AI for Language Preservation**

- **Bhashini: AI-Powered Multilingual Platform:**
  - Launched under the National Language Translation Mission (NLTM).
  - Enables real-time translation among 22 Scheduled and tribal languages using machine translation, speech recognition, and natural language understanding.
  - Initiatives like **Sansad Bhashini** provide AI-based translation of parliamentary debates, enhancing accessibility and citizen participation.
- **BharatGen: AI Models for Indian Languages:** Develops AI-based text-to-text and text-to-speech translation models.
- **Adi-Vaani: AI for Tribal Language Inclusion:**
  - India's first AI-driven tribal language platform (2024).
  - Supports Santali, Bhili, Mundari, and Gondi languages, enabling real-time translation between tribal and mainstream languages.
- **TRI-ECE Scheme (Ministry of Tribal Affairs):** Promotes AI-based translation tools between English/Hindi and tribal languages, ensuring cultural sensitivity and linguistic accuracy.
- **AI in Education: NEP 2020 Vision**
  - **e-KUMBH Portal:** Provides **technical books** in multiple Indian languages.
  - **Anuvadini App (AICTE):** Translates professional study materials into regional languages.
  - **SWAYAM Platform:** Over **5 crore learners** access multilingual digital courses.

## Challenges and Threats to Classical Languages

- **Declining Usage and Transmission:** Younger generations increasingly prefer English and dominant regional languages for education and employment, leading to reduced intergenerational transmission.
- **Shrinking Literary and Academic Ecosystem:** The number of scholars proficient in Classical Languages is declining, resulting in fewer translations, research publications, and critical editions.
- **Neglect of Oral and Folk Traditions:** Many tribal and folk dialects linked to Classical Languages remain undocumented and are at risk of extinction.
- **Inadequate Technological Integration:** Until recently, Classical Languages lacked digital tools, fonts, and platforms for online usage, limiting their visibility and access.
- **Fragmented Preservation Efforts:** Lack of coordination among states, universities, and cultural institutions often leads to duplication or underutilization of resources.
- **Limited Global Awareness:** The global academic community remains largely unaware of the depth and diversity of Indian Classical Languages, reducing international collaboration.

## Government Interventions for Preservation and Promotion

- **Institutional and Academic Support:**
  - **Central Institute of Indian Languages (CIIL), Mysuru:** Nodal body for promoting Classical Languages through research, digitization, and education.
  - **Centres of Excellence (CoEs)** for Classical Languages: **Tamil** (Chennai), **Kannada** (Mysuru), **Telugu** (Nellore), **Malayalam** (Tirur), **Odia** (Bhubaneswar).
- **Documentation and Translation Efforts:** Translation of seminal texts like Thirukkural into 28 Indian and over 30 foreign languages, including Braille.
- **Promotion of Endangered Languages:**
  - **Scheme for Protection and Preservation of Endangered Languages (SPPEL)**: Documents and digitally archives languages spoken by fewer than 10,000 people.
  - **Sanchika Digital Repository:** Managed by CIIL, it stores dictionaries, primers, and oral resources across Scheduled and tribal languages.

## Way Forward

- **Digital Integration with Academia:** Universities should collaborate with AI platforms to digitize and translate classical manuscripts, creating open-access archives.
- **Community Participation:** Engage local scholars, monks, and tribal elders in digital documentation to ensure authenticity and inclusivity.
- **AI Ethics and Cultural Sensitivity:** Ensure that AI-based translations respect cultural nuances, idioms, and context to preserve meaning and integrity.
- **Multilingual Policy Implementation:** Encourage use of Classical Languages in governance, academia, and digital communication to maintain their functional relevance.
- **Global Collaboration:** Partner with UNESCO and global universities for linguistic research, digitization, and cultural exchange.

# Topics for Prelims

## Bathukamma Festival

### Context

The celebrations of Bathukamma Festival in Telangana have set two new Guinness World Records – largest Bathukamma floral decoration and highly synchronised performance by a large number of women.

