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Topics for Mains

The Himalayan Ecocide

Syllabus Mapping: GS1- Geography, GS3- Environment

Context

In 2025, climate-related extreme events claimed over 4,000 lives in India, with Himalayan states facing a disproportionately high impact

About the Indian Himalayan Region (IHR)

- **The IHR** is the section of the Himalayas within the India, spanning **thirteen Indian states and union territories** namely Ladakh, Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, West Bengal, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, Assam, and Arunachal Pradesh.
- It has a geographical coverage of over **5.3 lakh kilometre square,** extends over 2,500 kilometres in length between the **Indus** and the **Brahmaputra** river systems.
- The IHR physiographically, starting from the **foothills in the south (Siwalik)**, extends up **to Tibetan plateau in the north (Trans-Himalaya).**

Significance of the Indian Himalayan Region

- **Biodiversity Hotspot:** The IHR is a biodiversity hotspot, home to a wide variety of flora and fauna, including many endangered species.
  - E.g., IHR is home to a diverse range of animal species, with over 300 mammal species (including 12 endemic and 4 threatened species)
- **Water Source:** The region is the source of several major rivers, including the Ganga, Yamuna, Brahmaputra, and their tributaries.
  - It is widely known as India's **"Water Tower"**
- **Cultural and Religious Significance**: The Himalayas hold deep cultural and religious significance in India. Many sacred sites, temples, and monasteries are located in the region.
- **Tourism:** The Himalayas are a major tourist destination, drawing visitors from around the world for trekking, mountaineering, and adventure sports.
- **Hydropower Generation:** The steep terrain and abundant rivers in the Himalayas make it an ideal location for hydropower generation.
  - Almost 33% of the country's thermal electricity and **52% of its hydropower** is dependent on river waters originating in the Himalayas.
- **Ecological Services:** The IHR provides essential ecological services such as carbon sequestration, soil conservation, and maintenance of microclimates.

Major Environmental concerns in the IHR

- **Climate Change:** Its impact can be seen in the form of retreating glaciers in the Himalayan region.
  - E.g., A study by the G.B. Pant Institute of Himalayan Environment and Development found that the Gangotri Glacier has retreated by over 1,500 meters in the last 70 years.
- **Deforestation:** It has intensified in the recent past due to population growth, industrialization, and unsustainable development in the region.
  - E.g., A 2018 study in the journal nature reported that the Himalayan region lost more than 24,000 square kilometres of forest cover between 2000 and 2014.
- **Increase in Forest Fires:** due to natural and human-made factors
  - E.g., A report by the Forest Survey of India estimated that nearly 49,000 hectares of forest cover in the Indian Himalayas were affected by forest fires in 2020.
- **Water Scarcity:** Due to the population boom, unsustainable development, and lack of awareness among the people, there has been increasing water scarcity in the region.
  - E.g., A study by the Central Ground Water Board (CGWB) indicates that more than 50% of the springs in the Indian Himalayas are drying up.
- **Biodiversity Loss:** due to habitat loss, degradation, and fragmentation caused by human activities such as deforestation, infrastructure development, and agriculture.
  - E.g., A 2020 study in Biological Conservation reported a 43% decline in vertebrate populations in the Himalayan region over the past 50 years.
- **Flash Floods:** common in monsoon season but has worsened due to human activities.
  - E.g., the 2013 flash flood in Kedarnath resulted in nearly 6000 deaths.
- **Landslides:** Tectonic activity makes the Himalayan region prone to landslides, but recent deforestation, hydropower projects,

and construction of roads and tunnels have exacerbated the situation.
  - E.g., landslides caused over 150 deaths in Himachal Pradesh and around 70 in Uttarakhand between 2022 and September 2023.
- **Air Pollution:** due to unregulated industrialization, unplanned expansion of transportation, and weak implementation of policies.
  - E.g., A report released by the International Centre for Integrated Mountain Development (ICIMOD) in 2019 stated that the concentration of particulate matter (PM2.5) in the air in the Himalayan region exceeds the guidelines set by the WHO.

Government Initiatives for IHR

- **National Mission for Sustaining the Himalayan Ecosystem (NMSHE):** One of the missions under NAPCC, its goals include enhancing ecosystem resilience, promoting sustainable livelihoods, and addressing the impacts of climate change on the region.
- **WWF Conservation Program:** Launched in 1961, it aims to preserve the distinctive biodiversity of the Himalayan region while promoting sustainable development.
- **The Indian Himalayas Climate Adaptation Programme (IHCAP):** It strengthens Indian institutions and Himalayan states to enhance resilience and adaptation planning for vulnerable communities.
- **"Parvat Mala" (National Ropeways Programme):** Aims to develop 1,200 km of ropeways across 250+ projects (Budget 2024–25), replacing ecologically damaging road expansion with zero-footprint aerial mobility.
- **PM Surya Ghar in Hills**: Promotes **decentralised rooftop solar micro-grids** with an extra **10% subsidy for Special Category States**, cutting deforestation-linked transmission lines, diesel use, black carbon emissions, and ensuring power security during disasters.
- **Springshed (Dhara Vikas) Management**: NITI Aayog's aquifer-recharge–focused approach prioritises mapping and rejuvenation of springs (dharas) to secure hill agriculture water needs, as nearly 50% of IHR springs are drying.
- **Vibrant Villages Programme (VVP)**: Reimagines border security by reversing out-migration through climate-smart livelihoods, keeping frontier villages populated as strategic assets without ecologically damaging military infrastructure.
- **SECURE Himalaya Project:** part of the Global Wildlife Program and funded by GEF, aims to sustainably manage alpine pastures and forests in the high-altitude Himalayan ecosystems.
- **Five-point call for Global Action to Protect Mountain Ecosystems.** Highlighted during the inaugural Sagarmatha Sambaad held in Kathmandu, Nepal, with the theme 'Climate Change, Mountains, and the Future of Humanity'.
  - Enhanced Scientific Cooperation
  - Building Climate Resilience
  - Empowering Mountain Communities
  - Providing Green Finance
  - Recognizing Mountain Perspectives

Judicial Interventions

- In **M.K. Ranjitsinh vs Union of India,** the Supreme Court of India recognised freedom from adverse climate effects as part of fundamental rights, signalling a departure from the "unlimited growth" development model.
  - Acting on judicial guidance, the MoEFFC has proposed scientific carrying-capacity assessments for all 13 Himalayan states to regulate development pressure.
- In **Ashok Kumar Raghav vs Union of India, t**he Supreme Court of India directed the preparation of action plans for the Indian Himalayan Region (IHR) based on carrying-capacity principles to curb uncontrolled growth.

Suggested Measures for Sustainable Development in the IHR

- **Himalayan-Specific Land-Use Code**: Enact a legally binding, slope- and geology-sensitive Himalayan Mountain Code to regulate construction, roads, tunnelling, and seismic-zone development based on micro-zonation and cumulative impact limits.
- **Resilience-Led Development Planning**: Replace infrastructure-centric growth with risk-minimisation and disaster-resilience–first planning, embedding geologists, ecologists, and disaster experts at the project design stage.
- **Cumulative & Basin-Scale Assessments**: Shift from project-wise clearances to river-basin and landscape-level planning with caps on infrastructure density to avoid valley-scale destabilisation.
- **Nature-Based Solutions as Infrastructure**: Treat forests, wetlands, alpine meadows, and riparian buffers as core disaster-risk-reduction infrastructure, and fund ecosystem restoration as a cost-effective resilience strategy.
- **Carrying-Capacity-Based Tourism Regulation**: Move to capacity-regulated, spatially zoned, and seasonally staggered tourism, with strict caps on footfall, vehicles, and construction in fragile zones.
- **Context-Sensitive Hydropower & Transport Design**: Redesign hydropower and transport projects using terrain-adaptive, low-impact designs, prioritising prevention of geological instability over post-facto retrofitting.
- **Community-Centric Institutional Strengthening**: Empower local communities and panchayats as co-managers of Himalayan landscapes, integrating indigenous knowledge into formal planning and disaster governance.
- **Integrated Climate–Disaster–Development Governance**: Merge climate adaptation, disaster risk reduction, and development planning into a single Himalayan governance framework to address systemic and interconnected risks.

Development as Adaptation: India's Strategic Pivot in Climate Action

Syllabus Mapping: GS3- Environment

Context

In a significant departure from conventional climate narratives, the **Economic Survey 2025-26** has introduced a paradigm shift: **"Development is, in itself, a form of adaptation."**

Need for Development as Adaptation

- **High Climate Vulnerability of a Developing Economy**: India faces disproportionate climate risks due to its geography, population density, and dependence on climate-sensitive sectors, making **development-led resilience essential for survival rather than choice**.
- **Limits of Mitigation-Only Approaches**: Even aggressive global emission cuts cannot prevent near-term climate impacts, so **strengthening adaptive capacity through development is unavoidable**.
- **Protecting Lives and Livelihoods**: Investments in health, housing, water, energy, and agriculture directly reduce mortality, income losses, and displacement during extreme climate events.
- **Reducing Inequality and Climate Injustice**: Poor and informal workers are most exposed to climate shocks; **development as adaptation ensures equity by protecting the most vulnerable first**.
- **Fiscal and Institutional Realism**: With limited and uncertain global climate finance, **domestically funded development offers a reliable and scalable adaptation pathway**.
- **Long-Term Economic Stability**: Climate-resilient infrastructure and human capital lower disaster-recovery costs and prevent growth reversals, **making adaptation economically prudent**.
- **Building Systemic Resilience**: Development improves state capacity, early warning systems, and service delivery, enabling societies to **absorb, adapt, and recover from climate shocks**.
- **Aligning Growth with Climate Reality**: Treating development as adaptation integrates climate risk into everyday planning, **embedding resilience into India's growth trajectory rather than treating it as an add-on**.

Three main pillars of India's Climate Strategy

- India **puts adaptation first** to protect lives, livelihoods, water and food security from climate impacts, using public investment, state planning and community-led development to reduce losses and build local resilience.
- At the same time, it **pursues mitigation by expanding renewables, efficiency, green hydrogen and nuclear**, while prioritising reliable, affordable energy despite challenges of technology access, critical minerals and finance.
- With limited global climate finance, India **relies largely on domestic reforms and innovative tools like green bonds and sustainable finance frameworks** to mobilise capital for climate action.

Public Investment–Led Climate Adaptation in India

Mission / Programme	Focus Area	Key Actions / Components	Outcomes for Climate Resilience
National Mission on Sustainable Agriculture	Climate-resilient farming	Efficient irrigation under **"Per Drop More Crop"**, integrated rainfed farming, soil health management via Soil Health Cards	Improves water use efficiency, sustains farm productivity, and enhances resilience to droughts and climate variability
National Water Mission	Water conservation and equitable access	Integrated water resource management, state-specific water plans, rainwater harvesting with financial support to States/UTs	Strengthens water security and reduces vulnerability to water stress
National Programme on Climate Change and Human Health	Climate and public health	Awareness on climate-related health risks, strengthening health systems for vulnerable groups	Reduces health impacts from heatwaves, disasters and changing disease patterns
National Mission on Sustainable Habitat	Climate-resilient urban development	Integration with Swachh Bharat Mission and sustainable urban transport	Enhances urban liveability and resilience to heat, floods and pollution
National Coastal Mission	Coastal and marine resilience	Integrated coastal zone management and climate-resilient coastal infrastructure	Protects coastal communities from sea-level rise and extreme weather
MISHTI (Mangrove Initiative for Shoreline Habitats & Tangible Incomes)	Mangrove restoration and livelihoods	Restoration of 540 sq km of mangroves (2023–28) across coastal States/UTs through convergence with existing schemes	Creates coastal protection, carbon sink (4.5 Mt), jobs (22.8 million person-days) and nature-based livelihoods
National Plan for Conservation of Aquatic Ecosystems	Wetland and aquatic ecosystem protection	Expansion and conservation of wetlands	Provides natural buffers for floods and improves long-term water security
Mission LiFE (Lifestyle for Environment)	Behavioural and community action	Promotes mindful resource use and sustainable lifestyles	Supports ecosystem-led, development-integrated climate resilience through citizen participation

Subnational initiatives on adaptation

- **Kerala (KERA Project)**: A $285 million project modernizing agri-value chains for 400,000 farmers.
- **Meghalaya (MegARISE)**: Focuses on **Spring Mapping** and GIS technology to protect critical catchment areas.
- **Odisha (Pani Panchayats)**: Community-led water governance that has boosted high-value vegetable farming by 105%.
- **Ahmedabad Heat Action Plan**: Includes a **Parametric Heat Insurance** scheme for informal workers, triggering automatic payouts when temperatures cross thresholds.
- **Uttarakhand (Mandakini ki Aawaz)**: A community radio station leading disaster preparedness and early warnings.

Challenges in Using Development as Adaptation

- **Severe Climate Finance Gap**: Globally, climate finance is heavily skewed toward Mitigation (Solar, Wind, EVs) because they offer commercial returns. Adaptation (Mangrove restoration, flood defenses) remains underfunded.
  - Citing the UNEP Adaptation Gap Report 2025, the Survey notes that developing countries need $310–$365 billion annually by 2035, yet current flows are a mere $26 billion.
- **Fiscal Stress and Competing Priorities**: High adaptation spending strains government finances, especially when balanced against poverty reduction, infrastructure expansion, and social welfare needs.
- **Uneven Institutional and State Capacity**: Wide variations in technical expertise, planning capability, and governance across states and local bodies limit uniform and effective implementation.
- **Climate-Blind Infrastructure Legacy**: Existing infrastructure was designed for historical climate conditions, making retrofitting costly and technically complex.
- **High Exposure of Climate-Sensitive Livelihoods**: A large share of the workforce remains dependent on agriculture and informal sectors, where adaptive transitions are slow and socially sensitive.
- **Data, Modelling, and Early-Warning Gaps**: Limited granular climate-risk data, forecasting capacity, and impact assessment tools undermine evidence-based planning.
- **Balancing Growth with Environmental Limits**: Rapid development can unintentionally increase vulnerability if carrying capacity, ecosystems, and local contexts are ignored.
- **Coordination Deficits Across Sectors**: Fragmented mandates across climate, disaster management, infrastructure, and development agencies dilute accountability and delay integrated action.

Way Forward

- **Strengthen Climate-Ready Health Systems**: Scale up heat-action plans, disease surveillance, and resilient healthcare infrastructure to manage rising heat stress, vector-borne diseases, and disaster-related health shocks.
- **Invest in Climate-Resilient Infrastructure**: Redesign roads, bridges, housing, and power grids using climate-risk assessments so critical infrastructure remains functional during floods, cyclones, and heatwaves.
- **Enhance Agricultural Productivity and Resilience**: Promote climate-resilient crops, efficient irrigation, soil health management, and risk-transfer tools to protect the **45% workforce** dependent on climate-sensitive agriculture.
- **Ensure Reliable and Affordable Energy Access**: Balance renewable expansion with grid stability, storage, and diversified energy sources to provide **dependable power** that sustains industry, services, and disaster response.
- **Integrate Resilience into Development Planning**: Make climate-risk screening mandatory across sectors so health, infrastructure, agriculture, and energy investments collectively enhance society's capacity to absorb and recover from climate shocks.

Community-Based Disaster Risk Management

Syllabus Mapping: GS3- Disaster Management

Context

The Government of India has approved the National Project for Strengthening Community-Based Disaster Risk Reduction (DRR) Initiatives in Panchayati Raj Institutions (PRIs) with an outlay of ₹507.37 crore.

About Community-Based Disaster Management

Community-Based Disaster Management (CBDM) or Community Based Disaster Risk Management (CBDRM) refers to the **active involvement of local communities** in identifying, analysing, monitoring, and managing disaster risks to reduce vulnerabilities and enhance resilience.

- **Core Features**
  - Participatory risk assessment and local-level planning
  - Use of indigenous knowledge and contextual understanding
  - Effective last-mile information dissemination
  - Communities acting as **first responders** during disasters
- CBDRR aligns with the **Sendai Framework for Disaster Risk Reduction (2015–2030)**, which calls for empowering local communities and institutions as the foundation of disaster resilience.

Need for Community-Based Disaster Management (CBDM)

- **First Responders at the Frontline**: Local communities are the first to experience and respond to disasters, making community preparedness critical during the crucial early hours.
- **Context-Specific Risk Management**: Communities possess indigenous knowledge of local hazards, terrain, and vulnerabilities, enabling more accurate and effective disaster planning.
- **Reduced Loss of Life and Livelihoods**: Early warning, preparedness, and timely evacuation at the community level significantly lower casualties and economic losses.
- **Bridging Governance Gaps**: CBDM complements state-led disaster management by strengthening last-mile delivery and local implementation capacity.
- **Cost-Effective and Sustainable**: Community-led risk reduction relies on local resources and nature-based solutions, reducing long-term disaster recovery costs.
- **Inclusive and Equitable Resilience**: CBDM ensures participation of women, elderly, children, and other vulnerable groups in planning and response.
- **Strengthening Social Capital**: Collective action during preparedness and response builds trust, cooperation, and long-term community resilience.

Key Initiatives for Local-Level Disaster Management

- **National Project for Strengthening Community-Based Disaster Risk Reduction (CBDRR) Initiatives in Panchayati Raj Institutions (PRIs):**
  - **Objective:** To foster community-based disaster management, promote local ownership, and reduce vulnerabilities through participatory risk assessment.

  - **Target**: 81 disaster-prone districts across 20 states to create model Gram Panchayats; Each focuses on six major hazard themes (e.g. floods, earthquakes, cyclones)
  - **Jointly implemented by:** Ministry of Panchayati Raj and National Disaster Management Authority
- Integration of **Disaster Management Plans (DMP–MoPR)** into Gram Panchayat Development Plans (GPDP)
- **Aapda Mitra Scheme** trains local volunteers in search, rescue, and first aid→Strengthens Panchayat-led emergency response during the critical "golden hours"
- **eGramSwaraj:** Work-based accounting platform ensuring transparency and accountability in decentralised planning
- **Gram Manchitra:** GIS-based spatial planning tool for hazard mapping and decision-making
- **SACHET Portal:** National Disaster Alert Portal based on the Common Alerting Protocol (CAP)
  - CAP is an international emergency alert standard adopted by the International Telecommunication Union (ITU)

Best Practices of Community-Based Disaster Management (CBDM)

India

- **Odisha – Community-Based Early Warning System**: "Last Mile Connectivity" uses trained **Cyclone Warning Volunteers** with megaphones, drums, and sirens to ensure timely evacuation and drastically reduce cyclone casualties.
- **Bihar – Community-Led Flood Management**: **Flood Management Committees (FMCs)** train local residents in preparedness, early warning, and rescue, enabling rapid evacuation and reduced flood impacts.

International

- **Senegal – Tostan Model**: The **Tostan** approach empowers communities through non-formal education to build disaster preparedness, social resilience, and sustainable development.
- **Mexico – Brigades of Civil Protection**: Community-trained emergency brigades conduct search, rescue, and evacuation during earthquakes, significantly reducing casualties and response time.

Challenges in Community-Based Disaster Management

- **Capacity and Skill Gaps**: Limited technical expertise and low disaster literacy at the Panchayat level constrain effective planning, early warning, and response.
- **Financial Constraints**: Inadequate and delayed access to disaster mitigation funds weakens preparedness and timely implementation of risk-reduction measures.
- **Institutional Coordination Deficit**: Fragmented roles and weak coordination among local, district, and state authorities lead to overlaps, gaps, and delayed decision-making.
- **Digital Divide**: Uneven digital infrastructure and low technology adoption restrict real-time information flow, planning, and early-warning dissemination.
- **Scaling and Replication Challenges**: Successful community pilots are difficult to replicate across regions due to diverse socio-ecological conditions and local capacities.

Way Forward

- **Mainstream CBDM into Local Governance**: Make disaster resilience a mandatory component of Panchayat planning, infrastructure design, and Gram Panchayat Development Plans (GPDPs).
- **Scale Up Model Gram Panchayats**: Replicate best practices from Model Gram Panchayats across **2.5 lakh+ GPs** through structured peer learning and handholding.
- **Strengthen Financial Support Mechanisms**: Ensure timely, adequate, and effective utilisation of **State Disaster Mitigation Funds (SDMF)** for local-level risk reduction.
- **Promote Ecosystem-Based Disaster Risk Reduction**: Restore wetlands, mangroves, forests, and watersheds as cost-effective natural buffers against floods, cyclones, and droughts.
- **Deepen Technological Integration**: Equip PRIs with user-friendly digital tools, satellite-based early warning systems, and continuous capacity-building for adoption and use.

Topic for Prelims (Geography)

Bomb Cyclone

Context

A powerful winter storm rapidly intensified into a "bomb cyclone" across large parts of the United States.

About Bomb Cyclone

- A bomb cyclone is a large, intense mid-latitude storm.
- The cyclone has a low pressure at its centre, but it turns into a bomb when it undergoes **bombogenesis**. In other words, the pressure at the centre decreases rapidly (around 24 millibars in 24 hours).
- A cyclone after undergoing bombogenesis rapidly intensifies, while normal cyclones don't intensify at such a rapid rate.
- **Bombogenesis** is a combination of words **cyclogenesis** (i.e. formation of a cyclone) and **bomb.**
- The bombogenesis occurs when a cold air mass collides with a warm air mass, such as air over warm ocean waters, which rapidly strengthens the weather system.
- **Formation Bomb Cyclone**
  - Heat and moisture are abundantly found over the warmer ocean.
  - However, as cool continental air moves over and creates a large difference in temperature, the lower atmosphere becomes unstable and buoyant.
  - Then the air rises, cools and condenses, thus forming clouds and precipitation.
- **Most occurrences witnessed:** Events of bombogenesis are mostly witnessed over the coast of the USA.

Sprites

Context

A rare atmospheric phenomenon called "red sprites" was captured on camera above an intense thunderstorm in the Kimberley region of Western Australia.

About Sprites (Red Sprites)

- **Sprites** are **brief, luminous electrical discharges** that appear as **red flashes or tendril-like structures** high above active thunderstorms.
- They are classified as **Transient Luminous Events (TLEs)** occurring in the **upper atmosphere**, specifically: **Stratosphere & Mesosphere** (roughly **40–90 km above Earth's surface**)
- Unlike ordinary lightning (which occurs in the **troposphere**), sprites **shoot upward from thunderclouds into space**.
- They are triggered by **intense cloud-to-ground lightning strikes**, especially **positive lightning** with large electrical charge transfer.
- Physically, sprites are believed to be a form of **luminous plasma**, making them distinct from conventional lightning.
- They are:
  - **Extremely short-lived** (milliseconds)
  - **Difficult to see with the naked eye**
  - Best observed in **dark skies with minimal light pollution**

Comparison of Transient Luminous Events (TLEs)

Feature	Sprites	ELVEs	Blue Jets
Basic Nature	Vertical, jellyfish-like flashes of light	Rapidly expanding circular rings of light	Narrow, cone-shaped upward jets
Trigger Mechanism	Positive cloud-to-ground lightning	Electromagnetic pulse from intense lightning	Strong electric fields within thunderstorms
Shape	Columnar or carrot-shaped structures	Expanding ring or halo	Conical beam
Duration	Few milliseconds	Less than 1 millisecond	Hundreds of milliseconds
Altitude Range	50–90 km (mesosphere)	80–100 km (lower ionosphere)	20–50 km (stratosphere)
Colour	Reddish-orange	Faint red	Blue
Associated Atmospheric Layer	Mesosphere	Ionosphere	Stratosphere
Visibility	Best observed from space or aircraft	Detected mainly by satellites	Occasionally visible from aircraft
Common Location	Over large thunderstorms	More frequent over oceans	Above powerful thunderclouds

Doomsday Glacier

Context

The destabilisation of the Doomsday Glacier signals the potential future trajectory of widespread instability across Antarctic ice sheets.

About Doomsday Glacier (Thwaites Glacier)

- It is a **rapidly moving glacier in West Antarctica**, roughly comparable in size to **Britain**.
- **Why it is called the 'Doomsday Glacier':** It is considered highly vulnerable to warming and poses a **serious global sea-level rise risk** due to its instability.
- With an area of about **1.9 lakh sq km**, it holds enough ice to raise **global sea levels by over 0.5 metres** if fully melted.
- **Significance:**
  - Thwaites acts as a **natural barrier**, slowing the flow of inland Antarctic ice into the ocean.
  - Its collapse could trigger **accelerated ice loss** from the interior of Antarctica.

Important glaciers of Antarctica

Name of Glacier / Ice Shelf	Location & Key Feature
Thwaites (Doomsday) Glacier	West Antarctica; highly unstable, holds ice capable of raising global sea level by over 0.5 m
Pine Island Glacier	West Antarctica (Amundsen Sea); fastest-retreating glacier, major contributor to sea-level rise
Totten Glacier	East Antarctica; largest glacier in East Antarctica, potential to raise sea levels by ~3.5 m
Larsen C Ice Shelf	Antarctic Peninsula; buttresses inland glaciers, vulnerable to large calving events
Wilkes Land Ice Sheet	East Antarctica; marine-based ice sheet with multi-metre sea-level rise potential
Recovery Glacier	East Antarctica; drains a vast interior basin, sensitive to bedrock conditions
Ross Ice Shelf	Southern Antarctica; world's largest ice shelf, stabilises multiple major glaciers
Filchner–Ronne Ice Shelf	Weddell Sea, Antarctica; second-largest ice shelf, key regulator of ice flow

Silver Price Explosion

Context

Silver prices have surged sharply, following a 160%+ rise in 2025, with an additional over 7% increase in the first week of 2026.

Reasons for the Rise in Silver Prices

- **Industrial demand boom:** Growing use of silver in **solar panels, batteries, electric vehicles, electronics, and smart grids**.
  - Rapid expansion of **artificial intelligence (AI)** infrastructure has increased silver demand in **data centres, power transmission, and advanced electronics**.
- **Critical mineral status:** The **United States** added silver to its **critical minerals list**, signalling strategic importance and raising concerns about future supply security.
- **Supply-side constraints:** Silver is largely a **by-product of mining** for other metals like zinc, lead, and copper.
  - Supply growth has failed to keep pace with rising industrial and investment demand.
- **Geopolitical and trade factors: US–China trade tensions**, tariff fears, and China's export restrictions on rare and strategic metals have triggered stockpiling.
  - Large accumulation of silver inventories in the US created shortages in global hubs like London.
- **Investment and FOMO effect:** Rising gold prices spilled over into silver, attracting **retail and ETF investors**.
  - Strong inflows into **silver ETFs** forced fund houses to buy physical silver, further tightening supply and pushing prices higher.

About Silver

- **Silver (Ag- 47)** is a **precious metal** known for its **lustre, conductivity, and malleability**.
- It is extensively used in **jewellery, electroplating, photography, electronics, chemicals, and glass colouring**.
- Found mixed with **copper, lead, gold, and zinc** ores.
- Extracted primarily as a **by-product** during the smelting of **lead, zinc, and copper** ores.
- **Major Silver Ore Minerals**
  - **Argentite (Ag_2S)**: Most important silver ore.
  - **Stephanite (Ag_5SbS_4)**: Sulphide of silver and antimony.
  - **Pyrargyrite (Ag_3SbS_3)**: Ruby silver, dark red in colour.
  - **Proustite (Ag_3AsS_3)**: Another ruby silver ore with arsenic.
  - **Galena (PbS)**: Lead ore which often contains silver as an impurity.
  - **India** is rich in ores such as **sphalerite (ZnS) and galena (PbS)**, which contain zinc, lead and silver.
- **Uses**
  - Jewellery, ornaments and silverware
  - Electronics and electrical equipment (switches, conductors, solar panels)
  - Photographic industry (silver halides)
  - Medical uses: antimicrobial coatings, wound dressings
  - Coins, bullion and investment instruments
  - Mirrors, brazing alloys and high-precision instruments
- **Global Distribution**: Silver is widely distributed across the world, mainly in **Mexico, China, Peru, Chile, Australia, Russia, and Poland**.
  - It occurs largely in **polymetallic ore belts** and is commonly extracted as a **by-product of lead, zinc, and copper ores**.
- **Distribution of Silver in India**: India has **limited primary silver deposits**, and most production comes as a **by-product of lead–zinc mining**, mainly in **Rajasthan**.
  - **Hindustan Zinc Limited** is the largest producer

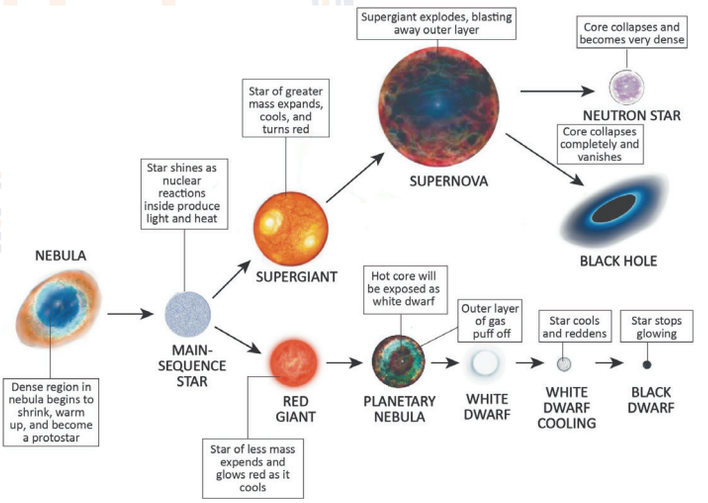
White Dwarf system

Context

NASA's Imaging X-ray Polarization Explorer (IXPE) has, for the first time, investigated the internal structure of a white dwarf system using X-ray polarimetry.

About White Dwarf System

- A **white dwarf system** consists of a **white dwarf**, which is the dense, compact remnant of a **low- or medium-mass star** that has exhausted its nuclear fuel.
- The white dwarf is typically **Earth-sized but extremely massive**, formed after the star sheds its outer layers and collapses its core.
- Such systems often exist in **binary configurations**, where the white dwarf interacts with a companion star by **accreting matter**.
- White dwarf systems are important for studying **stellar evolution, X-ray emission, magnetic fields**, and phenomena like **novae and Type Ia supernovae**.



Water Vapor and heating of atmosphere

Context

A recent scientific study has highlighted that water vapour contributes more to atmospheric heating than aerosols.

How does water vapour heat the land more than aerosols?

- **Strong greenhouse behaviour:** Water vapour is a **powerful greenhouse gas** that efficiently absorbs **outgoing longwave**

(infrared) radiation emitted by the Earth's surface and re-emits part of it back, leading to enhanced **surface and lower-atmospheric warming**.

- **Continuous radiative absorption:** Unlike aerosols, whose radiative effects vary widely with type (scattering vs absorbing), water vapour **consistently absorbs radiation across a broad range of infrared wavelengths**, making its heating effect more uniform and persistent.
- **Vertical distribution advantage:** Water vapour is abundant in the **lower troposphere**, close to the land surface, allowing it to directly influence **near-surface temperature and atmospheric heating rates**, whereas aerosols may be distributed at different altitudes.
- **Feedback amplification:** Increased temperatures lead to higher evaporation, which raises water vapour concentration, creating a **positive feedback loop** that further enhances warming—an effect aerosols do not produce at a comparable scale.
- **Aerosol limitation:** Many aerosols primarily **scatter incoming solar radiation**, which can cool the surface, while only absorbing aerosols (like black carbon) contribute to heating—and even then, their effect is generally weaker than that of water vapour.

About water vapour

- **Water Vapour (H_2O)** is a colourless, invisible gas and the **most dynamic constituent of the atmosphere**. Its concentration is **highly variable**, ranging from about **0.02% in cold deserts to nearly 4% in hot, humid regions**.
- Nearly **90% of atmospheric water vapour is concentrated within the lowest 6 km** of the atmosphere, especially over **warm oceans and tropical regions**.
- **Significance:**
  - It is the **most important natural greenhouse gas**, absorbing terrestrial (long-wave) radiation and moderating Earth's temperature.
  - Regulates **cooling and warming** through **latent heat exchange** during evaporation and condensation.
  - Plays a central role in **weather and hydrological processes**, including **cloud formation, rainfall, fog, dew, and frost**.

First Global Repository of Global ice cores

Context

As rapid global warming accelerates glacier melt worldwide, scientists have created the world's first ice vault to preserve mountain ice cores as a permanent archive of Earth's past climate.

About World's First Ice vault

- It has been inaugurated on the **Antarctic Plateau**, providing a secure location for preserving Earth's climate records.
- The initiative is led by the Ice Memory Foundation, with scientific support from leading institutions in France (CNRS, IRD), Italy (National Research Council), and Switzerland (Paul Scherrer Institute).
- Ice cores are stored at a **naturally stable temperature of about –52°C**
- The **initial collection** includes ice cores extracted from **Mont Blanc (France)** and **Grand Combin (Switzerland)**, representing vulnerable alpine glaciers.

About Ice vaults and Ice Cores

- An ice vault is a secure, long-term storage facility designed to preserve ice core samples extracted from mountain glaciers.
- Ice cores act as a frozen climate archive, recording past atmospheric composition, temperatures, pollution levels, and major climatic events.
- **Significance of Ice Cores**
  - Ice cores are frozen climate archives, containing trapped air bubbles that record past greenhouse gas concentrations, along with layers of dust, ash, and pollutants reflecting volcanic eruptions and human activity.
  - They enable scientists to measure the rate of climate change and distinguish between natural climate cycles and human-induced warming.
  - Ice cores also help compare regional climate variations with global trends, improving long-term climate reconstruction and prediction.

Seed vault

- A **seed vault** preserves **genetic material of crop plants** to protect global food security against climate change, disasters, or conflicts.
- **Svalbard Global Seed Vault**
  - Located in **Svalbard, Norway**, inside Arctic permafrost.
  - Stores **over 1.2 million seed samples** from across the world.
  - Maintained at around **–18°C** for long-term viability.
  - Acts as a **backup of national and international gene banks**.

Magnetic Fields Mapped in Young Star Birth

Context

A new astrophysics study has traced the **role of magnetic fields in the birth of a young star**,

About the Study

- A recent observational study led by researchers at the **Indian Institute of Astrophysics (IIA)** has traced magnetic fields on multiple scales within the **L328 molecular cloud**, located about **700 light-years away** from Earth.
- The team mapped magnetic field lines from the large cloud scale down to the dense core where star formation is actually occurring.

About Molecular Clouds

- Molecular clouds are vast regions of interstellar space made up of gas (mainly molecular hydrogen) and fine dust.
- They are extremely cold, often just 10–20 K above absolute zero, and have moderate densities compared to other regions of space.
- Because of these conditions, molecular clouds act as the primary nurseries of star formation in galaxies.
- **Significance of studying molecular clouds**
  - They determine where, when, and how many stars are formed.

- Their internal physics shapes the mass, type, and distribution of stars.
- Understanding molecular clouds helps explain the evolution of galaxies, since stars drive galactic light, energy, and chemical enrichment.

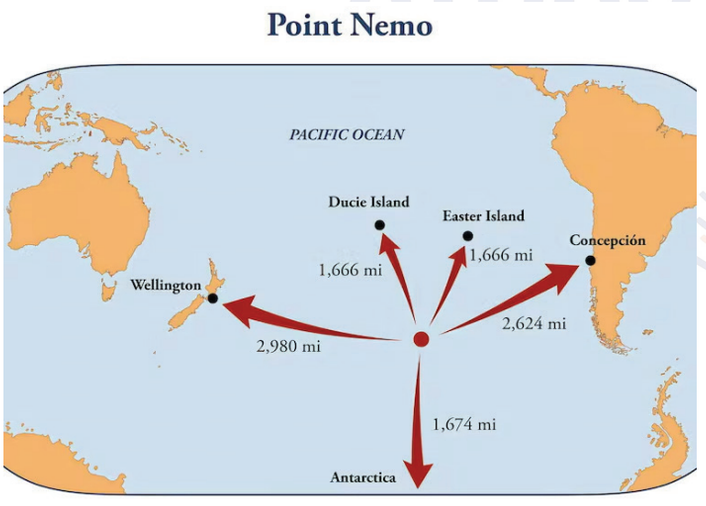
Formation of Stars inside Molecular Clouds

- Star formation occurs when parts of a molecular cloud collapse under gravity. This collapse, however, is not governed by gravity alone. It depends on the delicate balance and interaction of three key forces:
  - **Gravity**: Gravity pulls gas and dust inward, causing dense regions within the cloud to contract and form a protostar.
  - **Turbulence:** Random motions within the cloud can either support the cloud against collapse or create local density enhancements that trigger star formation.
  - **Magnetic Fields:** Magnetic fields thread through molecular clouds and can slow down or regulate collapse by providing magnetic pressure and guiding the flow of material.
- Stars are born only when gravity becomes strong enough to overcome turbulence and magnetic resistance in a small region of the cloud.

Point Nemo

Context

Point Nemo is the most remote location on Earth, gaining attention for its role in oceanography, space exploration, and environmental studies.



About Point Nemo

- **Discovery:** Unlike most geographic discoveries, Point Nemo was identified in 1992 using computer calculations by Hrvoje Lukatela, a Croatian-Canadian survey engineer.
- **Location:** Point Nemo lies in the South Pacific Ocean (within the South Pacific Gyre) at 48°52.6′ S latitude and 123°23.6′ W longitude.
- It is the oceanic pole of inaccessibility, meaning it is the point on Earth farthest from any landmass.
- The **closest landforms** to Point Nemo are:
  - Ducie Island (Pitcairn Islands)
  - Motu Nui (off Easter Island)
  - Maher Island (near Antarctica)
  - The nearest inhabited land lies thousands of kilometres away, such as the Chatham Islands of New Zealand.
- Astronauts aboard the International Space Station orbiting about 400 km above Earth are often closer to Point Nemo than any human on land.
- Due to its extreme isolation, Point Nemo serves as a **spacecraft disposal zone,** also called an orbital graveyard.
  - Notable examples include the Mir Space Station in 2001, and Point Nemo is planned as the final resting site for the ISS.
- In 1997, underwater sensors detected a powerful low-frequency sound near Point Nemo, dubbed **"The Bloop."**
  - Initially unexplained, it was later identified as an icequake, caused by cracking and melting Antarctic icebergs.

South Pacific Gyre

- It is a vast system of slow-moving circular ocean currents formed by: Antarctic Circumpolar Current, Humboldt Current and West Wind Drift It is considered one of the **most biologically barren regions** of the world's oceans.
  - The region is extremely far from land, so winds carry almost no nutrients into surface waters.
  - Circular ocean currents prevent upwelling of nutrient-rich deep waters.
  - As plankton growth is minimal, the marine food chain cannot be sustained, making it a biological desert.

Visibility in Weather Science

Context

Episodes of dense fog and smog across north India have brought renewed focus on how visibility is scientifically measured and classified in meteorology.

About Visibility

- In weather science, visibility refers to the Meteorological Optical Range (MOR).
- It is defined as the distance a beam of light can travel through the atmosphere before its intensity reduces to 5% of its original value.
- Visibility depends on the presence of fog, mist, dust, smoke, aerosols, and pollution particles in the air.

Modern Instrument-Based Measurement of Visibility

- **Direct (Transmissometer) Method**
  - A transmitter sends a laser beam to a receiver placed at a fixed distance, usually 20–75 metres.
  - The receiver measures how much light reaches it after atmospheric attenuation.
  - The reduction in light intensity is mathematically converted into visibility distance.
- **Indirect (Scatter) Method**
  - A light beam is projected past, not directly at, the receiver.
  - In clear air, little or no light reaches the receiver.

- Fog, dust, or smog particles scatter light, deflecting part of it into the receiver.
- The amount of scattered light is used to estimate visibility.

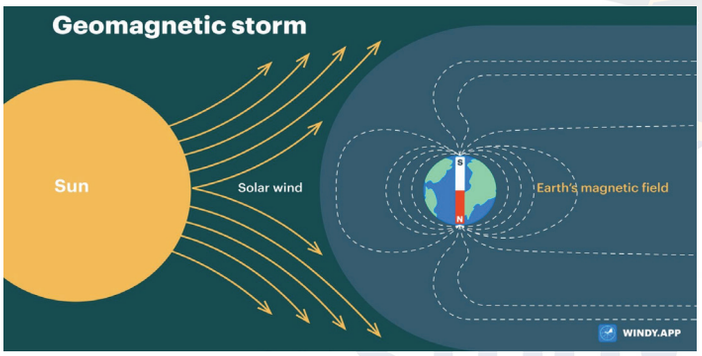
Visibility Classification in India

- The **India Meteorological Department** classifies visibility based on **fog and smog intensity**.
  - **Shallow fog:** 500–1,000 metres
  - **Moderate fog:** 200–500 metres
  - **Dense fog:** 50–200 metres
  - **Very dense fog:** Less than 50 metres
- Such classifications are critical for **aviation, road transport, railways, and disaster management**.

Severe G4 geomagnetic storm

Context

Northern lights were reported across mid-latitudes during a night of rapidly fluctuating geomagnetic conditions that fluctuated between G1, G2, G3 and G4 storm levels.



About Geomagnetic Storms

- A geomagnetic storm is a severe disturbance in Earth's magnetosphere caused by enhanced energy transfer from the Sun to the near-Earth space environment, leading to large-scale variations in Earth's magnetic field.
- **Formation**
  - Energy produced by nuclear fusion in the Sun is released as radiation and charged particles.
  - These charged particles continuously flow outward as the solar wind.
  - At times, the Sun ejects massive clouds of magnetised plasma called coronal mass ejections (CMEs).
  - When fast solar wind or CMEs reach Earth, they collide with Earth's magnetic field, disturbing the magnetosphere and triggering geomagnetic storms.
- **Favourable Conditions for Geomagnetic Storms**
  - Sustained high-speed solar wind directed toward Earth for several hours.
  - A southward-oriented solar wind magnetic field, opposite to Earth's magnetic field, enabling efficient energy transfer into the magnetosphere.
- **Classification:** Geomagnetic storms are classified on the G-scale from G1 (Minor) and G2 (Moderate) to G3 (Strong), G4 (Severe), and G5 (Extreme) based on their intensity.

Impacts of G4 Geomagnetic Storms

- **Satellite Operations:** Increased drag on low-Earth orbit satellites and disruption of satellite electronics and communication links.
- **Power Systems:** Voltage instability, transformer heating, and increased risk of damage to power transmission networks.
- **Communication Systems:** Disruption of high-frequency radio communications, particularly on the sunlit side of Earth.
- **Navigation Systems:** Reduced accuracy of GPS and other satellite-based navigation systems during the storm.
- **Auroral Effects:** Strong geomagnetic storms cause the auroral oval to expand, allowing auroras to be visible at much lower latitudes than usual.

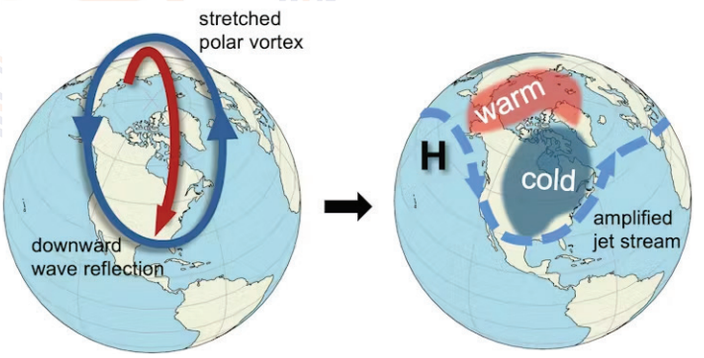
Polar Vortex

Context

A massive winter storm driven by a weakened polar vortex swept across the United States.

About Polar Vortex

- The polar vortex is a large, persistent low-pressure system of cold air that forms over the Earth's polar regions in the stratosphere and upper troposphere during winter.
- It consists of strong westerly winds that circulate around the poles, effectively trapping cold air and isolating polar atmospheric conditions from lower latitudes.
- The polar vortex spins in an anticlockwise direction over the North Pole and clockwise over the South Pole.
- **Factors for development**: It develops due to **sharp temperature contrasts** between the extremely cold polar regions and the warmer tropics, combined with **Earth's rotation (Coriolis force), pressure gradient forces, and interactions with the jet stream.**



- **Stability of the Polar Vortex:**
  - When the vortex remains strong and stable, it confines the jet stream to a compact, circular path, effectively locking cold air in the polar regions and preventing its southward movement.
  - However, when the vortex weakens, it becomes distorted and wavy, allowing frigid polar air to spill into lower latitudes, resulting in extreme cold events.
- **Types of Polar Vortex:**
  - **Tropospheric polar vortex (10–15 km):** Exists in the lower atmosphere where most weather systems operate.

  - **Stratospheric polar vortex (15–50 km):** Located higher in the atmosphere and is strongest during the winter season.
- **Impacts of the Polar Vortex:**
  - **Cold weather extremes:** Rapid Arctic warming (Arctic amplification) is reducing the temperature gradient between the poles and mid-latitudes, potentially destabilizing the vortex and increasing the likelihood of severe winter outbreaks.
  - **Ozone depletion:** Extremely cold conditions within the vortex enhance chemical reactions that accelerate ozone loss, especially over Antarctica, contributing to the formation of the ozone hole.

Coking Coal as Critical & Strategic Mineral

Context

The Government of India has notified coking coal as a Critical and Strategic Mineral under the Mines and Minerals (Development and Regulation) Act, 1957.

About the Notification

- The decision is based on the recommendations of the High-Level Committee on Implementation of Viksit Bharat Goals and policy inputs from NITI Aayog, recognising the strategic importance of coking coal for mineral security and the domestic steel sector.
- Under Section 11C of the MMDR Act, the First Schedule has been amended to explicitly include coking coal as a Critical and Strategic Mineral.
- Coking coal has been explicitly included in Part D (Critical and Strategic Minerals) of the First Schedule of the MMDR Act.
  - Mining of critical minerals is exempt from public consultation requirements.
  - Use of degraded forest land for compensatory afforestation is permitted.
  - Faster approvals and simplified regulatory processes are enabled to promote exploration and mining.
- **Expected Benefits**
  - The reform is expected to **reduce import dependence** and strengthen **supply-chain resilience** for the steel sector.
  - It will support the objectives of the **National Steel Policy** by ensuring availability of a key raw material.
  - The notification is likely to attract **private investment** in exploration, beneficiation and adoption of advanced mining technologies.
  - It is also expected to generate employment across mining, logistics and steel value chains.

About Coking Coal

- Coking coal is a high-grade variety of coal used primarily in the manufacture of coke, a key input for steel production through the blast furnace route.
- It has low ash, low moisture and low sulphur content with strong caking properties.
- When heated in the absence of air, it softens, swells and solidifies into porous coke capable of withstanding high temperatures and pressure inside a blast furnace.
- Unlike thermal coal, which is used for electricity generation, coking coal is used as a raw material in metallurgy, especially iron and steel making.
- **Coking coal is converted into coke, which acts as:**
  - A fuel providing heat
  - A reducing agent to remove oxygen from iron ore
  - A structural support allowing gases to circulate inside the blast furnace
- **Global distribution:** Major producers include Australia, China, Russia, the United States and Canada.
  - Australia is the world's largest exporter of coking coal.
- **Distribution in India:** India has an estimated **37.37 billion tonnes of coking coal resources**, mainly in **Jharkhand**, with additional reserves in **Madhya Pradesh, West Bengal and Chhattisgarh**.
  - Despite domestic availability, imports increased from **51.20 million tonnes (2020–21)** to **57.58 million tonnes (2024–25)**.
  - Currently, nearly **95% of the steel sector's coking coal requirement** is met through imports, resulting in high foreign exchange outgo.

Topics for Prelims (Environment)

Carbon Border Adjustment Tax

Context

The European Union commenced implementation of the world's first carbon tax under the Carbon Border Adjustment Mechanism (CBAM), a move that has drawn strong criticism from several developing countries, including India.

About Carbon Border Adjustment Tax

- CBAM is a climate policy instrument of the **European Union** designed to levy a carbon price on certain imported goods equivalent to the carbon cost faced by EU producers under the Emissions Trading System (ETS).
- **Objective:**
  - Prevent carbon leakage (shifting of production to countries with weaker climate regulations).
  - Ensure a level playing field between EU manufacturers and foreign producers.
  - Encourage global decarbonisation by incentivising cleaner production practices.
- **Legal Basis:** Introduced as part of the EU's *Fit for 55* climate package aimed at reducing greenhouse gas emissions by 55% by 2030 (from 1990 levels).
- **Sectors Covered (initial phase):** Cement, Iron and steel, Aluminium, Fertilisers, Electricity & Hydrogen

- **How it works:**
  - Importers must declare the embedded carbon emissions in covered products.
  - They are required to purchase CBAM certificates priced in line with EU ETS carbon prices.
  - If a carbon price has already been paid in the country of origin, a corresponding deduction is allowed.
- **Phases of Implementation:**
  - **Transitional Phase (Oct 2023–Dec 2025):** Only reporting of emissions; no financial payment.
  - **Definitive Phase (from Jan 2026):** Mandatory purchase of CBAM certificates begins.

Biomaterials

Context

As nations transition toward cleaner manufacturing processes for consumer goods such as plastics and textiles, biomaterials are emerging as the next frontier in materials engineering.

Type of Biomaterial	Key Characteristics	Infrastructure Requirement	Examples
Drop-in Biomaterials	Chemically identical to fossil-based materials	Compatible with existing manufacturing, recycling, and disposal systems	Bio-PET, Bio-PE
Drop-out Biomaterials	Chemically different from petroleum-based materials	Require new processing methods or end-of-life systems (industrial composting or specialised recycling)	Polylactic Acid (PLA), Polyhydroxyalkanoates (PHA)
Novel Biomaterials	Possess new or enhanced properties not found in conventional materials	Often require advanced processing and specialised applications	Self-healing materials, Bioactive implants, Advanced bio-composites

About Biomaterials

- **Biomaterials** are materials derived wholly or partly from **biological sources** (plants, microorganisms, biomass residues) or **engineered using biological processes**.
- They are designed to **replace, complement, or interact with conventional materials** such as petroleum-based plastics, fibres, and chemicals.
- Biomaterials are increasingly used to support **low-carbon, circular, and sustainable manufacturing systems**.
- Common examples include **bioplastics made from plant sugars or starch**, **bio-based fibres used in textiles**, and **medical biomaterials such as biodegradable sutures and tissue scaffolds.**

Rules For Private Afforestation Work On Leased Forest Land

Context

The Union Ministry of Environment has approved a policy allowing both private and public entities to lease forest land for afforestation and timber-related activities without the requirement to pay mandatory environmental compensation charges.

Key Provisions of Amendments

- The change has been implemented through amendments to the **consolidated guidelines** issued under the **Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980** (earlier known as the Forest Conservation Act).
- Assisted Natural Regeneration, including **afforestation and plantation activities** undertaken by both **government and private entities**, will now be classified as **"forestry activities."**
- As a result, such activities are **exempted from the requirements of Compensatory Afforestation (CA)** and **payment of Net Present Value (NPV).**
- Funds collected under **CA and NPV** are deposited with the **State Compensatory Afforestation Fund Management and Planning Authority (CAMPA)**, constituted under the **Compensatory Afforestation Fund (CAF) Act, 2016**.
- State governments are empowered to **develop frameworks for the utilization of such plantations** and **determine mechanisms for revenue sharing**.

Compensatory Afforestation and Related facts

- **Compensatory Afforestation (CA):** Refers to afforestation undertaken to offset the diversion of forest land for **non-forest purposes**.
  - Aims to compensate for the loss on a **"land-for-land" and "tree-for-tree" basis**.
  - Typically carried out on **non-forest land**.
- **Net Present Value (NPV):** A mandatory charge levied to compensate for the loss of **ecosystem services**, such as carbon sequestration, groundwater recharge, and biodiversity.
- **CAMPA Funds:** CAMPA funds are used to compensate for forest land diverted for non-forest purposes through afforestation and forest regeneration.
  - **Legal Basis:** Established under the **Compensatory Afforestation Fund (CAF) Act, 2016**.
  - **Sources:** Collected mainly from **Compensatory Afforestation (CA) charges** and **Net Present Value (NPV)** paid by project developers.
  - **Fund Sharing: 90%** of funds go to **State CAMPA** and **10%** to **National CAMPA** for forest conservation activities.

Aerosols

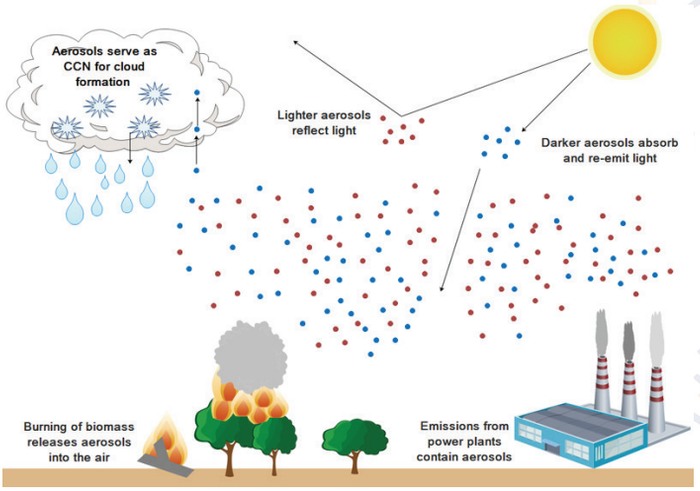
Context

The peer-reviewed study, led by researchers from IIT Madras, shows that high concentrations of aerosols are "invigorating" fog layers over parts of northern India.

About Aerosols

- Aerosols are tiny solid or liquid particles suspended in the atmosphere.

- Their size typically ranges from a few nanometres to several micrometres.
- They can remain airborne from hours to weeks, depending on size and atmospheric conditions.
- **Sources of aerosols**
  - **Natural Sources:** Volcanic ash; Sea salt spray; Desert dust; Forest fires; Pollen and spores
  - **Anthropogenic (Human-made) Sources:** Burning of fossil fuels (coal, diesel); Biomass burning (crop residue, firewood); Industrial emissions; Construction activities; Vehicular exhaust
- **Types of Aerosols**
  - **Sulfate aerosols** – mainly from SO_2 emissions; generally cooling in effect
  - **Carbonaceous aerosols:** *Black carbon* (soot): warming effect, *Organic carbon*: mixed effects
  - **Dust aerosols** – mineral particles from arid regions
  - **Sea salt aerosols** – from oceans
- **Role of Aerosols in Climate**
  - **Direct effect:** Scatter or absorb sunlight Some aerosols cool the Earth (sulfates), others warm it (black carbon)
  - **Indirect effect:**Act as **cloud condensation nuclei**, altering cloud formation, brightness, and rainfall patterns



Impact of Aerosols on Environment & Human Health

- **Environmental Impacts**
  - **Reduced visibility & atmospheric transparency:** Aerosols scatter and absorb sunlight, leading to haze, smog, and dense winter fog over the Indo-Gangetic Plain.
  - **Intensification of winter fog:** High aerosol loading thickens fog layers and prolongs their persistence, disrupting transport and daily activities
  - **Altered monsoon patterns:** Anthropogenic aerosols cool the land surface, weakening the **land–sea temperature gradient** that drives the Indian monsoon.
  - **Suppressed rainfall:** Increased cloud reflectivity (the **"dimming effect"**) reduces solar heating and precipitation, contributing to drying trends in the **Ganga Basin**.
  - **Acid rain formation:** Sulfate and nitrate aerosols lead to acid deposition, damaging soils, crops, and freshwater ecosystems.
  - **Glacier melt acceleration:** Deposition of **black carbon** on Himalayan glaciers lowers albedo, increasing ice melt and affecting long-term water security.
- **Health impact**
  - Fine particles like **$PM_{2.5}$** penetrate deep into lungs
  - Cause respiratory and cardiovascular diseases
  - Increase premature mortality, especially in urban areas

Mycorrhizal Systems

Context

American scientist Toby Kiers has been awarded the Tyler Prize for Environmental Achievement for her pioneering research that reveals how vast underground fungal networks regulate plant health, nutrient exchange, and Earth's climate systems.

About Mycorrhizal Systems

- Mycorrhizal networks are symbiotic associations between fungi and plant roots.
- These fungi form extensive underground webs that connect plants across ecosystems, enabling the exchange of nutrients, water, and chemical signals.
- Toby Kiers' research has shown that these networks are not passive conduits but economically strategic systems, where fungi and plants actively trade resources like carbon, nitrogen, and phosphorus

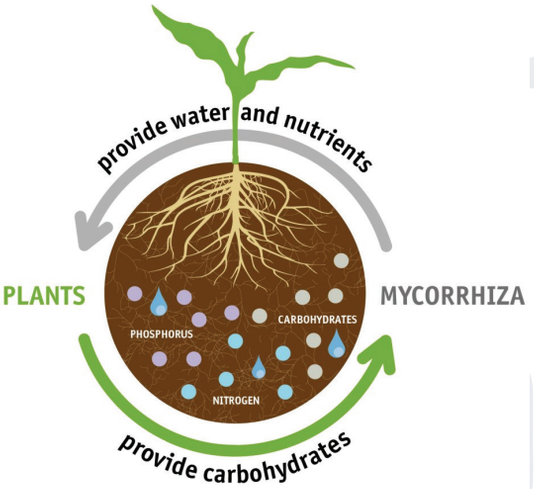
Examples of Mycorrhizal Systems

Type of Mycorrhiza	Plant Examples	Fungal Examples	Key Features
Arbuscular Mycorrhiza (AM / Endomycorrhiza)	Wheat, Rice, Maize, Sunflower, Legumes	*Glomus*, *Rhizophagus*, *Acaulospora*	Most widespread type; penetrates root cells; crucial for phosphorus uptake; dominant in croplands & grasslands
Ectomycorrhiza (ECM)	Pine (*Pinus*), Oak (*Quercus*), Eucalyptus, Birch	*Amanita*, *Boletus*, *Laccaria*, *Russula*	Forms sheath around roots (does not enter cells); common in forests; improves nitrogen & water uptake
Ericoid Mycorrhiza	Tea, Blueberry, Rhododendron, Heather (*Erica*)	*Rhizoscyphus*, *Oidiodendron*	Adapted to acidic, nutrient-poor soils; important in hill & heath ecosystems
Orchid Mycorrhiza	Orchids (*Vanilla*, *Dendrobium*, *Orchis*)	*Rhizoctonia*-like fungi	Essential for seed germination; orchids depend on fungi for early growth

Type of Mycorrhiza	Plant Examples	Fungal Examples	Key Features
Arbutoid Mycorrhiza	Strawberry tree (*Arbutus*)	*Russula*, *Amanita*	Intermediate form between ecto- and endomycorrhiza; found in Mediterranean ecosystems
Ectendomycorrhiza	Willow, Poplar	*Wilcoxina*	Combines features of ecto- and endomycorrhiza; occurs in stressed or disturbed soils

Significance of Mycorrhizal Systems

- **Climate regulation:** Mycorrhizal fungi store large quantities of carbon in soils, making them critical for climate change mitigation.
- **Ecosystem stability:** They enhance plant resistance to drought, disease, and nutrient stress.
- **Biodiversity conservation:** Underground networks support diverse plant communities by redistributing nutrients.
- **Rethinking agriculture:** Insights challenge chemical-intensive farming and promote soil-centric, regenerative practices.



India's Potential

- India's forests, grasslands, and agro-ecosystems host rich but under-studied fungal diversity crucial for soil fertility and crop resilience.
- Mycorrhizal fungi can significantly support climate-smart agriculture, especially in drought-prone and degraded regions.
- Integrating fungal ecology aligns with national priorities such as sustainable agriculture, soil health cards, natural farming, and land restoration under climate commitments.

Tyler Prize

- Often called the "Nobel Prize for the Environment," the Tyler Prize honours individuals whose work delivers transformative insights for environmental protection and sustainability.
- The prize is administered by the University of Southern California and was established by John and Alice Tyler in 1973.

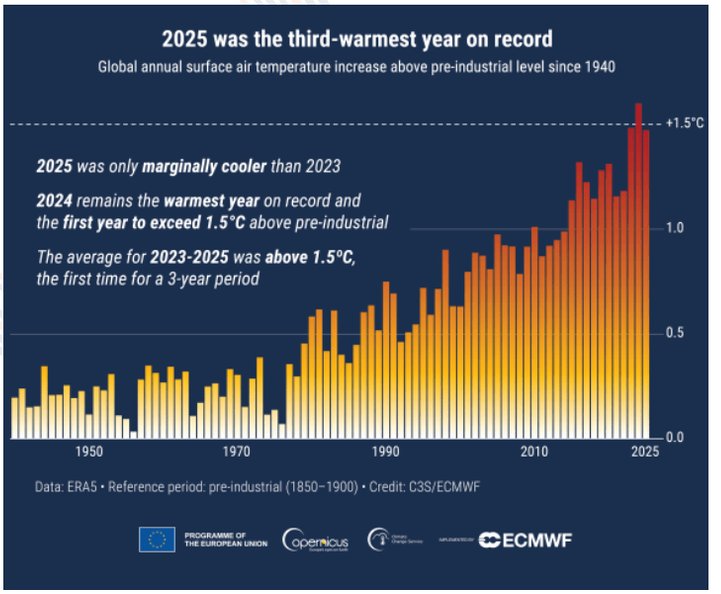
Why the Past Three Years Have Been the Warmest on Record?

Context

According to the Copernicus Climate Change Service, the year 2025 was the third-warmest year ever recorded, with the global mean surface air temperature 1.47°C above pre-industrial levels (1850–1900).

Reasons Behind Record-Breaking Warmth

- **Unabated Accumulation of Greenhouse Gases:** Atmospheric concentrations of CO_2, methane, and nitrous oxide continue to rise due to fossil fuel combustion, deforestation, and industrial activity.
  - CO_2 alone accounts for nearly 70% of observed global warming, making it the single most important driver.
  - Long atmospheric lifetime of CO_2 means warming is cumulative and persistent.
- **Reduced CO_2 Uptake by Natural Carbon Sinks:** Forests, soils, and oceans, which normally absorb nearly half of anthropogenic CO_2 emissions, have shown declining efficiency. Weakened sinks imply more CO_2 remains in the atmosphere, accelerating warming.
  - In 2023, the land carbon sink absorbed almost no CO_2, largely due to: Increased droughts, Intensifying wildfires and Heat stress on vegetation



- **Declining Cooling Effect of Aerosols:** Aerosols (such as sulphates) reflect sunlight and enhance cloud formation, exerting a temporary cooling effect.
  - Global efforts to improve air quality have reduced aerosol emissions, unintentionally revealing "hidden warming". Reduced aerosols = less solar radiation reflected back to space.
  - E.g., Regulations by the International Maritime Organization on low-sulphur marine fuels led to a warming of about 0.04°C.

- **Exceptionally High Ocean Temperatures:** Oceans absorb nearly **90% of excess heat** trapped by greenhouse gases.
  - Sea Surface Temperatures (SSTs) remained **abnormally high even after El Niño ended in 2024**.
  - Warming was observed **beyond the tropical Pacific**, indicating: Global-scale ocean heat accumulation and enhanced **air–sea heat exchange**, warming the atmosphere further
  - Warmer oceans also fuel **marine heatwaves, coral bleaching, and extreme weather events**.
- **Climate Feedback Loops Intensifying Warming:** Positive feedback mechanisms amplified warming trends:
  - Droughts → forest fires → more CO_2 emissions
  - Warmer oceans → reduced CO_2 solubility
  - Ice and snow loss → lower albedo → more heat absorption

Environmental Protection Fund Rules, 2026

Context

The Centre has notified Environmental (Protection) Fund Rules, 2026, under the Environment Protection Act, 1986.

Key Features of the Environmental (Protection) Fund Rules, 2026

- **Source of the Fund:** The Fund is created from penalties imposed for violations under the Environment Protection Act, 1986, Air (Prevention and Control of Pollution) Act, 1981, and Water (Prevention and Control of Pollution) Act, 1974, with penalties ranging from ₹10,000 to ₹15 lakh.
- **Purpose and Scope of Utilisation:** The Rules specify 11 eligible activities, focusing on restorative environmental governance, including monitoring infrastructure, remediation of polluted sites, laboratory and institutional capacity building, and court- or tribunal-mandated studies.
- **Administrative Expenditure Cap:** Administrative costs, including salaries and consultancy expenses of the Project Management Unit, are capped at 5% of the annual fund, ensuring most resources are used for environmental outcomes.
- **Competent Authority:** The Union Minister for Environment, Forest and Climate Change is the competent authority, empowered to approve fund use for listed purposes and any other environmentally necessary activities.
- **Fund Flow and Accounting Mechanism**: Penalty amounts are first credited to the Consolidated Fund of India and then transferred to the Public Account of India, ensuring constitutional and financial transparency.
- **Centre–State Sharing Formula:** Of the penalties collected, 75% is transferred to the concerned State/UT and 25% is retained by the Centre, promoting decentralised, location-specific environmental remediation.
- **Audit and Legislative Oversight**: The Fund is audited by the Comptroller and Auditor General of India, and audit reports are tabled in Parliament and State Legislatures to ensure accountability.

Draft National Electricity Policy (NEP), 2026

Context

The Ministry of Power has released the Draft National Electricity Policy (NEP), 2026 for public consultation, aiming to transform India's power sector in line with the vision of Viksit Bharat @2047, and to replace the existing National Electricity Policy, 2005.

Key Features of Draft NEP 2026

- **Resource Adequacy (RA):** DISCOMs and SLDCs will prepare decentralised resource adequacy plans at state and utility levels, while the CEA will formulate a national-level plan to ensure overall capacity sufficiency.
- **Financial Viability & Economic Competitiveness**: Tariffs will be linked to suitable indices for automatic annual revision, with progressive recovery of fixed costs through demand charges to reduce cross-subsidisation and improve industrial competitiveness.
- **Rationalisation of Cross-Subsidies:** Cross-subsidy and surcharge exemptions are proposed for manufacturing, railways, and metro railways to lower logistics costs and enhance global competitiveness of Indian industry.
- **Distribution Sector Reforms:** Regulatory Commissions may exempt large consumers (≥1 MW load) from Universal Service Obligation, alongside measures to strengthen dispute resolution and reduce regulatory and consumer burdens.
- **Renewable Energy Generation & Storage:** Renewable capacity addition will be promoted through market-based mechanisms, captive plants, peer-to-peer energy trading, and large-scale deployment of storage, including Battery Energy Storage Systems (BESS).
- **Grid Parity for Renewables**: Parity between renewable and conventional energy sources in scheduling and deviation mechanisms is targeted to be achieved by 2030.
- **Thermal Power Transition:** Thermal plants will integrate storage solutions and repurpose older units for grid support, while exploring direct use of steam for district cooling and industrial applications.
- **Nuclear Energy Expansion:** In line with the SHANTI Act, 2025, advanced nuclear technologies, including Small Modular Reactors, will be promoted to achieve 100 GW of nuclear capacity by 2047.
- **Hydropower Development:** The policy emphasises accelerated development of storage-based hydro projects to support flood moderation, irrigation, and long-term energy security.
- **Power Market Strengthening:** A robust regulatory framework for market monitoring and surveillance will be established to prevent collusion, gaming, and abuse of market dominance.
- **Transmission Sector Reforms**: The Draft NEP proposes adoption of advanced technologies, resolution of Right of Way issues, parity of transmission tariffs for renewables by 2030, and utilisation-based allocation of transmission connectivity.
- **Distribution Network Modernisation:** Measures include achieving single-digit AT&C losses, shared distribution networks, creation of a Distribution System Operator (DSO), and N-1 redundancy in large cities.

- **Grid Operations**: Functional unbundling of State Transmission Utilities and alignment of State Grid Codes with the Indian Electricity Grid Code are proposed to improve efficiency and reliability.
- **Cybersecurity and Data Sovereignty:** A robust cybersecurity framework is mandated, with compulsory domestic storage of power sector data to ensure system resilience and data sovereignty.

Greenhouse Gases Emission Intensity Target (Amendment) Rules, 2025

Context

The Ministry of Environment, Forest, and Climate Change has notified Greenhouse Gases Emission Intensity Target (Amendment) Rules, 2025 under the Environment (Protection) Act, 1986.

Key Features of Greenhouse Gases Emission Intensity Target (Amendment) Rules, 2025

- **Sectoral Inclusion:** Four additional sectors—**petroleum refineries, petrochemicals, textiles, and secondary aluminium** have been brought under the mandatory greenhouse gas emission reduction regime, expanding the list of obligated sectors beyond the earlier coverage of **aluminium, cement, chlor-alkali, and pulp & paper industries.**
- **Coverage of Industrial Units**: A total of 208 industrial units including 173 textile units, 21 petroleum refineries, 11 petrochemical units, and 3 secondary aluminium units have been brought under the compliance framework.
- **Emission Intensity Targets:** These units are required to reduce GHG emissions per unit of product starting from FY 2025–26, with overall reduction targets in the range of 3–7% by FY 2026–27 compared to the 2023–24 baseline.
- **Legal Framework:** The rules have been notified under the compliance mechanism of the Carbon Credit Trading Scheme, 2023, making emission intensity reductions legally binding.
- **Penalty for Non-Compliance:** Industrial units that fail to meet the prescribed emission intensity targets will be liable to pay penalties as per the amended rules.

Carbon Credit Trading Scheme (CCTS)

- **Nodal Ministry:** Ministry of Power
- **Aim:** To develop the Indian Carbon Market (ICM), where a framework will be established to decarbonize the Indian economy by pricing the Green House Gas (GHG) emissions through trading of the Carbon Credit Certificates.
- **Institutional Structure:**
  - The governance and oversight of the Indian Carbon Market (ICM) is managed by the **National Steering Committee of Indian Carbon Market (NSCICM)**, chaired by the Secretary of the Ministry of Power and co-chaired by the Secretary of the MoEF&CC
  - The **Bureau of Energy Efficiency (BEE)** acts as the administrator for the ICM, responsible for developing GHG emissions trajectory and targets for obligated entities.
  - The **Grid Controller of India Limited** is the designated agency for maintaining the ICM Registry and overseeing transactions among obligated entities.
  - The **Central Electricity Regulatory Commission (CERC)** acts as the regulator for carbon credit trading.

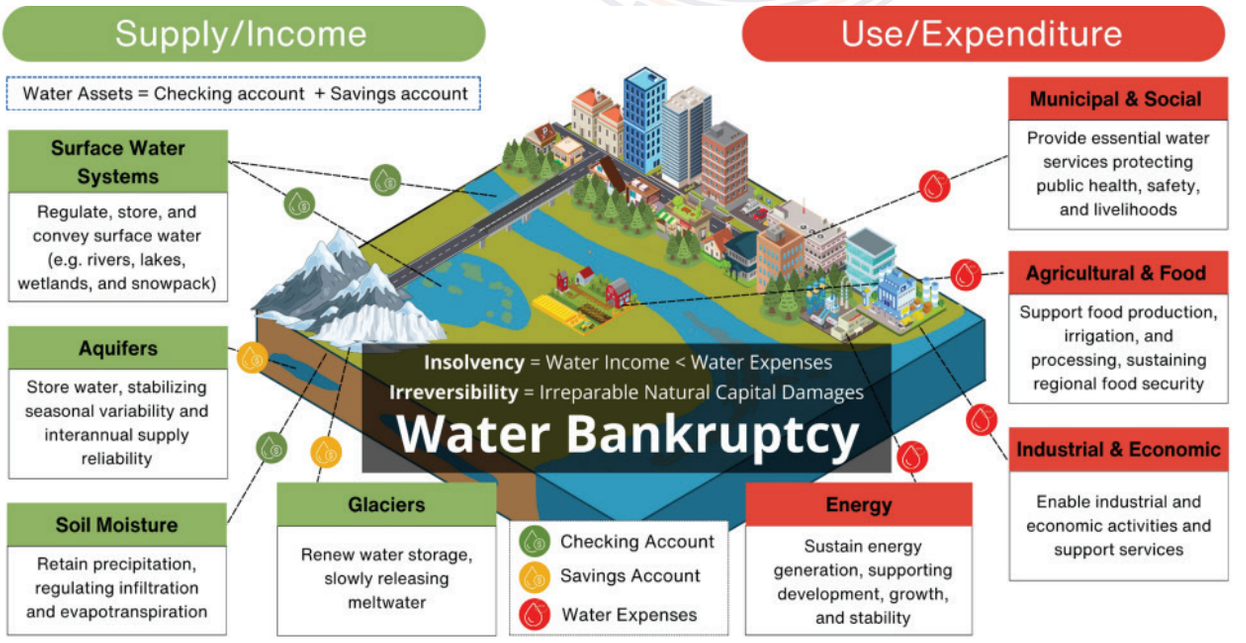
Global Water Bankruptcy

Context

The United Nations University Institute for Water, Environment and Health (UNU-INWEH) released the Global Water Bankruptcy: Living Beyond Our Hydrological Means in the Post-Crisis Era.

Key Highlights

- The global human–water system as a whole has already entered the era of Global Water Bankruptcy
- About 2.2 billion people still lack safely managed drinking water, 3.5 billion lack safely managed sanitation, and about 4 billion people experience severe water scarcity for at least one month per year.



- Nearly 75% of the world's population lives in countries classified as water-insecure or critically water-insecure with progress toward SDG 6 is far off track for 2030.
- **Factors Leading to Water Bankruptcy**
  - **Slow-Onset Depletion:** Persistent overuse of surface and groundwater gradually erodes storage and quality, with warning signs often ignored until irreversible thresholds are crossed.
  - **Infrastructure-Driven Overshoot:** Large dams and inter-basin transfers enable expansion of water use beyond sustainable limits.
  - **Ecological Liquidation:** Degradation of wetlands, floodplains, forests, and soils boosts short-term productivity while undermining long-term water storage and buffering capacity.
  - **Climate-Amplified Overshoot:** Climate change intensifies existing pressures by reducing reliable water supply and increasing variability in already overexploited systems.

Water Bankruptcy vs Water Stress vs Water Crisis

- **Water Stress:** High demand relative to supply, with impacts that are largely reversible through improved management.
- **Water Crisis**: Shock-driven disruptions that temporarily overwhelm water systems but can be restored through emergency and recovery measures.
- **Water Bankruptcy:** A chronic condition marked by structural depletion and long-term ecological damage.

Land Subsidence in India's River Deltas

Context

A new international study published in Nature has found a systemic and widespread decline in land elevation across India's major river deltas.

Key Highlights of the Study

- While deltas naturally subside due to sediment compaction, isostatic adjustment, and tectonic processes, the study emphasises that human interventions have dramatically accelerated this process
- Confirmed active subsidence in the Ganges–Brahmaputra, Brahmani, Mahanadi, Godavari, Cauvery, and Kabani deltas.
- More than 90% of the Ganges–Brahmaputra, Brahmani, and Mahanadi delta areas were found to be sinking.
- In the Ganges–Brahmaputra, Brahmani, Mahanadi, Godavari, and Kabani deltas, the average land subsidence rate exceeded regional sea-level rise, significantly amplifying flood and inundation risks.
- In the Brahmani and Mahanadi deltas, 77% and 69% of the area respectively is sinking at rates greater than 5 mm per year.
- In Kolkata, subsidence rates matched or exceeded the delta average due to the weight of urban infrastructure, groundwater extraction, and resource consumption.
- **Drivers of Delta Subsidence**
  - **Unsustainable groundwater extraction:** Particularly severe in the Ganges–Brahmaputra and Cauvery deltas.
  - **Rapid urbanisation:** The primary driver in the Brahmani delta.
  - **Reduced sediment supply:** Affecting the Mahanadi and Kabani deltas due to upstream dams and river regulation.
  - **Population pressure:** Intensifying land and water stress across multiple deltas.

Atlas of Climate Adaptation in Indian Agriculture (ACASA-India)

Context

The government has launched the Atlas of Climate Adaptation in Indian Agriculture (ACASA-India).

About Atlas of Climate Adaptation in Indian Agriculture (ACASA-India)

- The Digital Climate Atlas is a **geospatial, decision-support platform** that integrates climate, disaster, and socio-economic datasets.
- It provides **district- and sub-district-level climate risk profiles**, covering hazards such as heatwaves, floods, droughts, cyclones, and sea-level rise.
- The platform aims to support **evidence-based policymaking** for climate adaptation, infrastructure planning, and disaster risk reduction.

About National Innovations in Climate Resilient Agriculture (NICRA)

- The National Innovations in Climate Resilient Agriculture (NICRA) was initiated in 2011 by the Indian Council of Agricultural Research (ICAR).
- **Objectives:**
  - To strengthen the adaptive capacity and resilience of Indian agriculture to climate variability and long-term climate change.
  - To test, validate, and demonstrate climate-resilient technologies and practices directly on farmers' fields under real agro-climatic conditions.
- The project consists of **four components** viz. Strategic Research, Technology Demonstration, Capacity Building and Sponsored/ Competitive Grants.

Solid Waste Management (SWM) Rules, 2026

Context

The Union Ministry of Environment, Forest and Climate Change has notified the Solid Waste Management (SWM) Rules, 2026, superseding the Solid Waste Management Rules, 2016.

Key Provisions of Solid Waste Management (SWM) Rules, 2026

- **Four-stream segregation at source:** Mandatory segregation of waste into wet waste, dry waste, sanitary waste and special care waste at the point of generation.
- **Clear definition of Bulk Waste Generators (BWGs):** BWGs are defined based on built-up area (≥20,000 sq. m), water

consumption (≥40,000 litres/day) or waste generation (≥100 kg/day).

- **Extended Bulk Waste Generator Responsibility:** BWGs must process wet waste on-site where feasible or ensure scientific processing through authorised agencies and obtain certification.
- **Polluter Pays Principle:** Environmental compensation will be imposed for non-compliance such as non-segregation, false reporting or operating without authorisation.
- **Centralised online monitoring system:** A national portal will track waste generation, collection, transport, processing and disposal, along with online registration and reporting.
- **Material Recovery Facilities (MRFs) recognised:** MRFs are formally integrated into urban waste management systems to enhance recycling and resource recovery.
- **Promotion of Refuse Derived Fuel (RDF):** Industries such as cement and waste-to-energy plants are mandated to progressively increase the use of RDF from 5% to 15%.
- **Restrictions on landfilling:** Only inert, non-recyclable and non-recoverable waste is permitted in landfills, with higher charges for unsegregated waste.
- **Legacy waste management:** Mandatory biomining and bioremediation of old dumpsites with periodic progress reporting.
- **Special provisions for hilly areas and islands:** Tourist waste management measures, decentralised processing and user charges linked to local carrying capacity are mandated.
- **Strengthened institutional framework:** Central and State-level committees headed by senior officials are created to ensure effective implementation and monitoring.

Uniform Consent Guidelines under Air and Water Acts

Context

The Government has amended the Uniform Consent Guidelines notified under the Air (Prevention and Control of Pollution) Act, 1981 and the Water (Prevention and Control of Pollution) Act, 1974 to further streamline the consent mechanism for industries across all States and Union territories.

Key highlights of the Amendment

- **Uniform national consent framework:** The amended guidelines reinforce a common, transparent and accountable framework for granting, refusing or cancelling Consent to Establish (CTE) and Consent to Operate (CTO) across the country.
- **Consolidated Consent and Authorisation:** State Pollution Control Boards (SPCBs) can issue a single integrated approval covering consents under the Air and Water Acts along with authorisations under Waste Management Rules, reducing multiple applications and approval timelines.
- **Validity of Consent to Operate (CTO):** Once granted, CTO will remain valid until cancelled, eliminating the need for periodic renewals while ensuring continued enforcement through inspections and cancellation in case of violations.
- **Reduced approval timelines:** The processing time for granting consent to **Red Category industries** has been reduced from 120 days to 90 days.
- **Role of Registered Environmental Auditors:** Certified Registered Environmental Auditors under the Environment Audit Rules, 2025 are authorised to conduct site inspections and compliance verification, supplementing SPCB inspections.
- **Special provisions for Micro and Small Enterprises:** For MSMEs located in notified industrial estates, Consent to Establish is deemed granted upon submission of a self-certified application, as the land is already environmentally assessed.
- **Shift to site-specific siting criteria:** Rigid minimum-distance norms are replaced with site-specific environmental assessment, allowing authorities to prescribe safeguards based on local ecological and social conditions.
- **Flexible CTO fee structure:** States and UTs may levy a one-time Consent to Operate fee for a period ranging from 5 to 25 years, reducing repetitive administrative and financial burdens.
- **Clarity in capital investment definition:** A uniform definition of 'capital investment' has been introduced to remove ambiguity in consent fee assessment and ensure consistency across States.
- **Retention of environmental safeguards:** Provisions for refusal or cancellation of consent remain intact in cases of non-compliance, environmental damage, violation of conditions or location in prohibited areas.

Two New Ramsar Sites Added

Context

Patna Bird Sanctuary in Etah (Uttar Pradesh) and Chhari-Dhand in Kutch (Gujarat) have been designated as Ramsar sites. With these additions, India now has 98 Ramsar sites.

About Patna Bird Sanctuary

- **Type:** Natural Freshwater
- **Location:** Patna Vihar Bird Sanctuary is a protected sanctuary in Etah district in Uttar Pradesh.
- The entire lake area gets covered by profuse growth of macrophytic vegetation of water hyacinth and Potamogeton sp. during summers.
- The important aquatic birds inhabiting the lake are Lesser Whistling-Duck, Greylag Goose, Comb Duck,Ruddy Shelduck ,Gadwall,Eurasian Wigeon, Indian Spot-billed Duck, Northern Shoveler, Northern Pintail.

About Chhari Dhand Wetland Reserve

- **Type:** seasonal desert wetland; Chhari means "salty" and Dhand means "shallow wetlands".
- **Location:** on the edge of the arid Banni grasslands and the marshy salt flats of the Rann of Kutch in Kutch district, Gujarat
- Home to endangered species such as Dalmatian Pelican, Oriental Darter, Black-necked Stork, and Indian Skimmer
- Also attracts chinkara, wolves, caracal, desert cats, and desert foxes

Ramsar Convention

- The Ramsar Convention is an international treaty for the conservation and wise use of wetlands, adopted in 1971 in the city of Ramsar, Iran.
- It aims to halt the global loss of wetlands and ensure their sustainable management through national action and international cooperation.
- Member countries designate important wetlands as "Ramsar Sites" to give them priority for conservation and ecological protection.
- It promotes the concept of "wise use", meaning wetlands should be used in a way that maintains their ecological character while supporting sustainable development.

Accelerating Hydro Pumped-Storage: CEA's Roadmap to 100 GW

Context

The Central Electricity Authority (CEA) has released a "Roadmap to 100 GW of Hydro Pumped Storage Projects by 2035-36," proposing a significant regulatory reset to address India's critical energy storage deficit and stabilize a renewable-heavy grid.

Rationale for Energy Storage

- **Intermittency Challenge:** With non-fossil fuel generation reaching 50% in 2025, the intermittent nature of solar and wind requires robust storage to maintain grid frequency and stability.
- **Storage Demand-Supply Gap:** India's projected storage need is 161 GW by 2034-35, whereas current operational PSP capacity is a mere 7.1 GW (as of December 2025).
- **Strategic Advantages:** PSPs offer long-duration storage capabilities and a service life of nearly 100 years, significantly outlasting chemical battery alternatives.

Proposed Regulatory Reforms

To meet the ambitious 100 GW target, the CEA proposes easing existing environmental constraints:

- **ESZ Integration:** Permitting PSP development within Eco-Sensitive Zones (ESZs) and within a 10km aerial distance of protected areas.
- **Differentiated Clearance Framework:** Treating PSPs (particularly off-river or closed-loop systems) as a distinct category from conventional hydropower due to lower human displacement and lower ecological footprints.
- **Land Acquisition Measures:** Utilizing degraded forest land for compensatory afforestation and establishing a National Land Bank to expedite project timelines.

Comparative Analysis: PSP vs. BESS

The CEA prioritizes PSPs for grid-scale, long-duration storage based on economic and operational reliability:

Feature	Pumped Hydro Storage (PSP)	Battery Energy Storage (BESS)
Capital Cost	₹1.0 Crore / MWh	₹1.5 - ₹1.75 Crore / MWh
Service Life	100 Years	10 - 15 Years
Operational Duration	Long-duration (>4-6 hours)	Short-duration (<4 hours)
Environmental Impact	High land/forest footprint	High chemical waste & mineral dependency

Rules for pvt afforestation work on forest land eased

Context

The Union Ministry of Environment, Forest and Climate Change (MoEF&CC) notified significant amendments to the consolidated guidelines of the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980.

Key Highlights of the Amendment

- **Reclassification of Status:** Assisted natural regeneration, afforestation, and plantations—whether by government or non-government entities—are now legally treated as "forestry activities."
- **Exemption from CA and NPV:** Because these are no longer deemed "non-forest use," the requirements for Compensatory Afforestation (CA) (land-for-land) and Net Present Value (NPV) (ecosystem service fees) are not applicable.
- **Detailed Project Reports (DPR):** States must approve these projects via a DPR that aligns with existing Working Plans, specifying species, area, and "silviculturally available sustainable harvest."
- **State Discretion:** State governments are empowered to devise their own frameworks for the utilization of these plantations and create revenue-sharing arrangements with private partners.

Additional information

- **Compensatory Afforestation (CA):** CA refers to afforestation done in lieu of the diversion of forest land for non-forest purposes. It is designed to compensate for the loss of "land by land" and "trees by trees," typically executed on non-forest land.
- **Net Present Value (NPV):** NPV is a mandatory fee intended to compensate for the loss of vital ecosystem services such as carbon sequestration, water recharge, and biodiversity.
- **Management of Funds:** All funds collected towards CA and NPV are deposited in the **State Compensatory Afforestation Fund Management and Planning Authority (CAMPA)**, established under the **Compensatory Afforestation Fund (CAF) Act, 2016**.
  - State governments are empowered to devise specific frameworks for the **utilization of these plantations** and for subsequent **revenue sharing** with stakeholders.

Species in News

GALAXY FROG

- **Distribution:** The only known species of its genus (*Melanobatrachus indicus*), endemic to the **south-western Western Ghats**.
  - Primarily occurs in **high-altitude evergreen forests and shola ecosystems**.
- **Characteristics:**
  - A **rare frog species** with a **slender, elongated body** of nearly uniform width.
  - **Terrestrial in nature**, closely associated with **leaf litter, rocks, and moist ground cover** in tropical evergreen forests.
- **Conservation status: Vulnerable** on the **IUCN Red List**.