### About Bathukamma Festival

- It is a **flower festival celebrated predominantly in Telangana** and some parts of Andhra Pradesh.
- The word **'Bathukamma'** in Telugu means **'Mother Goddess come alive'** (**Bathuku** = life, **Amma** = mother).
- Celebrated for **nine days during Navaratri (September–October)**, ending on **Durgashtami or the day before Dussehra**.
- The last day is called **'Saddula Bathukamma'** or **'Pedda Bathukamma'**.
- Declared as the **State Festival of Telangana** in 2014 after the formation of the state.

## Thumri

### Context

Classical singer Pandit Chhannulal Mishra, a prominent singer of thumri, has passed away recently.

### About Thumri

- **Nature**: Semi-classical vocal form, emerged in the 19th **century**, rooted in **North India**.
- **Origin:** Originated in **Lucknow** under Nawab **Wajid Ali Shah** (Awadh).
  - It spread to Banaras after the fall of Awadh (1856).
- **Meaning**: Derived from the Hindi word **thumakna** (graceful walking/dancing movement).
- **Themes**: Love, longing, devotion (Radha–Krishna, separation, cajoling, complaint).
- **Language**: Mainly in **Awadhi, Braj Bhasha, Hindi, Urdu**.

### Musical Features:

- Flexible structure, lighter ragas (Kafi, Khamaj, Bhairavi, Piloo, Yaman, Desh).
- Rhythms: **Dadra (6 beats), Keherva (8 beats)**.
- Rich in ornamentation (**meend, murki, gamak, khatka**).
- Emphasis on **bhava** (emotive expression).
- **Types**:
  - **Bandish Thumri** – Structured, rhythmic (Punjab style).
  - **Bol-Banav Thumri** – Slow, emotive, improvisational (Banaras, Lucknow).
  - Other variations: Tappa-Thumri, Dadra, Bhakti Thumri, Fusion Thumri.

## Abhidhamma Divas

### Context

The International Buddhist Confederation (IBC) and the Ministry of Culture, recently celebrated International Abhidhamma Day on the full moon day of Śharada Pūrṇimā.

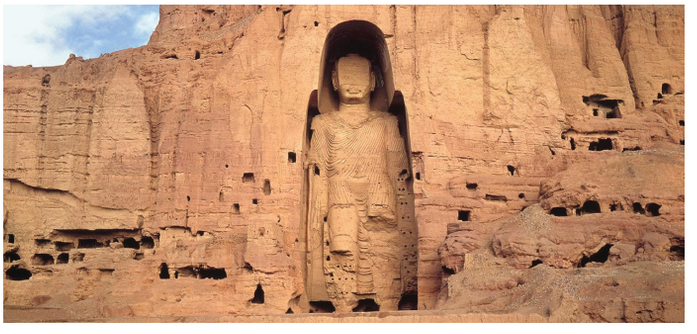
### About Abhidhamma Divas

- It commemorates the day when Lord Buddha descended from the celestial realm, Tāvatimsa-devaloka to Sankassiya (now Sankisa Basantapur) in Uttar Pradesh.
  - The **Asokan Elephant Pillar at Sankassiya** marks this significant event.
- **Abhidhamma:** It refers to the third "basket" (pitaka) of the Pali Canon which forms the doctrinal foundation of Theravada Buddhism.
  - The primary texts of the Abhidhamma are: **Dhammasangani**, **Vibhanga**, **Puggalapaññatti**.
- **Tripitaka of Buddhism:**
  - Vinaya Pitaka (monastic rules)
  - Sutta Pitaka (Buddha's discourses)
  - Abhidhamma Pitaka (Buddhist philosophy and psychology)
- **Important Buddhist Texts:**
  - Buddhacarita - **Ashvaghosha**
  - Mahavibhasa Sastra - **Vasumitra**
  - Visuddhimagga, Sumangala-vilasini, Atthakathayen - **Budhhaghosh**

## Bamiya Buddhas

### Context

At a press conference held by Taliban Foreign Minister Amir Khan Muttaqi at the Afghan Embassy in New Delhi, a painting of the Bamiyan Buddhas was prominently displayed in the background.