WHITE BELLIED HERON

- **Distribution:** It inhabits **wetlands within tropical and subtropical forests** along the **foothills of the eastern Himalayas**.
  - Its distribution is mainly confined to **northeast India and Bhutan**, with limited presence in adjoining regions.
- **Characteristics:**
  - It is a **large heron species** and the **second-largest living heron** in the world.
  - It is also known as the **imperial heron** or **great white-bellied heron**.
  - The species is an important **ecological indicator**, reflecting river health, water quality, fish population status, & overall environmental conditions
  - It primarily feeds on **fish found in fast-flowing river rapids**.
- **Major threats** include:
  - Habitat loss and degradation
  - Conversion of wetlands for agriculture
  - Expansion of human settlements
  - Increasing anthropogenic disturbance
- **Conservation Status**:
  - **IUCN Red List:** Critically Endangered
  - **Wildlife (Protection) Act, 1972:** Schedule I

AMAZON'S STINGLESS BEES

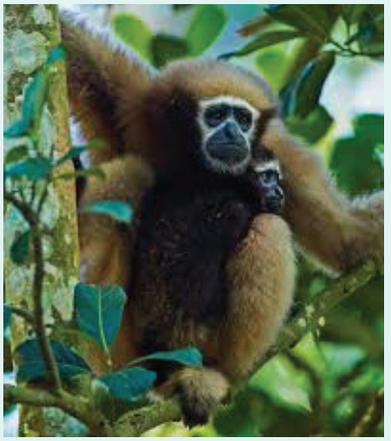
- **Distribution:** Native to the **Amazon rainforest**, spread across countries such as **Brazil, Peru, Colombia, Ecuador, and Bolivia**.
  - Commonly found in **tropical lowland rainforests**, nesting in tree hollows, logs, underground cavities, and sometimes human-made structures.
- **Characteristics:**
  - Belong to the group of **stingless bees (Meliponini)**; they lack functional stingers and rely on biting or resin use for defense.
  - Smaller than honey bees and highly **social**, living in perennial colonies with a queen, workers, and drones.
  - Produce **stingless bee honey**, which is more liquid, aromatic, and acidic than conventional honey and valued for medicinal properties.
  - Play a **critical ecological role as pollinators**, especially for native Amazonian plants and forest regeneration.
  - Traditionally managed by indigenous communities through **meliponiculture**.
- Amazonian stingless bees have become the first insect in the world to be granted legal rights, after two municipalities — Satipo and Nauta — in Peru passed an ordinance.

GANGETIC RIVER DOLPHIN

- Found in Ganges and tributaries of the river Brahmaputra.(In India and Bangladesh)
- In the river Ganga they are found in the states of UP, MP, Rajasthan, Bihar, Assam, Jharkhand, and West Bengal.
- **Characteristics**
  - They only live in fresh water
  - Act as an indicator species, indicating the health of the river.
  - The female Gangetic Dolphins are larger than males.
  - They are blind and hunt using ultrasonic sound.
  - It is also known as susu. Susu refers to the noise made by the dolphin when it breathes.
  - National aquatic animal of India.
- **Conservation status:**
  - **IUCN**: Endangered
  - **CITES**: Appendix I
  - **Wildlife Protection Act 1972**: Schedule I

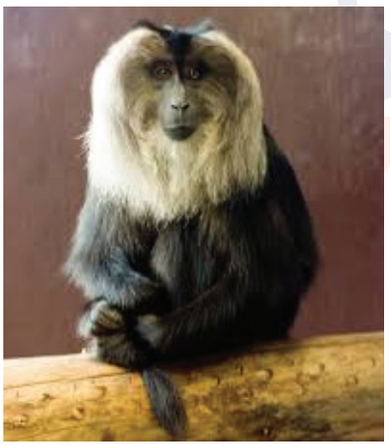
INDIAN SKIMMER

- Found along large rivers and wetlands in India and Bangladesh
- Strongly associated with the Ganga river system and tributaries of the Brahmaputra
- In India, recorded in Uttar Pradesh, Madhya Pradesh, Rajasthan, Bihar, Jharkhand, Assam, and West Bengal
- **Characteristics**
  - A medium-sized water bird with a striking orange bill, where the lower mandible is longer than the upper
  - Feeds by flying low over water and "skimming" the surface to catch fish — a unique feeding adaptation
  - Nests directly on sandy river islands and sandbars, making it highly vulnerable to floods and human disturbance
  - Breeding success depends on natural river flow regimes and availability of undisturbed sandbars
  - Acts as an indicator species for river health
- **Conservation Status**
  - **IUCN Red List:** Endangered
  - **CITES:** Appendix I
  - **Wildlife (Protection) Act, 1972:** Schedule I



HOOLOCK GIBBON

- Only ape found in India (northeast)
- **Two types:** Western Hoolock Gibbon and Eastern Hillock Gibbon
- **Distribution:** Native to eastern Bangladesh, Northeast India, Myanmar, and Southwest China.
- **Characteristics**
  - smallest and swiftest apes
  - Characterized by their prominent white eyebrows, elongated arms, and a throat pouch used for vocalizing
- **Conservation Status:**
  - **IUCN:** Western Hoolock Gibbon-Endangered; Eastern Hoolock Gibbon-Vulnerable
  - **CITES:** Appendix I
  - **Wildlife Protection Act, 1972:** Schedule I
- **Conservation Programme:** IUCN's Global Gibbon Network Initiative



LION-TAILED MACQUE

- An Old World monkey (not an ape) endemic to the Western Ghats of South India.
- **Distribution:** Found only in the rainforests of Karnataka, Kerala, and Tamil Nadu.
  - Silent Valley National Park (Kerala) holds the largest single viable population.
  - Other key areas include Kalakkad-Mundanthurai Tiger Reserve (TN) and Sirsi-Honnavara (Karnataka).
- **Characteristics**
  - Distinguished by a striking silver-white mane that encircles the face from cheeks to chin (hence the name "Beard Ape").
  - Has a medium-length tail with a black lion-like tuft at the end.
  - Equipped with cheek pouches that can store as much food as their stomach.
  - It is the most arboreal (tree-living) of all macaque species
  - Lives in hierarchical groups of 10–20 members. Dominant males use a distinctive "whoop" call to advertise territorial boundaries.
- **Conservation Status**
  - **IUCN Red List:** Endangered
  - **CITES:** Appendix I
  - **Wildlife Protection Act, 1972:** Schedule I

ROYLE's PIKA

- A small, tail-less mountain mammal belonging to the Lagomorpha order (relatives of rabbits and hares).
- **Distribution**: Found across the **Himalayan Arc** (2,400–5,000 m elevation).
  - Northwestern Pakistan, Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh, Nepal, and Tibet.
- **Characteristics**
  - called the "Himalayan Mouse Hare."
  - Known as the **"Sentinel of Climate Change,"** scientists are monitoring Royle's Pika as a primary indicator of Himalayan warming.
  - Crepuscular: Most active during dawn and dusk to avoid the midday heat.
  - Unlike many alpine mammals, they do not hibernate.
  - They are folivores (leaf-eaters), primarily consuming moisture-loving Himalayan herbs and C3 plants
- **Conservation Status**
  - **IUCN Red List:** Least Concern

DARWIN'S BLACK SPIDER

- First discovered in Madagascar in 2009.
- **Size:** They exhibit extreme sexual dimorphism. Females are large (approx. 18-22 mm), while males are tiny (approx. 6 mm), weighing about 1/10th as much.
- **Appearance**: They are masters of camouflage, with bumpy, grayish-brown bodies that mimic the bark of the trees they live on.
- They build the **largest orb webs ever recorded**, sometimes spanning up to 2.8 square meters.
- These spiders are unique because they spin their webs directly across rivers and lakes. They cast a single bridge line of silk that can stretch up to 25 meters to anchor on the opposite bank.
- The spider's silk has a tensile strength of 1.6 gigapascals, outperforming steel and iron.
- Only large adult females produce this high-performance silk.

FISHING CAT

- A medium-sized wild cat specifically adapted for life in wetlands; it is approximately **twice the size** of a typical house cat.
- **Distribution:** Native to South and Southeast Asia; found in fragmented populations across **India, Sri Lanka, Bangladesh, Nepal, Myanmar, and Thailand**.
  - **In India:** Major populations are found in the **Sundarbans** (West Bengal), **Chilika Lake** (Odisha), and the **Coringa/Godavari Mangroves** (Andhra Pradesh).
- **Characteristics:**
  - Characterized by a **double-layered coat** (to keep skin dry), **partially webbed feet** for swimming, and short, rounded ears with a white spot on the back.
  - Primarily nocturnal and elusive; it is the **State Animal of West Bengal** (declared in 2012).
  - Unlike most felines, it is a proficient swimmer and diver, with **fish** making up over 75% of its diet, though it also preys on frogs, crustaceans, and snakes.
- **Conservation Status:**
  - **IUCN Red List: Vulnerable**
  - **CITES: Appendix II**.
  - **Wildlife Protection Act, 1972: Schedule I**
- **Conservation Programme: Fishing Cat Conservation Alliance (FCCA)** and **The Fishing Cat Project (TFCP)** (Active in West Bengal and Odisha).

BACTRIAN CAMEL

- Large, even-toed ungulates, historically serving as the primary pack animal for caravans crossing the cold deserts of the Silk Road.
- **Distribution:** Native to the steppes and cold deserts of **Central Asia** (Mongolia, China, Kazakhstan).
  - **In India:** The species is found **only in the Nubra Valley of Ladakh**. Descended from animals left behind after the closure of the Silk Route in the 1950s, the population has grown to roughly **300–400** individuals.
- **Characteristics:**
  - Characterized by its **double humps** (storing fat, not water), a thick **shaggy winter coat** that sheds in large tufts during summer, and **closable nostrils** and long eyelashes to block sand and snow.
  - Uniquely adapted to extreme temperature fluctuations, surviving from **-40°C to 40°C**.
  - It can drink saline water and eat snow to meet its hydration needs.
  - In 2025, the **Indian Army** officially inducted these camels into the Remount Veterinary Corps for high-altitude patrols and "last-mile" logistics in Eastern Ladakh.
- **Conservation Status**
  - **IUCN Red List: Critically Endangered** (for the *Wild* Bactrian Camel, *Camelus ferus*)
  - **CITES: Appendix I** (for the Wild species).
  - **Wildlife Protection Act, 1972: Schedule I**

MADRAS HEDGEHOG

- Also known as the **Bare-bellied Hedgehog**, it is a small, spiny mammal and one of only three hedgehog species found in India.
- **Distribution: Endemic to Peninsular India**, specifically in the semi-arid scrublands, thorn forests, and red-sand dunes (*Theri Kaadu*) of **Tamil Nadu, Kerala, Andhra Pradesh, Telangana, and Karnataka**.
- **Characteristics:**
  - Characterized by its **"bare" pale belly** (lacking quills), short stiff spines on its back, a pig-like snout, and large ears that help in heat dissipation.
  - Unlike the Indian Hedgehog, it has a noticeably darker face and more prominent ears.
  - When threatened, it curls into a **spiny ball** for protection against predators like foxes and mongooses.
  - It is a nocturnal scavenger and a "farmer's friend," consuming up to **40 insects per hour**, including beetles, ants, and termites.
  - To survive the harsh southern summers and periods of water scarcity, it undergoes **Aestivation** (summer sleep) between May and June, reducing its metabolic rate.

- **Conservation Status**
  - **IUCN Red List: Least Concern** (though researchers warn its population is declining and poorly documented).
  - **CITES:** Not listed.
  - **Wildlife Protection Act (WPA), 1972: Schedule II**

GREATER FLAMINGO

- **Distribution:** Largest and most widespread flamingo species found across Africa, southern Europe, and South and West Asia.
  - In India, it is commonly seen in the Gujarat coast, Rann of Kutch, Pulicat Lake, Chilika Lake, and the Gulf of Mannar region.
- **Characteristics:**
  - Prefers **shallow saline and brackish water bodies** such as **lagoons, estuaries, salt pans, and coastal wetlands**.
  - Pink coloration comes from **carotenoid pigments** in their diet (mainly algae, plankton, and small crustaceans).
  - **Highly social**, living in large colonies.
  - These species form monogamous pairs.
- **Conservation Status:** Listed as Least Concern (IUCN Red List)

News in Short

Kaziranga Elevated Corridor Project

Context: Prime Minister performed Bhoomi Pujan of the Kaziranga Elevated Corridor Project

About the Project

- The Kaziranga Elevated Corridor Project, officially the 4-laning of Kaliabor–Numaligarh section of NH-715, is a landmark green infrastructure initiative worth over ₹6,950 crore.
  - **Key components: 35 km Elevated Wildlife Corridor** through **Kaziranga National Park**
  - **21 km bypass section**
  - **30 km widening** of existing highway (2 lanes → 4 lanes)
  - **Districts covered:** Nagaon, Karbi Anglong and Golaghat

New Crustacean Species

Context: A new genus and species of microscopic crustacean has been discovered from the Kavaratti lagoon in Lakshadweep Islands.

Key Findings

- The organism has been named Indiaphonte bijoyi.
- It belongs to the family Laophontidae, under the class Copepoda and order Harpacticoida.
- It is microscopic and can be studied only using a microscope.
- Classified as Meiofauna: Tiny invertebrates <1 mm in size, they live in sediments of marine and freshwater ecosystems
- Discovered from lagoon sediments of Kavaratti Island.
- Play a crucial role in: Nutrient cycling, Sediment health and in Marine food webs
- Also act as indicators of ecosystem health despite microscopic size

Use of Tools in Animals

Context: A recent study published in Current Biology has sparked scientific interest after documenting sophisticated tool use by a cow in Austria.

Animals Known to Use Tools

- **Primates:** Chimpanzees using sticks or grass to extract termites, first observed by Jane Goodall.
- **Birds:** Crows and parrots shaping sticks or wires to retrieve food.
- **Marine Mammals:** Whales using bubbles or objects to aid feeding.
- **Large Mammals**: Elephants using branches to scratch or swat insects.
- **Monkeys in India:** Bonnet macaques observed manufacturing and using tools in the wild.

Coconut Root Wilt Disease

Context: Phytoplasma-induced root wilt disease has destroyed large tracts of coconut-growing areas in Karnataka, Tamil Nadu, and Kerala

About Coconut Root Wilt Disease

- Coconut root wilt is a chronic disease caused by phytoplasma, spread by sap-sucking insect vectors and facilitated by continuous coconut belts, wind movement, and climatic stressors like rising temperatures.
- It primarily affects major coconut-growing states like Kerala, Karnataka, and Tamil Nadu
- The disease weakens palms, reduces nut yield, and disrupts intercropping systems, increasing vulnerability of shade-dependent crops when the coconut canopy is lost.

G7 Critical Minerals Ministerial	**Context:** The Union Minister for Electronics and Information Technology will participate in the G7 Critical Minerals Ministerial Meeting. **About G7 Critical Minerals Ministerial** • The G7 Critical Minerals Ministerial is a high-level meeting of G7 countries to strengthen cooperation on secure, resilient and sustainable supply chains for critical minerals essential for clean energy, digital technologies and defence. • It aims to reduce over-dependence on a few countries for critical minerals and address supply chain vulnerabilities through diversification, transparency and trusted partnerships. • It complements initiatives such as the Minerals Security Partnership (MSP) and broader G7 commitments on climate action and economic security.
Bio Bitumen	**Context:** India has become the first country in the world to commercially produce bio-bitumen in road construction. **About Bio-Bitumen** • Bio-bitumen is a sustainable alternative to conventional bitumen, produced using organic and renewable materials. Traditional bitumen is a black, adhesive material obtained from the distillation of crude oil. • **Raw Materials**: Derived from sources such as agricultural residue, lignin, bio-char, and bio-oil. • **Benefits:** – Lowers crude oil imports – Helps tackle stubble burning by utilising agricultural waste – Supports the bio-economy and circular economy • **Applications:** Used in road construction (paving) and waterproofing works.
Arctic Report Card 2025	**Context:** The National Oceanic and Atmospheric Administration (NOAA) has released its 2025 Arctic Report Card **Key Highlights** • **Record Warming:** The period between October 2024 and September 2025 saw the **highest surface air temperatures** recorded in the Arctic since 1900. • **Atlantification:** Warmer, saltier Atlantic waters are increasingly infiltrating the Arctic Ocean, weakening stratification and **accelerating sea-ice melt** from below. • **Rusting Rivers:** Thawing permafrost is releasing iron and acids into over **200 Alaskan watersheds**, turning clear rivers orange and threatening local fish and water supplies. • **Arctic Greening:** Warming temperatures are driving a long-term **increase in tundra vegetation** productivity and abundance, marking a significant shift in the region's ecology. • **Sea Ice Decline:** Winter sea ice reached its **lowest annual maximum extent** on record in 2025, with multi-year thick ice having declined by 95% since the 1980s.
Berkeley Earth Annual Temperature Report 2025	**Context:** The 2025 Annual Temperature Report released by Berkeley Earth presents a stark assessment of the global climate system. **Key Highlights** • **Warmest La Niña year on record**: Global temperatures in 2025 exceeded all previous La Niña years, showing that **anthropogenic warming now overwhelms natural climate variability**. • **Extreme heat becoming the norm**: About **770 million people** were exposed to extreme heat, with heatwaves occurring across continents even during a traditional "cooling phase." • **Disproportionate global impacts and warning**: The **Global South** faced the highest risks to food, health, and labour productivity, while the report warns that **only sustained emission reductions**, not natural cycles, can curb escalating heat extremes.
Namami Gange Mission's Aquatic Biodiversity Conservation Initiatives	**Context:** The Ministry of Jal Shakti inaugurated a suite of landmark initiatives at the Wildlife Institute of India (WII), Dehradun, strengthening scientific and community-led efforts to protect freshwater ecosystems. **Key Highlights** • **Aqua Life Conservation Monitoring Centre:** A dedicated centre has been established at WII to monitor and conserve biodiversity in the **Ganga and other rivers**. It will support data-driven policymaking, research, and conservation strategy. • **Dolphin Rescue Ambulance:** A specialised, scientifically equipped vehicle for rapid response to distressed **Ganga dolphins** was inaugurated. • **Freshwater Ecology Master's Programme:** Under Namami Gange and WII's partnership, a **two-year Master's programme** in Freshwater Ecology and Conservation was launched. • **Indian Skimmer Conservation Project:** Launched in partnership with the **Bombay Natural History Society**, this initiative aims to protect rare riverine bird species, expanding the conservation focus beyond aquatic fauna to the broader river ecosystem. Press Information Bureau.

Places in News

BULGARIA

News: Bulgaria officially became the 21st member of the Eurozone, replacing the Bulgarian lev with the Euro (€).

About Bulgaria

- **Location:** Situated in **Southeastern Europe** on the eastern half of the Balkan Peninsula.
- **Capital: Sofia**, nestled in the Sofia Valley and surrounded by the Balkan, Vitosha, and Lyulin mountains.
- **Bordering Countries:** Bordered by **Romania** to the north, **Serbia** and **North Macedonia** to the west, **Greece** and **Turkey** to the south, and the **Black Sea** to the east.
- **Balkan Mountains (Stara Planina):** A 750 km range that bisects the country from west to east, acting as a natural climate barrier.
- **Major Rivers**: Danube, Iskar, Maritsa

HADHRAMAUT

News: Saudi-backed National Shield Forces retook the port city of Mukalla and regained control of Hadramout province in Yemen.

About Hadhramaut

- **Hadramout** is the **largest governorate of Yemen**, located in the **eastern part** of the country.
- **Administrative Centre:** The capital city is **Mukalla**, a major **port city** on the Gulf of Aden.
- Home to **Shibam**, often called the *"Manhattan of the Desert"* for its **mud-brick high-rise buildings** (UNESCO World Heritage Site).

About Yemen

- **Location:** Situated at the southern end of the **Arabian Peninsula** in Western Asia.
- **Bordering Countries & Coast:** Bounded by **Saudi Arabia** to the north, **Oman** to the northeast, the **Red Sea** to the west, and the **Gulf of Aden** and **Arabian Sea** to the south.

MAYON VOLCANO

News: A series of mild eruptions occurred in Mayon Volcano

About Mayon Volcano

- **Location:** Situated in **Albay province**, **Luzon Island**, Philippines.
  - Part of the **Pacific Ring of Fire**, a highly seismically active zone.
- **Characteristics:**
  - Known as the **most symmetrical (perfect cone) volcano** in the world.
  - Stratovolcano is composed of layers of lava, ash, and pyroclastic material.
  - One of the most active volcanoes in the country.

LIECHTENSTEIN

News: Union Minister of Commerce and Industry of India visited Liechtenstein to accelerate implementation of India–EFTA Trade and Economic Partnership Agreement (TEPA).

About Liechtenstein

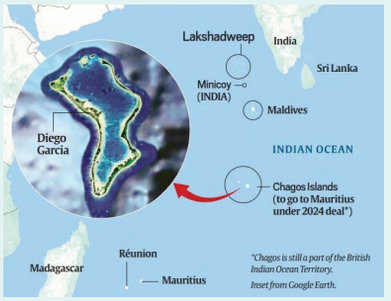
- It is **Europe's only doubly landlocked country**, being surrounded entirely by landlocked states.
- It is **not a member of the European Union**.
- **Neighbouring countries: Austria** & **Switzerland**
- **Physiography:** Dominated by the **Alps mountain range**.
  - **Grauspitz** is the highest peak.
- **Major rivers: Rhine** and **Samina**.

GREENLAND

News: Proposed United States acquisition of Greenland

About Greenland

- **Location:** North Atlantic Ocean
  - Greenland is separated from Canada's Ellesmere Island to the north by only 16 26 km.
  - The nearest European country is Iceland, lying about 320 km across the Denmark Strait to the southeast.
- It is the **world's largest island.**
- Presently, it is an autonomous territory under the Kingdom of Denmark.
- Three-fourth of its surface is permanently covered by ice
  - Greenland Ice Sheet- 2nd only to Antarctica in size
- It is majorly inhibited by the **Inuit community.**



CHAGOS and DIEGO GARCIA

News: Donald Trump's reference to Diego Garcia while justifying the Greenland bid highlights how geography, military basing, and sovereignty disputes are central to contemporary geopolitics

About Chagos Archipelago

- **Location:** 500 km to the South of the Maldives archipelago in the Indian Ocean, roughly halfway between Africa and Indonesia
- It comprises around **58** islands.
- Mauritius, which gained independence from **Britain in 1968,** has consistently maintained its claim over the Chagos Islands.
- **In 2019, the International Court of Justice (ICJ)** dismissed the UK's right to govern the Chagos Islands and called on its government to withdraw from the archipelago.

About Diego Garcia

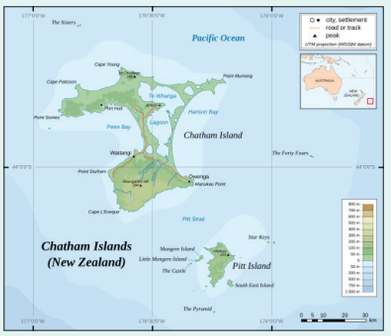
- **Location:** Central Indian Ocean, part of **Chagos Archipelago.**
- It is the largest of **58 islands** that form the Chagos Archipelago within the **British Indian Ocean Territory (BIOT).**
- It is leased to the United States for a military base.
- **Features:**
  - It is a **coral atoll** with an open lagoon at its northern end.
  - Discovered by the **Portuguese in the 16th century.**
  - Located in the **south of the equator.**

BALKAN REGION

News: A recent assessment titled Hydromorphological Status of Balkan Rivers 2025 warns that the Balkan Peninsula, home to Europe's last major stretches of free-flowing rivers, is witnessing rapid ecological degradation.

About Balkan Region

- The Balkan Peninsula is located in Southeast Europe and includes countries such as Albania, Bosnia and Herzegovina, Serbia, Montenegro, North Macedonia, Kosovo, Bulgaria, Greece, Croatia, Slovenia, and parts of Romania.
- The Balkan Peninsula is bordered by the Adriatic Sea in the northwest, the Ionian Sea in the southwest, the Aegean Sea in the south, the Turkish straits in the east, and the Black Sea in the northeast.
- The highest point of the Balkans is Musala, in the Rila mountain range, Bulgaria.



CHATHAM ISLANDS

News: During the Southern Hemisphere summer, an unusual phytoplankton bloom was observed in the ocean around the Chatham Islands

About Chatham Islands

- A remote archipelago and the **easternmost territory of New Zealand**, located in the South Pacific Ocean.
- **Location:** Approximately **800 km east** of New Zealand's South Island
- The Chatham Islands sit on the **Chatham Rise,** an underwater plateau that extends eastward from the South Island of New Zealand.
  - The top of the rise is relatively shallow and separates areas of deeper water to the north and south. These seafloor contours make blooms common along the Chatham Rise, where cold, nutrient-rich currents from the Antarctic and warm, nutrient-poor water from the subtropics converge.
  - The well-mixed water, coupled with long daylight hours, can boost phytoplankton populations.
- **Islands:** The group consists of **10 islands**, but only two are permanently inhabited: **Chatham Island (Rekohu/Wharekauri)** & **Pitt Island (Rangiauria)**

- **Time Zone:** The islands observe **Chatham Island Standard Time (CHAST)**, which is **45 minutes ahead** of mainland New Zealand, making it the first inhabited place to see the sunrise each day.
- **Endemic Biodiversity:** Home to some of the world's rarest birds, including the **Chatham Island Black Robin** (once down to just 5 individuals), the Magenta Petrel (Tāiko), and the Chatham Island Pigeon (Parea).

KOBANI

News: A United Nations aid convoy carrying aid reached the besieged town of Kobani (or Ayn al-Arab) in northeast Syria, bordering Turkey.

About Kobani

Kobani is a Kurdish majority town in northern Syria along the Syria-Turkey border. It is officially known as Ayn-al-Arab.

About Syria

- **Location:** Situated in **West Asia** in the Eastern Mediterranean and the Levant.
- **Bordering Countries & Coast:** Turkey to the north, Iraq to the east and southeast, Jordan to the south, Israel and Lebanon to the southwest, and the Mediterranean Sea along its western coastline.
- **Capital**: Damascus (facing severe water crisis)
- **Topography:** Features the coastal plain in the west, the Anti-Lebanon Mountains, the central Syrian Desert, and the fertile Euphrates River valley in the east.
- **Major Rivers:** Euphrates , Tigris (On the border between Syria and Iraq) and Orontes.

SALAL RESERVOIR

News: The Union Minister of Power and Housing & Urban Affairs directed sediment removal at the Salal Power Project in Jammu and Kashmir

About Salal Reservoir

- Located on the **Chenab River** in **Jammu & Kashmir**.
- A **concrete dam** commissioned in stages (1987–1995) with **690 MW** capacity.
- Managed by **NHPC Limited**.
- Part of India's effort to utilize water rights under the **IWT**.
- **Other Key Reservoirs or Dam on Chenab River:** Baglihar Hydroelectric Project, Dulhasti Hydroelectric Project, Ratle Hydroelectric Project, Kirru Hydroelectric Project, & Pakal Dul Hydroelectric Project.

KUKRALI FOREST AREA

News: Lucknow to get India's 1st urban night safari at Kukrail Forest Area.

About Kukrail Forest Area.

- **Location:** Lucknow
- It houses a renowned **Gharial Rehabilitation and Breeding Centre (established in 1978).**
- **Flora and Fauna:**
  - **Dense plantation and natural vegetation** including teak, mango, neem, eucalyptus, acacia, and various native tree species.
  - It supports **over 200 bird species**, both resident and migratory.

Protected Areas in News

VALLEY OF FLOWERS	• Located in **Chamoli district, Uttarakhand**, in the Pushpawati river valley which is in the upper expanses of Bhyundar Ganga river near Joshimath in Garhwal region. – Lies within a transition zone between the Zanskar and Great Himalaya ranges to the north and south with the highest point in the national park being Gauri parbat • **National Park in 1982**, forms a part of the **Nanda Devi Biosphere Reserve**. • Recognised as a **UNESCO World Heritage Site (2005)** along with Nanda Devi National Park. • **Flora:** Brahma Kamal, Blue Poppy, Cobra Lily • **Fauna:** Asiatic black bear, Snow leopard (rare sightings), Himalayan musk deer, Bharal (blue sheep)
KAZIRANGA NATIONAL PARK	• Tiger Reserve and UNESCO World Heritage Site; conserves nearly two-thirds of the global population of the One-horned Indian Rhinoceros. • **Rivers**: Located in the floodplains of the Brahmaputra with tributaries Mora Diphlu, Diphlu and Mora Dhansiri, shaping its alluvial ecosystem. • **Flora:** Dominated by alluvial grasslands and moist deciduous forests; key species include Silk Cotton Tree, Elephant Apple and Cluster Fig. • **Fauna:** Indian Rhinoceros, Royal Bengal Tiger and Wild Water Buffalo. • **Tribes**: Mising and Karbi tribes.
CORINGA WILDLIFE SANCTUARY	• **Location:** Near Kakinada in Andhra Pradesh – Part of the Godavari estuary – **Hope Island** is a 16-km-long, young sand-spit island in the Bay of Bengal near Kakinada. • **Rivers:** Coringa and Gaderu • **Flora:** Third largest stretch of mangrove forests in India with 24 mangrove tree species; dry deciduous tropical forest. • **Fauna:** More than 120 bird species; white-backed vulture and the long billed vulture

INTERNATIONAL RELATIONS & INTERNAL SECURITY

Topics for Mains

16th India - EU Summit

Syllabus Mapping: GS-2- Bilateral Relation

Context:

EU leadership led by Antonio Costa and Ursula von der Leyen visited India as Republic Day Chief Guests and attended the 16th India-EU summit.

16th India–EU Summit Outcomes

- **Elevation of Strategic Partnership:** Commitment to deepen partnership based on democracy, rule of law, human rights, multilateralism and UN-centric global order.
- **Business and Economic Engagement:** Leaders addressed India–EU Business Forum, urging private investment in critical and emerging sectors.

Economic and Trade Cooperation

- **India–EU Free Trade Agreement (FTA):** Successful conclusion of FTA negotiations aimed at boosting trade, investment, resilient supply chains and inclusive growth.
- **Future Economic Instruments**
- Commitment to early conclusion of **Investment Protection Agreement (IPA) a**nd Geographical Indications (GI) Agreement.
- Promotion of trilateral cooperation and third-country investments under EU's Global Gateway.

Security & Defence Partnership: Signing of first-ever **India–EU Security and Defence Partnership** covering maritime security, cyber threats, space, defence technology and counter-terrorism.

Information Sharing

- Launch of negotiations on **Security of Information Agreement** to enable classified information exchange.

Trade and Technology Council (TTC)

- TTC is reaffirmed as the **main coordination platform** for trade, technology and economic security.
- It helps India and the EU **align policies instead of working in silos**, especially during global disruptions.

Key Areas of Cooperation

- **Semiconductors**: Reducing dependence on limited suppliers.
- **Artificial Intelligence & Quantum**: Trusted and ethical tech development.
- **6G & Digital Public Infrastructure**: Secure and interoperable digital systems.
- **Clean tech**: Technologies supporting green transition.

Research & Space Cooperation

- **Science & Technology Agreement extended till 2030**, ensuring continuity in joint research.
- **Exploratory talks on Horizon Europe**: Opens access to one of the world's largest research funding programmes.
- **India–EU Space Dialogue**: Cooperation in satellite technology, space security and applications.

Important aspects of FTA

Tariffs Liberalisation

- **EU** will eliminate tariffs on **over 90% tariff lines** (99.3% by value).
- **India** will eliminate tariffs on **86% tariff lines** (96.6% overall liberalisation).
- Remaining lines are **partially liberalised** to protect sensitive sectors.

Sectoral Gains

- **EU gains**: agri-food, chemicals, pharmaceuticals, machinery, medical devices, automobiles.
- **India gains**: fisheries, textiles, footwear, chemicals, pharmaceuticals.

Rules of Origin

- Only goods **substantially produced or processed** in India/EU get tariff benefits.
- **The self-certification system** simplifies compliance, especially for SMEs.
- Customs verification done through **administrative cooperation**.

Sanitary & Phytosanitary (SPS) Measures

- **EU's strict food safety, animal and plant health rules remain unchanged**.
- Clear timelines for approvals, audits, certifications and inspections.
- SPS disputes covered under **FTA dispute settlement**.

Trade Remedies

- Retains right to use:Anti-dumping, Anti-subsidy and Safeguard measures
- Includes **bilateral safeguard mechanism** against import surges.

Intellectual Property Rights (IPR)

- Strong IP protection aligned with Indian and EU laws.
- It Covers: Copyrights, Trademarks, Designs, Trade secrets and Plant varieties
- Enforceable with Indian and EU laws to promote investment.

Competition, Subsidies & Mergers

- Competition law applies to **public and private enterprises**.
- EU can seek information on **Indian subsidies** if trade distortions arise.

Trade and Sustainable Development (TSD)

- **Environment & Climate:** The TSD chapter integrates trade with environmental protection by supporting climate action, biodiversity conservation and transition to low-carbon economies.
- **Workers' Rights:** The agreement upholds core **International Labour Organization** principles to ensure fair, safe and non-discriminatory working conditions.
- **Gender Equality:** Trade provisions support women's economic empowerment by promoting inclusive participation and cooperation aligned with international gender equality standards.
- **Enforcement:** Sustainable development commitments are legally binding and enforced through structured consultations involving experts and political decision-makers.

Clean Energy Transition

- **India–EU Task Force on Green Hydrogen** to promote clean fuel technologies.

- **India–EU Wind Business Summit (2026)** to boost renewable investments.
- **Disaster Risk Management Arrangement** to improve preparedness and response.
- EU engagement with **CDRI and ISA** strengthens global resilience and solar adoption.

Connectivity Initiatives

- Joint infrastructure projects under **India–EU Connectivity Partnership**.
- Alignment of EU's **Global Gateway** with India's **MAHASAGAR** vision.

Strategic Corridors

- Support for **India-Middle East-Europe Economic Corridor (IMEC)** to enhance trade and logistics.
- **Aviation Dialogue and maritime cooperation** to improve transport efficiency and safety.

Mobility Framework

- Adoption of **India–EU Comprehensive Framework on Mobility** for legal and orderly migration.
- **European Legal Gateway Office** launched as a single window for skilled Indian workers, starting with ICT sector.

Education and Skills

- Launch of **Education and Skills Dialogue (2026)**.
- Focus on **recognition of qualifications**, academic mobility and vocational training.

India-EU Relations

The **EU-India Strategic Partnership** was formalised in 2004, with sectoral dialogues on trade, climate, and security

- **Institutional Architecture**
  - **India–EU Summit** is the apex platform; **16 Summits** held so far (first in **2000, Lisbon**).
  - **India–EU Trade and Technology Council (TTC)** (set up **2022**) is the key mechanism on **tech sovereignty, trade security and supply chains**.
- The EU is India's **largest trading partner** and a major source of investment and technology.
  - **Bilateral trade:** $136.53 billion in 2024-25 (exports worth $75.85 billion and imports worth $60.68 billion), making it the largest trading partner for goods..
  - **Market share:** The EU market accounts for about 17 per cent of India's total exports.
  - EU FDI **in** India **(April 2000 - Sept 2024)**: $117.4 billion (16.6% of total FDI).
  - **Indian FDI in** the **EU**: $40.04 billion (April 2000 - March 2024).
  - **FTA negotiations** (re-launched 2022) have gained urgency; **both sides aimed to conclude by end-2025**, with tough bargaining on autos, wine/spirits, dairy, and India's textiles/pharma/steel exports.
- **Technology & Digital Cooperation**
  - India–EU S&T cooperation is guided by parity/symmetry, co-investment and shared IPR principles.
  - **Developing trustworthy AI:** Both European AI Office and India AI Mission agreed to deepen cooperation
- **People-to-People Ties**
  - 20% of EU Blue Cards (2023-24) issued to Indian professionals.
  - 6,000+ Erasmus scholarships awarded to Indian students in 20 years.
  - 2,700+ Indian researchers funded under Marie Sklodowska-Curie Actions.
- **Defence & Security**
  - Maritime security cooperation under ESIWA+ programme.
  - First joint naval exercise (2023) in the Gulf of Guinea.
  - Collaboration on global security, piracy, counterterrorism, and disaster relief.
- **Space Cooperation**
  - ISRO launched the EU's PROBA-3 mission (Dec 2024).
  - ISRO-ESA cooperation in Chandrayaan-3 and Aditya-L1 missions.
  - Signed MoU for Gaganyaan mission cooperation.

Issue in India-EU relations

- **CBAM (EU carbon tax):** India sees it as extra tax on steel/cement, reducing export competitiveness.
- **GDPR vs India data rules:** EU wants free data flows; India prefers data localisation and sovereignty controls.
- **IPR (TRIPS-plus):** EU seeks stricter patent rules; India worries about higher medicine prices, weaker generics.
- **Government procurement:** EU wants access to Indian public tenders; India wants to protect domestic industry.
- **Mode 4 visas:** India wants easier EU work/business visas for professionals and service providers.
- **EU services market access**: EU firms seek more entry into banking, legal, auditing, and financial services

Significance of India-EU FTA (Mother of all Deals)

- EU is one of the largest trading partners of India, with bilateral trade in goods and services standing at approx. 220 billion in FY 2024-25.
- The EU is the world's 2nd largest economy and India the world's 4th largest economy, together accounting for 25% of Global GDP and one-third of global trade.
- Integrate a market of over 1.9 billion people creating one of the world's largest free trade agreements.
- Promotion of bilateral trade, mutual foreign direct investment and business collaborations between the two countries.
- Provides a framework for political collaboration and certainty in a world increasingly marked by conflict and uncertainty.

India-EU FTA restores trust in rules-based trade order

Syllabus Mapping: GS-2- Global Order

Context

The conclusion of the India-EU FTA is a reaffirmation of the relevance of a rules-based trade order at a time when international trade faces unprecedented strain.

How the FTA Restores Trust in the Rules-Based Order

- **Anchoring Trade in Rules, Not Discretion:** The FTA reduces scope for **arbitrary tariffs and regulatory actions**. Businesses gain **predictability**, which is essential for investment and long-term planning.

- **Harmonisation of Standards:** Product safety, environmental, and technical standards are increasingly decisive in market access.
- **Clear Rules:** By aligning specifications, the FTA ensures trade is governed by **clear rules rather than opaque barriers**. This is critical because **non-compliance can shut markets entirely**, unlike tariffs which can be absorbed.
- **Strengthening Dispute Settlement:** The agreement embeds **clear bilateral dispute-resolution mechanisms**. Dispute settlement is treated as a **core pillar of trust**, not a technical afterthought.
- **Investors confidence:** Effective enforcement reduces risks of trade retaliation and enhances **investor confidence**.

International Trade Under Unprecedented Strain

- **Weakening of Multilateralism:** The global trading system is facing a **crisis of credibility**, with multilateralism under strain.
- **Paralysis of Dispute Settlement:** The continued paralysis of the **WTO Appellate Body** has eroded trust in the system.
  - Without effective dispute resolution, countries increasingly resort to **unilateral trade measures**.
- **Geopolitics issues:** Trade has become entangled with **geopolitical rivalries**, sanctions, and strategic decoupling.
- **Supply Chain Disruptions:** Conflicts, pandemics, and economic nationalism have disrupted **global supply chains**, reducing predictability.
- **Rise of Protectionism**: Countries are using tariffs, subsidies, and standards as **strategic tools**, often bypassing WTO norms.
- **Regulatory Fragmentation**: **Non-tariff barriers**—especially environmental and technical standards—now shape market access more than tariffs.

India–EU FTA: A Response to Global Trade Stress

- **Reaffirmation of the Rules-Based Trade Order:** The India–EU FTA goes beyond a bilateral deal; it **reasserts faith in rules, predictability, and fairness**.
  - It shows that **constructive engagement remains possible**, even in a fractured global environment.
- **Scale and Economic Significance:** Together, India and the **European Union** account for:
  - ~25% of global GDP
  - ~33% of global trade
  - A combined market of nearly **2 billion people**
- **Balanced Liberalisation with Safeguards:** India safeguarded **agricultural and developmental red lines**.The EU maintained its stance on climate-linked measures such as **CBAM**, reflecting regulatory autonomy.
  - This balance demonstrates how **domestic sensitivities can coexist with openness**.
- **Complementing WTO Reform:** The FTA arrives ahead of the **WTO's 14th Ministerial Conference (MC14)**. The agreement shows that **bilateral and regional accords can keep rules alive** during periods of WTO gridlock.
- **Supply Chain Resilience:** The FTA creates a **de-risked $136 billion trade corridor** between two reform-oriented economies. It reduces overdependence on single trade routes or geographies.
- **Template for Future Trade Agreements:** Often described as the **"mother of all deals"**, the FTA sets benchmarks for:
  - Balancing openness and sovereignty
  - Integrating sustainability with market access
  - Embedding enforceable rules in trade agreements
- **Restoring Confidence in Globalisation:** At a time when globalisation is questioned, the agreement proves it can be **rules-based, inclusive, and resilient**.

The India–EU FTA is more than a trade agreement; it is a statement of faith in the **rules-based global trading system**. At a moment of fragmentation and uncertainty, it shows that cooperation, predictability and trust can still guide international commerce. If implemented well and replicated elsewhere, it could help rebuild confidence in global trade as an engine of shared prosperity.

India Germany Relationship

Syllabus Mapping: GS-2- Bilateral Relation

Context:

Germany Chancellor H.E. Mr. Friedrich Merz's official visit to India in January 2026 comes during **75 years of diplomatic relations (2026)**, giving strong momentum to bilateral ties.

Key Outcome:

- **Defence Industrial Cooperation Roadmap** signed for co-development, co-production and technology transfer.
- **Germany to participate in Indian military exercises** – **MILAN**, **IONS Conclave 2026**, and **TARANG SHAKTI 2026**; liaison officer at **IFC–IOR**.
- **Bilateral trade crossed USD 50 billion (2024)**; commitment to expand trade and investment.
- **Semiconductor Ecosystem Partnership** agreed through a Joint Declaration of Intent.
- **Critical Minerals cooperation** initiated for exploration, processing and recycling.
- **Green & Sustainable Development Partnership (GSDP)** reaffirmed – **€10 billion German support till 2030**.
- **Visa-free transit facility for Indian passport holders** through Germany announced.