### About Bamiya Buddhas

- Situated in the **Bamiyan Valley**, in **central Afghanistan**, about **230 km northwest of Kabul**.

- The valley lies on the **ancient Silk Road**, a historic trade route linking East and West.
- There were **two colossal standing Buddha statues**, carved into **sandstone cliffs**:
  - **Western Buddha (Vairocana)** – about **55 metres (180 feet)** tall.
  - **Eastern Buddha (Shakyamuni)** – about **38 metres (125 feet)** tall.
  - Built into cliffside niches, surrounded by **monastic caves** with murals and inscriptions.
- Constructed around the **6th century CE** (between **500–600 CE**) during the **Gandhara–Kushan period** of Buddhist influence in the region.
- Bamiyan was a **major centre of Mahayana Buddhism**, with monks and pilgrims from across Asia.
- Represented a **fusion of Hellenistic Greek and Indian Gupta artistic styles** — known as **Greco-Buddhist art**.
- They were destroyed by the Taliban in 2001.

## Guryul Ravine

### Context

The Geological Survey of India (GSI) has declared the Guryul Ravine in Kashmir as a national geo-heritage site on the occasion of the 9th International Geo-ethics Day.

### About it

- It preserves one of the **most complete fossil records** of the Permian–Triassic mass extinction event, also known as the "Great Dying", which occurred about 252 million years ago, wiping out nearly 90–95% of marine species and 70% of terrestrial life.
- Also consist of **traces of the world's earliest known tsunami** within the one-metre-thick boundary layer at the site.
- The rock layers at Guryul Ravine capture the transition between the Permian and Triassic ages.

#### National Geo-Heritage Recognition

- Sites that exhibit **rare and unique geological, geomorphological, paleontological, or stratigraphic features** of scientific importance are declared as Geo-heritage sites by the **Geological Survey of India (GSI).**
- These sites may include caves, natural rock formations, distinctive sediments, minerals, meteorites, and fossil remains.

## Poompuhar Port

### Context

The Tamil Nadu State Department of Archaeology (TNSDA) has completed the first phase of an underwater archaeological survey off the coast of Poompuhar in Mayiladuthurai district.

### About The Poompuhar Port

- **Ancient Name: Kaveripoompattinam** (meaning "the city where the River Kaveri flows into the sea").
- **Background:** Flourished during the **Sangam Age (circa 300 BCE–300 CE)** under the **early Chola dynasty**.
- Believed to have been **submerged by the sea** due to **catastrophic coastal erosion or flooding** around **4th–5th century CE**.
  - Earlier underwater studies were carried out by **archaeologist S. R. Rao** in the 1980s, who identified submerged structures offshore.
- **Significance:** Served as a **major maritime trade port** connecting South India with **Rome, Southeast Asia, and Sri Lanka**.
  - » Acted as a **hub for inland and overseas trade**, exporting pearls, spices, textiles, and precious stones.
  - Extensively mentioned in **Sangam literature**, especially in **Pattinappalai** and **Silappathikaram**, describing its prosperity and vibrant harbor life.
  - » Known for its planned urban structure, bustling markets, and cultural richness.

## Kotada Bhadli - Harappan Site

### Context

A new multidisciplinary study has identified a 4,000-year-old Harappan site at Kotada Bhadli in Kutch (Gujarat) as the earliest known caravanserai in the Indian subcontinent.

### About the Site

- **Location:** Kutch district, Gujarat.
  - Lies strategically between major Harappan urban centres like **Dholavira**, **Lothal**, and **Shikarpur**.
- It belongs to the **Mature Harappan period (c. 2300–1900 BCE)**.
- **Excavation Findings: Fortified structure** with **bastions** indicating a secure enclosure.
  - **Central multi-roomed building**, possibly for traders' rest and storage.
  - **Large open spaces**, likely used as **animal pens or loading areas**.
  - **Evidence of food waste, imported goods, and pottery**, suggesting transient human activity and trade exchange.