Areas of cooperation between India and Germany

- **Shared vision:** Both share a vision for stable peaceful and rule based world order.
- **Political relations:** Intergovernmental Consultations (IGC) is a whole-of-government framework under which ministers from both sides hold discussions in their respective areas of responsibility.
- **Trade and Investment:** Germany is India's top trading partner in Europe, with bilateral trade reaching **US$ 33.33 billion in 2023**.
  - Germany continued to be the 12th largest trading partner for India in 2023-24.
  - It ranks as the **9th largest FDI source** for India, with cumulative investments of **US$ 14.5 billion** (April 2000 - Dec 2023)..
  - **Export:** Major Indian exports to Germany include electrical products and auto components, textile and garments, chemicals, pharma, electronics, metal/metal products etc

  - **Fast Track Mechanism (FTM) in India:** resolve issues faced by German investors in India. Similar mechanisms also exist in Germany.
- **Climate and Sustainability:** Under the **Green and Sustainable Development Partnership (2022)**, Germany committed **€10 billion** for projects such as **solar energy** and **agro-ecology**.
  - Germany actively supports **India-led initiatives** like the **International Solar Alliance (ISA)** and **Coalition for Disaster Resilient Infrastructure (CDRI)**.
- **Technology and Innovation:** The **Indo-German Science and Technology Centre (IGSTC)** funds **49 priority projects**, including programs like **WISER (Women in Science and Engineering Research)**.
- **Defence and Security Cooperation:** The **2006 Defence Cooperation Agreement** led to mechanisms like **Joint Working Groups on Counter-Terrorism, Cybersecurity, and Defence**.
  - Germany is keen to join India's **Project-75I** for building conventional submarines.
  - Conduct of joint exercises such as **MILAN, PASSEX**, and **TARANG SHAKTI-1** reflects growing strategic alignment.
- **Strategic Trade Diversification:** India offers Germany a **"China+1" alternative**, especially amidst rising **EU-China tensions**.
- **Development cooperation:** Germany engages with India on development cooperation, both of a technical and financial nature. Some examples of the fruitful collaboration include
  - Green Energy Corridor Projects in various states (such as Gujarat, Rajasthan, Maharashtra, Andhra Pradesh & Tamil Nadu), and
  - Urban Mobility Integrated Water Transport in Kochi.
  - Indo-German partnership on Green Urban Mobility is also an important flagship programme to finance projects for efficient public transport systems.
    - » i.e Nagpur Metro Rail project
- **Indian Diaspora:**
  - There are around 2.46 lakh (December 2023) Indian passport holders and Indian-origin people (about 1.93 lakh NRIs/Indian Passport holders and around 52,864 PIOs) in Germany.
  - There are approximately 49,483 (2024) Indian students who are studying in Germany, a number which has doubled in the last 4 years.

India-Arab League: bridging cultures, creating opportunities

Syllabus Mapping: GS-2- Multilateral Relations

Context

- India hosted the **2nd India–Arab Foreign Ministers' Meeting** which involves ministers and delegates from the **22-member Arab League**, signalling India's deepening engagement with West Asia and North Africa.
- It comes at a time when India is emerging as a **major economic and strategic power** with expanding global responsibilities.

Global Context of the Meeting

- The West Asia–North Africa region is witnessing **simultaneous conflicts and tensions**, creating instability. For example,
- The Gaza conflict following the Israel–Hamas war has regional spillovers.
- Uncertainty in Syria despite ceasefires.
- Yemen conflict involving Saudi Arabia and the Houthis.
- Rising tensions around Iran due to sanctions and military posturing.

This instability directly affects India's energy security and diaspora interests.

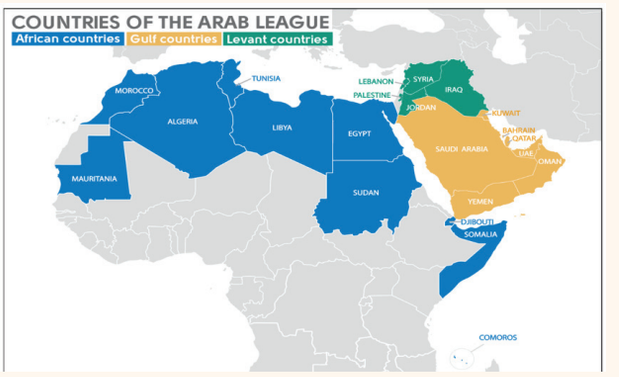
- **Erosion of the Rules-Based International Order:** Unilateral actions by major powers are weakening **respect for sovereignty and multilateralism**. For example
  - Selective military interventions without UN mandates.
  - Sanctions regimes bypassing international consensus.
  - Declining effectiveness of institutions like the UN Security Council.
- **Shifting Power Alignments in West Asia:** Traditional alliances in the Arab world are **no longer monolithic**, creating new strategic equations.
- Emerging differences between **Saudi Arabia and the UAE**, particularly over Yemen and regional influence.
- Normalisation trends with Israel by some Arab states, while others remain opposed.
- **Energy and Supply Chain Risks:** Conflicts have exposed vulnerabilities in **global trade and energy routes** critical to India. For example:
  - Attacks in the **Red Sea and Gulf of Aden** affecting shipping via the Suez Canal.
  - Disruptions increase insurance costs and shipping delays for Indian trade.

Hence, stability in the region is economically vital for India.

Together, these factors explain **why the India–Arab League Foreign Ministers' Meeting is strategically timed**—to manage uncertainty, diversify partnerships, secure energy and trade interests, and shape a cooperative multipolar order.

About Arab League

- It is officially known as the **League of Arab States(LAS)**, established in 1945 in Cairo.
- It comprises **22 member states** across West Asia and North Africa.
- The Gulf countries of the Arab League are the members of the Gulf Cooperation Council (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates [UAE]) and Yemen.
- The Levant countries of the Arab League are Iraq, Jordan, Lebanon, Palestinian territories, and Syria.
- The African countries of the Arab League are Algeria, Comoros, Djibouti, Egypt, Libya, Morocco, Mauritania, Somalia, Sudan, and Tunisia.



- **Objective:** It aims to promote political coordination, economic cooperation and regional stability among Arab nations.
- India formalised engagement with the Arab League through an **MoU in 2002**, institutionalising regular dialogue.

Institutional Framework of India–Arab League Engagement

- **Arab–India Cooperation Forum (AICF)** established in 2008 to deepen sectoral cooperation.
- Annual meetings between India's External Affairs Minister and the Arab League Secretary General.

First India–Arab Foreign Ministers' Meeting

- **Held in**: 2023
- **Significance**: First-ever ministerial-level dialogue between India and the **League of Arab States**
- **Objective**: Institutionalise regular political engagement
- **Key Focus Areas**: Trade, energy security, counter-terrorism and maritime cooperation
- **Outcome**: Laid the foundation for the current second meeting and deeper India–Arab strategic partnership
- Biennial **India–LAS Partnership and Investment Summit** as a flagship economic platform.
- Launch of **India–Arab Chambers of Commerce, Industry and Agriculture** to boost private-sector ties.

Importance of the Meeting for India

- **Strategic Outreach**: Reinforces India's role as a credible and non-interventionist partner in West Asia.
- **Energy Security**: Arab League countries supply nearly 60% of India's crude oil and 70% of natural gas.
- **Trade and Investment**: Bilateral trade exceeds **$240 billion**, with growing FDI into Indian infrastructure.
- **Security Cooperation**: Strengthens counter-terrorism, maritime security and defence collaboration.
- **Connectivity Vision**: Advances discussions on the **India–Middle East–Europe Economic Corridor (IMEC)**.

Importance of the Meeting for the Arab League

- **Reliable Partner** – India is seen as a stable, non-disruptive power with long-term commitment.
- **Economic Opportunities** – Access to India's large market, skilled workforce and digital infrastructure.
- **Strategic Balancing** – India provides diversification amid overdependence on Western or Chinese partnerships.
- **Development Cooperation** – Alignment between national visions like Saudi Vision 2030 and India's Viksit Bharat 2047.

Areas of Cooperation between India and Arab States

India–Arab cooperation spans economic, strategic, security and technological domains, evolving from transactional engagement to a **comprehensive, future-oriented partnership**

- **Trade, Investment and Economic Cooperation:** Trade forms the **bedrock of India–Arab relations**, with bilateral trade exceeding **$240 billion**.
  - E.g. CEPAs with **UAE and Oman** have accelerated trade growth.
  - India–UAE trade target reset to **$200 billion by 2030**.
  - Major investments from Saudi Arabia, UAE and Qatar in **infrastructure, manufacturing and energy**.
- **Economic Corridors:** Cooperation focuses on **ports, shipping, logistics and multimodal connectivity**.
  - E.g. **India–Middle East–Europe Economic Corridor (IMEC)** enhances trade efficiency and geopolitical connectivity.
  - Acts as a bridge between **economic integration and strategic alignment**.
- **Fintech and Technology Cooperation:** Convergence in **digital public infrastructure, fintech and financial inclusion** strengthens people-centric cooperation.
  - Expansion of **RuPay cards** and acceptance of the Indian rupee in UAE.
  - Operationalisation of **rupee–dirham settlement system** reduces dollar dependence.
  - **UPI adoption** in Bahrain, Saudi Arabia, Qatar and UAE.
- **Energy and Strategic Resources Cooperation:**
  - Long-term LNG agreements, including a **20-year LNG deal with Qatar**, ensure energy security.
  - ADNOC–Indian Oil LNG contracts diversify energy sources.
  - Strategic petroleum reserve collaboration with UAE enhances **energy resilience**.
- **Security and Defence Cooperation**
  - Defence cooperation agreements with **Oman, UAE, Saudi Arabia, Egypt and Qatar**.
  - Maritime security collaboration under India's **MAHASAGAR** vision in the Indian Ocean Region.
  - Strategic access to **Duqm Port (Oman)** strengthens India's naval presence.
  - Growing interest in **joint defence production and exports** (BrahMos, Tejas, Aakash).
- **Counter-Terrorism and Regional Stability:** Arab states have **consistently supported India** against cross-border terrorism.
  - E.g. Condemnation of major terror attacks in India reflects political convergence.
  - Shared concerns over **extremism, Gaza conflict, Yemen instability, Iran tensions and Red Sea security**.
- **Emerging and Future-Oriented Cooperation**
  - Cooperation expanding into **cybersecurity, space, drones and advanced technologies**.
  - Joint innovation and defence technology partnerships gaining traction.
  - Alignment of national development visions such as **Saudi Vision 2030, UAE Centennial 2071 and Viksit Bharat 2047**.

Issues in India–Arab League Cooperation

- **Institutional Limitations of the Arab League:** The **League of Arab States** has weak enforcement mechanisms and consensus-based decision-making, limiting its effectiveness as a unified partner for India.
- **Intra-Arab Differences** – Diverging interests among Arab states (e.g., Saudi Arabia–UAE differences) complicate India's engagement with the **League of Arab States** as a collective bloc.
- **Geopolitical Pressures and Balancing** – China's growing economic footprint and the US's entrenched security role reduce India's relative influence in some Arab League states.

- **Maritime Security Risks** – Instability in the Red Sea, Gulf of Aden and Suez Canal region threatens shipping, insurance costs and supply chains critical for India's trade.
- **Energy Transition Challenges** – Global shift towards renewable energy may gradually affect traditional hydrocarbon-based cooperation, requiring diversification into green energy partnerships.
- **Implementation Gaps** – Despite multiple MoUs and forums, delays in project execution and coordination sometimes limit tangible outcomes.
- **Limited Defence Industrial Collaboration:** Despite strong defence ties, **joint production, technology transfer and co-development** remain limited in scale and scope.
- **Limited Institutional Depth** – Engagement with the Arab League as an institution remains less deep compared to India's strong bilateral ties with individual Arab countries.
- **Diaspora and Labour Issues** – Protection of Indian workers' rights and welfare in some Gulf countries remains an ongoing concern.

Way Forward for Strengthening India–Arab League Cooperation

- **Deepen Institutional Engagement** – Strengthen structured dialogue with the **League of Arab States** beyond bilateral ties to enhance collective cooperation.
- **Diversify Cooperation Areas** – Expand engagement into green energy, hydrogen, climate action, digital economy and innovation-led sectors.
- **Strengthen Maritime and Connectivity Security** – Enhance joint maritime security initiatives to safeguard trade routes through the Red Sea, Gulf of Aden and Suez Canal.
- **Promote Defence Industrial Collaboration** – Move beyond defence agreements towards joint production, technology transfer and co-development of defence platforms.
- **Protect Diaspora Welfare** – Strengthen labour agreements and grievance redressal mechanisms for Indian workers in Arab countries.
- **Improve Implementation Mechanisms** – Establish clear timelines, monitoring frameworks and inter-ministerial coordination for timely execution of agreements.
- **Leverage Multilateral Platforms** – Use forums like G20, BRICS and SCO to align India–Arab interests on global governance reforms.
- **Encourage People-to-People Ties** – Promote education, tourism, cultural exchanges and academic collaboration to sustain long-term partnership.

How computer warfare is becoming a lethal part of Pentagon's arsenal

Syllabus Mapping: GS-3- Defence Technology

Context:

- US used the cyberweapons in the venezuela and attack on Iranian Nuclear facility last year reflects the growing importance of the fusing computer network warfare with the rest of military arsenal.

Cyber Warfare

- With the emerging technologies and increased reliance on IT infrastructure in almost every domain, cyberspace has emerged as a new arena for warfare among countries in the 21st century.
- It generally refers to 'use of internet-based invisible forces as an instrument of a state policy to sabotage and espionage against other nations.'

Key Differences Between Cyber Warfare and Traditional Warfare

Aspect	Cyber Warfare	Traditional Warfare
Theatre of War	Conducted in **cyberspace**, recognised as the **fifth domain of warfare**.	Conducted in **physical domains** such as land, sea and air.
Nature of Space	**Borderless and undefined**, with no clear national boundaries.	**Geographically defined** by territorial, air and maritime boundaries.
Attribution of Attack	**Difficult to identify attackers** due to anonymity and spoofing.	**Relatively easy attribution** through visible military forces.
Physical Contact	**No direct physical engagement** between opposing forces.	**Direct physical confrontation** between armed forces.
Casualties	Usually **no immediate loss of life**, though indirect impacts exist.	Involves **direct human casualties and physical destruction**.
Threshold of Conflict	Operates **below declared war**, enabling deniability.	Often involves **clear acts of war or formal conflict**.

Conceptual Evolution of Cyber Warfare

- **From support to strike capability**: Cyber tools have evolved from intelligence and espionage roles to instruments capable of producing battlefield and strategic effects.
- **Fifth domain of warfare**: Cyberspace now stands alongside land, sea, air and space as a recognised domain of military operations.

Integration with Conventional Military Operations

- **Cyber–kinetic fusion**: Cyberattacks are increasingly used alongside airstrikes, special forces and electronic warfare to paralyse defences before physical engagement.
- **Force multiplier effect**: Disabling radars, power and communications enhances the effectiveness and survivability of conventional forces.

Global Expansion of Cyber Military Capabilities

- Major powers including the US, China and Russia are investing heavily in cyber commands, offensive cyber tools and cyber-enabled intelligence, treating cyberspace as a permanent arena of strategic competition.

Examples of Cyber warfare:

- **Venezuela Operation:** The **United States Cyber Command** reportedly shut down power grids, radar systems and military radios during the Venezuela operation.
- **China's Approach: Volt Typhoon Operation**
  - **Pre-positioning strategy**: China's Volt Typhoon campaign focused on infiltrating US critical infrastructure networks near military bases.
  - **Crisis-delay objective**: Aimed to disrupt power, water and communications to slow US mobilisation during a Pacific conflict.
- **Precedents of Lethal Cyber Operation:** Earlier operations such as Stuxnet proved that cyber tools can cause physical destruction, reinforcing the idea that cyber warfare can produce real-world, lethal consequences.

India's Preparedness in Cyber Warfare and Defence

- **Strategic Recognition of Cyberspace**
  - India officially recognises **cyberspace as a domain of warfare**, alongside land, sea, air and space.
  - Cyber threats are viewed not merely as law-and-order issues but as **national security challenges** with military implications.
- **Institutional Architecture**
  - **Defence Cyber Agency** acts as the nodal body for coordinating cyber operations across the Army, Navy and Air Force.
  - Works under the Integrated Defence Staff, reflecting a **joint-services approach** to cyber warfare.
- **Military Network Hardening:** Efforts to secure **command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR)** systems
- **Cyber–Space–AI Convergence:** Integration of **artificial intelligence and data analytics** for threat detection, predictive cyber defence and faster response to complex cyberattacks.
- **Capability Development and Skill Building:** Efforts to build **indigenous cyber tools**, reduce dependence on foreign software and enhance technological sovereignty.
- **International Cooperation**
  - India participates actively in **UN processes on responsible state behaviour in cyberspace**.
  - Engages in bilateral and multilateral cyber dialogues with key partners to share best practices.

Topics for Prelims

New Window of opportunity fro India and Venezuela Crisis

Context

The United States, under President Donald Trump, has forcibly detained Venezuelan President Nicolás Maduro, triggering a major geopolitical shock in Latin America. The move signals a shift from overt regime change to regime co-option, with Washington seeking to draw sections of the Maduro establishment into cooperation.

Opportunities for India in Latin America

- **Trade Diversification:** Latin America offers a large, under-tapped market (**~$5.5 trillion GDP; 650+ million population**).
  - Helps India diversify exports amid global trade uncertainties and tariff pressures.
  - Scope for expansion in pharmaceuticals, automobiles and auto components, IT and digital services, renewable energy, agricultural machinery and food processing.
- **Energy Security:** Access to oil and gas resources, especially in Venezuela and Brazil.
  - Scope for long-term supply contracts and upstream investments by Indian companies.
- **China-Plus-One Opportunity:** As the US pushes Latin American countries to reduce dependence on China, India can emerge as a **reliable alternative economic partner**.
  - Advantage of being viewed as non-coercive and politically less intrusive.
- **Diplomatic & Institutional Engagement:** Opportunity to increase high-level political visits, strengthen embassies and trade missions, deepen engagement with regional groupings.
  - Move beyond symbolic ties to **sustained diplomatic presence**.

US–Venezuela Relations

- **Historical Context:** Relations deteriorated sharply after **Hugo Chávez** adopted an **anti-US, socialist orientation** in the early 2000s.
  - Venezuela emerged as a hub of **anti-American politics**, backed by **Cuba, Russia, China, and Iran**.
- **Under Nicolás Maduro:** The US imposed **economic sanctions**, targeting oil exports and financial flows.
  - Washington supported opposition forces and questioned the **legitimacy of elections**.
  - Venezuela deepened strategic ties with **Russia and China** to counter US pressure.
- **Recent Shifts:** After the **Russia–Ukraine war (2022)**, the US explored engagement with Caracas to:
  - Access Venezuelan oil
  - Reduce dependence on Russian energy
- Talks between Washington and Caracas have been intermittent and fragile.
- Trump's current intervention marks a **dramatic escalation**, potentially redefining bilateral ties.

Carbon Border Adjustment Tax

Context

The European Union commenced implementation of the world's first carbon tax under the Carbon Border Adjustment Mechanism (CBAM), a move that has drawn strong criticism from several developing countries, including India.

About Carbon Border Adjustment Tax

- CBAM is a climate policy instrument of the **European Union** designed to levy a carbon price on certain imported goods equivalent to the carbon cost faced by EU producers under the Emissions Trading System (ETS).
- **Objective:**
  - Prevent carbon leakage (shifting of production to countries with weaker climate regulations).
  - Ensure a level playing field between EU manufacturers and foreign producers.
  - Encourage global decarbonisation by incentivising cleaner production practices.
- **Legal Basis:** Introduced as part of the EU's Fit for 55 climate package aimed at reducing greenhouse gas emissions by 55% by 2030 (from 1990 levels).
- **Sectors Covered (initial phase):** Cement, Iron and steel, Aluminium, Fertilisers, Electricity & Hydrogen
- **How it works:**
  - Importers must declare the embedded carbon emissions in covered products.
  - They are required to purchase CBAM certificates priced in line with EU ETS carbon prices.
  - If a carbon price has already been paid in the country of origin, a corresponding deduction is allowed.
- **Phases of Implementation:**
  - **Transitional Phase (Oct 2023–Dec 2025):** Only reporting of emissions; no financial payment.
  - **Definitive Phase (from Jan 2026):** Mandatory purchase of CBAM certificates begins.

India-Bangladesh Ganga Water Sharing Treaty

Context

Officials from the Union Ministry of Jal Shakti inspected the Farakka Barrage in view of the India–Bangladesh Ganga Water Sharing Treaty (1996) approaching its expiry in December 2026.

Ganga Water Treaty

- **Signed in 1996:** The treaty was concluded to replace earlier short-term arrangements and to establish a **stable, long-term framework** for water sharing between the two countries.
- **Parties involved:** The agreement is bilateral, signed between **India (upper riparian)** and **Bangladesh (lower riparian)**.
- **Purpose of the treaty:** To regulate the sharing of **Ganga river waters at the Farakka Barrage**, particularly during the **lean (dry) season** when water availability is low.
- **Duration:** The treaty is valid for **30 years**, i.e., up to **2026**, with a provision for review and renewal by mutual consent.
- **Water-sharing period:** The treaty applies from **1 January to 31 May**, the period when river flow is minimum and disputes are most likely.
- **Sharing mechanism:** Water allocation is decided on the basis of **10-day periods**, using an agreed formula that ensures **minimum assured flows to Bangladesh** during critical months.
- **Institutional mechanism:** A **Joint Committee** comprising officials from both countries monitors implementation, shares hydrological data, and addresses day-to-day issues.
- **Significance:** It is considered a **successful example of bilateral river-water cooperation** in South Asia, ensuring predictability and reducing conflicts.
- **Current concerns:** Changing river flows due to **climate change**, increased upstream usage, and the approaching **2026 expiry** raise the need for **renegotiation or updating** of the treaty.

United Nation Department of Economic and Social Affairs

Context

The United Nations Department of Economic and Social Affairs (UNDESA), in its **World Economic Situation and Prospects 2026**, has projected India's GDP growth at 7.4% for 2025–26.

About UNDESA

- It was **established in 1997** and is **headquartered at the United Nations Headquarters in New York**.
- It provides **research, policy analysis, and data** to UN Member States on issues such as **macroeconomic trends, poverty reduction, inequality, social development, population dynamics, and public administration**.
- UNDESA acts as the **secretariat for major UN intergovernmental processes**, including the **High-Level Political Forum on Sustainable Development (HLPF)** and the **Financing for Development (FfD) process**.
- It publishes key global reports such as the **World Economic Situation and Prospects (WESP)**, the **World Social Report**, and the **Sustainable Development Goals Report**.

Weimar Triangle

Context

- In **January 2026**, India's External Affairs Minister participated in India's **first engagement in the Weimar Triangle format** with **France, Germany and Poland**, discussing:
  - **India–EU relations**
  - **Indo-Pacific**
  - **Ukraine conflict**
- The outreach reflects India's effort to deepen engagement with **key European powers** through small-group diplomacy, alongside India's broader EU engagement through Brussels.

What is the Weimar Triangle

- The **Weimar Triangle** is a **minilateral consultative format** of **France, Germany and Poland**.
- It was created in **1991 (Weimar, Germany)** to help overcome divisions in post–Cold War Europe and to support **Poland's integration into European and Euro-Atlantic structures**.

- It functions mainly through **meetings of leaders and foreign ministers**, and coordination on major European policy and security issues.

Why the Weimar Triangle matters in today's Europe

- The format has gained renewed relevance due to Europe's strategic environment, especially the **Ukraine war** and wider European security debate

What "India joining the format" means

- India DOES NOT become a "member" (membership remains **France–Germany–Poland**).
- It means India was **invited for an inaugural engagement** with the three countries under this **small-group consultation format** (a diplomatic outreach mechanism).

UN Body on Disarmament

Context:

Senior Indian diplomat and National Security Advisory Board member DB Venkatesh Varma has been nominated by the UN Secretary General as chair of his Advisory Board on Disarmament Matters for 2026-27.

About United Nations Office for Disarmament Affairs

- It is a specialized office of the United Nations Secretariat responsible for promoting global disarmament and international security.
- It works to reduce and ultimately eliminate weapons of mass destruction and excessive conventional arms, thereby strengthening international peace and stability.
- UNODA supports and advances multilateral disarmament norms, treaties, and confidence-building measures among states.
- **Structured around three core areas of work:**
  - **Weapons of Mass Destruction (WMDs)**: Focuses on nuclear, chemical, and biological disarmament, non-proliferation, and implementation of related treaties.
  - **Conventional Weapons**: Addresses regulation of small arms and light weapons, landmines, cluster munitions, and emerging weapons technologies.
  - **Disarmament Education & Outreach**: Promotes awareness, capacity building, and youth engagement to foster a culture of peace and responsible security governance.
- **Coverage:** Global; works with all UN Member States, regional organizations, and civil society.

About Advisory Board on Disarmament Matters (ABDM)

- It is an expert advisory body established by the United Nations to provide independent advice to the UN Secretary-General on disarmament and international security issues.
- It functions as a **non-political, expert-driven forum**, drawing on the professional experience of its members rather than representing national positions.
- The Board plays a key role in strengthening the **intellectual and normative foundations** of the UN's disarmament agenda.
- **Composition:** Comprises 15 experts appointed by the UN Secretary-General, selected on the basis of expertise and equitable geographical representation.

Pax Silica Initiative

Context:

India has been formally invited to join "Pax Silica".

About Pax Silica Initiative

- **Pax Silica** is a **US-led strategic initiative** aimed at building a **secure, resilient and innovation-driven global silicon and semiconductor supply chain**.
- **Meaning of the Name**
  - **"Pax"** (Latin): peace, stability, long-term prosperity.
  - **"Silica"**: refined into silicon, the foundation of **computer chips and AI hardware**.
- **Key Areas of Cooperation (Deliverables)**
- Joint projects in:
  - **Critical minerals** (refining and processing)
  - **Semiconductor design, fabrication, and packaging**
  - **Compute, data centres, ICT systems, and fiber-optic networks**
  - **Energy grids and power generation**
  - **Logistics and transportation**
- **Joint ventures and strategic co-investments**.
- **Protection of sensitive technologies** from countries of concern.
- Building **trusted technology ecosystems**, including AI models and applications.
- **Participating Countries:** Japan, South Korea, Singapore, Netherlands, United Kingdom, Israel, United Arab Emirates, Australia.
- **Objectives:**
  - **Reduce coercive dependencies** in critical technologies and semiconductor supply chains.
  - **Protect strategic materials and capabilities** essential for artificial intelligence and advanced computing.
  - Enable **trusted and aligned nations** to **develop, scale and deploy transformative technologies**.
  - Strengthen **economic security** in the era of AI and digital geopolitics.

Significance

- **Strategic tech coordination:** Enables trusted countries to align policies and investments, reducing over-dependence on concentrated supply chains.
- **Economic & innovation boost:** Facilitates joint ventures and co-investment in semiconductors and AI, strengthening India's tech ecosystem.
- **Geopolitical alignment:** Deepens U.S.–India strategic ties and cooperation among like-minded democracies.
- **Tech security**: Enhances resilience and protection of critical and sensitive technology infrastructure.

Importance for India

- **Tech ecosystem growth:** Can support India's ambitions in **semiconductor production, AI development, and critical mineral value chains**.
- **Supply chain diversification:** Strengthens India's role in diversified global tech supply chains and reduces **coercive dependencies** on single poles of production.
- **Diplomatic leverage:** Positions India as a **trusted partner** in global tech governance and economic security discussions.

Henley Passport Index 2026

Context

The Henley Passport Index 2026 has been released, ranking countries based on the travel freedom their passports provide, measured by visa-free or visa-on-arrival access.

About Henley Passport Index

- Published annually by **Henley & Partners**, using data from the **International Air Transport Association (IATA)**.
- Ranks passports according to the **number of destinations their holders can access without a prior visa**.
- Considered a key indicator of **global mobility, diplomatic reach, and international trust**.

Key Highlights of Henley Passport Index 2026

- Singapore retains the top position, offering visa-free/visa-on-arrival access to the maximum number of destinations globally.
- Other strong performers include Japan, France, Germany, Italy, Spain, and several other European countries, reflecting strong diplomatic networks
- India ranks 80th in the Henley Passport Index 2026.
  - Indian passport holders enjoy visa-free or visa-on-arrival access to around 60 destinations.

EU–MERCOSUR Free Trade Agreement

Context

After nearly 25 years of negotiations, the European Union and MERCOSUR have signed one of the world's largest free trade agreements, marking a major milestone in global trade diplomacy.

About the EU–MERCOSUR Agreement

- **Background**
  - Negotiations for the EU–MERCOSUR Free Trade Agreement began in **1999**, reflecting the complexity of aligning interests between advanced European economies and South America's resource-rich nations.
  - The agreement was formally signed in **Asunción, Paraguay**, following approval by EU institutions and political consensus among member states.
- **Key Features of the Agreement**
  - Creates an integrated market of around **780 million consumers**, making it one of the largest FTAs globally.
  - Gradual elimination of tariffs on a wide range of goods, including agricultural products, industrial goods, automobiles, machinery, and chemicals.
  - Improved market access for South American agricultural exports and European manufactured products.
  - Includes provisions on services, public procurement, intellectual property, and sustainable development.
  - Aims to strengthen trade rules based on transparency, predictability, and fair competition.

Significance of the Agreement

- **Economic Impact**
  - Expected to boost **MERCOSUR's economy by up to 0.7% by 2040**, while increasing the EU economy by around **0.1% over 15 years**. Benefits South American agricultural exporters through reduced tariffs on farm goods.
  - Supports European industry by removing levies on cars, machinery, and industrial products.
- **Strategic and Geopolitical Significance**
  - Strengthens Europe's economic foothold in a **resource-rich and strategically important region**.
  - Provides both blocs an opportunity to diversify trade partnerships amid rising **US–China strategic competition**.
  - Leaders have projected the agreement as a signal of **strategic autonomy and independence** from major global powers.

MERCOSUR (Southern Common Market)

- It is a South American regional trade bloc established in **1991** under the **Treaty of Asunción**.
- Its **full members** are **Brazil, Argentina, Uruguay, and Paraguay**, with Bolivia in the process of accession and several associate members in the region.
- MERCOSUR aims to promote **free movement of goods, services, and factors of production**, along with a **common external tariff**. It is a major **agricultural and commodities powerhouse**, playing a significant role in global exports of soybeans, beef, and minerals.

Board of Peace

Context

India has been invited by Donald Trump to join a proposed international body called the "Board of Peace".

About the Board of Peace

Background

- The Board of Peace emerged from Trump's 20-point Gaza peace plan, which envisages a temporary international body to supervise transitional governance and stabilisation in Gaza.
- Although it had received backing from the United Nations Security Council with Resolution 2803 in November 2025, the initiative's latest charter suggests an expanded role that could extend beyond Gaza to address global conflicts more broadly.

Key Features of the Initiative:

- The Board is envisaged as a new international organisation tasked with strategic oversight, reconstruction, and long-term stability in conflict zones.
- Trump is proposed to serve as its inaugural Chairman, exercising leadership even after his presidential tenure, raising questions about sovereign equality and governance structure within the body.
- Membership terms reportedly include three-year tenures for participating states, with an option for permanent membership on higher financial contributions, though official U.S. statements have denied mandatory fees.

Significance of the invite for India

- **Recognition of India as a Responsible Global Stakeholder**: India's inclusion signals its growing diplomatic stature and recognition as a responsible global actor capable of contributing to peace-building efforts.
- **Alignment with Constitutional Commitment to International Peace (Article 51):** Participation would align with India's

constitutional vision under Article 51, which encourages promotion of international peace, security, and cooperation.

- **India's Expanding Strategic Engagement in West Asia:** The invite reflects India's increasing engagement in West Asian geopolitics, where it balances strategic ties with Israel, the Arab world, and Iran.

Implications for Global Governance

- **Rise of Ad Hoc Coalitions alongside Formal Multilateralism:** The proposal reflects a broader trend of ad hoc coalitions and informal groupings emerging alongside traditional multilateral institutions.
- **Shifting Approaches to Conflict Resolution and Peace-Building**: If operationalised, the Board could influence debates on peace enforcement versus peace-building, and the role of powerful states in conflict resolution.
- **Implications for the Future of Global Institutional Architecture:** It also raises questions about the future relevance and reform of existing international institutions.

International Solar Alliance

Context

The United States decided to withdraw from the International Solar Alliance (ISA), a decision which aligns with its broader retreat from multilateral climate and clean energy frameworks..

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.

Impact of US Exit on ISA

- **Financial Implications:** Temporary reduction in access to low-cost finance and risk guarantees for solar projects in developing countries.
- **Reduced Global Political Weight:** Marginal weakening of ISA's influence in global climate negotiations despite continued leadership by India and France.
- **Limited Operational Disruption:** Routine ISA operations remain largely unaffected due to South–South cooperation and multilateral/private funding support.
- **Opportunity for Leadership Realignment:** Space created for emerging economies, EU and climate-committed nations, reinforcing India's leadership role.
- **Stress on Climate Multilateralism:** Highlights vulnerability of climate institutions to geopolitical shifts, stressing need for diversified funding and resilience.

Implications for India

- Strengthens India's image as a global climate leader and voice of the Global South.
- Pushes India to deepen partnerships with Africa, Southeast Asia, and island nations through solar infrastructure

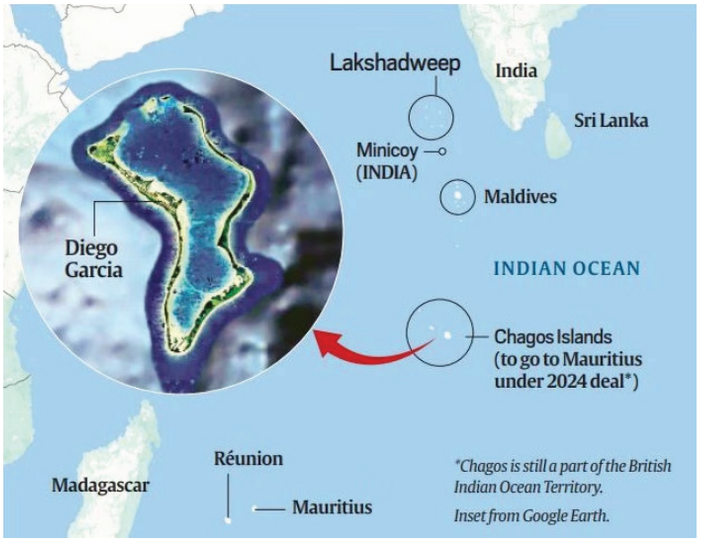
Way Forward for ISA

- **Diversification of Funding Sources:** Expand use of green bonds, blended finance and private sector participation for financial sustainability.
- **Strengthening Multilateral Partnerships**: Collaborate more closely with multilateral development banks and regional financial institutions
- **Emphasis on Decentralised Solar Solutions:** Focus on decentralised solar, energy storage and grid integration to improve energy access and resilience.
- **Enhancing Institutional Autonomy:** Increase financial and operational independence to remain effective amid geopolitical uncertainties.

Chagos Islands and Diego Garcia

Context

Donald Trump's reference to Diego Garcia while justifying the Greenland bid highlights how geography, military basing, and sovereignty disputes are central to contemporary geopolitics



About Chagos Archipelago

- **Location:** 500 km to the South of the Maldives archipelago in the Indian Ocean, roughly halfway between Africa and Indonesia
- It comprises around **58** islands.
- Mauritius, which gained independence from **Britain in 1968,** has consistently maintained its claim over the Chagos Islands.
- **In 2019, the International Court of Justice (ICJ)** dismissed the UK's right to govern the Chagos Islands and called on its government to withdraw from the archipelago.

About Diego Garcia

- **Location:** Central Indian Ocean, part of **Chagos Archipelago.**
- It is the largest of **58 islands** that form the Chagos Archipelago within the **British Indian Ocean Territory (BIOT).**
- It is leased to the United States for a military base.
- **Features:**
  - It is a **coral atoll** with an open lagoon at its northern end.
  - Discovered by the **Portuguese in the 16th century.**
  - Located in the **south of the equator.**
- **Strategic Importance of Diego Garcia**
- **Power Projection Hub**: Its central Indian Ocean location enables military power projection across the Middle East, East Africa, and South Asia.
- **Operational Role:** The base has supported major US military operations, including the Gulf War and the wars in Iraq and Afghanistan.
- **Counter-Terror Platform:** Post-9/11, Diego Garcia has served as a critical hub for counter-terrorism missions.
- **Maritime Surveillance:** The base facilitates monitoring of the Malacca Strait, a vital global trade chokepoint, particularly significant for China's energy security.
- **Indo-Pacific Stability:** According to US and UK assessments, Diego Garcia underpins Indo-Pacific stability by enabling rapid military response and strategic deterrence.

The 'Donroe Doctrine': Trump's Revival of the Monroe Doctrine

Context

Following the capture of Venezuelan President Nicolás Maduro in January 2026, **Donald Trump** publicly justified the operation by invoking the **Monroe Doctrine**, a foundational principle of U.S. foreign policy

What Is the Monroe Doctrine?

- Announced in **1823** by U.S. President **James Monroe**.
- Asserted that **European powers should not interfere in the affairs of the Americas**.
- In return, the U.S. pledged non-interference in European internal matters.
- Initially symbolic, it later became a **cornerstone of U.S. dominance in the Western Hemisphere**.

Strategic Logic Behind the Doctrine

- Framed **Latin America as a U.S. sphere of influence**, often described as America's "strategic backyard."
- Aimed to prevent the return of European colonialism after independence movements in Latin America.
- Over time, it shifted from a **defensive warning** to an **interventionist justification**.

Criticism and Decline

- Widely criticised as a tool for **imperialism and regime change** in Latin America.
- Seen as undermining sovereignty and self-determination of regional states.
- In 2013, U.S. Secretary of State John Kerry declared that **"the era of the Monroe Doctrine is over."**

Trump's 'Donroe Doctrine': What Is New?

- Trump argued that Venezuela was **harbouring foreign adversaries**, acquiring offensive weapons, and undermining U.S. interests.
- By coining the term **"Donroe Doctrine,"** he suggested an **expanded and more assertive version** of Monroe's original principle.
- Unlike the classical doctrine aimed at European powers, Trump's version targets **any external or internal actor** perceived as threatening U.S. dominance in the Americas

Trump's invocation of the Monroe Doctrine—rebranded as the "Donroe Doctrine"—represents not continuity, but escalation. By extending a 19th-century doctrine to justify 21st-century regime change, the U.S. risks normalising unilateral intervention and weakening international norms of sovereignty

K-4 Missile

Context

Defence Research and Development Organization (DRDO) successfully tests K-4 submarine-launched Ballistic Missile from INS Arighat.

About K-4 (Kalam-4) Missile

- **K-4 / Kalam-4** is a **nuclear-capable, intermediate-range submarine-launched ballistic missile (SLBM)**.
- It has an operational **range of about 3,500 km**.
- **Specifically designed for deployment on Arihant-class nuclear submarines**, including **INS Arihant** and **INS Arighat**.
- **Significance:**
  - Forms a critical pillar of **India's nuclear triad**, ensuring a **credible second-strike capability**.
  - Enables India to conduct nuclear deterrence **from underwater platform**s, enhancing survivability.

Village Defence Guards

Context

J&K army training Village Defence Guards to enhance operational readiness.

About Village Defense Guards

- **Background:**
  - **Village Defence Committees (VDCs)** were first raised in the **mid-1990s** in the erstwhile **Doda district** as a **force multiplier** against militant attacks.

  - VDCs have now been **restructured and renamed as Village Defence Guards (VDGs)**.
  - They operate mainly in rural and border areas of **Jammu and Kashmir**, especially in the **Jammu division.**
- **Purpose:**
  - To **enhance local self-defence capacity** in vulnerable villages.
  - To act as a **first line of defence** against terror strikes in remote areas.
  - To **supplement security forces** in counter-insurgency operations.
- **Composition:**
  - Comprise **local civilian volunteers** from identified villages.
  - Members are **armed and trained by the Government of India**.
- **Functions:**
  - **Village security:** Protect villages from militant attacks and infiltration.
  - **Intelligence gathering:** Provide **local-level intelligence** to police and security forces.
  - **Support role:** Assist security agencies during **counter-terror and search operations**.
  - **Deterrence:** Act as a visible deterrent against militant movement.
- **Command & Control:** Function under the **supervision of the District Superintendent of Police (SP) / Senior Superintendent of Police (SSP)**.
  - Operate in coordination with: Local police, Army and paramilitary forces (as required)

Why Revival of VDCs / Strengthening of VDGs is Being Demanded

- **Rising terror incidents** in previously peaceful areas of Jammu division.
- **Distinct militancy dynamics** due to mixed demographic composition (Hindus and Muslims).
- Increased incidents such as **infiltration attempts, recovery of war-like stores, explosions and targeted attacks & discovery and neutralisation of militant hideouts**.
- Recognition that **local participation** is critical in long-term counter-insurgency success.

Justice Mission-2025

Context

China conducted military drills named "Justice Mission 2025" around Taiwan.

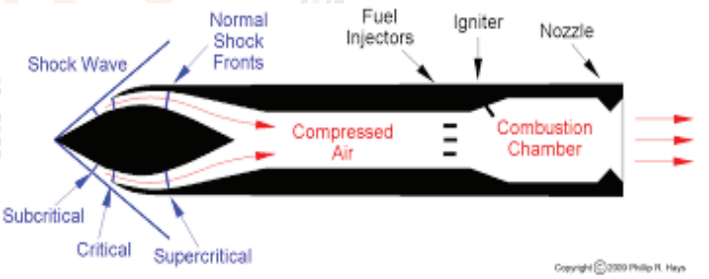
About Justice Mission 2025

- It is a **high-intensity, two-day military exercise** conducted by China's **People's Liberation Army (PLA)**.
- It involves **live-fire missile launches** along with coordinated **air and naval manoeuvres**.
- **Objective:**
  - Designed to **simulate blockade operations** and **precision strikes**.
  - Focuses on targeting **ports, sea lines of communication, and maritime infrastructure** linked to **Taiwan**.
  - Tests joint-operations capability and rapid escalation scenarios.

Ramjet Technology

Context

Army set to deploy ramjet-powered shells for 155 mm artillery guns.



What is Ramjet Technology?

- **Ramjet propulsion** is a form of **air-breathing jet engine** that operates **without turbines or compressors**.
- It relies on the **high forward speed** of the projectile to compress incoming air.
- **Working Principle:** The artillery shell is fired from a gun and accelerated to around **Mach 2**.
  - At this speed:
    - » Incoming air is **naturally compressed** in the ramjet inlet.
    - » **Fuel is injected and ignited** in the combustor.
    - » The resulting thrust **sustains propulsion during flight**, extending range.

Suryastra Rocket System

Context

The Indian Army has signed a ₹293-crore emergency procurement contract with NIBE Ltd., in collaboration with Elbit Systems, to induct the Suryastra rocket system.

About Suryastra Rocket System

- **Suryastra** is **India's first indigenously produced universal multi-calibre rocket launcher system**.
- It is designed for **precision surface-to-surface strikes** at ranges of: **150 km & 300 km**

- **Key Features:**
  - **Universal launcher capability:** Can integrate and fire **multiple types of rockets** from a single platform.
  - **High accuracy:** Achieved a **Circular Error Probable (CEP) of less than 5 metres** during trials.
  - **Multi-target engagement:** Capable of striking **multiple targets simultaneously** at varying ranges.
  - **Loitering munition capability:** Can also fire **loitering munitions up to 100 km**, enhancing battlefield flexibility.

Lokayan 26

Context

INS Sudarshini, the second sail training ship of the Indian Navy, is embarking on a 10-month, 22,000+ nautical mile transoceanic expedition named Lokayan 26.

About Lokayan 26

- The ship will participate in prestigious international events, including Escale à Sète in France and SAIL 250 in New York, USA.
- It serves as a symbol of maritime diplomacy, strengthening cooperation and trust across nations (MAHASAGAR vision).

About MAHASAGAR (Mutual and Holistic Advancement for Security and Growth Across Regions) Vision

It was formally announced by **Prime Minister Narendra Modi** during his visit to **Mauritius** in **March 2025.**

About MAHASAGAR Vision

It builds on the SAGAR policy announced during his visit to Mauritius in 2015 that has guided India's engagement with the IOR for one decade.

Components of MAHASAGAR initiative:

- **Partnership for shared future:** MAHASAGAR emphasize trade for development, capacity building for sustainable growth, and mutual security for a shared future.
- **Broader geographic region:** While SAGAR initiative was South Asia-centric concept, MAHASAGAR expands to encompass the broader Indian Ocean and, significantly, Africa's eastern littoral states
- **Economic Development:** Cooperation will be ensured through technology sharing, concessional loans and grants
- **Voice of Global South:** The objective is also to bring the voice of the Global South to the global high table.
- **Multilateralism:** Greater cooperation with IOR groupings like IORA, Colombo Security Conclave, and QUAD.

Successful Salvo Launch of Pralay Missile

Context

India successfully conducted a **salvo launch of two indigenously developed Pralay missiles** from the same launcher off the Odisha coast, marking a major milestone in user evaluation trials and operational readiness.

Nature of the Test

- The test involved **two missiles fired in quick succession** from a single launcher.
- Conducted near the **Integrated Test Range (ITR), Chandipur**.
- Both missiles met all **flight, trajectory and terminal objectives**.

What is a Salvo Launch?

A **salvo launch** refers to the **firing of multiple missiles in rapid succession**, either simultaneously or within a very short time.

it is a tactic used to **hit targets quickly and in large numbers**, reducing the enemy's ability to intercept incoming missiles.

Significance of Salvo Launch

- Demonstrates **high operational reliability** and system robustness.
- Confirms the missile's capability for **rapid successive strikes**, critical in modern warfare.
- Enhances battlefield effectiveness through **saturation and quick-response capability**.

Features of Pralay Missile

- **Solid propellant, quasi-ballistic missile**, designed for short-range precision strikes.
- Equipped with **advanced guidance and navigation systems** ensuring high accuracy.
- Developed by **Research Centre Imarat**, Hyderabad, under the aegis of **Defence Research and Development Organisation**.

Indian Army Procures Suryastra

Context

- Under emergency procurement powers, the Indian Army has signed a **₹293 crore contract** for the acquisition of **Suryastra.**

About the Suryastra Rocket Launcher

- **Suryastra** is India's **first indigenous universal multi-calibre rocket launcher**.
  - Manufactured by **NIBE Limited**, a Pune-based private defence firm.
- It represent **India–Israel Defence Collaboration:** The system is developed in collaboration with **Elbit Systems** through a **Technology Collaboration Agreement (TCA)** signed in July 2025.

- Capable of executing **precision surface-to-surface strikes** at ranges of **150 km and 300 km**.
- Designed to engage **multiple targets simultaneously at varying ranges**
- **Universal launcher:** Can fire multiple calibres and compatible tactical missiles.
- **Demonstrated a Circular Error Probable (CEP)** of less than 5 metres, indicating high accuracy.

Emergency Procurement (EP) Framework

- Cleared under EP powers approved by the **Defence Acquisition Council (DAC)**.
- Allows armed forces to procure systems worth up to **₹300 crore** without prolonged approvals.
- Mandates **delivery within 6–12 months**, ensuring rapid capability augmentation.
- Reflects urgency in addressing operational gaps.

India AI Impact Summit 2026

Context:

India has announced the India–AI Impact Summit 2026, scheduled for 19–20 February 2026 in New Delhi.

About the India AI Impact Summit 2026

- **Venue & Date:** Bharat Mandapam, New Delhi | February 19–20, 2026
- **Significance:** First-ever **global AI summit hosted in the Global South**
- **Theme:** Sarvajana Hitaya, Sarvajana Sukhaya (Welfare and happiness for all)
- **Objective:** Move from **aspirational AI principles to measurable global impact**

The summit builds on earlier global efforts such as the G20 AI Principles, UN and GPAI resolutions, and the Hamburg Declaration on Responsible AI, but seeks to **bridge the gap between global commitments and ground realities**.

Discombobulator: The system that US likely used in Venezuela Attack

Context:

The reported use of a "discombobulator" by the United States during its January 2026 military operation in Venezuela highlights the increasing reliance on non-kinetic and hybrid warfare capabilities in contemporary military operations.

About the "discombobulator"

The discombobulator is an integrated operational concept combining electronic warfare, directed-energy systems, cyber tools and psychological disorientation to paralyse enemy defences and personnel simultaneously.

Why is it Called a Discombobulator?

- The name comes from its main purpose—to **disorient soldiers and disrupt military systems**, making it difficult for the enemy to respond effectively during an operation.

How Does It Affect Soldiers?

- **Active Denial Systems (ADS):** Directed-energy "heat ray" weapons that penetrate the skin's surface to induce intense burning sensations, triggering panic and flight without permanent injury.
- **Acoustic Hailing Devices (LRAD):** High-decibel, highly directional sonic systems capable of inducing nausea and confusion, blurring the line between crowd control and battlefield use.
- **Vortex Ring Generators and Visual Dazzlers:** Technologies that employ pressure waves, chemical irritants, or pulsed lasers to disorient, temporarily blind, or incapacitate troops.

Systems Aimed at Disabling Military Infrastructure: Beyond human targets, the discombobulator reportedly focused on neutralising Venezuela's defensive architecture:

- **Electronic Warfare (EW) and Radar Jamming:** Advanced EW systems can suppress or deceive radars and sensors, forming the backbone of Suppression of Enemy Air Defences (SEAD) missions.
- **High-Power Microwave (HPM) Weapons:** Developed under US counter-electronics programmes, these weapons emit microwave pulses that can irreversibly damage electronic circuits.
- **Cyber Operations:** The precedent of Stuxnet demonstrates how malware can sabotage critical infrastructure without a single missile being fired.
- **Graphite Munitions:** Non-lethal weapons designed to short-circuit power grids, plunging regions into darkness and paralysing command-and-control systems.

The Suter Programme and Network-Centric Warfare: A critical enabler of such operations is the US Suter programme, integrated into combat aircraft:

- Suter 1 allows operators to see what enemy radar operators see.
- Suter 2 seizes control of enemy networks and manipulates sensors.
- Suter 3 penetrates links to surface-to-air missile launchers.

Why is This Weapon Important?

The discombobulator allows a military to **win without large-scale fighting**, reducing casualties, avoiding visible destruction and achieving quick control over strategic locations.

Implications for Global Security and India

For countries like India, this highlights:

- The growing importance of **electromagnetic spectrum dominance** and cyber resilience.
- The need to integrate **EW and counter-EW capabilities** into military doctrine.
- The urgency of shaping **international norms** on the use of directed-energy and cyber weapons to prevent destabilising misuse.

Concerns Related to the Use of the "Discombobulator"

- **Lack of Transparency:** Statements by US leadership refusing to disclose details of the weapon create opacity around its nature, effects and oversight, undermining global trust and accountability in military operations.
- **Humanitarian and Health Risks:** Reports of physical harm, disorientation and medical distress among Venezuelan personnel suggest potential long-term health impacts of directed-energy and sonic weapons, whose effects remain insufficiently studied.

- **Legal Grey Zones:** Directed-energy, cyber and electronic warfare systems operate outside well-defined arms-control regimes, exposing gaps in international humanitarian law regarding proportionality, distinction and permissible means of warfare.

Long Range Anti-Ship Hypersonic Missile (LR-AShM)

Context

The Defence Research and Development Organisation (DRDO) displayed the Long Range Anti-Ship Hypersonic Missile (LR-AShM) at the Republic Day parade.

About LR-AShM

- The LRASHM is a hypersonic glide missile capable of travelling at speeds above Mach 5, making interception by existing air defence systems extremely difficult.
- It is developed by Defence Research and Development Organisation (DRDO)
- It uses a Hypersonic Glide Vehicle (HGV) that separates from the launch vehicle and manoeuvres at low altitudes toward its target.
- Designed specifically for maritime strike, the missile can accurately hit high-value enemy naval assets such as aircraft carriers and destroyers at long ranges.
- The missile supports coastal defense batteries and is launched from shore-based transporter-erector-launchers (TELs).
- Its high speed, low flight trajectory, and manoeuvrability enable it to evade radar detection and missile defence systems.

Man Portable Anti-Tank Guided Missile

Context:

Defence Research and Development Organisation successfully flight-tested the **Man Portable Anti-Tank Guided Missile (MPATGM)**

Key Features

- **Generation:** Third-generation ATGM
- **Guidance: Fire-and-forget** (no post-launch operator guidance required)
- **Attack Mode: Top-attack capability** (hits weaker top armour of tanks)
- Can be launched from **Tripod-based launcher and Military Vehicle Launcher**
- **Target:** Successfully hit a **moving target**
- **Operational Capability: Day and night combat operations**

Core Technologies Used

- **Imaging Infrared (IIR) Homing Seeker:** Enables autonomous target tracking.
- **All-Electric Control Actuation System:** Improves reliability and response.
- **Fire Control System (FCS):** Enhances targeting accuracy.
- **Tandem Warhead:** Designed to defeat **modern Main Battle Tanks (MBTs)** with reactive armour.

US and Russia on the brink of a new arms race

Context:

The United States and Russia could embark on an unrestrained nuclear arms race for the first time since the Cold War as New START treaty is set to end on February 5

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).
- **Compliance:** 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.

Topic for Mains

When Governors walk out: Constitution vs Conscience

Syllabus Mapping: GS2: Executive

Context

Recent instances of Governors exiting Assembly sessions in Karnataka, Tamil Nadu, and Kerala have reignited constitutional debate on the balance between gubernatorial discretion and the authority of elected governments. These actions put the scope of **Article 176's** mandatory address and Article 163's "aid and advice" framework to the test.

Constitutional Position on the Governor's Address

Article 175: Power to Address and Send Messages

- **Discretionary Address**: Under Article 175(1), the Governor is empowered to address the Legislative Assembly, either House, or both Houses sitting jointly, at any point in time.
- **Legislative Messages:** Article 175(2) authorises the Governor to communicate messages to the House(s) on pending Bills or other matters.
- **Obligation of the Legislature:** Messages sent under Article 175(2) must be taken up by the Legislature with "all convenient dispatch", meaning within a reasonable and expeditious timeframe.

Article 176: Mandatory Special Address

- **Compulsory Address:** Article 176(1) obliges the Governor to deliver a Special Address to the Legislature:
  - At the first session following a General Election, and
  - At the first session of every calendar year.
- **Purpose of the Address:** The Special Address is meant to inform the Legislature of the reasons for its summons, as constitutionally required.
- **Absence of Discretion:** The Governor does not possess the authority to decline, modify, or withhold this address, as it is a mandatory constitutional duty.

Motion of Thanks

- **Legislative Discussion:** Article 176(2) mandates that the Legislature set aside time to debate the Governor's Special Address.
- **Formal Procedure:** A Motion of Thanks is moved, typically by a member of the ruling party, to formally acknowledge the address.
- **Scope for Amendments:** Members may propose amendments to point out omissions, express criticism, or flag policy concerns.
- **Test of Confidence:** Rejection of the Motion of Thanks is treated as an indication that the government has lost the confidence of the House.

Nature of the Governor's Address

- **Executive Character:**The address is an executive act, carried out strictly on the aid and advice of the Council of Ministers.
- **Cabinet-Drafted Content:** The speech is prepared by the State Cabinet and reflects the agenda and policies of the elected government.
- **No Scope for Modification**: Constitutional convention prevents the Governor from altering, omitting, or supplementing the Cabinet-approved text.
- **Historical Background:** The practice is derived from the British tradition of the "Speech from the Throne", where the monarch reads the government's statement without personal endorsement.
- **Judicial Clarification**: In Shamsher Singh v. State of Punjab (1974) and Nabam Rebia v. Deputy Speaker (2016), the Supreme Court held that Governors cannot disregard the aid and advice of the Council of Ministers while performing executive functions.

Emerging Challenges

- **Ambiguity in Textual Requirement:** While the Constitution requires the Governor to "address" the House, it does not explicitly state whether the speech must be read word-for-word.
- **Increasing Politicisation:** State Cabinets often include partisan narratives or Centre–State disputes, converting the address into a political statement.
- **Claim of Conscience:** Governors have argued that they cannot be compelled to deliver content they believe to be inaccurate or misleading.
- **Procedural Concerns:** The growing practice of Legislatures treating the address as "read" after a walkout weakens procedural propriety and constitutional decorum.

Role of Governor as the cornerstone of federalism

- **Appointment of Chief Ministers:** In exceptional circumstances, this power helps to ensure smooth functioning of the state governments.
  - **E.g.-** Discretionary powers of the Governor to appoint the Chief Minister in case of no clear majority.
- **Checks and balances:** Governor ensures that the state government abides by the federal provisions enshrined in the Constitution.
  - **Eg:** Under **Article 356** of the Constitution, the Governor can send a report to the President in case of Constitutional Machinery Failure.
- **Bridge between Centre and States:** On critical matters, the Governor acts as a link between central and state governments.
  - **Eg:** Under **Article 200** of the Constitution, the Governor can reserve a bill for the assent of the President.
- **Safeguarding State Interests:** The governor ensures that the state's concerns, aspirations, and developmental needs are given due consideration.
  - **Eg:** Role of Governor in administration of **5th and 6th Schedule areas**.

- **Mediating Conflicts:**
  - **Eg:** Role of Governors in mediating discussions for the implementation of GST.

Supreme Court's Interpretation of the Governor's Office

- **In Shamsher Singh v. State of Punjab (1974)**, the Supreme Court clarified that the Governor functions as a constitutional figurehead and is required to act in accordance with the aid and advice of the Council of Ministers, rather than exercising independent executive authority.
  - The Court noted that any public dissent from established Cabinet policy undermines the foundations of the parliamentary form of government.
- **In Nabam Rebia & Bamang Felix v. Deputy Speaker (2016),** the Court reaffirmed that, under Article 163, the Governor is ordinarily bound by ministerial advice, and that personal discretion is confined only to areas where the Constitution explicitly provides for it.
- **In the State of Tamil Nadu v. Governor of Tamil Nadu (2025)**, the Court held that gubernatorial powers cannot be exercised in a manner that delays, frustrates, or weakens the functioning of a democratically elected government.

Sarkaria and Punchi Commission on strengthening Governor's office:

- The procedure of consulting the Chief Minister in the appointment of Governor should be mentioned in the Constitution itself.
- The Governor should be given a fixed term of five years and their removal should not be at the will of the Government at the Centre.

Way Forward

- **Promoting Cooperative Federalism:** Establishing structured and regular dialogue between Governors and State governments can help minimise institutional friction and foster trust.
- **Respect for Constitutional Norms:** Governors should adhere closely to constitutional provisions and established conventions, particularly in legislative processes such as granting assent to Bills and delivering addresses to the Legislature.
- **Revisiting Reform Recommendations:** The Sarkaria and Punchhi Commissions both emphasised the importance of neutrality, fixed tenure, and clearly defined limits on gubernatorial discretion to preserve the non-partisan character of the office.

The role of the Governor as a constitutional bridge between central and state governments is crucial. Transparent and merit-based appointments, along with enhanced inter-state cooperation and engagement of civil society, can further strengthen the governor's office.

India's Cooperatives: Scale to Strength

Syllabus Mapping: GS2: Cooperatives

Context

India's cooperative movement has witnessed accelerated growth in recent years, emerging as one of the largest structured economic systems globally.

Current Landscape of Cooperative Societies in India

- **Overall Numbers**: As per the National Cooperative Database, India has more than 8.5 lakh registered cooperative societies, representing nearly 27% of the world's cooperatives.
- **Functioning Entities**: Approximately 6.6 lakh societies—about three-fourths of the total—are actively operational.
- **Membership Reach**: The cooperative network serves nearly 32 crore members across 30 sectors, extending its presence to about 98% of rural regions.
- **Women's Participation:** Close to 10 crore women are associated with cooperatives, primarily through self-help groups (SHGs).
- **Leading State**: Maharashtra tops the list with over 2.21 lakh societies and a membership base of around 5.8 crore.
- **National Cooperative Database (NCD)**: Maintained by the Ministry of Cooperation, this digital platform functions as a unified national portal for cooperative society data.

Importance of Cooperatives in the Indian Economy

- **Expanding Financial Access**: Primary Agricultural Credit Societies (PACS) play a crucial role in delivering credit at the grassroots, contributing nearly 15% of total agricultural lending.
- **Ensuring Input Availability:** Major national cooperatives such as IFFCO and KRIBHCO collectively provide about one-third of the country's fertiliser supply.
- **Processing and Marketing**: Cooperatives handle over 30% of sugar production and distribute a substantial portion of India's milk output.
- **Better Returns for Producers:** By cutting down intermediaries, the cooperative framework enables producers to secure a larger share of the final market price.
- **Employment Generation:** The sector supports extensive non-farm employment, accounting for more than 13% of direct job creation.
- **Inclusive Development:** Cooperatives foster participatory growth by bringing women and small farmers into the formal financial system.

Regulatory and Legal Framework for Cooperatives

- **Constitutional Right:** The 97th Constitutional Amendment Act, 2011 recognised the right to form cooperative societies as a fundamental right under Article 19(1)(c).
- **Part IXB:** The amendment introduced Part IXB to establish a standard structure for the registration and governance of cooperatives.
- **Supreme Court Ruling (2021):** The Court limited the applicability of Part IXB to Multi-State Cooperative Societies.
- **State-Level Cooperatives**:These are regulated by respective State Cooperative Societies Acts under Entry 32 of the State List.
- **Multi-State Cooperatives**: Governed by the Multi-State Cooperative Societies (MSCS) Act, 2002, under Entry 44 of the Union List.
- **Supervisory Authorities**:State cooperatives fall under State Registrars, while multi-state entities are overseen by the Central Registrar.
- **Banking Oversight**:Although cooperative banks are registered under cooperative laws, they are regulated by the RBI as per the Banking Regulation Act, 1949.
- **Rural Banking Supervision:** NABARD monitors and supervises rural cooperative banking institutions.

- **Policy Oversight:** The Ministry of Cooperation, set up in 2021, provides national-level policy direction.

Role played by cooperatives in advancing India's aim of Atmanirbhar Bharat

- **Strengthening Rural and Agricultural Economy: Primary Agricultural Credit Societies (PACS)** provide easy credit, fertilizer distribution, and storage, enabling input self-sufficiency.
  - **Eg: The GOI aims to computerize 63,000+ PACS by 2027.**
- **Promoting Local Production**: Cooperatives encourage local entrepreneurship, processing, and marketing, aligning with vocal locals.
  - **Eg: Amul's dairy model supports 36 lakh milk producers and handles over 26 million litres/day, turning villages into production hubs.**
- **Women and Tribal Empowerment:** Women's cooperatives provide financial independence, self-employment, and collective voice.
  - **Eg: Jaswanti Ben's Lijjat Papad Cooperative empowers over 45,000 women**
  - **Eg: Van Dhan Vikas Kendras (VDVKs) under TRIFED promote tribal entrepreneurship.**
- **Employment Generation**: Cooperatives operate in various sectors—handicrafts, fisheries, housing, and microfinance—creating sustainable, community-based jobs.
  - **Eg: A new report by Primus Partners** indicates that cooperatives are set to generate **56 million self-employment opportunities by 2030**, strengthening financial inclusion and rural development.
- **Digital Transformation and Market Access:** National Cooperative Database and e-Marketing platforms (e.g., Sahakar Se Samriddhi) enable digital service delivery, real-time procurement, and price discovery.
  - **Eg: Launch of the CRCS-Sahara Refund Portal in 2023** enhances transparency and accountability in financial cooperatives.
- **Reducing Regional and Sectoral Disparities**: Cooperatives act as socio-economic equalizers by pooling local resources and redistributing surpluses within the community.
  - **Eg:** Fisheries cooperatives in Kerala and Meghalaya have improved livelihoods and reduced out-migration.

Limitations in the role played by Cooperatives

- **Internal issues:** Many cooperatives are plagued by **nepotism, elite capture, and lack of internal democracy**. This hampers transparency and performance, especially in state-dominated sectors like sugar cooperatives in Maharashtra.
  - **Eg: A 2022 study by the Institute of Rural Management Anand (IRMA)** found that over 40% of elected directors in PACS were politically affiliated, reducing the autonomy of cooperatives.
- **Uneven Regional Distribution:** Cooperative development is highly skewed toward certain states like Maharashtra, Gujarat, Kerala, and Karnataka.
  - **Eg: According to the Ministry of Cooperation (2024),** Maharashtra alone accounts for 25% of the total cooperatives in India. While states in the North East have weak cooperative penetration.
- **Limited Professional Management:** Most cooperatives lack trained professionals in finance, marketing, and digital technology.
  - **Eg: The 2023 Primus Partners report** noted that only 8% of cooperatives surveyed had professional CEOs or trained managers.
- **Financial Constraints and Credit Linkages:** Cooperatives face poor access to institutional finance, especially for working capital and modernisation.
  - **Eg:** In Bihar and Jharkhand, PACS often depend on informal lenders due to delayed refinancing.
- **Lack of Digital Integration:** Absence of digital infrastructure restricts cooperatives' market access and governance efficiency.
  - **Eg: The "Janani" platform for women-led cooperatives** remains underutilised due to lack of digital onboarding.
- **Limited Market Access:** Most cooperatives lack visibility, national branding, or value-chain integration.
  - **Eg: The Economic Survey (2021–22**) highlighted that cooperatives contribute less than 1% to agricultural exports due to branding and market linkage issues.

Way forward to make cooperatives a reliable partner in the development industry

- **Technology and Market Integration**: Integrate cooperatives with digital commerce platforms like the **Open Network for Digital Commerce (ONDC)** to improve logistics and widen market access.
  - **Eg: Specialised initiatives such as "Janani", an e-marketplace for women-led cooperatives**, should be promoted to support inclusive growth.
- **Global best practices:** Learning from global best practices such as **Italy (agri-cooperatives), Japan (consumer cooperatives), and Kenya (savings and credit cooperatives)**
- **Continuity in policy support:** The new ₹2,000 crore grant-in-aid to NCDC scheme and earlier reforms like the **Multi-State Cooperative Societies (Amendment) Act, 2023,** the creation of the **Ministry of Cooperation in 2021**, show continuity in policy support towards cooperatives.
- **Capacity Building**: Set up **Centres of Excellence (CoEs)** in collaboration with institutions like **Krishi Vigyan Kendras (KVKs)** to provide training in digital literacy, entrepreneurship, and modern farming practices.
- **Access to Finance**: Broaden the scope of Priority Sector Lending (PSL), encourage the use of CSR funds and foster collaborations with international development agencies for concessional funding.
- **Brand Development**: Enhance the public profile of cooperatives through structured branding campaigns and clearly articulated long-term visions.
  - **Eg: One District One Cooperative (ODOC) initiative to improve scalability.**
- **Regulatory and Governance Reforms:** Strengthen internal governance mechanisms by instituting robust regulatory frameworks focused on accountability, transparency, and

compliance. Bring cooperatives under the purview of the RBI to ensure uniform standards and better financial oversight.

- **Quantify socio-economic impact:** Cooperatives account for nearly 3% of India's GDP, include 8.5 lakh societies with over 29 crore members, and thus remain a critical pillar of rural livelihoods.

Conclusion

Recently, the 'Five P' strategy - People, PACS, Platforms, Policy, and Prosperity has been proposed by the Home Minister to leverage cooperatives as foundational pillars of reform. The success of the NCDC scheme will hinge on how well India can modernize cooperatives into digitally driven, professionally managed, and community-centric institutions. If executed well, cooperatives can bridge rural-urban divides, empower marginalized groups, and anchor India's ambition of becoming **a $10 trillion economy by 2035**

National Sports Governance (National Sports Bodies) Rules, 2026

Syllabus Mapping: GS2: Governance

Context

The Central Government has notified the National Sports Governance (National Sports Bodies) Rules, 2026, under the National Sports Governance Act, 2025.

About National Sports Governance (National Sports Bodies) Rules, 2026

- Provide the framework for the inclusion of Sportspersons of Outstanding Merit, composition of the General Body and Executive Committee, election procedures, and disqualification criteria for members of National Sports Bodies and Regional Sports Federations.
- Outline provisions for the National Sports Election Panel and specify procedures for registration and periodic updating of affiliate units with the National Sports Board.
- Provide for the inclusion of at least four sportspersons of outstanding merit (SOMs) in the General Bodies of National Sports Bodies.
- For ensuring representation of women SOMs in the General Body, the Rules specifically provide for fifty per cent of women sportspersons of outstanding merit in the General Body.

About National Sports Governance Act, 2025

- **Objective:** To ensure professional management, financial transparency, and "athlete-centric" governance in all recognized sports bodies.
- **Key Features**
  - Establishes the National Olympic Committee, National Paralympic Committee, National Sports Federations and Regional Sports Federations with clear governance norms
  - Requires sports bodies to have a General Body and Executive Committee with defined representation, including sportspersons of merit and women members.
  - Lays ground rules for affiliation and compliance with both international and national governance standards.

Sports Governance in India

- **Constitutional Position:** Sports regulation is a state subject under Entry 33 of the State List, Seventh Schedule.
- **Policy Framework:**
  - **National Sports Policy (NSP)**: Introduced in 1984, revised in 2001.
  - **Sports Broadcasting Signals Act, 2007:** Ensures mandatory sharing with Prasar Bharati.
- **Recent Development:**
  - Cabinet has cleared NSP 2025, replacing the 2001 policy.
  - Built on core pillars, emphasising:
    - » Achieving global sporting excellence.
    - » Promoting economic and social development through sports.
    - » Making sports a people's movement.
    - » Integrating sports with the education system.

Challenges in India's sports governance system

Structural problems

- **Political capture & patronage:** Many National Sports Federations (NSFs) operate like personal fiefdoms.

  - Age and tenure caps are often flouted; entrenched leadership and family dominance are common.
  - Patronage networks marginalise professionals and athletes from decision-making.
- **Democratic deficit:** Athlete representation remains tokenistic, with little decision-making power.
  - Women are under-represented in leadership roles.
  - Opaque selections foster mistrust, favouritism, and legal disputes.
- **Legitimacy wars:** Rival factions frequently claim to be the "real" federation, leading to parallel associations.
  - International bodies intervene when governance collapses:
    - » AIFF suspension (2022): Undue third-party interference.
    - » WFI suspension (2023): Governance disputes and lack of elections.
    - » AKFI suspension (2024): Mismanagement and non-compliance with norms.

Process & compliance gaps

- **Electoral Malpractices**
  - Officials overstay beyond permissible tenure.
  - Dubious electoral rolls, manipulated voting rights, and sham elections undermine credibility.
- **Financial Opacity**
  - Central grants, sponsor funds, ticket sales, and media rights lack transparency.
  - Weak auditing leads to leakages and corruption.
- **Litigation Spiral**
  - Over 350 legal cases pending against sports federations across courts.
  - Constant litigation stalls governance decisions and directly impacts athletes' participation.

Athlete-Centric Issues

- **Selections & Trials**
  - Last-minute notifications, arbitrary criteria, and limited appeals affect fairness.
  - Athletes often learn about trials days before, disrupting preparation.
- **Safeguarding Concerns**
  - Weak mechanisms against sexual harassment, bullying, and retaliation.
  - Absence of independent "safe sport" units; existing mechanisms lack credibility.
- **Lack of Support Systems**
  - Unequal access to sports science, physiotherapy, nutrition, and mental health services.
  - Disability sports face structural neglect—poor funding, inadequate facilities, and lack of visibility.

International Compliance Risks

- **Autonomy vs Oversight Conflict**
  - IOC and international federations insist on autonomy, free from government interference.
  - Indian courts and government push for accountability and transparency.
  - Eg: IOC suspended IOA in 2012 citing government interference.
- **Doping Risks**
  - Governance crises divert attention from anti-doping measures.
  - Failure to enforce WADA norms risks international sanctions and damages India's global sporting image.

Measures to strengthen India's sporting excellence

- **Athlete-centric governance:** There is a need to ensure athletes' voices are heard in decision-making, with mandatory representation of women and sportspersons in all sports federations. **Eg: In 2022, the Delhi High Court directed the All India Football Federation (AIFF)** to include eminent players in governance after FIFA's suspension threat.
- **Transparency & Accountability:** Independent audits, compliance checks, and financial disclosures of federations. **Eg: BCCI publishes audited accounts annually**, a similar practice can be mandated across NSFs.
- Grassroots to Elite Integration: There is a need to develop a seamless pipeline from **Khelo India → SAI Training Centres → National Camps → International Games. Eg: Neeraj Chopra (javelin)** benefited from Khelo India early support before excelling on the Olympic stage.
- **Professionalisation of Sports Bodies:** Hiring trained administrators, managers, and legal experts alongside former players. **Eg: England & Wales Cricket Board (ECB)** employs professional sports managers for smooth governance.
- **Global Best Practices:** Adopt successful governance models like UK Sport's Lottery Funding and US Olympic Committee's Athlete Support Programmes. **Eg: UK's medal tally** rose dramatically after adopting performance-based funding before the London 2012 Olympics.
- **Para-Sport Mainstreaming:** Accessible venues, classification expertise, dedicated physio/nutrition/tech support, and equal rewards/media coverage. **Eg: Paralympians like Avani Lekhara and Devendra Jhajharia** proved India's medal potential when given support.
- **Technology Integration**: Create a Central Sports Science Cloud to track injury logs, training loads, and recovery analytics with athlete consent. **Eg: Australia's "AIS Performance Data Hub"** aids injury prevention and optimises athlete load management.
- **Anti-Doping Education First**: Mandatory e-learning for national campers, nutrition/supplement guidance, and quick adjudication in doping cases. **Eg: WADA's Athlete Learning Gateway** is a global model India can replicate under NADA.

Conclusion

The National Sports Governance Act, 2025 marks a paradigm shift in India's sports administration. By institutionalising transparency, accountability, and athlete-centric governance, it curbs political patronage and empowers sportspersons in decision-making. Mandatory oversight, professional management, and alignment with global best practices strengthen credibility of sports bodies. With emphasis on fair play, inclusivity, and long-term capacity building, the Act seeks to ensure sustained sporting excellence and enhance India's stature in international sports.

Strengthening AI Governance through a Techno-Legal Framework

Syllabus Mapping: GS2: Governance

Context

The White Paper issued by the Office of the Principal Scientific Adviser (OPSA) advocates moving away from rigid, rule-based regulation towards a techno-legal approach to AI governance, where legal norms and technical safeguards work together.

Core principles of the techno-legal approach

- **Governance by design:** Legal, ethical, and accountability requirements are integrated into AI systems at the development and design stage itself.
- **Innovation-friendly and adaptive regulation:** Regulatory safeguards are structured to manage risks without stifling technological advancement.
- **Risk-Based and proportionate control:** Oversight mechanisms are calibrated to the level of risk and potential harm associated with specific AI applications.
- **Human-in-the-Loop oversight:** Critical decisions remain subject to human review to reduce the risk of unchecked automated outcomes.
- **Lifecycle-oriented governance:** Regulatory safeguards apply throughout the AI lifecycle, from data sourcing and model training to deployment and real-world use.

AI lifecycle phase	Major risks involved	Suggested techno-legal safeguards
Data Acquisition	Breach of privacy, ingestion of harmful or deepfake material, infringement of intellectual property rights, and biased data sampling	Conducting Data Protection Impact Assessments (DPIAs), verifying informed consent, and undertaking privacy risk and threat analysis
Protection of Data During Use	Illegal access, data poisoning attacks, and leakage of sensitive information to external entities	Deployment of Privacy-Enhancing Technologies (PETs), adoption of Differential Privacy, use of Synthetic Data, and Confidential Computing environments
Model Training and Evaluation	Model inversion threats, unintended retention of personal data, and limited transparency or explainability	Red-team simulations, rigorous stress testing, and evaluation frameworks covering privacy, safety, fairness, and explainability
Secure AI Inference	Hallucinated outputs, prompt-based manipulation, and harmful responses during real-time deployment	Continuous runtime oversight, implementation of "Responsible AI" firewalls, and risk-graded prompt classification (Red/Amber/Green)
Trustworthy Autonomous Agents	Agents exceeding authorised boundaries, escalation of privileges, and weak audit trails	Strong agent authentication, context-aware security firewalls, emergency shutdown mechanisms, and comprehensive activity logging

Key implementation challenges

- **Tension between privacy and system performance:** Measures such as large-scale data deletion can degrade model accuracy, particularly for linguistically or culturally underrepresented populations.
- **User–subject asymmetry:** In sectors like healthcare, policing, and welfare delivery, individuals are often AI subjects rather than active users, limiting their ability to question or appeal algorithmic decisions.
- **Cross-border regulatory gaps:** AI systems developed or trained overseas may not align with Indian legal and ethical safeguards, complicating enforcement.
- **Accuracy versus compliance trade-offs**: Embedding techno-legal controls may affect system efficiency or predictive performance.

Way forward

- **Institutional Architecture**: Adoption of a coordinated, whole-of-government framework supported by dedicated bodies, including:
  - AI Governance Group (AIGG) for inter-ministerial coordination
  - Technology and Policy Expert Committee (TPEC) to bring together expertise in law, public policy, and AI safety
- **Technological Tools for Governance:** Deployment of emerging solutions such as:
  - Machine Unlearning to operationalise the right to erasure
  - Synthetic Data to enhance privacy protection
  - Content Provenance tools like watermarking and metadata to identify deepfakes
  - Integration with Digital Public Infrastructure (DPI) systems such as Aadhaar and UPI
- **DEPA-Based Data Governance:** Leveraging the Data Empowerment and Protection Architecture (DEPA) to ensure consent-based data sharing and secure, trusted execution environments.

ED and writ petitions

Syllabus Mapping: GS2: Statutory, Regulatory and various Quasi-judicial bodies

Context

- The Supreme Court's consideration of whether the Enforcement Directorate (ED) can invoke the writ jurisdiction of constitutional courts raises key issues about the constitutional status of central agencies, the limits of judicial remedies, and the balance of power between the Union and State governments.

- This question emerged from a jurisdictional dispute between the State of Kerala and the ED in a gold smuggling case. The decision is likely to shape the future legal standing of statutory bodies and define their ability to seek constitutional relief.

Enforcement Directorate (ED): Authority to File Writ Petitions Before Courts

The Supreme Court has agreed to consider a key constitutional issue: whether the Enforcement Directorate (ED) has the legal standing (locus standi) to approach High Courts under Article 226 of the Constitution by filing writ petitions.

This question has emerged from an ongoing legal dispute between the central agency and the State governments of Kerala and Tamil Nadu. The outcome is expected to have wider implications for Centre–State relations, the balance of federal power, and the independence and role of investigative bodies.

Background of the Dispute

The matter traces its origins to the 2020 Kerala gold smuggling case, which involved the illegal transport of gold through diplomatic cargo from the UAE at Thiruvananthapuram airport.

In response, the ED initiated proceedings under the Foreign Exchange Management Act (FEMA), 1999, and the Prevention of Money Laundering Act (PMLA), 2002. Allegations were raised against senior officials of the Kerala government, including the then Chief Minister.

The ED moved the Kerala High Court seeking:

- A writ of mandamus to compel access to certain official records, and
- A writ of certiorari to invalidate a State notification that challenged the ED's jurisdiction.

About ED

The Enforcement Directorate (ED) is a key investigative agency in India responsible for probing money laundering and foreign exchange violations. Over the years, its mandate has expanded to tackling a broader range of economic offences and safeguarding financial integrity. However, the agency has drawn criticism for the extensive scope of its powers and the potential for misuse, underlining the urgent need for reforms to ensure investigations are both fair and accountable.

Evolution of ED

- **1956**: The "Enforcement Unit" was created within the Department of Economic Affairs, Ministry of Finance, to investigate violations under the Foreign Exchange Regulation Act, **1947 (FERA)**. It was headquartered in Delhi and led by the Director of Enforcement.
- **1957**: The Enforcement Unit was officially renamed as the Enforcement Directorate (ED).
- **1960**: Administrative control of the ED was shifted from the Department of Economic Affairs to the Department of Revenue, Ministry of Finance.
- **1973–1977:** During this period, the ED functioned under the Department of Personnel and Administrative Reforms.
- **1977**: The ED was brought back under the Department of Revenue, where it continues to operate today.

Key Functions of ED

- **Enforcement of Laws:** Implements the provisions of key financial legislations, including the Foreign Exchange Management Act (FEMA), the Prevention of Money Laundering Act (PMLA), and the Fugitive Economic Offenders Act (FEOA)
- **Investigation of Financial Offences**: Conducts investigations into a range of economic crimes, such as money laundering, foreign exchange violations, and banking frauds.
- **Exercise of Investigative Powers**: Has the authority to arrest individuals, conduct searches and seizures, and summon documents and individuals for questioning during the course of its investigations.
- **Inter-agency Coordination:** Collaborates with other enforcement and regulatory bodies, including the Central Bureau of Investigation (CBI), Income Tax Department, and Customs Department, to address complex economic offences.

Statutory Functions of ED

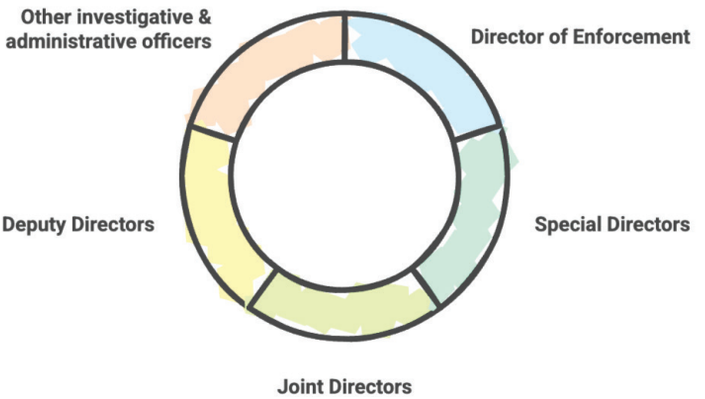
1. Prevention of Money Laundering Act, 2002 (PMLA)

- A criminal statute aimed at curbing money laundering and enabling the confiscation of assets derived from such activities.
- The ED is entrusted with: Investigating the origin and movement of illicit assets.
  - Provisionally **attaching properties linked to proceeds of crime**
  - Assisting in the prosecution of offenders and facilitating confiscation of assets through designated Special Courts.

2. Foreign Exchange Management Act, 1999 (FEMA)

- A civil law enacted to regulate foreign exchange transactions, facilitate external trade and payments, and promote a stable foreign exchange market.
- **The ED's responsibilities under FEMA include:**
  - Investigating suspected violations of foreign exchange rules.
  - Conducting adjudication proceedings.
  - Imposing penalties on individuals or entities found guilty of contravention.

Organizational Structure of ED



3. Fugitive Economic Offenders Act, 2018 (FEOA)

- Enacted to prevent economic offenders from evading legal proceedings by remaining outside Indian jurisdiction.

- **Under FEOA, the ED is empowered to:**
  - Identify and attach properties of declared **Fugitive Economic Offenders (FEOs).**
  - Facilitate the confiscation of such assets and ensure they are transferred to the Central Government

Composition and Structure of the ED

Recruitment of ED Officials

The ED recruits officers through two main channels:

- **Direct recruitment**
- **Deputation from other government services**, particularly:
  - Indian Revenue Service (IRS)
  - Indian Police Service (IPS)

Indian Administrative Service (IAS)

Director of Enforcement Directorate

- The Director is the head of the ED and is responsible for overall administration, supervision, and strategic direction of the agency.

Appointment of the Director

- The appointment is governed by the **Central Vigilance Commission Act, 2003 (CVC Act).**
- The Central Government appoints the Director based on the recommendation of a **high-level committee** comprising:
  - Central Vigilance Commissioner (CVC)
  - Vigilance Commissioners
  - Secretaries from the Ministries of Home Affairs, Personnel, and Finance
- Under the CVC Act, 2003, the **Director has a fixed tenure of 2 years.**

Understanding Writ Petitions

Meaning: A writ petition is a formal application made to a constitutional court—either the Supreme Court under Article 32 or a High Court under Article 226—seeking judicial intervention to enforce legal or fundamental rights, or to correct unlawful actions by public authorities.

Writs provide swift relief when ordinary legal remedies are inadequate, often directing authorities to act within the bounds of law or restraining them from exceeding their powers.

Types of Writs

- **Habeas Corpus:** Orders the release of a person unlawfully detained
- **Mandamus**: Directs a public authority to perform a legal duty
- **Prohibition**: Restrains a lower authority from exceeding its jurisdiction
- **Certiorari**: Quashes an unlawful order or decision
- **Quo Warranto**: Challenges the legality of a person holding a public office

Limitations

- Under Article 361, writs such as mandamus cannot be issued against the President or a State Governor for actions taken in their official capacity.
- Generally, writs also do not apply to private individuals or entities unless the State is alleged to have acted in collusion with them in violation of constitutional or legal provisions.

Central Constitutional Issue

The primary question is whether the ED can legitimately invoke the writ jurisdiction of High Courts under Article 226.

While Article 226 empowers High Courts to issue writs not only for enforcing fundamental rights but also "for any other purpose," it has traditionally been used by individuals, legal persons, and entities possessing enforceable legal rights. The controversy lies in determining whether the ED qualifies as such an entity.

Position of the High Courts (Kerala and Madras)

Both the Kerala High Court (2021) and the Madras High Court later ruled that the ED is a statutory authority with independent powers. Since its officers perform quasi-judicial functions, the courts held that the ED is not merely a department of the Union Government but has the legal capacity to approach courts on its own.

Arguments by Kerala and Tamil Nadu Governments

Before the Supreme Court, the State governments contended that:

- The ED is not a juristic person but only a department under the Union Government.
- Neither FEMA nor PMLA explicitly grants the ED the right to initiate legal proceedings in its own name.
- Allowing the ED to file writ petitions weakens Article 131, which grants the Supreme Court exclusive jurisdiction over disputes between the Centre and States.
- This practice could enable the Centre to sidestep constitutional safeguards.

Kerala also objected to the High Court's dismissal of its challenge to the ED's writ petition as a "minor procedural flaw." It cited Supreme Court rulings such as State of Andhra Pradesh v. Union of India (2012) and Chief Conservator of Forests v. Collector (2003), which emphasized that only juristic persons have the legal standing to sue governments.

Union Government and ED's Stand

The Union argued that the writ petitions were filed by ED officers in their official capacity. It maintained that:

- ED officials are not ordinary civil servants but statutory authorities empowered under FEMA and PMLA.
- Their independent legal authority justifies their access to constitutional remedies.
- Denying them this right would hinder effective law enforcement and create unnecessary procedural barriers.

Supreme Court's View

The Supreme Court observed that the matter is not a mere technicality but raises a serious constitutional issue with federal implications. As a result, it has referred the case for comprehensive examination and detailed hearing.