## 150 Years of Vande Mataram

### Context

PM Modi urges citizens to celebrate 150 years of Vande Mataram.

### Historical Background Of Vande Mataram

- **"Vande Mataram"**, meaning **"I bow to thee, Mother"**, was written by **Bankim Chandra Chatterjee (Chattopadhyay)** in **1876**.
- It was originally composed in **Sanskrit and Bengali**, as part of his famous novel **'Anandamath'** (published in **1882**).
- **Rabindranath Tagore** was the first to **sing "Vande Mataram"** in **1896** at the **Indian National Congress session** in Calcutta.
- "Vande Mataram" was declared the national song of India on **January 24, 1950.**

## International Aryan Summit 2025

### Context

International Aryan Summit 2025 was recently conducted in New Delhi, which is part of the Jyāna Jyoti Festival commemorating the

200th birth anniversary of Maharshi Dayanand Saraswati Ji and 150 years of Arya Samaj.

### About Dayanand Saraswati

- **Born:** 1824, Tankara, Gujarat
- **Known as:** "Martin Luther of **Hindustan**"
- **Philosophy: Return to Vedas (Back to the Vedas)**
- **Fought against:** Caste discrimination & social evils, Untouchability, Idol worship & ritualism, Superstitions
- **Contributions:**
  - Founded **Arya Samaj** (1875, Bombay)
  - Inspired: **Shuddhi Movement** (reconversion), **Vedic education, Nationalism & socio-economic reform**
  - Influenced freedom fighters like **Lala Lajpat Rai, Bhagat Singh, Madan Mohan Malaviya**
  - **Works: Satyarth Prakash** (The Light of Truth)

#### About Arya Samaj

- **Founded in 1875 by Swami Dayanand Saraswati** as a socio-religious reform movement advocating a **return to the Vedas**, monotheism and rational worship.
- **Opposed caste discrimination, idol worship, ritualism & social evils**; promoted widow remarriage, women's education, and equality.
- Launched the **Shuddhi Movement** for reconversion to Hindu fold and established **DAV schools & Gurukuls** to promote Vedic-modern education.

## UNESCO World Conference on Cultural Policies and Sustainable Development (MONDIACULT)

### Context

MONDIACULT 2025 was recently conducted in Barcelona, Spain.

### About MONDIACULT

- **Organizer**: UNESCO (United Nations Educational, Scientific and Cultural Organization).
- **Nature**: A **global intergovernmental conference** on cultural policies and sustainable development.
- **Editions:**
  - **First held**: 1982 (Mexico City) – adopted the Mexico City Declaration on Cultural Policies.
  - **Second edition**: 1998, Stockholm – called the Intergovernmental Conference on Cultural Policies for Development.
  - **Third edition**: 2022, Mexico City – 40 years after the first; declared culture as a "global public good."
  - **Fourth edition**: 2025, Barcelona, Spain.
- **Objectives:**
  - To place culture at the heart of public policy and international cooperation.
  - To strengthen cultural rights and cultural diversity.
  - To align cultural policies with the UN 2030 Agenda for Sustainable Development.
  - To reaffirm international solidarity for safeguarding heritage, creative industries, and intangible cultural traditions.
- **Key Outcomes of 2025 Conference:**
  - Adoption of **Outcome Document** → roadmap for cultural policies & cooperation.
  - Reaffirmed **Culture as a Global Public Good**.
  - Inclusion of **civil society & youth voices** in cultural policy shaping.

## UNESCO's new virtual museum of stolen objects

### Context

UNESCO (United Nations Educational, Scientific and Cultural Organization) has launched a new Virtual Museum of Stolen Cultural Objects on September 29, 2024, during the MONDIACULT conference.