Key Challenges and Potential Consequences

Key challenges	Consequences
• Possible erosion of the federal division of powers between Centre and States • Expansion of ED's authority without explicit legislative recognition • Risk of executive overreach through constitutional mechanisms • Weakening of the exclusive scope of Article 131	• If the ED is permitted to file writs, it may be treated on par with statutory or constitutional bodies such as the RBI, strengthening the Centre's investigative influence. • If not, Centre–State disputes may remain confined to Article 131, reinforcing State autonomy.

Way Forward

- Legislative clarification: Explicitly define the ED's legal status and powers under FEMA and PMLA.
- Judicial guidelines: Establish clear principles on the locus standi of central agencies.
- Strengthen cooperative federalism: Maintain balance between effective enforcement and constitutional limits.

Conclusion

The Supreme Court's ruling will shape the future scope of writ jurisdiction and determine the institutional standing of central investigative agencies. More than a procedural matter, the case addresses fundamental issues of constitutional balance, federalism, and the boundaries of executive authority.

Stray Dog Issue in Telangana

Syllabus Mapping: GS2: Rights issue

Context

- Multiple villages across Telangana reported coordinated mass killings of stray dogs, bringing the issue into administrative, legal, and media focus.
- Activists and villagers alleged the use of poisoned darts and hired squads, suggesting planned and systematic extermination rather than spontaneous violence.
- Recent panchayat elections saw candidates campaign on promises to "resolve" the stray dog and monkey menace, linking public safety concerns with political mobilisation.

Scale of the problem

- **Estimated fatalities:** Animal welfare groups reported 1,500–1,600 stray dogs killed within a month across more than a dozen villages.
- **Geographic spread:** Cases reported from Kamareddy, Jagtial, Hanamkonda, Nagarkurnool, Ranga Reddy, and Nirmal districts, indicating statewide reach.
- **Evidence circulation:** Images and videos of carcasses surfaced on social media, amplifying public outrage and civil society mobilisation.
- **Legal action:** Filing of FIRs, NGO complaints, and petitions before authorities and courts demanding accountability and enforcement of animal welfare laws.
- **Media attention:** National and regional media coverage framed the issue as a public safety vs animal rights dilemma.

Public safety concerns

- **Human health risk:** Rising dog-bite cases, increasing demand for Anti-Rabies Vaccines (ARV) and Human Rabies Immunoglobulin (HRIG) in severe cases.
- **Local health data:**
  - 667 dog-bite cases since January 2025 across 19 villages in Yacharam mandal.
  - 109 cases from Yacharam alone, despite a population of ~5,000, reflecting high incidence density.
- **State-level trend:** Reported cases rose from 92,924 (2022) to 1,21,997 (2024) — nearly 30% increase.
- **Livelihood impact**: Attacks on livestock (goats, poultry) affecting small farmers' income and food security.
- **Social fear**: Parents escorting children to schools; restricted mobility of elderly and women, impacting daily life and social cohesion.

Causes Identified

- **Solid waste mismanagement:** Open dumping, burning of garbage, and absence of segregation create feeding hotspots.
  - Lack of scientific landfills and door-to-door waste monitoring in rural areas.
- **Food source availability:** Poultry waste, slaughter remnants, and discarded household food sustain and concentrate stray populations.
- **Health & population control gaps**: Limited sterilisation coverage and anti-rabies vaccination in villages.
  - Absence of dog-catching squads and mobile veterinary units.
- **Urbanisation pressures:** Expansion of real estate and infrastructure projects in peri-urban belts displacing animal habitats.
  - Increased human–animal interface leading to conflict.
- **Community behaviour**:Irregular feeding by residents and feeders without responsibility for long-term care or population management.

Governance & Institutional Gaps

- **Panchayat capacity constraints**: Insufficient financial grants, trained staff, and equipment for humane stray management.
  - Lack of standard operating procedures (SOPs) at village level.
- **Urban–rural policy divide**: GHMC implements ABC-AR programmes with NGO partnerships and budgetary support.
  - Rural local bodies lack access to similar funding mechanisms and institutional backing.
- **Legal ambiguity:** Telangana Panchayat Raj Act, 2018 offers limited clarity on authority and methods for stray control.
  - Overlap and tension with AWBI rules and PCA Act, 1960.
- **NGO limitations:** Uneven geographic presence, focus on urban areas.

  - Lack of shelters, helplines, and field teams in rural mandals.
- **Inter-departmental coordination:** Weak linkages between Panchayats, Animal Husbandry, Health Department, Urban Bodies, and Police.
- **Funding model gap:** Absence of a dedicated rural stray management fund akin to municipal allocations in cities.

Legal & Policy Framework

Prevention of Cruelty to Animals (PCA) Act, 1960

- **Core objective:** Prevents infliction of unnecessary pain or suffering on animals while recognising the role of local authorities in animal control.
- **Cruelty provisions:** Criminalises acts such as poisoning, maiming, or torture of animals.
- **Humane euthanasia**: Permits destruction of stray or unwanted animals when authorised by law, provided it is done humanely and without unnecessary suffering.
- **Institutional role**: Empowers the Animal Welfare Board of India (AWBI) to advise governments on animal welfare policies and enforcement.
- **Relevance**: Often invoked by NGOs to challenge mass killings, while authorities cite it to justify legally sanctioned population control measures.

Animal Welfare Board of India (AWBI) Rules / Guidelines

- **Preferred method:** Mandates Animal Birth Control–Anti Rabies (ABC-AR) as the scientific and humane approach to manage stray dog populations.
- **Public health linkage:** Integrates rabies prevention with population control.
- **Implementation gap**: Effective in cities with municipal support; limited reach in rural panchayats due to lack of funds and infrastructure.

Telangana Panchayat Raj Act, 2018

- **Panchayat powers:** Allows Gram Panchayats, in consultation with the District Collector, to issue notices on unlicensed or stray animals.
- **Restraint provision**: Permits panchayats to "restrain" stray dogs or pigs in cases of public health threats or disease outbreaks.
- **Legal ambiguity:**
  - No clear definition of "Animal Protection Committee"
  - Lacks standard operating procedures (SOPs) for humane capture, shelter, sterilisation, or euthanasia
- **Result**: Creates scope for ad hoc and extra-legal actions at the village level.

GHMC Act, 1955

- **Urban authority**: Empowers the Municipal Commissioner to destroy unclaimed or dangerous dogs under specified public safety conditions.
- **Operational backing**: Provides legal basis for ABC-AR programs and municipal dog-catching squads.
- **Urban–rural divide**: Stronger statutory powers and funding mechanisms in cities compared to weak legal clarity in panchayat jurisdictions.

Role of NGOs & Civil Society

- **Urban interventions**: NGOs like Blue Cross partner with GHMC to implement ABC-AR, including sterilisation, vaccination, sheltering, and post-operative care.
- **Service delivery:** Provide rescue, treatment, adoption drives, and public awareness campaigns in select urban zones.
- **Rural gap:** Limited geographical reach beyond city limits
  - Absence of 24x7 emergency helplines, mobile rescue units, and permanent shelters in most mandals
- **Public perception:** Growing resentment among affected villagers, who feel activists prioritise animal rights over human safety.
  - Social media debates and backlash against high-profile animal welfare advocates.
- **Accountability issues:** Variations in transparency, funding disclosure, and field presence among registered organisations.

Judiciary & Public Debate

- **Supreme Court observations:**
  - Held dog feeders accountable for ensuring public safety in areas where feeding occurs.
  - Emphasised a balance between animal welfare and citizens' right to safe public spaces.
- **Legal contestation:** Courts increasingly asked to interpret PCA Act, AWBI Rules, and municipal laws in cases of stray management.
- **Social divide:**
  - Polarisation between "dog lovers" and daily victims of attacks.
  - Viral videos and media narratives intensifying emotional and moral arguments.
- **Policy impact:** Judicial remarks shaping municipal actions, relocation drives, and feeding guidelines.

Government Response

- **Urban measures (GHMC):** Relocation of strays from sensitive and institutional premises to shelters.
  - Expansion of ABC-AR coverage in select city zones.
- **State-level stance:** Telangana Minister urging humane and lawful methods.
  - Public condemnation of mass killings and cruelty.
- **Administrative actions:** District authorities conducting inquiries and police investigations into alleged exterminations.
  - Coordination with Health and Animal Husbandry Departments for vaccination and treatment.
- **Limitations**: Absence of a statewide rural stray management policy.
  - Resource and manpower constraints at panchayat level.

Way Forward

- **Strengthen village waste management**: Enforce door-to-door collection, segregation, composting, and scientific disposal to eliminate open feeding grounds.

- **Legal clarity for panchayats**: Issue model rules/SOPs defining humane capture, sheltering, sterilisation, and euthanasia procedures.
- **Community participation:** Promote adoption drives, responsible feeding guidelines, and awareness campaigns on rabies prevention.
- **Institutional coordination:** Establish district-level task forces linking Panchayats, Urban Local Bodies (ULBs), NGOs, Health, Police, and Animal Husbandry Departments.
- **Dedicated funding**: Introduce a Rural Stray Animal Management Grant under state or centrally sponsored schemes.
- **Data-driven governance**: Maintain village-wise dog population and bite incident databases to guide targeted interventions.

UGC equity guidelines

Syllabus Mapping: GS2: Statutory body

Context

The UGC notified the Promotion of Equity in Higher Education Institutions Regulations, 2026, creating enforceable mechanisms to prevent discrimination across universities. It has attracted protests by students in various parts of the country.

University Grants Commission (UGC)

- The UGC is India's sole statutory body entrusted with disbursing grants and ensuring coordination, determination, and maintenance of standards in higher education institutions.
- It accords formal recognition to universities and extends financial assistance to universities and colleges approved by the government.
- The Commission was inaugurated on 28 December 1953 by Maulana Abul Kalam Azad and later acquired statutory authority through the UGC Act, 1956.
- Headquartered in New Delhi, the UGC functions through six regional offices located at Pune, Hyderabad, Kolkata, Bhopal, Guwahati, and Bengaluru to enhance oversight and outreach.
- It operates under the Department of Higher Education, Ministry of Education.

Status of Discrimination in Universities

- **Sharp Rise in Complaints:** Reported cases of caste-based discrimination increased by 118.4 percent, from 173 in 2019–20 to 378 in 2023–24, reflecting persistent campus-level concerns.
- **Growing Pendency:** Even with high disposal rates, pending cases rose from 18 to 108 over the same period, indicating repetitive grievances and uneven enforcement.
- **Symbolic Cases: The Rohith Vemula case (2016) and Payal Tadvi case (2019)** emerged as national flashpoints highlighting alleged systemic caste exclusion in higher education.

Key Provisions of UGC Anti-Discrimination Regulations, 2026

Institutional Architecture

- **Equal Opportunity Centre (EOC):** A compulsory nodal unit in every HEI tasked with implementing equity policies and addressing discrimination complaints.
- **Equity Committee**: A representative inquiry body under the EOC, chaired by the Head of the Institution, including faculty, non-teaching staff, civil society members, and students, with mandatory representation of SC, ST, OBC, women, and persons with disabilities.
- **Equity Squads:** Mobile monitoring teams assigned to regularly survey sensitive campus spaces.
- **Equity Ambassadors:** Designated individuals in departments, hostels, libraries, and other units to promote inclusivity and assist in grievance reporting.
- **24×7 Equity Helpline:** Continuous access for complaint registration with confidentiality assurances, and escalation to law enforcement in cases involving penal provisions.
- **Ombudsperson**: An independent appellate authority empowered to review decisions of the Equity Committee and issue binding directions.

Complaint Redressal Mechanism

- **Multiple Reporting Channels:** Complaints can be submitted through an online portal, email, written applications, or the helpline.
- **Expedited Process:** The Equity Committee must meet within 24 hours of complaint receipt and complete the inquiry within 15 working days.
- **Appeal Framework:** Appeals are to be decided by the Ombudsperson within 30 days, supported by external oversight.

Changes Introduced in UGC Regulations, 2026 (Earlier 2012 Framework)

- **From Advisory to Binding:** Earlier guidelines lacked enforceability; the revised regulations empower UGC to initiate strict action for non-compliance.
- **Procedural Clarity:** Defined, time-bound mechanisms for complaint inquiry and appeals have been laid down.
- **Wider Inclusion:** OBCs are now explicitly covered within the definition of caste-based discrimination.
- **Comprehensive Definition:** The scope extends to direct, indirect, implicit, and structural forms of discrimination.

Grounds for Opposition to the Regulations

- **Concerns of Social Engineering:** Fears that regulatory intervention may indirectly influence campus demographic composition.
- **Absence of Safeguards**: No explicit provisions to address false or malicious complaints.
- **Risk to Reputation**: Lack of confidentiality protections for the accused during inquiry stages.
- **Time Constraints:** Short investigation timelines may affect the depth and fairness of fact-finding.
- **Criminalisation Anxiety:** Police linkage through the helpline may discourage open academic dialogue.

Way Forward

- **Defined Evidentiary Standards:** Issue detailed guidelines on proof thresholds and interpretative limits, similar to service conduct rules.
- **Confidentiality Protocols**: Ensure anonymity of respondents during inquiries through sealed or restricted proceedings.
- **Capacity Building**: Strengthen Equity Committees through structured training programmes, drawing from institutional models like IIIDEM.

- **Flexible Timelines:** Introduce graded inquiry durations for complex cases to balance speed with procedural fairness.

Proposal to Lower the Juvenile Age Threshold

Syllabus Mapping: GS2: Judiciary

Context

A proposed Bill aims to modify the Juvenile Justice (Care and Protection of Children) Act, 2015 by lowering the minimum age for trying children as adults in cases involving heinous offences from 16 to 14 years.

Current State of Juvenile Justice Administration

- **Case Backlog:** As of October 2023, nearly 55% of the 100,904 cases before JJBs were pending, with an average caseload of 154 cases per Board.
- **Institutional Gaps:** About 25% of JJBs are operating without the mandated three-member composition, and 30% lack attached legal services clinics.
- **Infrastructure Deficits:** Fourteen States have yet to establish the compulsory Places of Safety for 16–18-year-olds accused of heinous offences.
- **Compliance Shortfalls:** Only 11 out of 292 districts met all seven prescribed minimum standards, and there are just 40 child-care homes exclusively for girls nationwide.

Understanding the Transfer System

- **Legal Provision:** The Juvenile Justice Act introduced a transfer mechanism under which children aged 16–18 years, accused of heinous offences punishable with seven years or more, may be tried as adults.
- **Preliminary Assessment by JJB:** The Juvenile Justice Board (JJB) conducts an initial evaluation of the child's mental and physical capacity, ability to comprehend consequences, and the circumstances of the alleged offence to decide whether an adult trial is warranted.
- **Role of the Children's Court:** Upon transfer, the Children's Court retains discretion to either conduct the trial as an adult court or continue proceedings under the juvenile framework, depending on its assessment.

Arguments Supporting Reduction of the Age Limit

- **Deterrence Rationale:** Proponents argue that stricter legal consequences could discourage violent conduct among adolescents aged 14–16 by reinforcing the seriousness of punishment.
- **Public Safety Concerns:** High-profile and brutal crimes involving minors have intensified demands for stronger accountability mechanisms to safeguard society and deter repeat offences.
- **Victim-Centric Justice:** Supporters emphasise proportionality in punishment, arguing that grave harm requires responses closer to adult criminal liability.
- **Institutional Credibility**: There is a perception that existing juvenile protections are being misused, weakening deterrence and public confidence in the justice system.

Arguments Opposing Reduction of the Age Limit

- **Limited Share of Juvenile Crime:** NCRB data for 2023 indicates that cases involving Children in Conflict with Law (CICL) numbered 31,365, constituting only 0.5% of total recorded crimes, undermining claims of a widespread juvenile crime surge.
- **Concentration among Older Adolescents:** Of the 40,036 CICL apprehended in 2023, nearly 79% (31,610) belonged to the 16–18 age group, suggesting that younger adolescents are not the principal contributors.
- **Marginal Role of Younger Cohort**: Only 21% (8,426) of CICL fell in the 12–16 age bracket, contradicting assertions that the 14–16 group is driving serious crime trends.
- **Greater Scope for Arbitrariness**: Extending the transfer system to younger children widens the ambit of subjective assessments, increasing the risk of inconsistent and unequal outcomes.
- **Erosion of Reformative Ethos**: The juvenile justice framework is anchored in rehabilitation and reintegration; early exposure to adult trials may compromise long-term corrective outcomes.

Way Forward

- **Preventive and Early Interventions:** Enhance early risk detection through schools, anganwadis, and local institutions, leveraging frameworks such as Mission Vatsalya.
- **Mental Health and De-Addiction Support:** Mainstream counselling and substance abuse interventions for adolescents in conflict situations, including services like Tele-MANAS.
- **Capacity Building of JJBs**: Standardise preliminary assessment procedures and strengthen training to minimise discretion-based inconsistencies.
- **Rehabilitation-Centric Approach:** Prioritise education, skill development, and restorative justice pathways, for instance through open schooling and PMKVY-linked skill programmes.

Topic for Prelims

PITA and Personal Liberty: When care becomes detention

Context

The Bombay High Court ordered the release of an adult trafficking survivor, holding that statutory "care" under PITA cannot be converted into compulsory confinement. The ruling reaffirmed that protective measures must operate within constitutional limits of personal liberty.

Safeguards on Custody After Rescue (Section 17)

- **Initial Custody:** If immediate production before a magistrate is not possible, a rescued person may be kept in protective custody for a maximum of 10 days.
- **Judicial Inquiry and Interim Custody:** Once produced before a magistrate, a formal inquiry is mandatory.
  - During this stage, interim placement may continue for up to three weeks.

Immoral Traffic (Prevention) Act, 1956: Key Features

- **Purpose of the Law**: PITA is designed to curb commercial sexual exploitation and human trafficking, with its focus on organised actors such as traffickers, brothel operators, and intermediaries, rather than on survivors.
- **Prostitution per se Not an Offence:** The statute does not criminalise prostitution itself, but penalises associated activities like running brothels, procuring persons, unlawful detention, and deriving income from exploitation.
- **Protective and Corrective Institutions**
  - Protective Homes (Section 2(g)) are intended for the care and rehabilitation of rescued persons.
  - Corrective Institutions (Sections 2(b) and 10A) provide for detention of offenders following a finding of guilt.
- **Safeguards on Custody:** Custody after rescue under Section 17 is strictly time-bound and subject to judicial inquiry, reflecting legislative intent that rescue should not translate into unlawful detention.

  - Any extension beyond this period requires explicit judicial justification and is not automatic.
- **Extended Placement:** A longer stay in a protective home (ranging from one to three years) can be ordered only if the magistrate records a clear finding that the person is genuinely "in need of care and protection."
- The High Court noted that these timelines reflect legislative intent to prevent rescue from turning into prolonged detention.

Constitutional Rights of Adult Survivors

Article 19 Protections

- For adults, fundamental freedoms including movement, choice of residence, and pursuit of livelihood — remain intact even after rescue.

Centrality of Consent

- Institutional care for adults must be voluntary.
- Once an adult clearly expresses a desire to leave a protective home, continued confinement ceases to be care and becomes unlawful detention.

Judicial Test: Care versus Detention

- **Meaning of Care:** Care involves voluntary assistance such as counselling, shelter offered with consent, and rehabilitation support that respects personal autonomy.
- **Meaning of Detention:** Detention is marked by compulsion, restrictions on movement and choice, and continued institutional stay despite refusal.
- **Victims Are Not Offenders:** The Court reiterated that PITA is designed to punish exploitation networks, not trafficking survivors. In the absence of conduct attracting penal provisions, restrictions on liberty cannot be imposed.

Role of the Magistrate

Only a magistrate, after conducting a proper inquiry, can determine whether a rescued person genuinely requires institutional care and protection. Any placement must comply with statutory safeguards and be supported by recorded, reasoned satisfaction.

Evidentiary Threshold for Restricting Liberty

- Material Justification Required: Restrictions must be based on concrete evidence, not assumptions or paternalistic welfare reasoning.
- Speculation Rejected: The possibility of returning to sex work is insufficient to justify confinement.
- Poverty Not a Ground: Economic vulnerability may warrant assistance, but cannot legitimise detention.

Limited Exceptions Permitting Restraint

Detention may be lawful only in narrowly defined circumstances:

- Incapacity: Medical evidence showing impaired decision-making ability
- Public Safety: A demonstrable and immediate risk to society if released
- Criminal Proceedings: The individual being an accused in a separate criminal case

Application in the Present Case

None of the above conditions were satisfied. There was no medical evidence of incapacity, no finding of threat to public safety, and the woman was not accused in any offence. The Court therefore ordered her release, holding that continued confinement violated constitutional liberty.

SC Affirms Lok Sabha Speaker's Authority to Constitute Inquiry Committee for Removal of Justice Yashwant Varma

Context

The Supreme Court upheld the decision of the Lok Sabha Speaker to set up an Inquiry Committee for examining allegations against Justice Yashwant Varma. The Court clarified that non-admission or rejection of a removal motion in one House of Parliament does not bar the other House from initiating an investigation or constituting an inquiry committee.

Constitutional Framework for Removal of Judges

- **Relevant Articles**
  - **Article 124:** Removal of Supreme Court judges
  - **Article 218:** Removal of High Court judges
- **Grounds for Removal**: Judges may be removed on the grounds of proved misbehaviour or incapacity, though these terms are not explicitly defined in the Constitution.
- **Statutory Regulation:** The detailed procedure is laid down in the Judges (Inquiry) Act, 1968.
- **Note**: The Constitution does not use the term "impeachment" in the context of judicial removal.

Procedure for Removal of Judges

- **Initiation of Motion:** A notice for removal must be signed by at least 100 members of the Lok Sabha or 50 members of the Rajya Sabha and submitted to the Presiding Officer of the concerned House, who has discretion to admit or reject it.
- **Constitution of Inquiry Committee:** Upon admission of the motion, it is referred to a three-member committee consisting of:
  - One judge of the Supreme Court
  - One Chief Justice of a High Court
  - One distinguished jurist

- The committee is constituted by the Speaker of the Lok Sabha or the Chairman of the Rajya Sabha, depending on where the motion is admitted.
- **Inquiry and Report:** After completing the investigation, the committee submits its findings to the Presiding Officer, who places the report before the concerned House of Parliament.
- **Consideration of Removal Motion:** If the report concludes that misbehaviour or incapacity is established, the motion for removal is taken up for discussion and voting.
- **Parliamentary Approval:** The motion must be passed by a special majority in both Houses, that is:
  - A majority of the total membership of the House, and
  - At least two-thirds of the members present and voting.
- **Presidential Order:** A judge is removed only through an order of the President of India, following the adoption of the motion by both Houses.

Current Position

- So far, no judge of the Supreme Court or High Courts has been removed through this constitutional process.

Supreme Court Calls on Union Government to Consider a "Romeo–Juliet" Exception under the POCSO Act

Context

Noting concerns over the application of the Protection of Children from Sexual Offences (POCSO) Act, the Supreme Court urged the Union Government to examine the feasibility of incorporating a "Romeo–Juliet clause". The Court observed that such a provision could help reconcile the objective of child protection with the constitutional value of personal liberty, particularly in cases involving consensual adolescent relationships.

Key Observations of the Court

- **Misapplication of the Statute**: The Court pointed out instances where the age of the alleged victim is incorrectly projected to attract the stringent provisions of POCSO, as well as cases where the law is invoked by families opposing youthful romantic relationships.
- **Need for a Romeo–Juliet Provision**: The Court suggested carving out an exception for bona fide consensual relationships between adolescents, especially where the age gap between the parties is marginal, to prevent disproportionate criminalisation.
- **Risk of Injustice**: Disregarding the consensual nature of such relationships may result in unwarranted arrests, prolonged incarceration, and severe legal consequences for young persons.

Overview of POCSO Act

- **Objective**: The Act was enacted to safeguard children below the age of 18 from sexual assault, sexual harassment, and exploitation through pornography.
- **Gender-Neutral Framework:** It defines a child as any individual under 18 years of age and applies equally, irrespective of the gender of the victim or the accused.
- **Classification of Offences:** Sexual offences are categorised into penetrative and non-penetrative assaults, along with aggravated variants, with punishments ranging from rigorous imprisonment to life imprisonment.
- **Special Courts and Child-Friendly Procedures:** The Act provides for designated Special Courts to conduct expeditious, in-camera trials, ensures protection of children from hostile cross-examination or confrontation with the accused, and mandates compensation and rehabilitation for victims.

Centre Notifies First Phase of Census 2027

Context

The Union Government has issued a notification for the initial stage of Census 2027, under which house-listing and housing census operations will be carried out from April to September 2026 across all States and Union Territories.

The population enumeration phase, which constitutes the second stage of the Census, is scheduled for February 2027.

For the Union Territory of Ladakh and other snow-bound, non-synchronous regions including parts of Jammu and Kashmir, Himachal Pradesh, and Uttarakhand, population enumeration will take place earlier, in September 2026.

Salient Features of the 16th Census (2027)

- **India's First Fully Digital Census:** Data collection will largely be carried out through mobile-based applications used by enumerators.
- **First Nationwide Caste Enumeration Since Independence:** Census 2027 will record caste data for all communities, marking the first comprehensive caste count since 1931, beyond the existing enumeration of Scheduled Castes and Scheduled Tribes.
- **Key Digital Innovations**
  - **Self-Enumeration Portal:** A secure online interface enabling citizens to fill in census details independently.
  - **Census Management and Monitoring System (CMMS):** A digital dashboard for supervisors and district officials to monitor progress in real time.
  - **Houselisting Block (HLB) Creator**: A satellite-enabled web mapping tool allowing Charge Officers to digitally demarcate accurate enumeration blocks.
  - **Census as a Service (CaaS)**: A platform providing ministries access to standardised, machine-readable, and searchable census datasets to support data-driven policymaking.

Census in India: Key Facts

- **Conducting Authority:** Office of the Registrar General and Census Commissioner of India, under the Ministry of Home Affairs.
- **Periodicity and Legal Framework:** Conducted every ten years, in accordance with the Census Act, 1948 and Census Rules, 1990.
- **Historical Significance**
  - Census 2027 will be the 16th Census of India and the 8th since Independence.
  - The first synchronous Census in India was conducted in 1881, under W.C. Plowden.

CAG Publishes "State Finances 2023–24" Report

Context

The Comptroller and Auditor General (CAG) has released the second edition of the State Finances report, offering a consolidated assessment of the fiscal position of all 28 States for FY 2023–24. The inaugural edition, titled State Finances 2022–23, was brought out in September 2025.

Major Findings of the Report

- **Rising State-Level Public Debt**: Outstanding liabilities of States stood at approximately ₹67.87 lakh crore, accounting for nearly 23% of Gross State Domestic Product (GSDP) as of 31 March 2024.
- **Fiscal Deficit Pressures**: As many as 18 States breached the 3% of GSDP fiscal deficit ceiling prescribed by the 15th Finance Commission for FY 2023–24.
- **High Degree of Fiscal Inflexibility**: Around 60% of total revenue expenditure is absorbed by committed obligations such as salaries, pensions, and interest payments, leaving limited fiscal room for new developmental initiatives.
- **Growing Dependence on Union Tax Transfers:** States' reliance on tax devolution from the Centre increased from about 21% in 2014–15 to nearly 30% in 2023–24, exposing State finances to fluctuations in national economic conditions.
- **Weak Capital Spending:** Revenue expenditure continues to dominate State budgets at roughly 83%, while capital expenditure remains low at about 16%, reflecting a tilt towards short-term consumption over asset creation.
  - In States such as Punjab and Andhra Pradesh, borrowings are increasingly being used to finance routine expenditure rather than productive investments.
- **Concerns over Fiscal Transparency**: Practices such as misclassification of expenditure have resulted in "shadow budgeting", obscuring the actual financial health of States.

CAG's Key Recommendation

- **Standardisation of Budget Classification:** To tackle inconsistencies in expenditure reporting, the CAG has directed the harmonisation of Object Heads across Union and State governments, to be fully implemented by FY 2027–28.

One Crore e-Passports Issued

Context

According to The Indian Express, close to one crore electronic passports have been issued since their nationwide rollout in 2024.

- Automatic Coverage: All fresh passport applications as well as renewals are now being issued e-Passports by default.
- Long-Term Transition Goal: India plans to achieve complete migration to e-Passports by June 2035.

What is an e-Passport?

- **Nature of the Document:** An e-Passport is a regular paper passport that contains an embedded Radio Frequency Identification (RFID) chip.
- **International Compliance:** It conforms to the ICAO Document 9303 specifications for machine-readable travel documents.
- **Implementing Authority:** The initiative is being implemented by the Ministry of External Affairs under Passport Seva Programme (PSP) Version 2.0.

Salient Features of e-Passports

- **On-Chip Data Storage:** A 64-KB embedded RFID chip stores personal particulars, a digitised photograph, and biometric identifiers such as fingerprints and iris scans.
- **Passive Chip Technology:** The RFID chip is passive in nature and communicates only with authorised readers using contactless smart-card technology.
- **Protection against Tracking:** The chip is read-only and activates only at close range, eliminating the risk of location tracking or remote exploitation.
- **Robust Security Framework:** Data security is ensured through Public Key Infrastructure (PKI) and digital signatures, preventing tampering or cloning.
- **Controlled Access Mechanism:** Supplemental Access Control (SAC) restricts unauthorised skimming by requiring physical access to the passport before data can be read.

Benefits of e-Passports

- **Faster Immigration Processing:** Integration with automated e-gates enables quicker and contactless border clearance.
- **Enhanced Protection against Fraud:** Encrypted chip technology significantly reduces the risk of counterfeiting and manipulation.
- **Improved Identity Verification**: Biometric authentication ensures accurate one-to-one identity matching, curbing impersonation.

Karnataka High Court Curbs Misuse of BNS Section 69 in Consensual Relationships

Context

The Karnataka High Court held that Section 69 of the Bharatiya Nyaya Sanhita (BNS) cannot be invoked as a tool of retaliation after the breakdown of a consensual relationship.

Background

The Bharatiya Nyaya Sanhita, 2023, has replaced the 163-year-old Indian Penal Code, and now serves as India's principal criminal statute.

Key Findings of the Court

- **Legislative Intent:** Section 69 is meant to address deception, fraud, and sexual exploitation, not emotional distress arising from failed relationships or unmet expectations.
- **No Retrospective Criminality:** A consensual relationship cannot be criminalised retrospectively based solely on allegations raised after the relationship ends.
- **Threshold of Criminality:** A charge of "false promise of marriage" is sustainable only when dishonest intent is shown to have existed from the outset, not when consent was initially genuine.

Section 69 of the Bharatiya Nyaya Sanhita: Overview

- **Nature of Offence:** Penalises sexual intercourse (excluding rape) where consent is obtained through deceptive or fraudulent means.
- **Scope of Deceit:** Includes false assurances of marriage or employment, inducement through fraud, or marriage by concealing identity such as an existing marriage or true name.
- **Punishment**: Imprisonment extending up to ten years, along with a fine.
- **Procedural Status:** A cognisable, non-bailable, and non-compoundable offence, triable by a Court of Session.

ECI Hosts International Conference IICDEM 2026

Context

The Election Commission of India is organising the first edition of the India International Conference on Democracy and Election Management (IICDEM) 2026 in New Delhi.

About IICDEM 2026

- **Event Overview:** A three-day international forum on democratic systems and election administration, aimed at exchanging best practices among Election Management Bodies (EMBs). The conference will take place at Bharat Mandapam, New Delhi.
- **Organisers**: The event is being conducted by the India International Institute of Democracy and Election Management (IIIDEM) under the guidance of the Election Commission of India (ECI).

Major Themes

- **Electoral Roll Accuracy**: Highlighting the Special Intensive Revision (SIR) process as a reliable method for strengthening voter list credibility.
- **Election Technology**: Deliberations on the role of technology in elections, including contemporary tools and innovative management practices.

About IIIDEM

- **Institute Overview**: IIIDEM functions as the training and capacity-building wing of the Election Commission of India.
- **Establishment**: Founded in 2011 to enhance professional standards in election administration and democratic governance.
- **Campus**: It operates from an independent campus located in Dwarka, New Delhi.
- **Training Record**: Has conducted over 1,300 national training programmes and trained more than 2,800 international participants.

Election Commission of India (ECI)

- **Constitutional Basis (Article 324)**: The ECI is entrusted with the supervision, direction, and control of electoral rolls and elections to Parliament, State Legislatures, and the offices of the President and Vice-President.
- **Constitutional Coverage**: Provisions related to elections are contained in Part XV (Articles 324–329) of the Constitution.
- **Structure**: A multi-member constitutional body consisting of a Chief Election Commissioner (CEC) and two Election Commissioners, appointed by the President for a term of six years or until the age of 65, whichever is earlier.
- **Removal of CEC**: The Chief Election Commissioner can be removed only through a process similar to that of a Supreme Court judge, ensuring institutional independence.
- **Removal of ECs**: Election Commissioners can be removed solely on the recommendation of the Chief Election Commissioner

Central deputation made mandatory for IPS IG posts

- **Policy Change:** MHA mandates minimum 2 years of Central deputation at SP/DIG (or equivalent) level for IPS officers to be eligible for IG/IG-equivalent posts at the Centre.
- **Applicability**: Applies to IPS officers of the 2011 batch onwards.
- **Administrative Basis:** Issued via guideline modification for empanelment communicated to State Chief Secretaries
- **Centre–State Relations**: Highlights State role in sponsoring officers and need for State clearance + officer's consent for Central deputation (federal administrative control over AIS).
- **Capacity Constraint:** Indicates shortage at Centre
  - 104/229 SP-level posts vacant
  - 69/256 DIG-level posts vacant (as of Dec 23, 2025)
- **Governance Significance:** Aims to strengthen central staffing, inter-cadre exposure, and uniform administrative standards across AIS.

Supreme Court Issues Split Ruling on Constitutionality of Prevention of Corruption Act Amendment

Context

In Centre for Public Interest Litigation v. Union of India, the Supreme Court delivered a divided opinion on the validity of Section 17A of the Prevention of Corruption Act, 1988, introduced through the 2018 amendment.

Section 17A requires prior approval from the government before initiating any inquiry or investigation against a public servant under the Act.

Key Features of the Judgment

- **Split Decision**
  - **Justice Viswanathan upheld the constitutional validity of Section 17A**, subject to the safeguard that the decision on sanction should rest with the Lokpal at the Centre or the Lokayukta in the States.
  - **Justice B.V. Nagarathna held that Section 17A violates Article 14,** as it creates an unreasonable classification by extending protection only to a particular category of public servants.
- **Reference to Larger Bench:** Owing to the divergence of views, the matter has been placed before the Chief Justice of India for the constitution of an appropriate bench to resolve the issue.

Prevention of Corruption Act, 1988: Overview

- **Meaning of Corruption:** Corruption includes the acceptance or demand of any gratification, other than lawful remuneration, by a public servant in return for performing or refraining from an official act.
- **Punishment**: The Act prescribes imprisonment of up to five years, along with applicable fines.

Prevention of Corruption (Amendment) Act, 2018

- **Objective**: Introduced to enable public officials to perform their duties without fear of vexatious complaints or undue prosecution.
- **Key Change:** The amendment criminalises the act of offering bribes, including to foreign public officials.

Other Legal and Institutional Measures Against Corruption

- **Lokpal and Lokayuktas Act, 2013:** Provides for investigation into corruption allegations against specified public authorities, including the Prime Minister.
- **Central Vigilance Commission (CVC) Act, 2003:** Seeks to promote integrity, accountability, and transparency in public administration.
- **Right to Information Act, 2005:** Strengthens citizen access to information to enhance governmental transparency.
- **United Nations Convention against Corruption (UNCAC):** A binding international framework against corruption, ratified by India in 2011.

Language Policy and Cultural Identity: The Case for Tulu in Karnataka

Context

- Karnataka government is in favour of declaring Tulu as the State's second official language.
- Decision will be taken after studying models followed by West Bengal and Andhra Pradesh.

Official Languages of India

- **Article 343(1)**: Declares Hindi in Devanagari script as the official language of the Union.
- From 1950 to 1965, English continued as an official language, with Parliament empowered to extend its use.
- Protests by non-Hindi-speaking communities led to the enactment of the **Official Language Act, 1963**, which:
  - Declares Hindi as the official language and English as a subsidiary official language.
  - Provides for the continued use of English alongside Hindi without a time limit.
  - Mandates the use of English in certain cases after its amendment in 1967.
  - **Article 345**: Allows states to adopt any one or more languages as their official language for state-level communication.

Cultural and Linguistic Significance of Tulu

- Tulu has a history of over 3,000 years.
- It has its own script.
- Included in Google Translate.
- Being researched by foreign universities.
- Universities and academies offer courses in Tulu.

Geographical Relevance

- Predominantly spoken in coastal Karnataka, especially Dakshina Kannada and Udupi regions.

Eighth Schedule of the Constitution:

- Initially listed 14 official languages, including Assamese, Bengali, Gujarati, Hindi, Kannada, Kashmiri, Malayalam, Marathi, Odia, Punjabi, Sanskrit, Tamil, Telugu, and Urdu.
- Additional languages added:
  - Sindhi (15th) by the 21st Amendment Act, 1967.
  - Konkani, Manipuri, Nepali by the 71st Amendment Act, 1992.
  - Bodo, Maithili, Dogri, Santhali by the 92nd Amendment Act, 2003.
- Total scheduled languages: 22.
- English is not a scheduled language as it is not included in the Eighth Schedule.
- States can adopt official languages not listed in the Eighth Schedule.

List of Official Languages by States

State	Official Languages	State	Official Languages
Andhra Pradesh	Telugu	Arunachal Pradesh	English
Assam	Assamese & Bodo	Bihar	Hindi
Chhattisgarh	Hindi	Goa	Konkani
Gujarat	Gujarati	Haryana	Hindi
Himachal Pradesh	Hindi	Jharkhand	Hindi
Karnataka	Kannada	Kerala	Malayalam
Madhya Pradesh	Hindi	Maharashtra	Marathi
Manipur	Meitei and English	Meghalaya	English
Mizoram	Mizo & English	Nagaland	English
Odisha	Oriya	Punjab	Punjabi

State	Official Languages	State	Official Languages
Rajasthan	Hindi	Sikkim	English, Nepali, Sikkimese, Lepcha
Tamil Nadu	Tamil	Telangana	Telugu
Tripura	Bengali, English Kokborok	Uttar Pradesh	Hindi
Uttarakhand	Hindi	West Bengal	Bengali, English

List of Official Languages by Union Territories

Union Territory	Official Language	Union Territory	Official Language
Andaman and Nicobar Islands	Hindi, English	Chandigarh	**English**
Dadra and Nagar Haveli and Daman and Diu	Gujarati, Hindi, Marathi, English	Delhi	Hindi
Lakshadweep	Malayalam, English	Jammu and Kashmir	Kashmiri, Dogri, Urdu, Hindi, English
Ladakh	Hindi and English	Puducherry	**French**, Tamil, English

Constitutional Tort

Context

Prominent activists and religious leaders urged the Supreme Court to recognise hate speech as a "constitutional tort" rather than a mere disruption of law and order.

About Constitutional Tort

- A constitutional tort is a public law remedy that allows the State to be held vicariously liable for violations of fundamental rights committed by its officials while exercising official authority.
- **Key Features of Constitutional Tort**
  - Holds the State accountable for wrongful acts committed by public officials in the course of their official duties.
  - Applies to violations carried out under the colour of State law, involving misuse or abuse of official authority.
  - Provides monetary compensation for infringement of fundamental rights, particularly under Articles 19, 20, and 21.
  - Strengthens constitutional governance by subjecting State power to continuous judicial scrutiny and oversight.

Constitutional Basis of Constitutional Tort

- **Article 294(b):** Makes the Union and State governments liable for contractual obligations inherited from pre-Constitution governments, forming an early basis for State liability.
- **Article 300(1)**: Enables the Union and States to sue or be sued in their own names, providing constitutional grounding for tortious liability of the State.
- Remedies for constitutional torts are typically sought through **writ petitions under Article 32** before the **Supreme Court** or **Article 226 before High Courts** for enforcement of fundamental rights.

Responsible Nations Index

Context

Responsible Nations Index is being developed by World Intellectual Foundation (WIF) in collaboration with Jawaharlal Nehru University (JNU), Indian Institute of Management Mumbai (IIM-Mumbai) and Dr. Ambedkar International Centre (DAIC).

About Responsible Nations Index (RNI)

- RNI is India's first globally anchored index designed to assess countries on the basis of responsible governance, social well-being, environmental stewardship and global responsibility.
- It moves beyond the conventional indexes which rank countries on conventional power & GDP based measures.
- Structured around three core dimensions:
  - Internal responsibility - focusing on dignity, justice and well-being of citizens.
  - Environmental responsibility - covering stewardship of natural resources & climate action.
  - External responsibility - measuring a country's contribution to peace, cooperation & global stability.
- Covers: 154 countries.
- The objective of the Responsible Nations Index is to promote global dialogue on ethics, responsibility, global food security, and sustainable leadership in international affairs, and is expected to contribute to a more balanced and value-based understanding of national performance on the global stage.

Topics for Mains (Economy)

Bank Frauds in India

Syllabus Mapping: GSIII, Indian Economy, Banking Sector

Context

RBI's Report on Trend and Progress of Banking in India 2024-25 shows fraud cases fell, but money involved surged in FY25.

Key Findings from the RBI Report

- **Nature:** Frauds fell to 23,879 (from 36,052), but value jumped to ₹34,771 crore (from ₹11,261 crore).
- **Court-Linked Reclassification:** Spike largely due to 122 cases worth ₹18,336 crore re-reported after complying with SC on borrower hearing/natural justice.
- **H1 Trend:** Apr–Sep FY26 cases fell to 5,092 (from 18,386), but the amount rose to ₹21,515 crore.
- **Digital Volume:** Card/Internet frauds around 66.8% of cases by number (FY25).
- **Loan Fraud:** Advances-related frauds are around 33.1% of the total amount by value.
- **Bank-Group Pattern:** Private banks: 59.3% of cases; PSBs: 70.7% of amount involved (FY25).

Reasons for Decline in the Number of Bank Frauds

- **Digital Transaction Controls:** AI-based fraud monitoring systems deployed across core banking platforms, velocity checks, and risk-based authentication have reduced small-value fraud attempts.
- **Stronger KYC Framework:** Mandatory re-KYC, video-based customer identification and centralised KYC records have reduced impersonation and mule accounts.
- **Early Warning Systems:** Automated alerts for unusual account behaviour help freeze suspicious transactions faster; E.g., account-level early warning signal dashboards in scheduled banks.
- **Consumer Awareness Drives:** SMS alerts, fraud advisories and helpline integration have improved customer response time; E.g., nationwide cyber awareness campaigns linked to digital payments.

Reasons for High Value Loss in Bank Frauds

- **Legacy Loan Frauds:** Large corporate and consortium loan frauds surface after forensic audits, inflating total value despite fewer cases.
- **Reclassification Effect:** Earlier under-reported or disputed frauds were re-examined and reported afresh, adding high-ticket amounts in a single year.
- **Advances Concentration:** Credit-related frauds are fewer in number but involve large exposure sizes compared to retail digital frauds.

Way Forward

- **Risk-Based Supervision:** Intensify scrutiny of large-value advances using dynamic risk scoring models; E.g., borrower risk heat-maps for early supervisory intervention.
- **Unified Fraud Intelligence:** Integrate fraud registries across banks and non-banks for real-time red-flag sharing; E.g., interoperable fraud alert platforms similar to payment switch networks.
- **Digital Payment Safeguards**: Introduce cooling-off periods and beneficiary verification for high-risk transactions; E.g., delayed execution for first-time high-value transfers.
- **Board-Level Accountability:** Mandate periodic fraud-risk reviews by bank boards with fixed response timelines; E.g., quarterly fraud governance dashboards.

Land acquisition major hurdle in India's Infrastructure Development

Syllabus Mapping: GSIII, Indian Economy, Infrastructure

Context

Land acquisition has been identified as the biggest bottleneck in India's infrastructure projects reviewed under PRAGATI. Land acquisition caused 35% of project delays, while environmental clearances and right-of-way issues together account for 73% of total delays nationwide.

Landscape of Infrastructure Development in India

- **Financial Outlay:** The 2025-26 Union Budget allocated a record ₹11.21 lakh crore (3.1% of GDP) for capital investment, a 10.1% increase from the previous year.
- **Road:** India has the 2nd-largest road network, with national highways spanning 1,46,145 km in 2024.
- **Railway:** Indian Railways has electrified 99.2% of the Broad Gauge network by 2025.
- **Aviation:** India is the 3rd largest domestic aviation market after the United States and China.
- **Shipping:** Under Sagarmala 2.0, cargo handling reached 1,630 MT, improving India's global ranking in international shipments from 44th to 22nd.
- **Urban Infrastructure:** India now has the 3rd-largest operational metro network, spanning 1,013 km across 23 cities (May 2025).
- **Rural Development:** Jal Jeevan Mission (JJM) achieved 80% rural tap water coverage by early 2025.

Land Acquisition in India

- Land acquisition involves the government acquiring private land for public uses like infrastructure, defence, industrial projects, and social infrastructure.
- It is governed by the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (LARR) Act, 2013.
- The Act mandates a Social Impact Assessment (SIA) to evaluate the impacts on livelihoods, infrastructure, and communities before acquisition.
- **Consent Norms:** Prior consent of 80% families is required for private projects and 70% for PPP projects.
- **Compensation Rule:** Landowners receive four times the market value in rural areas and twice the market value in urban areas.

- An additional "solatium" equal to 100% of compensation is paid to account for the involuntary nature of the acquisition.

The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (RFCT-LARR) Act, 2013

- In India, land acquisition is governed by this act and focuses on providing compensation to the land owners, extending rehabilitation and resettlement benefits to livelihood losers.
- **Mandatory:** 70% consent for Public Private Partnership (PPP) projects, 80% consent for private projects and Social impact assessment (SIA) for every project.
- **Compensation:** 4 times the market rate in rural areas and 2 times in urban areas.

Why is land acquisition in India needed?

- **Land is a Scarce Resource:** India holds only 2.4% of total land surface but hosts more than 18% of the world population.
- **Urban Expansion and Housing:** By 2050, India is likely to have 850-900 million people living in urban spaces. As cities expand and populations grow, land acquisition becomes essential.
- **Economic Growth:** Land is required for establishing industries, manufacturing units, etc.
- **Energy Projects:** Land acquisition is essential for the development of power plants, renewable energy projects, and other energy-related initiatives such as the Tehri Dam in Uttarakhand, Sardar Sarovar Dam in Gujarat, etc.

What are the challenges of land acquisition in India?

- **Lack of Support to Private Firms:** Private firms need to strike their own bargains with multiple owners which makes them vulnerable to ransom demands.
- **Eminent Domain:** State's power to acquire private property against the consent of the owner for a 'public purpose'. Under a valid law, the land owner must be paid just compensation and the acquisition of the property should only be for public purposes.
- **Land Deprivation:** Land ownership and control have been central to India's social structure and have been a source of power, wealth, and social status.
- **Social Disorder:** The process of land acquisition is often followed by protests and agitation due to multiple reasons ranging from environmental to political concern, often turning violent like the Narmada Bachao Andolan (NBA).
- **Overlapping Jurisdiction:** Though land is a state subject, "acquisition and requisitioning of property" lies in the concurrent list.
- **Politicization of Issue:** Land acquisition issues are often exploited for political gain.
- **Ideological Clash:** Land ownership has been a source of ideological conflict between capitalism and communism.
- **Misuse of "Public Purpose":** This term is vague and ambiguous.

Way Forward

- **Digitalisation and Modernisation** of land records such as SVAMITVA scheme.
- **Taking the Middle Path:** Ensuring the twin objectives of farmer welfare along with expeditiously meeting the strategic and developmental needs of the country are fulfilled.
- **Promotion of Special Economic Zones (SEZs):** Its promotion can help private firms overcome the challenges of bulk land acquisition.
- **Land Leasing over Acquisition:** Leasing land may also support sustainable project development since the lands need to be returned to the landowners at the end of the lease period.
- **Ensuring Ease of Doing Business:** Efficient and fair land acquisition processes are essential for improving the overall business environment in India.
- **Promoting Land Pooling and Land Banks:** Land pooling is a voluntary land acquisition strategy where landowners give their land to the government for development. After the development is complete, the land is returned to the original owners.
  - Land bank is a repository of all industrial infrastructure-related information serving as a decision support system for investors.

India Becomes the World's Largest Rice Producer

Context

The Union Minister of Agriculture announced that India has become the world's largest rice producer, surpassing China.

About Rice

- Rice is mainly a Kharif crop (sown in June–July and harvested in Nov–Dec), but it is also grown as Rabi and Zaid crops in Southern and Eastern India.
- **Climate:** Rice requires temperatures of 25-35°C, high humidity, and annual rainfall above 100 cm.
- **Soil:** It grows best in deep, clayey, and loamy soils with high water-holding capacity.
- Cultivation Methods: Indian farmers mainly use transplantation, broadcasting, & drilling methods.
  - New methods such as Direct Seeding of Rice (DSR) and Alternate Wetting and Drying (AWD) are promoted to conserve groundwater.

Rice Production in India

- **Global Share:** India produced a record 150.18 MT in 2024-25, accounting for over 28% of global output.
- **Area Coverage:** Rice occupies the largest cropped area in India, covering about 51–52 million hectares.
- **Key States:** West Bengal is the leading producer (about 15%), followed by Uttar Pradesh (12%) and Punjab (10%).
  - Punjab has the highest yield due to full irrigation and mechanisation, followed by Tamil Nadu and Telangana.
- **Export:** India is the world's largest rice exporter, accounting for nearly 40% of global trade.
  - Basmati rice is exported to West Asia; non-Basmati rice is exported to Africa and Southeast Asia.
- **Major Varieties:** GI-tagged rice includes Basmati, Gobindobhog (West Bengal), Joha Rice (Assam), and Navara Rice (Kerala). ICAR-developed climate-resilient varieties include Kamala and Pusa DST Rice-1.

Key Government Initiatives

- **NFSNM:** The National Food Security & Nutrition Mission (NFSNM) increases rice production through targeted productivity growth in low-yield rice districts.
- **RKVY:** Rashtriya Krishi Vikas Yojana allows states to design region-specific rice projects, including irrigation infrastructure and local processing facilities.
- **Rice Fortification:** The Rice Fortification Initiative ensures that rice distributed through the PDS, PMGKAY, and PM-POSHAN is fortified with iron, folic acid, and vitamin B12.
- **PMDDKY:** PM Dhan-Dhaanya Krishi Yojana, launched for 2025–26, targets 100 low-productivity districts to strengthen irrigation, credit access, and post-harvest infrastructure.
- **PKVY:** Paramparagat Krishi Vikas Yojana promotes organic rice farming through cluster-based support and certification for premium domestic and export markets.
- **CCTS:** Carbon Credit Trading Scheme enables rice farmers to earn carbon credits by adopting methane-reducing practices such as AWD.
- **Digital Support:** Depot Darpan (2025) and Digital Agri-Stack with Unified Farmer Service Platform enable depot monitoring, input geotagging, and transparent MSP procurement.

Key Concerns Associated with Rice Cultivation in India

- **Rapid Decline in Water Table:** Producing 1 kg of rice in India consumes 3,000–4,000 litres of water, 20–60% higher than the global average. In major rice states like Punjab and Haryana, groundwater has plummeted from ~30 feet to 80–200 feet, with most aquifers classified as over-exploited or critical due to extracting 35–57% more than is recharged annually.
  - Groundwater-intensive rice cultivation represents an inter-generational equity issue, as it transfers ecological debt to future generations through aquifer depletion.
- **Environmental Concerns:** Flooded rice paddies, by creating anaerobic soil, are a major source of methane, contributing 10–20% of India's agricultural GHG emissions. Post-harvest residue burning in Punjab and Haryana further exacerbates air pollution by releasing particulate matter and carbon monoxide.
- **Health Concerns:** Flooded rice cultivation in regions with arsenic-contaminated groundwater leads to high arsenic uptake in grains, linking consumption to serious health risks like cancer. Concurrent heavy pesticide use compounds toxicity, with studies confirming elevated arsenic levels in staple foods (rice, wheat, and potatoes) across 11 hotspot districts in Bihar.
- **Economic Concerns:** Farmers are forced into debt to fund costly deeper borewells and pumps, with smallholders hit hardest as these costs severely dent their meagre incomes. Punjab spends about Rs 39,000 per hectare on fertiliser and power subsidies for rice.
  - Prolonged flooded rice monoculture causes soil micronutrient imbalances (such as zinc and iron deficiency) leading to a growing need for higher fertiliser use over time.
- **Climatic Concerns:** Climate change, through rising temperatures and erratic rainfall, threatens to reduce rice yields by 6–10% or more, with northern and eastern India's rainfed systems most susceptible to production failures.
  - World Bank and Nature Sustainability studies highlight that rice cultivation in north-west India fuels a vicious energy–water–climate cycle, where subsidised electricity promotes groundwater over-extraction, raises carbon emissions from pumping, and locks farmers into unsustainable practices.
- **Global Food Security Implications:** As the supplier of 40% of the world's rice exports, any significant reduction in India's production due to water scarcity would have major implications for global food security and prices.

Way Forward

- **Reforming Subsidy Structures:** Shift from input-heavy subsidies to direct income and ecosystem-service payments that reward water saving, soil carbon enhancement, and crop diversification. Furthermore, guarantee a Minimum Support Price (MSP) and robust government procurement for diversified crops like millets, pulses, and oilseeds.
- **Technological Adoption and Water Conservation:** Scale up water-efficient techniques like System of Rice Intensification (SRI), and drip/sprinkler irrigation while fast-tracking the adoption of genome-edited crops (e.g., drought-tolerant Kamala rice). Combining precision irrigation with digital advisory services (AI-based weather, soil moisture sensors) can reduce water use by 30–40% without yield loss.
- **Strengthening Policy Frameworks:** Enforce bans on new borewells in critical zones and promote participatory groundwater management, while strengthening FPOs and cooperatives for collective action to cut costs. Community-led groundwater governance (including water budgeting and crop planning) is more effective than top-down regulation alone.
- **Resilience Against Climate Change:** Actively promote crop diversification and agroforestry to break the rice–wheat monoculture and enhance climate resilience. Support in-situ residue management and ex-situ utilization alongside soil health cards, as these are low-cost, high-impact adaptation strategies for smallholders.
- **Enhancing Farmer Income and Risk Mitigation:** Facilitate loans for adopting sustainable technology and scale up the Pradhan Mantri Fasal Bima Yojana (PMFBY), while supporting food processing for better price realization. Furthermore, develop cold chains, warehouses, and agro-processing units in rural clusters to reduce post-harvest losses and generate non-farm employment.

Conclusion

India's rise as the world's leading rice producer underscores the urgent water–energy–climate–health nexus, where short-term food security must be balanced with long-term sustainability. Achieving this requires subsidy reforms, crop diversification, and the adoption of water-efficient, climate-resilient practices to protect farmer welfare and environmental health.

GSDP as Criterion for Tax Devolution

Context

- Central tax devolution to States is guided by Finance Commission recommendations; while 15th FC norms are in force, 16th FC recommendations are awaited.
- Rising Centre–State tensions over tax devolution have revived debate on using GSDP as a criterion.

Why is Tax Devolution Contested?

- **GST Centralisation:** After GST, States surrendered key taxation powers; GST compensation ended in June 2022, while many States still report revenue shortfalls relative to pre-GST growth trends.
- **Cess Expansion:** Cesses and surcharges form 22–25% of the Centre's gross tax revenue, but are not shareable with States, shrinking the divisible pool (Union Budget data).
- **CSS Dominance:** Centrally Sponsored Schemes account for 40% of Central transfers, limiting States' flexibility to allocate funds based on local priorities (RBI State Finances).
- **Equity Skew:** Under the 15th FC, weight for income distance (45%) and population (15%) reduced the relative shares of fiscally high-performing States.
- **Declining Autonomy:** States' own tax revenue averages 7% of GSDP, while expenditure responsibilities continue to rise, widening vertical fiscal imbalance.

Tax Contribution vs Tax Collection

- **PAN Bias:** Direct taxes are recorded where PAN/registered offices are located, not where production occurs; E.g., factories in Tamil Nadu generate output, but taxes are booked in headquarters States.
- **Multi-State Firms:** Large firms operate across States, but tax is booked centrally, distorting estimates.
- **Labour Mobility:** Migrant labour generates income in host States, but tax attribution remains unclear.

Why is GSDP a Better Proxy for Tax Devolution?

- **Direct Taxes Link:** The correlation between GSDP and direct tax collections is 0.75 (2023–24), showing that States with larger economies contribute more to direct taxes.
- **GST Alignment:** GSDP has a 0.91 correlation with GST collections, reflecting GST's destination-based nature and close link with economic activity.
- **Efficiency–Equity Balance:** GSDP correlates 0.81 with tax collections and 0.58 with devolution shares, balancing efficiency in contribution recognition with redistribution goals.
- **Lower Distortion:** Unlike PAN-based tax attribution, GSDP reduces distortions from headquarters-based booking and better reflects real production across States.

Winners and Losers Under GSDP-Based Formula

- **Major Gainers:** Maharashtra, Karnataka, Tamil Nadu and Gujarat would gain as their higher GSDP shares better reflect real economic output and tax contribution.
- **Relative Losers:** Uttar Pradesh, Bihar and Madhya Pradesh would see reduced shares since current transfers exceed their GSDP-based entitlement, though redistribution would continue.

10-Minute Delivery Model

Context

In December 2025, over one lakh gig and platform workers went on strike demanding withdrawal of 10–20 minute delivery models, citing safety and livelihood concerns.

Government Initiatives for the Gig Economy

- **Code on Social Security (2020):** Defines gig and platform workers and enables welfare schemes such as life and disability cover, accident insurance, and maternity benefits.
- **e-SHRAM Portal (2021):** National database of unorganised workers, including gig workers; enables portable social security and accident insurance under PM Suraksha Bima Yojana.
- **Draft National Framework on Gig Workers (MoLE):** Proposes platform accountability, data sharing, and welfare financing, aimed at operationalising the Social Security Code.

State-Level Initiatives

- **Rajasthan Platform-Based Gig Workers (Registration and Welfare) Act, 2023:** Mandates aggregator registration and a welfare cess to fund social security for gig workers.
- **Karnataka Gig Workers Bill, 2024:** Proposes a Gig Workers' Welfare Board to provide insurance, pensions, and grievance redressal.

Arguments Against the Model

- **Worker Safety:** Speed pressure is borne by delivery workers, increasing accident risk; E.g., road accident deaths in India already exceed 1.7 lakh annually (MoRTH).
- **False Necessity:** There is little consumer welfare difference between 10 minutes vs 20–30 minutes, but a significant increase in worker stress and risk.
- **Labour as Shock Absorber:** Tech and marketing costs are protected, while labour is treated as the adjustable variable, shifting competition costs onto workers.

Quick Commerce Platforms to Remove 10-Minute Delivery Advertisements

- Quick commerce platforms agreed to remove advertisements for 10-minute delivery after direct intervention by the Union Labour Ministry.
- **Safety Concerns:** The Ministry warned that rigid 10-minute timelines create unsafe pressure on delivery partners, increasing accident risks.
- **Legal Framework:** The move aligns with the Code on Social Security, which formally includes gig and platform workers in welfare coverage.
- **Worker Protests:** The decision came after nationwide strikes by gig workers on December 25 and 31, 2025, demanding safer delivery models and social security.
- **Operational Reality:** Fast delivery times may not change because of the high density of dark stores nearby, even if riders do not speed.
- **Expectation Reset:** Removing time-bound promises aims to lower customer expectations and reduce the psychological strain on delivery riders.

Arguments Supporting the Model

- **Employment Creation:** Quick commerce has grown threefold between 2024–27, with market size rising from ₹50,000 crore (2025) to ₹1–1.5 lakh crore, absorbing low-skilled labour.

- **Demand-Driven Growth:** Online grocery is projected to grow 40–50%, indicating strong acceptance.
- **Job Deficit Reality: I**ndia adds 20 million workers annually, but creates only ~2 million formal jobs, making gig work a fallback livelihood.

Conclusion

The quick commerce model addresses India's acute job shortage by absorbing gig workers, but does so by shifting safety and stress costs onto delivery personnel for marginal consumer convenience gains. While the sector's growth reflects market demand and provides desperately needed income, it essentially treats labor as expendable infrastructure rather than creating sustainable employment.

SEBI (Stock Brokers) Regulations 2026

Context

SEBI notified the Stock Brokers Regulations, 2026, shifting brokerage regulation from compliance-heavy controls to an investor-centric framework.

- **Objective:** It replaces the 1992 framework to align brokerage rules with modern digital trading practices.

Securities and Exchange Board of India

- Established in April 1988 as a non-statutory body, SEBI became statutory on April 12, 1992, under the SEBI Act, 1992.
- It acts as the principal regulator of the securities market, and watchdog of the Indian capital market functioning under the Ministry of Finance.
- Its headquarters is in Mumbai, with regional offices in Ahmedabad, Kolkata, Chennai, and Delhi.
- The Board of Directors has 9 members including a chairperson nominated by the Government of India, 2 members from the Union Ministry of Finance, 1 member from the Reserve Bank of India and 5 other members appointed by the Government, including at least 3 full-time Members.

SEBI Chairperson

- Current Chairperson Madhabi Puri Buch is the first woman to hold the position, while D. R. Mehta is the longest-serving Chairperson.
- Appointment: Appointed by the Government of India for a maximum period of 5 years or till 65 years, whichever is earlier.
- **Procedure for Appointment:**
  - Candidates are shortlisted by the Financial Sector Regulatory Appointments Search Committee (FSRASC) headed by the Cabinet Secretary.
  - Shortlisted candidates are interviewed by a panel comprising the Economic Affairs Secretary and three external members with domain knowledge.
  - The Appointments Committee of Cabinet, headed by the Prime Minister, considers the panel's recommendations and appoints the Chairperson.

Key Provisions of the 2026 Regulations

- **Expanded Scope:** Brokers may undertake activities regulated by RBI, IRDAI, or IBBI through a single entity, subject to SEBI conditions.
- **Record Retention:** Books of accounts and records must be maintained for 8 years instead of five.
- **Digital Records:** They can be maintained electronically to simplify audits and inspections.
- **Board Governance:** Every brokerage firm must appoint one Designated Director residing in India for at least 182 days annually.
- **Whistleblower:** Brokers must have a written whistleblower policy with a confidential reporting system.
- **Entry Experience:** New applicants need at least two years' securities trading or dealing experience.
- **QSB Criteria:** Norms for Qualified Stock Brokers are streamlined to enhance oversight of large-client, high-volume entities.
- **Return Ban:** Brokers are explicitly prohibited from promoting schemes that promise indicative, guaranteed, or fixed investor returns.
- **Primary Oversight:** Stock exchanges are acknowledged as the primary regulators of stockbrokers, with increased reporting responsibilities.
- **Brokerage Caps:** Brokerage fees paid by Mutual Funds are capped at 6 basis points in cash markets and 2 basis points in derivative transactions.

Significance of the Regulations

- **Business Ease:** The regulations reduce the administrative burden by simplifying regulatory compliance.
- **Flexibility:** Stockbrokers are permitted to offer multiple financial services on a single platform.
- **Redundancy:** Outdated provisions like physical share delivery are removed to match current practices.
- **Investor Protection:** It reinforces fiduciary accountability and brokers' duty to protect clients' interests.

Challenges Faced by SEBI

- **Balancing market conduct regulation** with prudential oversight is increasingly challenging.
- **SEBI's broad enforcement power can severely impact** the economy, placing the burden on parties to disprove allegations.
- **Limited market consultation** and lack of regulation reviews create widespread fear of SEBI.
- **Insider trading** is a major issue and disclosure regulations often lack quality and substance.
- **SEBI's expansive statutory powers** grant significant discretion in subordinate legislation.
- **SEBI's smaller staff**, compared to its global counterparts, affects its market oversight effectiveness.

Recommendations for Improvement

- **Strengthen regulatory approach** by drawing lessons from responses to scandals like Wirecard's misappropriation (E.g., Germany's BaFin reformed its financial regulations and oversight mechanisms).
- **Increase staff and attract top talent,** similar to the UK's Financial Conduct Authority (FCA).
- Create a **unified financial regulator** to tackle overlaps, mirroring the UK's FCA model.
- **Shift focus to prudential oversight** with enhanced intelligence, as seen in the US post-2008 crisis.

- **Regularly review policies and act promptly on allegations**, following the example of global regulators like the European Securities and Markets Authority (ESMA).

New CPI Series (Base Year 2024): Food Weight Drops to 36.75% from 45.86%

Context

- The Ministry of Statistics and Programme Implementation (MoSPI) released documents on January 29, 2026, detailing the updated **Consumer Price Index (CPI)** basket with **2024 as the new base year**.
- The weight of **food and beverages** in the headline CPI is reduced significantly from **45.86%** (current 2012 series) to **36.75%**.
- This update is based on the latest **Household Consumption Expenditure Survey (HCES) 2023-24**, reflecting changing consumption patterns as incomes rise (Engel's Law).
- The first inflation print under the new series (January 2026 data) is scheduled for release on **February 12, 2026**. Detailed item-level weights will be published before that.

Changes in Major Category Weights

- **Food & Beverages**: ↓ from 45.86% to 36.75%
- **Housing**: ↑ sharply from 10.07% to 17.66% (includes expanded coverage of residential utilities like water, electricity, gas, and fuels; also reflects higher rent spending)
- **Number of Items in Basket**: ↑ from 299 to 358
- **Re-categorisation**: Some categories reorganised (e.g., "education services" now at 3.33% as a standalone; previously part of "miscellaneous" at 4.46% sub-weight). Direct comparison with old series not always possible.

Consumption Pattern Shifts (HCES 2023-24 vs. 2011-12)

- **Rural Households** — Food share in Monthly Per Capita Consumption Expenditure (MPCE): ↓ from 52.9% to 47.04%
- **Urban Households** — Food share in MPCE: ↓ from 42.62% to 39.68%
- **Rent Share** — Rural: ↑ from 0.45% to 0.56%; Urban: ↑ from 6.24% to 6.58%
- These trends align with **Ernst Engel's Law**: As household incomes rise, the proportion spent on food declines, while spending on non-food items (housing, education, services) increases.

Impact on Inflation Dynamics

- **Reduced Volatility**: Lower food weight will dampen headline CPI swings caused by volatile food prices (e.g., vegetables, cereals).
  - **E.g.:** In late 2025, negative food inflation (–5.02% in Oct 2025) dragged headline CPI to a record low of 0.25%. Under the new series, such episodes would have a muted effect.
  - **SBI estimate:** On unchanged indices, new CPI would be 20–30 bps higher when food inflation is low/negative, and 20–30 bps lower when food inflation is high.
- **Upward Pressure from Housing**: Higher weight + methodological improvements (e.g., excluding employer-provided accommodation from rent sample) → likely to show higher housing inflation, partially offsetting food volatility reduction.

Implications for RBI Monetary Policy

- Long-standing concern: High food weight (based on outdated 2011-12 patterns) made headline CPI overly sensitive to supply-side food shocks, limiting RBI's ability to respond to demand-side pressures.
- RBI has often been constrained from cutting rates during persistently high food inflation episodes, despite core inflation being moderate.
- New series better reflects current economy → should give RBI more policy space and improve transmission of interest rate changes.
- Flexible Inflation Targeting (FIT) framework (4% ± 2%) under review; most economists expect continuation in current form (target for next 5 years to be announced by March 2026). RBI has resisted excluding food from target.

Significance

- Modernises India's inflation measurement after over a decade, aligning it with current household spending realities.
- Expected to make headline inflation less volatile and more representative → strengthens credibility of inflation-targeting regime.
- Helps RBI better anchor expectations and conduct counter-cyclical policy, especially in a phase of moderating food price pressures and rising non-food components.

Inflation Below Comfort Zone

Context

India's CPI inflation has fallen below 1% for two consecutive months, far below the RBI's 4% target, raising concerns that disinflation is becoming a macroeconomic stress rather than a relief.

What is Inflation?

- It is the rise in the general level of prices of goods & services in an economy over a period of time.
- Headline Inflation: Inflation is due to all types of commodities in the economy.
- Core Inflation: Inflation excluding food and fuel items.

Inflation target in India

Under the RBI Act, the GoI, in consultation with the RBI, determines the inflation target in terms of the Consumer Price Index (CPI) every five years.

Current Inflation target is 4% with a band of 2% (2% to 6%).

CPI-Combined is India's official inflation indicator for monetary policy under the Flexible Inflation Targeting (FIT) framework mandated by the amended RBI Act, 1934.

Why Very Low Inflation Is a Concern?

- **Base Effect Distortion:** Recent sub-1% CPI prints are partly due to a high statistical base from last year, masking underlying price pressures and limiting policy clarity

- **Perception Gap:** RBI surveys (Nov 2025) show households perceive inflation at 6.6% currently and 7.6% three months ahead, indicating weak credibility of headline numbers.
- **Monetary Policy Dilemma:** With inflation low and growth buoyant, rate cuts seem logical; however, a future inflation rebound due to base effects may force policy reversals, unsettling markets.
- **Rural Income Stress:** Negative food inflation reduces farm realisations; crops like soybean and pulses sold below MSP in Oct–Nov, compressing rural incomes despite good output.
- **Manufacturing Margin Pressure:** Low WPI and muted core CPI for manufactured goods reflect weak pricing power, squeezing corporate margins even if volumes rise.
- **GST Revenue Slowdown:** Lower inflation dampens nominal transaction values; GST collections have slowed, partly due to lower price growth and rate rationalisation.
- **Fiscal Arithmetic Risk:** Nominal GDP growth is barely above Real GDP, unlike the historical 3–4 percentage point gap, complicating deficit targets and FY27 projections.

Implications for Key Stakeholders

- **Households:** Urban consumers may benefit temporarily, but income-linked groups face uncertainty.
- **Farmers & MSMEs:** Price deflation without income buffers leads to demand compression & debt stress.
- **Government:** Lower nominal growth weakens tax buoyancy and fiscal space.
- **RBI:** Managing expectations becomes harder when headline inflation diverges from lived experience.

35 Years After the New Economic Policy

Context

- The year 2026 marks 35 years of the New Economic Policy (NEP) 1991, which was "substantial but incomplete" in delivering mass non-farm job creation.
- India must revise its thinking, as China (similar per-capita GDP in 1991) is now 5x higher.

Key Features of New Economic Policy (NEP), 1991

- **Core Focus:** Based on Liberalisation–Privatisation–Globalisation (LPG) to reduce State control, expand private participation, attract foreign capital, and modernise the economy.
- **Fiscal Discipline:** Targeted at reducing fiscal deficit to ~3–4% (medium term) through subsidy rationalisation, lower non-plan expenditure and wider tax reforms to raise revenue.
- **Monetary Reforms:** Adopted a tighter monetary stance to curb imports and current account stress; used tools like treasury bills and long-term securities, and raised import credit costs.
- **Banking Liberalisation:** Gave banks greater autonomy to set deposit interest rates and maturity terms, moving away from heavy administrative control.
- **Trade Reforms:** Devalued the rupee by ~18% to boost exports, eased import restrictions for exporters, and liberalised capital goods imports without prior approvals.
- **Industrial Policy Reforms:** Abolished industrial licensing for most sectors, reduced public sector exclusivity, and opened key industries to private entry to raise competition.
- **MRTP & SSI Reforms:** Amended Monopolies and Restrictive Trade Practices Act to remove expansion approvals for large firms; allowed small enterprises to sell up to 44% equity to larger companies.
- **FDI Reforms:** Raised Foreign Direct Investment (FDI) cap from 40% to 51% in priority industries and created the Foreign Investment Promotion Board (FIPB) for faster clearances.

Achievements of the 1991 Reforms

- Mobility Rise: Vehicle ownership increased ~45 times, reflecting rising income capability.
- Formal Savings: Provident Fund rose ~75 times, signalling expansion of formal wage employment.
- External Strength: Foreign exchange reserves jumped ~120 times, improving macro-stability.
- Capital Markets: Stock market value expanded ~500 times, enabling deeper investment.
- Connectivity Boom: Phone connections rose ~600 times, powering productivity and services growth.

What 1991 Failed to Fix?

- **Farm Dependence:** 45% of India's workforce is still in agriculture, showing unfinished transformation.
- **Informality Trap:** India has 6.3 crore enterprises, but only 8 lakh are Provident Fund-paying employers, signalling the very thin formal base.
- **Weak Manufacturing Jobs:** Manufacturing workforce share is only 11%, similar to the post-industrial phase, indicating premature deindustrialisation.
- **Trust Deficit on Enterprise:** Over-regulation and suspicion toward entrepreneurs kept firms small; India's growth didn't translate into enough stable wage jobs.
- **Job Supply Mismatch:** India adds 20 million entrants annually but creates only 2 million jobs per year, widening underemployment pressure.

Revisions in Thinking Needed for Bypassing Failures

- **Wealth Creation:** "Garibi Hatao" needs "Ameeri Banao", because only expanding incomes, firms and tax base can sustainably fund welfare and jobs.
- **Policy Experimentation:** "Cross the river by feeling the stones", shift from policy paralysis to calibrated trials, piloting reforms in select sectors/States and scaling what works fast.
- **Pragmatism Over Ideology:** "Black/white cat", back any State/sector/firm (manufacturing or services, domestic or foreign) that delivers high-wage non-farm job creation, not ideological preferences.
- **Risk Acceptance:** "When you open the window, some flies will always get in" Fraud cases should be handled through smarter enforcement, not blanket over-criminalisation that discourages investment.

Reform Agenda for 2026

- **Deregulation:** Cut licensing, inspections and notices to reduce compliance fear; E.g., implement Jan Vishwas Siddhant as a single-source regulatory truth system.

- **Decriminalisation:** Replace jail-based compliance with civil penalties and graded deterrence; E.g., expand Jan Vishwas 2.0/3.0 to rationalise economic offences.
- **Digitisation:** Make government interface paperless and cashless to cut transaction costs; E.g., single-window approvals and faceless compliance like GST portal workflows.
- **Decentralisation:** Devolve funds, functions and functionaries to local levels for job creation ecosystems; E.g., 15th Finance Commission local body grants & SVAMITVA Scheme to strengthen Panchayat revenues.

VB-G RAM G Bill, 2025

- The Government of India has introduced the Viksit Bharat–Guarantee for Rozgar and Ajeevika Mission (Gramin) Bill, 2025 (VB-G RAM G Bill) in the Lok Sabha.
- This bill seeks to repeal and replace the landmark MGNREGA Act of 2005, marking a structural shift in India's rural employment landscape.

About the VB-G RAM G Bill

- Objective: To provide a statutory guarantee of wage employment to rural households while focusing on the creation of high-quality, durable assets that contribute to the national infrastructure.
- Core Vision: It aligns rural employment with broader economic goals, aiming to integrate local development plans (Viksit Gram Panchayat Plans) with national priorities (PM Gati Shakti).
- Legislative Status: It is proposed as a replacement for the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) of 2005.
- Enhanced Guarantee: It statutorily increases the guaranteed wage employment from 100 days to 125 days per household annually.
- Funding Structure Change: The bill introduces a 60:40 Centre-State cost-sharing model for the wage bill, a significant shift from the previous 100% central funding for unskilled wages.

Differences Between MGNREGA and Proposed VB-G Ram G Bill

- **Guaranteed Workdays**
  - MGNREGA: Provides a legal guarantee of at least 100 days of wage employment annually
  - Proposed VB-G Ram G Bill: Increases the statutory guarantee to 125 days of wage employment per household.
- **Wage Funding**
  - MGNREGA: The central government bears 100% of the cost for unskilled labour wages
  - Proposed VB-G Ram G Bill: Mandates a 60:40 Centre-State cost sharing model for most states' wage bills.
- **Nature of Right**
  - MGNREGA: Justiciable Right- Citizens can sue if work is denied; funding is open-ended
  - Proposed VB-G Ram G Bill: Schematic Entitlement- "Guarantee" is limited by the fixed budget cap.
- **Budgeting Approach**
  - MGNREGA: Funding is based on a "labour budget" reflecting actual demand for work from states
  - Proposed VB-G Ram G Bill: The Centre will determine a fixed, state-wise annual funding allocation.
- **Operational Period**
  - MGNREGA: Designed to operate continuously without seasonal pauses.
  - Proposed VB-G Ram G Bill: Allows work suspension for up to 60 days during peak agricultural seasons.
- **Payment Frequency**
  - MGNREGA: Mandates wages be paid within 15 days of work completion
  - Proposed VB-G Ram G Bill: Envisage paying wages weekly to improve workers' cash flow.

RBI Proposes Fresh Licensing Window for UCBs

Context

- After a 22-year pause (licensing halted in 2004), the Reserve Bank of India (RBI) has proposed reopening licences for Urban Co-operative Banks (UCBs).
- RBI halted UCB licensing as many of the newly licensed banks quickly turned financially unsound, and the R Gandhi Committee later advised granting licences only to financially strong credit societies.

Urban Cooperative Banks (UCBs)

- **Definition:** UCBs are member-owned financial institutions serving urban and semi-urban communities, small borrowers, and micro-businesses.
- **Legal Basis:** They are registered as cooperative societies under either the State Cooperative Societies Act or the Multi-State Cooperative Societies Act.
- **Regulation:** UCBs operate under a dual regulatory framework:
- The RBI oversees banking functions such as licensing, capital adequacy, and risk norms.
- The Registrar of Cooperative Societies (RCS) manages registration, internal governance, audits, and liquidation processes.

Proposals Made by RBI

- **Restart Licensing:** Reopen the UCB licensing window with stricter entry norms, due to past failures among newly licensed small UCBs.
- **Prefer Credit Societies:** Licence mainly large co-operative credit societies with a longer track record, stronger governance and financial maturity.
- **Wider Footprint:** RBI stresses new UCBs need broader presence to compete with Small Finance Banks (SFBs), commercial banks and Non-Banking Financial Companies (NBFCs).
- **Multi-State Preference:** Prefer multi-state co-operative credit societies as applicants; select uni-state societies may be considered if they meet wider footprint conditions.
- **Consultative Process:** Public feedback invited until February 13, 2026, after which RBI may issue detailed draft licensing guidelines for comments.

Current Status of UCBs in India

- **Bank Count:** Total 1,457 UCBs, with 838 Tier 1 (57.52%), 535 Tier 2, 78 Tier 3 and 6 Tier 4.
- **Deposit Concentration:** 7% UCBs (deposits above ₹1,000 crore) hold 62.5% of sector deposits.
- **Small Bank Majority:** 52% UCBs have deposits below ₹100 crore but contribute only 5.6% of deposits.
- **Balance Sheet Growth:** Assets rose to ₹7.38 lakh crore and deposits to ₹5.84 lakh crore in 2025 (from ₹4.35 lakh crore and ₹3.55 lakh crore in 2015).
- **Capital Strength:** Average CAR 18.0%; around 92% UCBs have CAR above 12% (vs 83% in 2015.
- Asset Quality (FY25): GNPA 6.2%, NNPA 0.7%, PCR 90.1%, indicating stronger provisioning.

Eligibility Filters for Licensing

- **Minimum Capital:** Applicant credit society must have ₹300 crore capital as on March 31 of previous FY.
- **Track Record:** Must have 10 years of active operations and a 5-year good financial track record.
- **Performance Trend:** Must show positive, progressive financial & operational trends over the last 5 years.
- **Capital Strength:** Capital Adequacy Ratio must be at least 12% at the time of licence grant.
- **Asset Quality:** Net Non-Performing Assets (NNPA) must not exceed 3% at the time of licence grant.

Winter Peak Power Surge

Context

- India's peak power demand rose to 245 GW on Jan 9, which exceeded the summer 2025 peak of 242 GW, driven mainly by unusual cold conditions.

Drivers of Winter Peak Power Surge

- **Harsher Winter Loads:** Unusually cold conditions across large parts of India increased domestic electricity use for heating and climate conditioning.
- **Muted Summer Cooling:** Summer 2025 saw intermittent rainfall and relatively mild temperatures, which kept the summer peak well below the projected 277 GW.
- **Climate Volatility:** Seasonal demand is becoming less predictable due to changing weather patterns, disturbing the traditional "summer peak" assumption.
- **EV Charging Push:** Rapid growth of electric two-wheelers, especially in towns and gig-economy segments, is adding new charging load.
- **Building Conditioning:** Rising glass-heavy commercial and residential buildings require higher climate conditioning even in winter months, which is expanding base electricity demand.

Impacts of Peak Power Surge

- **Peak Frequency Shock:** Peak demand crossed 240 GW only 7 times during Apr–Dec 2025, but in January it crossed 240 GW on three days (Jan 9, 12 and 13), signalling sharper short-duration stress events.
- **Rising Winter Sensitivity:** Peak demand in the first half of January was over 3% higher year-on-year, forcing utilities to hold higher reserves even in months previously treated as non-peak season.
- **Planning Mismatch:** Full-year demand growth is expected at only 1.5–2%, yet peak demand is surging disproportionately, increasing investment needs for peaking capacity.

Way Forward

- **Storage Scaling:** Expand grid-scale storage to shift surplus energy from non-peak to peak hours; E.g., Battery Energy Storage Systems (BESS).
- **Firm Capacity:** Increase reliable round-the-clock sources like nuclear and thermal for stability.
- **Demand Forecasting:** Upgrade climate-linked load forecasting using a granular weather model.
- **EV Load Management:** Promote smart charging and time-of-day tariffs to avoid peak stress.

NITI Aayog Initiative on MSME Scheme Convergence

Context

NITI Aayog released a roadmap on converging MSME schemes to reduce duplication, improve outreach, and strengthen delivery of credit, innovation and infrastructure support.

Status of MSME in India

- **Macro Importance**: MSMEs contribute about 30% of India's Gross Value Added (GVA).
- **Export Backbone:** MSME-specified products account for 45.7% of India's exports (FY 2023–24).
- **Employment Engine:** MSMEs employ 11 crore+, making them India's largest non-farm job creator.
- **Enterprise Base:** India has 6.3 crore MSMEs, indicating a massive base of small production.

Convergence Framework by NITI Aayog

- **Information Convergence:** Integrate government-generated MSME data across Centre–States to improve governance, targeting and monitoring.
- **Process Convergence:** Align scheme design and implementation to merge overlaps, unify common components and reduce redundancies.

Why Convergence is Needed?

- **Scheme Fragmentation:** The Ministry of MSME runs 18 schemes across credit, skill, marketing, innovation and infrastructure, but overlaps across ministries creating duplicated benefits.
- **Low Awareness Reach:** Even with large public spending, multiple schemes with different entry points reduce discoverability, so eligible MSMEs fail to access support.
- **High Compliance Load:** Separate documentation, verification and reporting for similar benefits raises transaction costs for small firms and creates time-loss.

- **Data Silos:** Without shared beneficiary databases, scheme monitoring becomes fragmented and outcome tracking weak, causing leakages and mis-targeting in delivery

Key Recommendations by Niti Aayog

Centralised MSME Portal

- **Unified Platform:** Build an AI-enabled portal integrating schemes in one digital window.
- **Smart Support:** Use AI chatbots, dashboards and mobile access to give real-time guidance.

Cluster Scheme Integration

- **SFURTI Merger:** Integrate Scheme of Fund for Regeneration of Traditional Industries (SFURTI) with Micro and Small Enterprises –Cluster Development Programme (MSE-CDP) for scale efficiency.
- **Traditional Sub-Scheme:** Create a dedicated traditional industries sub-window with earmarked support.

Skill Programme Rationalisation

- **Three-Tier Model:** Restructure skills into (i) entrepreneurship/ business skills, (ii) MSME technical skills and (iii) rural/women artisan training.
- **Overlap Removal:** Merge similar training schemes while retaining targeted elements for inclusion.

Marketing Assistance Wing

- **Domestic Component:** Support MSMEs through exhibitions and structured market linkage platforms.
- **Global Component:** Enable export access through curated international buyer connections.

Innovation Scheme Integration

- **ASPIRE Linkage**: Integrate A Scheme for Promoting Innovation, Rural Industry & Entrepreneurship (ASPIRE) into MSME Innovative as a special agro-rural category.
- **Budget Ring-Fencing:** Continue existing ASPIRE funds while earmarking future innovation budgets.

Safeguards Suggested

- **Targeted Schemes Protected:** Preserve dedicated programmes like National SC/ST Hub and Promotion of MSMEs in North Eastern Region (NER).
- **Flagships Standalone:** Keep large scale schemes like Prime Minister's Employment Generation Programme (PMEGP) and PM Vishwakarma independent due to size and strategic role.

Supreme Court Rules that GAAR Can Override Tax Treaties

Context

- The Supreme Court of India held that capital gains arising from Tiger Global's 2018 Flipkart stake sale to Walmart are taxable in India.
- **Treaty Claim:** US-based Tiger Global claimed an exemption under the India-Mauritius DTAA by routing investments through Mauritius-based entities.
- **Lack Substance:** The Court held that the Mauritius entities were conduit structures lacking genuine commercial substance; real decision-making was exercised from the United States.

About General Anti-Avoidance Rule (GAAR)

- GAAR is a set of anti-abuse provisions under Chapter X-A of the Income Tax Act, designed to curb aggressive tax planning.
- **Objective:** It allows authorities to deny tax benefits if a transaction is legally valid yet lacks commercial substance.
- **Recommendation:** The Parthasarathi Shome Committee played a key role in shaping GAAR's final structure.
- **Applicability Threshold:** GAAR applies only when the tax benefit of an arrangement exceeds ₹3 crore in a financial year.
- **Treaty Override:** GAAR provisions can override tax treaties (DTAAs) when an arrangement is found to be abusive.
- **Trigger Condition:** It is invoked when an arrangement is declared an Impermissible Avoidance Arrangement (IAA); a deal must pass a two-step test to be an IAA:
- **Main Purpose Test:** The primary objective of the deal is to secure a tax benefit.
- **Tainted Element Test:** It must have one of these flaws:
  - It creates rights/obligations not found in normal trade (at arm's length).
  - It results in the misuse or abuse of tax laws.
  - It lacks commercial substance (e.g., a shell company).
  - It is not bona fide (not genuine).