### About the Virtual Museum

- It is an **interactive digital platform** that displays **stolen or missing cultural artifacts** from across the world.
- **Initial collection:** Nearly **240 stolen objects from 46 countries**, including **two from India** — 9th-century sandstone sculptures (Nataraja and Brahma) from the **Mahadev Temple, Pali, Chhattisgarh**.
- The museum's interface, designed by **Pritzker Prize-winning architect Francis Kéré**, resembles a **baobab tree**, a traditional African symbol of strength and community.
- The museum intends to **"gradually empty itself"** as artifacts are recovered and repatriated to their home countries.

## Thirumalapuram: Iron Age Site

### Context

Recent excavations at Thirumalapuram, located in Tamil Nadu's Tenkasi district, have uncovered an extensive Iron Age burial site that may date around 3345 BCE.

### About the Thirumalapuram Site

- **Location:** The site spans around 35 acres near the Kulasegarapereri tank in Tenkasi district.

- **Burial Structure:** A rectangular stone slab chamber - constructed from 35 slabs and filled with cobblestones to a depth of 1.5 metres - was unearthed.
- **Pottery and Symbols:** Excavators discovered a rich variety of ceramics such as white-painted black-and-red ware, red-slipped ware, black-polished ware, and coarse red ware.
- A total of **78 antiquities** were recovered from the burial site, including items crafted from **bone, gold, bronze, and iron**.

## Personality in News

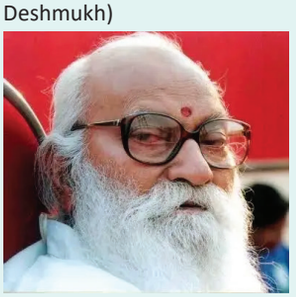
### Rani Chennemma (1778- 1829)

**News:** 3- day Kittur Rani Chennamma Utsav was started in Karnataka.

**About Rani Chennemma**

- Married **Raja Mallasarja of Kittur** at the age of 15.
- **Revolted against the British East India Company (EIC) in 1824** because EIC, under **the Doctrine of lapse,** rejected the **succession of her adopted son Shivalingappa** (after the death of her husband and her son Shivalingarudra Sarja).
- Her heroism is celebrated in **Karnataka's folklore, ballads (janapada songs), and lavanis**.
- Considered a symbol for **Kannadiga pride**, **Lingayat identity**, and **women's empowerment**.
- Doctrine of Lapse was a British policy that allowed **annexation** of **any princely state whose ruler died without a natural male heir.**
- Major princely states annexed under the Doctrine of Lapse included **Satara (1848), Jaitpur (1849), Sambalpur (1849), Baghat (1850), Udaipur (1852), Jhansi (1853),** and **Nagpur (1854)**.

### Nanaji Deshmukh (Chandikadas Amritrao Deshmukh)

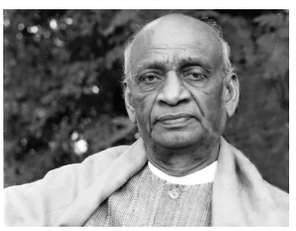


**News:** 11 October marks the Birth Anniversary of Nanaji Deshmukh.

About him

- **Born:** October 11, 1916, in Kadoli village, Maharashtra
- **Died:** February 27, 2010, in Chitrakoot, Uttar Pradesh
- **Contribution:**
  - Played a key role in building the **Bharatiya Jana Sangh (BJS)**, the predecessor of the **Bharatiya Janata Party (BJP)**.
  - Founder of Deendayal Research Institute (DRI), Chitrakoot.
  - Helped establish **Saraswati Shishu Mandirs** (schools run by Vidya Bharati).
  - Chitrakoot model which has been studied by NITI Aayog and several international organizations as a successful example of rural transformation.
- **Awards:** Padma Vibhushan (1999), Bharat Ratna (Posthumously, 2019)

### Sardar Vallabh Bhai Patel



**News:** October 31st will mark the 150th Birth anniversary of Sardar Vallabh Bhai Patel.

About him

- **Born**: October 31, 1875, in Nadiad, Gujarat (then part of Bombay Presidency).
- **Death**: December 15, 1950 in Bombay.
- **Contribution:**
  - He first gained prominence during the **Kheda Satyagraha (1918)** and **Bardoli Satyagraha (1928)** in Gujarat, where he led peasants against unjust taxes imposed by the British.
    - » His success earned him the title **"Sardar" (Leader)** from the people of Bardoli.
  - He played a key role in organizing Congress activities during the Non-Cooperation Movement and Civil Disobedience Movement.
  - Served as a senior leader in the **Quit India Movement (1942)** and worked for maintaining unity within the party.
  - After independence, Patel became India's first Deputy Prime Minister and Home Minister in Jawaharlal Nehru's cabinet (1947–1950).
  - His most significant contribution was the integration of 562 princely states into the Indian Union.
  - Through diplomacy and firmness, he ensured the accession of states like **Hyderabad, Junagadh, and Kashmir**, earning him the title **"Iron Man of India."**
  - Patel was instrumental in establishing the **Indian Administrative Service (IAS)** and **Indian Police Service (IPS)**, calling them the "**Steel Frame of India**."
- **Legacy:**
  - Revered as the **"Iron Man of India"**
  - The **Statue of Unity**, inaugurated in **2018 in Kevadia, Gujarat**, is the **world's tallest statue (182 metres)**, built in his honor.
  - His birthday, **October 31**, is observed as **National Unity Day (Rashtriya Ekta Diwas)** across India.

Muthulakshmi Reddy (1886–1968)

**News:** Recently a biography of Muthulakshmi Reddy was published.

About Her

- **Contribution:**
  - **First woman in India** to be admitted into a **men's college (Madras Medical College)**.
  - As a member of the Madras Legislative Council (1927), introduced:
    - **Abolition of the Devadasi system**.
    - Law against **child marriage**.
    - Efforts to raise the **age of marriage for girls**.
  - Advocated for **reservation of seats for women** in education and politics.
  - Founded the **Adyar Cancer Institute (1954, Chennai)**
  - **Established Avvai Home in Chennai** for destitute and orphan girls.
  - Co-founder of the **Women's Indian Association (WIA)** in 1917, along with Annie Besant and Margaret Cousins.
- **Honours: Padma Bhushan (1956)**.

Prasanta Chandra Mahalanobis (1893 – 1972)

**News:** Recently a biography of PC Mahalnobis was published.

About Him

- **Contribution:**
  - Introduced the famous **"Mahalanobis Distance (1936)"**, a statistical measure of comparison between two data sets.
  - Founded Indian Statistical Institute (ISI) in 1931 (Calcutta/Kolkata).
  - Established the **National Sample Survey (1949)** to provide comprehensive statistical data for planning, later evolved into the **National Sample Survey Office (NSSO)**.
  - Architect of the **Second Five-Year Plan (1956–61)**, which emphasised **industrialisation through heavy industries** → Known as the **"Mahalanobis Model"** of economic planning.
- **Honours:**
  - **"Father of Indian Statistics"**
  - Awarded the **Padma Vibhushan (1968)**.
  - Fellow of the **Royal Society (FRS)**, UK.
  - His birthday, **29 June**, is celebrated as **National Statistics Day** in India.

Baikunthbhai Mehta (1884–1964)

**News:** The Union Home Minister paid tribute to Baikunthbhai Mehta on his birth anniversary.

About Him

- Pioneer leader of the Indian cooperative movement; served for about **35 years as Chief Executive of the then Bombay (now Maharashtra) State Cooperative Bank.**
- Served as **Minister of Finance & Co-operation in the then Bombay State**.
- **1st Chairman** of the Khadi and Village Industries Commission (KVIC).
- The first Gujarati to be Awarded **Padma Bhushan (1954)** and awarded **Kaiser-i-Hind medal (1916)**.