Legal Implications of the Supreme Court Ruling

- **Substance Over Form:** The company's economic reality takes precedence over its legal structure to detect and penalise tax evasion.
- **TRC Role:** A Tax Residency Certificate (TRC) is required to claim treaty benefits; however, it alone does not establish eligibility for tax exemption.
- **GAAR Override:** General Anti-Avoidance Rules (GAAR) prevail over tax treaties (DTAAs) when an arrangement is primarily designed to avoid tax.
- **Business Substance:** Foreign investors must demonstrate active business operations and decision-making authority in the treaty country to claim tax benefits.
- **Grandfathering Scope:** Investments made before April 2017 (the effective date for GAAR) can be scrutinised if the structure is a sham or a colourable device.
- **Indirect Transfers:** Taxation now applies to the sale of offshore shares if their value is derived mainly from Indian assets.

Positive Consequences of the Ruling

- **Revenue Augmentation:** Taxing high-value offshore transactions increases government revenue from cross-border investments.
- **Global Alignment:** India's tax framework now aligns with OECD standards to curb Base Erosion and Profit Shifting.
- **Market Integrity:** Deterring treaty shopping and round-tripping encourages cleaner, more transparent capital inflows into India.
- **Level Playing Field:** Eliminating treaty-based tax advantages creates fair competition between foreign investors and domestic businesses.

Negative Consequences of the Ruling

- **Investor Uncertainty:** Fear of retrospective scrutiny may temporarily weaken global investor confidence in India.
- **Compliance Burden:** Foreign funds will face higher costs to set up offices and hire staff to demonstrate genuine commercial substance.
- **Startup Impact:** Taxing exit profits may deepen the ongoing funding slowdown for Indian startups.
- **Litigation Risk:** Subjective assessments of commercial substances increase the risk of official discretion and disputes.

NITI Aayog Sector-wise Green Transition Roadmaps

Context

NITI Aayog released three landmark reports outlining decarbonisation roadmaps for India's cement, aluminium, and MSME sectors.

Green Transition in the Cement Sector

- **Global Status:** India is the world's second-largest cement producer after China, contributing about 13% of global output.
- **Emission Impact:** In 2023, cement output was 391 million tonnes, accounting for 7% of India's total GHG emissions.
- **Future Growth:** Cement production is projected to rise sevenfold to 2,100 million tonnes by 2070 to support infrastructure expansion.
- **Decarbonisation Goal:** The roadmap aims to reduce carbon intensity from the current 0.63 tCO_2 to 0.09-0.13 tCO_2 per tonne by 2070.

Recommendations for the Cement Sector

- **Clinker Reduction:** Reduce the limestone-to-cement ratio using fly ash and slag to lower emissions.
- **Fuel Switching:** Replace coal in cement kilns with Refuse-Derived Fuel (RDF) from municipal waste.
- **Carbon Capture:** Deploy Carbon Capture, Utilisation, & Storage (CCUS) to manage residual emissions.
- **Standard Reform:** Shift from input-based norms to performance-based standards to encourage low-carbon cement blends.

Green Transition in the Aluminium Sector

- **Production Rank:** India is the second-largest producer of primary aluminium, contributing 6% of global output; 40-50% of India's primary aluminium output is exported.
- **Emission Burden:** Aluminium production reached 4 million tonnes in 2023, accounting for about 2.8% of national emissions.
- **High Intensity:** The current emission intensity is 20-21 tCO_2 per tonne, well above the global average of 15 tCO_2.

Recommendations for the Aluminium Sector

- **Short-term:** Shift to Renewable Energy Round-the-Clock (RE-RTC) to decarbonise the smelting process.
- **Medium-term:** Adopt small modular reactors or captive nuclear plants for a stable zero-carbon baseload.
- **Long-Term:** Integrate CCUS with existing coal-based power plants to manage deep decarbonization.
- **Recycling Expansion:** Promote secondary aluminium production through scrap recycling.

Green Transition in the MSME Sector

- **Sector Size:** India has nearly 69 million MSMEs, which contribute 30% of GDP & 45.7% of total exports.
- **Emission Share:** MSMEs emitted 135 million tonnes of carbon in 2022, accounting for about 3-4% of national emissions.

Recommendations for the MSME Sector

- **Central Coordination:** Establish a National Project Management Agency (NPMA) to coordinate the MSME green transition across industrial clusters.
- **Cleaner Fuels:** Replace coal and furnace oil with cleaner fuels such as natural gas or biomass.
- **Green Power:** Enable MSMEs to procure renewable electricity through the Green Open Access Rules.
- **Green Finance**: Allocate dedicated credit-guarantee funds to help MSMEs manage high upfront costs for green technologies.

RBI Report on State Budgets and Fiscal Performances

Context

The Reserve Bank of India released its annual report, "State Finances", for the fiscal year 2025-26 to assess states' fiscal health and budgetary priorities.

Key findings

Fiscal Performance of States

- **Fiscal Deficit:** The consolidated Gross Fiscal Deficit of states is budgeted at 3.3% of GDP for FY25, up from 3% over the previous three fiscals.
- **Capital Spending:** State capital expenditure is projected at 3.2% of GDP, with a focus on long-term public asset creation.
- **Central Support:** Growth in state capital expenditure is supported by 50-year interest-free loans under the SASCI scheme.
- **Debt Levels:** Total outstanding state liabilities stand at 29.2% of GDP, exceeding the fiscal prudence target of 20% recommended by the FRBM Review Committee (2017)
- **Tax Structure:** State Goods and Services Tax (SGST) has emerged as the primary tax source; its growth has slowed, and its share in SGDP remains below pre-GST levels.
  - Non-tax revenue sources have declined steadily over the past decade.

Demographic Transition

- **Young States:** States with youthful populations like Bihar and Uttar Pradesh must increase education and skills spending to utilise their working-age populations.
- **Ageing States:** States like Kerala and Tamil Nadu are facing rising fiscal pressure from pension and geriatric healthcare demands.

- **Transition States:** Demographically transitioning states like West Bengal and Maharashtra need to adjust their fiscal strategies for long-term revenue sustainability.

Major Concerns

- **Expenditure Rigidity:** High committed expenditure on salaries, pensions and interest payments restricts fiscal space for development projects.
- **Subsidy Quality:** Expansion of non-merit subsidies and freebies risks crowding out productive investments in the social sector.
- **Discom Stress:** Persistent financial losses of power distribution companies create large contingent liabilities for state finances.
- **Transparency Gaps:** Inconsistent disclosure of off-budget borrowings obscures the true extent of state indebtedness and fiscal risks.

Policy Recommendations

- **Fiscal Path:** States should adopt a time-bound fiscal consolidation roadmap to reduce debt-to-GDP ratios to sustainable levels.
- **Revenue Base:** Strengthening non-tax revenue sources is essential to reduce dependence on central transfers and borrowings.
- **Climate Budgeting:** States should integrate climate-sensitive budgeting to mitigate fiscal shocks caused by frequent disasters.
- **Digital Systems:** Stronger digital public financial management systems can improve the efficiency of tax collection and subsidy targeting.

Topic for Prelims (Economy)

Government Launches Twin Credit Support Measures For Exporters

Context

The Government of India launched the Interest Subvention Scheme and the Collateral Support Scheme under the Niryat Protsahan sub-scheme of the Export Promotion Mission (EPM). The two components aim to lower borrowing costs and address collateral constraints faced by MSME exporters.

About Interest Subvention Scheme

- **Interest Support:** It is a central sector scheme that offers a 2.75% interest subsidy on rupee export credit.
- **Objective:** Aims to reduce borrowing costs for MSME exporters and enhance the price competitiveness of Indian goods.
- **Implementing Bodies:** Jointly Implemented by the Directorate General of Foreign Trade (DGFT) and the Reserve Bank of India.
- **Budget Allocation:** The government earmarked ₹5,181 crore over six years, from FY 2025 to FY 2030.
- **Loan Coverage:** This applies to both pre-shipment (during production) and post-shipment (from shipment until payment is received) rupee export credit.
- **Product Scope:** The scheme covers about 75% of tariff lines, with significant MSME participation.
- **Exclusions List:** Restricted items, waste or scrap, and products covered under overlapping incentive schemes like PLI are excluded.
- **Benefit Ceiling:** The maximum annual interest subvention is capped at ₹50 lakh per firm.
- **Rate Review:** Subvention rates will remain floating and will be reviewed twice a year, depending on repo rates and global benchmarks.

About Collateral Support Scheme

- **Credit Guarantee:** The scheme offers government-backed credit guarantees to improve MSME exporters' access to bank finance.
- **Objective:** To ease collateral constraints for MSME exporters and expand access to export-linked working capital credit.
- **Implementing Body:** The Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE) is implementing it on a pilot basis.
- **Coverage Scope:** This applies only to export-linked working capital loans extended by scheduled commercial banks and other eligible lenders.
- **Guarantee Extent:** Guarantee coverage varies by enterprise size, up to 85% for micro and small exporters and 65% for medium exporters.
- **Exposure Cap:** The maximum guaranteed outstanding exposure per exporter is limited to ₹10 crore in a financial year.
- **Exclusions List:** Restricted items, waste or scrap, and products covered under overlapping export incentive schemes are excluded.

Reserve Bank – Integrated Ombudsman Scheme (RB-IOS), 2026

Context

The Reserve Bank of India (RBI) issued the Reserve Bank – Integrated Ombudsman Scheme (RB-IOS), 2026, replacing the 2021 version to enhance complaint resolution.

About RB-IOS

- RB-IOS is a free, grievance redressal mechanism to resolve customer complaints against RBI-Regulated Entities (REs) under the Alternate Grievance Redressal (AGR) framework.
  - AGR Framework is a comprehensive system developed by RBI to manage internal and external dispute-resolution mechanisms across the financial sector.
- The scheme adopts a jurisdiction-neutral, unified framework for all REs, under the "One Nation – One Ombudsman" principle.
- **Objective:** To simplify complaint filing, standardise procedures, and ensure faster, transparent, and fair resolution of customer grievances.
- **Entities Covered:** Commercial banks, regional rural banks, NBFCs with assets above ₹100 crore, system participants like UPI, Credit Information Companies, and State and District Central Co-operative Banks.

Key Features of RB-IOS 2026

- **Tightened Timelines:** REs must submit written replies within 15 days, while complainants must approach the Ombudsman within 90 days of response expiry (previously 1 year).
- **Appointments:** RBI may appoint one or more of its officers as RBI Ombudsman or RBI Deputy Ombudsman, generally for a period of three years.
- **CRPC Mechanism:** A permanent Centralised Receipt and Processing Centre to scrutinise all physical and email complaints, ensuring uniform handling.
- **Expanded Scope:** The definition of "deficiency in service" now covers all services provided by regulated entities, not only financial services.
- **Enhanced Compensation:** There is no cap on dispute value; the Ombudsman may award up to ₹30 lakh for financial loss and ₹3 lakh for non-financial harm.
- **Appeal Provision:** Both complainants and REs may appeal to the Appellate Authority within 30 days.
- **Ombudsman Authority:** The Ombudsman may implead third-party regulated entities whose negligence contributed to service deficiency and issue non-binding advisories for early settlement.
- **Increased Accountability:** The RBI must publish an annual report on the functioning and activities under the scheme to enhance transparency.

QR Code-Enabled Road Signage in Delhi

Context

The Public Works Department (PWD), Delhi, issued guidelines mandating QR codes on all existing and future road signage throughout the capital. The QR codes will provide instant details about the manufacturer and the type of materials used.

Other Key Infrastructure Monitoring Initiatives

- **NHAI:** The National Highways Authority (NHAI) of India is installing QR-coded Project Information Sign Boards on all national highways.
- **PMGSY:** The Ministry of Rural Development (MoRD) has integrated QR codes into the Pradhan Mantri Gram Sadak Yojana (PMGSY) to monitor the quality of rural roads digitally.
- **RAMS:** The Ministry of Road Transport and Highways (MoRTH) has expanded the Road Asset Management System (RAMS) to serve as the national standard for infrastructure life-cycle monitoring.
- **IBMS:** The Indian Bridge Management System (IBMS) digitally records the structural health ratings of national highway bridges to support preventive maintenance.

Key Features

- **Objective:** to standardise signage materials, improve visibility, and ensure uniformity across Delhi.
- **Rationale:** A 2024 audit by the Ministry of Road Transport and Highways (MoRTH) found inconsistent signage shapes and colours.
- **Implementation:**
  - **Phase 1:** QR codes will provide basic manufacturing and warranty information.
  - **Phase 2:** Integration with the PWD Sewa app to enable citizen complaints on damaged signage.

Banks Can Now Manage Assets in the National Pension System (NPS)

Context

The PFRDA has approved a framework that allows banks to set up pension funds to manage assets under the National Pension System (NPS).

Earlier Role: Scheduled Commercial Banks were earlier limited to acting as Points of Presence for onboarding and servicing NPS subscribers.

Expanded Scope: Banks can now directly sponsor a Pension Fund Manager entity, subject to meeting prescribed financial criteria.

Eligibility Norms: Bank eligibility will align with RBI norms on net worth, market capitalisation, and overall prudential soundness.

About National Pension System (NPS)

- NPS is a voluntary, defined-contribution retirement scheme regulated by the Pension Fund Regulatory and Development Authority (PFRDA).
- **Subscriber Choice:** Subscribers can choose a Pension Fund Manager and asset allocation, while the Permanent Retirement Account Number (PRAN) remains portable across jobs and locations.
- **Investment Pattern:** Professional managers allocate contributions among equities, government securities, corporate bonds, and alternative assets to generate market-linked returns.
- **Eligibility Scope:** Any Indian citizen or Overseas Citizen of India aged 18-70 can open NPS accounts.
- **Retirement Withdrawal:** At the normal retirement age of 60, government employees may withdraw up to 60% of their accumulated corpus tax-free.
- **Annuity Rule:** At least 40% of the corpus must be used to purchase an annuity from PFRDA-empanelled providers to receive a taxable monthly pension.
  - For non-government subscribers, recent reforms allow a lump sum withdrawal of up to 80%.

Pension Fund Regulatory and Development Authority (PFRDA)

- **Statutory Regulator:** PFRDA is the primary statutory pension regulator under the Ministry of Finance.
- **Legal Status:** It was constituted as an interim body in 2003 and later became statutory through the PFRDA Act, 2013.
- **Core Objective:** PFRDA promotes old-age income security by establishing, developing, and regulating pension funds.
- **Regulatory Role:** It prescribes guidelines for pension fund operations, investment norms, and performance benchmarking standards.
- **Major Schemes:** PFRDA administers National Pension System (NPS), Atal Pension Yojana (APY), Unified Pension Scheme (UPS), and NPS Vatsalya.

India's Forex Reserve Position

Context

India's foreign exchange reserves rose significantly, reflecting valuation gains and continued external sector resilience amid global volatility.

About Forex Reserves

- Forex reserves are external assets held by the RBI to ensure exchange rate stability, maintain liquidity for external payments, and build investor confidence.
- **Components:**
  - **Foreign Currency Assets (FCA):** Securities, deposits, and treasury holdings in foreign currencies.
  - **Gold Reserves:** Physical gold and gold deposit accounts valued at current international prices.
  - **SDRs:** International reserve assets allocated by the IMF to member nations.
  - **Reserve Tranche:** India's portion of its IMF quota that can be used for balance-of-payment needs.

Current Status of India's Forex Reserves

- **Total Forex Reserves:** Stood at $696.61 billion, marking an increase of $3.29 billion week-on-week.
- **Foreign Currency Assets (FCA):** Increased to $559.61 billion, forming the largest share of reserves and reflecting holdings in major global currencies.
- **Gold Reserves:** Rose sharply to $113.32 billion, driven mainly by valuation gains amid global gold prices.
- **Special Drawing Rights:** Increased to $18.80 billion, strengthening India's international liquidity.
- **IMF Reserve Position:** Improved to $4.88 billion, indicating India's readily available claim with the IMF.
- **Import Cover Strength:** Current reserves provide over 10 months of import cover.

Tax Residency Certificate (TRC)

Context

- The Supreme Court ruled that possession of a Tax Residency Certificate alone does not preclude scrutiny where tax avoidance allegations exist.
- **About TRC:** A Tax Residency Certificate (TRC) is an official document issued by a tax authority certifying residence for a specific financial year.
- **Purpose:** Its primary purpose is to prevent double taxation of income earned in multiple countries.
- **Treaty Benefit:** A TRC allows taxpayers to claim benefits under applicable Double Taxation Avoidance Agreements (DTAAs) between countries.
- **Indian Criteria:** In India, tax residency generally requires meeting the criteria under Section 6 of the Income Tax Act, 1961, including a 182-day stay in a financial year.

Co-location and Dark Fibre

Context

- The Securities and Exchange Board of India (SEBI) granted in-principle approval to settlement applications by the National Stock Exchange (NSE) in the co-location and dark fibre cases.
- **Implication:** The approval is expected to expedite clearance of the NSE's long-pending Initial Public Offering (IPO) application.
- **Co-location:** It is a globally accepted stock exchange service allowing brokers to place servers inside exchange data centres to minimise latency (time lag).
- **About the Case:** The case, originating in 2015, alleged preferential server access to select brokers, enabling unfair advantages in high-frequency trading.
- **Dark Fibre:** It refers to unused fibre-optic cables leased to create private, high-speed networks for greater control and security.
- **About the Case:** A parallel case alleged that NSE permitted an unauthorised vendor to install dark fibre lines, giving select brokers superior data transmission speeds.

Paripoorna Mediclaim Ayush Bima

Context

- The Ministry of Finance launched Paripoorna Mediclaim Ayush Bima for beneficiaries of the Central Government Health Scheme (CGHS).
- It is an optional health insurance plan that supplements CGHS, offering cashless treatment, modern procedures, and broader hospital access.
- The scheme offers insurance of ₹10 lakh or ₹20 lakh and allows up to six members on one policy.
- It lets beneficiaries choose between 70:30 or 50:50 co-sharing between insurers and subscribers.
- Premiums under the scheme are exempt from Goods and Services Tax (GST).

India's Real GDP to Grow at 7.4% in 2025-26

Context

The Ministry of Statistics and Programme Implementation (MoSPI) released the First Advance Estimates (FAE) for the Financial Year 2025-26.

- The FAE released by the National Statistical Office (NSO) under the MoSPI is an early assessment of the economy for the current financial year.

Key Macroeconomic Projections

- Real Growth: Real GDP is projected to grow by 7.4% in FY 2025–26, up from 6.5% in FY 2024-25.
- Nominal Growth: Nominal GDP growth is estimated at 8%, a five-year low due to softer inflation.
- Economy Size: Nominal GDP is expected to reach $3.97 trillion, bringing it close to the $4-trillion mark.

Sectoral Performance

- Services Growth: The services sector remains the main growth driver, growing by 9.1%, compared to 7.2% last year.
- Manufacturing: Manufacturing growth is projected to accelerate to 7.0% from 4.5% in FY 2024–25.
- Agri Slowdown: Growth in agriculture and allied activities is expected to moderate to 3.1% from last year's 4.6%.

Delhi Joins RBI's Full Banking and Debt Framework

Context

Delhi Government signed an MoU with the Reserve Bank of India (RBI), bringing Delhi under RBI's full financial management framework for the first time.

- Delhi earlier followed an ad hoc system, integrating its public accounts with the Government of India rather than managing them through the RBI.
- It borrowed funds from alternative sources like the National Small Savings Fund (NSF).

Key Benefits

- Lower Borrowing Costs: Delhi will now raise funds through State Development Loans (SDL) at about 7%, lower than the previous 12–13% charged by alternative sources.
- Cash Management: The RBI will manage cash balances, automatically investing daily surpluses to earn interest and prevent idle funds.
- Liquidity Access: Delhi gains access to low-cost options such as Ways and Means Advances and Special Drawing Facilities for short-term cash mismatches.
- Fiscal Discipline: The step aligns Delhi with national fiscal norms, ensuring greater transparency and long-term financial sustainability.

New Maritime Projects Launched

Context

- The Union Minister for Ports, Shipping and Waterways unveiled port infrastructure and digital governance projects in Tamil Nadu.
- He also launched the India International Regatta 2026 to encourage youth in maritime sports.
- **Significance:** The initiatives promote port modernisation, coastal resilience, and trade facilitation, aligning with the visions of Viksit Bharat and Atmanirbhar Bharat.

Key Projects Launched

- **Enterprise Business System:** A SAP-based digital platform integrating finance, operations, and human resources to improve Ease of Doing Business.
- **Coastal Revetment:** The project repairs and strengthens 850 metres of coastal revetment through climate-resilient engineering designs.
- **Northern Breakwater Head:** The rehabilitated structure, damaged by cyclones, ensures navigational safety and uninterrupted eastern corridor operations.
- **Boundary Wall Project:** A new boundary wall linked to the Northern Port Access Road to enhance logistics efficiency and port security.
- **e-Port Clearance Portal:** A nationwide portal to allow online submission and download of Port Clearance Certificates, reducing vessel turnaround time.

PANKHUDI Portal

Context

- The Ministry of Women and Child Development launched the PANKHUDI digital portal to improve coordination in women and child development efforts.
- It acts as a single window uniting stakeholders to foster inclusive, collaborative, outcome-focused development and streamline CSR and government partnerships.
- It focuses on critical areas such as nutrition, health, early childhood care and education, child protection, and women's safety.
- It ensures transparency and accountability through tracking of proposals and outcomes, with all financial contributions routed through non-cash modes.
- The portal strengthens the implementation of the Ministry's flagship missions like Mission Poshan 2.0, Mission Vatsalya, and Mission Shakti.

Department of Posts Revamps ATM Infrastructure

Context

- The Department of Posts announced a revamp of its ATM infrastructure, with over 800 ATMs now installed nationwide.
- The initiative aims to improve access to basic banking services in rural and underserved areas.

About ATMs in India

- **Regulatory Authority:** Reserve Bank of India (RBI) regulates ATM policy, while National Payments Corporation of India (NPCI) enables nationwide ATM interoperability.
- **Major Types:**
  - **White Label ATMs:** WLAs are owned and operated by non-bank entities and are licensed under the Payment and Settlement Systems Act, 2007, to expand rural banking access.
  - **Brown Label ATMs:** Under this model, third parties own the hardware and site, while sponsor banks handle branding and cash management.
  - **Micro-ATMs:** These handheld PoS devices are used by Business Correspondents to provide basic banking services through the Aadhaar-enabled Payment System in remote areas.
  - **Cash Recycler Machines:** These advanced ATMs reuse notes to accept deposits and dispense cash, lowering manual replenishment costs.

– **ATM Landscape:** Public sector banks operate the largest ATM network; bank-owned ATMs have declined while white-label ATMs expanded.

RBI Recommends Connecting CBDCs of BRICS Nations

Context

The Reserve Bank of India suggested connecting the Central Bank Digital Currencies (CBDCs) of BRICS nations to facilitate direct cross-border transactions.

About Central Bank Digital Currencies

- Central Bank Digital Currencies (CBDCs) are digital forms of money issued by central banks.
- They are designed to provide a secure and convenient alternative to physical cash and to make digital payments easier for individuals and businesses.
- CBDCs are backed by the central bank, which means they hold the same value as traditional fiat currencies and can be used in the same way.
- Unlike cryptocurrencies, which are not regulated by a central authority, CBDCs are issued and controlled by the central bank.
- All five core BRICS members currently have active CBDC pilot programs.
- India's digital rupee (e-₹) was launched in 2022, with retail and wholesale variants meant to support both individual transactions and inter-bank settlements.

Wholesale CBDC (CBDC-W)	Retail CBDCs (CBDC-R)
• They are intended for use by **banks and financial institutions.**	• They are intended for use by the **general public.**
• Used in **interbank settlements** and other financial transactions.	• Accessible to anyone with a **digital wallet.**
• They are **not accessible to the general public.**	• They could be used for making everyday purchases, **just like physical cash.**

Significance for Cross-Border Payments

- **Reducing Transaction Costs and Time:** Linking CBDCs could make cross-border payments between BRICS members faster, cheaper and more efficient, addressing current inefficiencies in settlement processes.
- **Potential Reduction in Dollar Dependence:** While Indian authorities have clarified the proposal isn't aimed explicitly at de-dollarisation, a linked BRICS CBDC framework could gradually lessen the dominance of the US dollar in intra-BRICS transactions under geopolitical pressures.
- **Enhanced Financial Integration:** Interoperable digital currencies would deepen economic cooperation among BRICS economies and support smoother business and tourism payments, enhancing financial linkages within the bloc.

Operational and Policy Challenges

- **Technological Interoperability:** Successful linkage depends on agreeing common technology standards, protocols and governance mechanisms across diverse CBDC platforms.
- **Regulatory and Legal Alignments:** Aligning regulations, data governance and consumer protection frameworks among member states is critical for seamless cross-border CBDC usage.
- **Managing Trade Imbalances:** Ideas such as bilateral foreign exchange swap arrangements among central banks are being explored to address trade imbalances that might arise from CBDC linkages.

BRICS

- BRICS is an intergovernmental group of major emerging economies that aims to foster cooperation in economic, political and social fields among developing nations.
- **Members:** The BRICS is currently composed of eleven countries: its five original members – Brasil, China, India, Russia, and South Africa -, and six new members admitted in 2024-25 - Egypt, Ethiopia, Indonesia, Iran, Saudi Arabia, and the United Arab Emirates.
- **Aim and Functions:** The organisation works through annual summits and meetings to enhance cooperation in political, security, economic, financial, and cultural exchanges, and to promote reform of global governance institutions such as the United Nations, IMF and World Bank.

Henley Passport Index

Context

- In the 2026 Henley Passport Index, the Indian passport rose five places to rank 80th globally, up from 85th in 2025.
- Indian passport holders can now travel to 55 destinations without a pre-approved visa.
- Singapore remains the world's strongest passport, with access to 192 destinations, followed by Japan and South Korea in second place.
- The Index is published by Henley and Partners, ranking passports by the number of destinations accessible without a visa.
- The index relies on data from the International Air Transport Association (IATA), which maintains the world's largest travel information database.

Global Economic Prospects Report 2026

Context

- The World Bank released the Global Economic Prospects 2026 report, upgrading global growth estimates amid resilience to trade tensions.
- Global Economic Prospects is a biannual World Bank report that assesses trends, risks, and growth projections in the global economy.

Key Highlights of the Report

- **Weak Decade:** The 2020s remain on track to be the weakest decade for global economic growth since the 1960s.
- **Global Slowdown:** Global economic growth is projected to ease to 2.6% in 2026 from 2.7% in 2025.
- **Advanced Economies:** Growth in advanced economies is expected to slow to 1.6% in 2026 due to persistently high interest rates.

- **EMDE Momentum:** Emerging Market and Developing Economies (EMDEs) are projected to sustain steady growth of 4.0% in 2026.
- **Catch-Up Erosion:** Catch-up growth is weakening, with nearly one-fourth of developing countries now poorer than in 2019.
- **Trade Deceleration:** Global trade growth is projected to slow to 2.2% in 2026 amid rising protectionism.
- **Inflation Easing:** Global headline inflation is expected to decline to 2.6% in 2026 from 3.4% in 2025.
- **Jobless Growth:** In many developing economies, weak job creation is turning demographic expansion into an economic burden.
- **Fiscal Stress:** Public debt in several developing countries has reached historic highs, sharply constraining fiscal space for development.

India-Specific Findings

- **Growth Leader:** India remains the fastest-growing major economy, with growth estimated at 7.2% for 2025-26.
- **Demand Driver:** Private consumption continues to be the main growth driver, supported by rising household expenditure.
- **Fiscal Consolidation:** India is reducing its fiscal deficit as expenditure declines outweigh revenue losses from recent tax cuts.

Key Recommendations

- **Fiscal Rules**: Adopt strict fiscal rules to restore credibility and attract long-term foreign investment.
- **Supply Reforms:** Prioritise supply-side reforms, including labour law improvements and ease of doing business, to raise productivity.
- **Human Capital:** Invest in education and health to maintain workforce employability amid structural economic changes.
- **Global Cooperation:** Resist geoeconomic fragmentation and cooperate on climate finance and debt relief for poorer nations.

NPS Vatsalya Scheme Guidelines 2025

Context

The Pension Fund Regulatory and Development Authority (PFRDA) has notified the NPS Vatsalya Scheme Guidelines, 2025.

About NPS Vatsalya

- **NPS Vatsalya** is a **contributory long-term financial security scheme** under the **National Pension System**, targeted exclusively at individuals **below 18 years of age**.
- The scheme allows parents or legal guardians to systematically build a pension corpus for children, with seamless transition into the regular NPS framework upon attaining adulthood.
- The 2025 Guidelines operationalise the scheme by detailing eligibility, contribution norms, withdrawal flexibility, and exit or transition pathways, aligned with amendments to the **PFRDA (Exits and Withdrawals under NPS) Regulations, 2015**.

Key Features of NPS Vatsalya (as per Guidelines 2025)

Aspect	Provisions
Eligibility	Open to all Indian citizens, including NRI/OCI, below 18 years; minor is the sole beneficiary; account opened in the minor's name and operated by the guardian
Contribution Framework	Minimum initial and annual contribution of ₹250; no upper limit on contributions; contributions can also be gifted by relatives and friends
Pension Fund Choice	Guardian may select any Pension Fund registered with PFRDA
Partial Withdrawal Provisions	Permitted after 3 years from account opening; up to 25% of own contributions (excluding returns); allowed for education, medical treatment, and specified disabilities; withdrawal frequency regulated before and after attaining majority
On Attaining Majority (18–21 years)	Mandatory fresh KYC at 18 years; options include continuing under NPS Vatsalya, shifting to NPS Tier I (All Citizen Model or other applicable models), or exiting with up to 80% as lump sum and minimum 20% annuitisation; full withdrawal permitted if total corpus is ₹8 lakh or less

PFRDA Constituted SAARG Committee to Modernise NPS

Context

- PFRDA has constituted the Strategic Asset Allocation and Risk Governance (SAARG) committee to modernise the National Pension System (NPS) investment framework.
- **Objective:** The committee aims to align NPS investment practices with global best practices for long-term retirement wealth creation.
- **Chairperson:** The nine-member SAARG committee is chaired by Narayan Ramachandran, former CEO of Morgan Stanley India.
- **Key Mandates:** The committee serves as a specialised body to review, recommend, and modernise the NPS within a nine-month timeline; specific mandates include:
  - Reassess equity, debt, and money market allocation models to balance risk and return.
  - Examine new investment options to improve diversification and mitigate market risks.
  - Compare NPS guidelines with leading global pension systems to adopt best practices.
  - Develop asset-liability management (ALM) and valuation standards for alternative investments.
  - Integrate environmental, social, and governance (ESG) and climate-transition risks into NPS investment decisions.

Pension Fund Regulatory and Development Authority (PFRDA)

- **About:** PFRDA is the statutory regulatory body responsible for the supervision and development of India's pension sector.
- **Legal Status:** It was set up as an interim body in 2003 and later became a statutory body under the PFRDA Act of 2013.
- **Jurisdiction:** The authority functions under the jurisdiction of the Ministry of Finance.
- **Schemes:** It regulates the National Pension System (NPS), Atal Pension Yojana (APY), Unified Pension Scheme (UPS), and NPS Vatsalya.
- **Regulation:** PFRDA registers and regulates pension funds, Central Recordkeeping Agencies, custodians, and trustee banks.

Extension of Atal Pension Yojana (APY)

Context

- The Union Cabinet approved the continuation of Atal Pension Yojana (APY) till FY 2030–31, including funding support for promotion, development, and gap funding.
- The decision ensures old-age income security, enhances financial inclusion, and supports the Viksit Bharat @2047 vision.

About APY

- The APY, launched in 2015, is a Central Sector Scheme that provides guaranteed monthly pensions to workers in the unorganised sector.
- **Objective:** To develop a universal, inclusive social security system for the unorganised sector through voluntary retirement savings.
- **Implementation:** By the Pension Fund Regulatory and Development Authority (PFRDA) under the National Pension System (NPS) framework.
- **Eligibility:** Open to non-income-tax payers aged 18 to 40 years with a valid bank account.

Global Risks Report 2026 by World Economic Forum

Context

- The World Economic Forum released the Global Risks Report 2026 with the central theme "Age of Competition."
- **Global Warning:** The report warns against "multipolarity without multilateralism," where fragmentation and confrontation increasingly replace international cooperation.
- The World Economic Forum releases the Global Risks Report annually to assess major threats to global stability over the short term (2 years) and the long term (10 years).

Key Findings of Global Risk Report 2026

- **Short-Term Risks:** Geoeconomic confrontation ranks first over the next two years, followed closely by misinformation and disinformation.
- **Economic Weaponisation:** The report identifies the "weaponisation of economic determinants" as a central driver of current global instability.
- **Long-Term Risks:** Extreme weather events remain the top ten-year risk, with biodiversity loss and ecosystem collapse following.
- **AI Disruptions:** Adverse outcomes of AI are the fastest-rising long-term risk, driven by labour displacement and autonomous warfare.
- **Social Polarisation:** Technological risks are increasingly intensifying political and social polarisation within countries.

India-Specific Findings

- **Cyber Insecurity:** Cyber insecurity is India's most significant national risk, ahead of inequality and weak public services.
- **Water Conflict:** The Indus River Basin is flagged as a potential flashpoint for future water conflicts between India and Pakistan.
- **Digital Success:** India's Unified Payments Interface (UPI) is recognised as a global best practice in digital public infrastructure.

Export Preparedness Index (EPI) 2024

Context

- NITI Aayog released the 4th edition of the Export Preparedness Index (EPI) 2024.
- It assesses export readiness across States and Union Territories, identifying structural gaps, growth drivers, and policy opportunities to enhance competitiveness.
- EPI 2024 is structured around four pillars: Export Infrastructure, Business Ecosystem, Policy and Governance, and Export Performance.
- These pillars are further divided into 13 sub-pillars and 70 indicators for a detailed assessment.
- **New Metrics:** The 2024 edition adds indicators for Macroeconomic Stability, Cost Competitiveness, Human Capital, Financial Access, and the MSME Ecosystem.
- **Categories:** States and UTs are grouped into Large States, Small States, North-Eastern States, and Union Territories; each category is classified as Leaders, Challengers, or Aspirers.
- **District Focus:** Districts have been highlighted as core units of competitiveness, translating national export goals into local strategies.
- **Significance:** EPI provides an evidence-based framework to support India's USD 1 trillion in merchandise exports by 2030 and Viksit Bharat @2047.

Key Highlights

- **Export Scale:** India's FY2023-24 exports hit a record ₹65 lakh crore, with global trade share rising from 1.7% to 1.8%, driven by IT and business services.
- **Top Performer:** Maharashtra ranked first among Large States, followed by Tamil Nadu and Gujarat.
- **Landlocked State:** Uttar Pradesh emerged as the top performer, ranking fourth nationwide.
- **Small States & UTs:** Uttarakhand ranked first, followed by Jammu and Kashmir and Nagaland.

Topic for Mains (Agriculture)

India's Agrarian Suicide Crisis

Context

A 28-year analysis of NCRB data (1995–2023) shows persistent and regionally concentrated farmer suicides, with a sharp resurgence in 2023 after a decade of decline.

Status of India's Agrarian Suicide

Scale And Long-Term Trends

- **Cumulative Burden:** Between 1995 and 2023, 3.94 lakh farmers and agricultural labourers died by suicide, averaging ~13,600 deaths annually.
- **Crisis Peak:** The worst phase was 2000–2009, with 1.54 lakh suicides, and 2002 alone recorded 17,971 deaths, the highest on record.
- **Recent Spike:** In 2023, farmer suicides rose to 10,786, a 75% increase over 2022.
- **Changing Profile:** Of 10,786 suicides, 6,096 were agricultural labourers and 4,690 cultivators.

Regional Concentration

- **Epicentre States:** Maharashtra reported 4,151 suicides and Karnataka 2,423, the highest in the country.
- **Regional Share:** Southern and western India account for 72.5% of all farmer suicides since 1995.
- **Other Hotspots:** Andhra Pradesh and Telangana together have seen 1.7 lakh suicides over 28 years.

Role Of Welfare Interventions

- **MGNREGA Impact:** From around 2010 onwards, suicides declined steadily, coinciding with expanded MGNREGA wage employment.
- **State Turnarounds:** Kerala reduced farmer suicides from 1,118 (2005) to 105 (2014), while West Bengal reported zero cases by 2012.

Structural Drivers of Distress

- **Rainfed Vulnerability:** Agrarian distress is concentrated in rainfed belts; E.g., ~52% of India's net sown area remains rainfed, but accounts for a disproportionate share of farmer suicides.
- **Debt Trap:** Repeated crop failures and price volatility deepened indebtedness; E.g., ~50% of agricultural households are indebted, with average debt exceeding ₹74,000 per household.
- **Trade Exposure:** Post-1990s liberalisation weakened farm income support; E.g., agricultural subsidies as a share of farm income declined while import competition increased after WTO entry in 1995.
- **Input Cost Inflation:** Costs rose faster than output prices; E.g., fertiliser, seed and pesticide costs increased by over 300% since the early 2000s, while real farm incomes stagnated.

Way Forward

- **Income Assurance:** Strengthen predictable farm incomes through price and income support; E.g., expand MSP procurement beyond rice–wheat and pilot price-deficiency payment schemes.
- **Risk Protection:** Fix crop insurance design to reduce distress from climate and price shocks; E.g., reform PM Fasal Bima Yojana with automatic weather-triggered payouts.
- **Rainfed Resilience:** Reduce dependence on single rainfed cash crops; E.g., scale integrated farming systems under NICRA combining millets, pulses and livestock in cotton belts.
- **Labour Security:** Ensure income stability for agricultural labourers; E.g., Kerala's Ayyankali Urban Employment Guarantee Scheme provides wage support during lean seasons, reducing livelihood shocks.

Alternate Wetting and Drying Method of Rice Cultivation

Context

- Rice farmers can increase incomes and reduce methane emissions by adopting the Alternate Wetting and Drying (AWD) method.
- Traditional rice cultivation accounts for about 10–12% of global anthropogenic methane emissions.
- **Emission Process:** Continuous flooding creates anaerobic soils, in which methanogenic archaea decompose organic matter and emit methane.

About Alternate Wetting and Drying (AWD)

- AWD is a sustainable water management practice for rice cultivation that replaces continuous flooding with periodic drying and reflooding of the field.
- Periodic flooding creates aerobic (oxygen-rich) soil conditions, suppressing methane-producing microbes while sustaining rice growth.
- **Mechanism:** Farmers re-irrigate after the water level in the paddy field drops to a certain threshold (usually 15 cm below the soil surface).
- **Monitoring Tool:** A low-cost water tube of perforated PVC or bamboo is installed in the field to monitor subsurface water levels visually.

Key Benefits of AWD

- Methane Reduction: AWD cuts emissions by 30–50%, with some studies showing up to 85% reduction.
- Water Conservation: It saves 25–40% of irrigation water compared with the traditional method.
- Input Savings: Reduced irrigation lowers labour requirements and pumping costs (fuel or electricity).
- Yield Effect: Properly implemented AWD remains yield-neutral and can even increase yields by up to 20% through improved root aeration.
- Health Safety: Periodic soil drying reduces the accumulation of toxic heavy metals, such as arsenic (up to 64%) and cadmium, in rice grains.

- Economic Benefit: AWD enables income generation through carbon credits; it reduces emissions by 2.5 tonnes of CO2 equivalent, yielding ₹3,000–4,000 per hectare per crop cycle.

Key Challenges of AWD

- **Weed Pressure:** Drying removes the natural water layer that suppresses weed growth, leading to higher weed growth and increased management costs.
- **GHG Trade-off:** Alternating wet–dry cycles can stimulate nitrifying bacteria, increasing Nitrous Oxide emissions, a greenhouse gas about 300 times more potent than CO2.
- **Infrastructure Gap:** India's gravity-based canal systems, with a "field-to-field" flow, restrict individual farmers' ability to dry fields without affecting neighbours.
- **Pricing Disincentive:** Flat-rate or free irrigation offers little financial incentive for farmers to conserve water through AWD.

Rajasthan Panchayat Earns Organic Farming Certification

Context

- Bamanwas Kankar became Rajasthan's first gram panchayat certified as fully organic.
- The certification covers all agricultural land and livestock across the entire panchayat.
- This milestone is the result of a community-driven movement led by women farmers.
- Rajasthan ranks third nationally in organic farm production, accounting for nearly 13% of India's total certified organic area.

About Organic Farming in India

- India ranks first in number of organic farmers & ninth in terms of area under organic farming.
- Sikkim became the first State in the world to become fully organic.
- States including Tripura & Uttarakhand have set similar targets.
- North East India has traditionally been organic, & the consumption of chemicals is far less than the rest of the country.
- About 2.78 million hectares of farmland is under organic cultivation.
- This is two per cent of the 140.1 million ha net sown area in the country.
- Madhya Pradesh tops the list with 0.76 million ha of area under organic cultivation — that is over 27 per cent of India's total organic cultivation area.
- The top three states — Madhya Pradesh, Rajasthan, & Maharashtra — account for about half the area under organic cultivation.
- Major organic exports from India are flax seeds, sesame, soybean, tea, medicinal plants, rice & pulses.
- Major exporting states: Assam, Mizoram, Manipur, & Nagaland.

Mission Organic Value Chain Development for North East Region (MOVCD-NER)

- MOVCD-NER is a Central Sector Scheme.
- It is a sub-mission under National Mission for Sustainable Agriculture (NMSA).
- It was launched by the Ministry of Agriculture & Farmers Welfare for implementation in all the North-Eastern states including Sikkim during the 12th plan period.
- The scheme aims to develop certified organic production in a value chain mode to link growers with consumers.
- The scheme supports the development of the entire value chain starting from inputs, seeds, certification, to the creation of facilities for collection, aggregation, processing, marketing & brand building initiative.

National Programme for Organic Production (NPOP)

- The Ministry of Industries & Commerce is implementing the NPOP since 2001 with the following objectives:
- To provide the means of evaluation of certification programmes for organic agriculture & products.
- To accredit certification programmes of Certification Bodies seeking accreditation.
- To facilitate the certification of organic products in conformity with the prescribed standards.
- To facilitate organic certification in conformity with the importing countries organic standards.
- To encourage the development of organic farming & organic processing.
- The Agricultural & Processed Food Products Export Development Authority (APEDA) is the implementation agency for the NPOP.
- APEDA is providing assistance to the exporters of organic products under various components of its export promotion scheme.

India's Fisheries Sector Growth

Context

Govt data shows India's fish production rose by 106% in a decade, driven by aquaculture expansion and policy push.

Significance of the Fisheries Boom

- **Livelihood Backbone:** Fisheries support the livelihoods of ~3 crore fishers and fish farmers, making it a critical rural employment and income sector.
- **Jobs Creation:** Fisheries schemes created ~74.66 lakh direct + indirect employment opportunities since 2014–15, supporting coastal and inland economies.
- **Nutrition Security:** Fish is a low- cost high-quality protein source; it helps improve nutrition.
- **Blue Economy Catalyst:** Marine fisheries are integral to India's Blue Economy framework, promoting sustainable marine resource utilisation and coastal development.

Government Push for the Fisheries Boom

- **Major Outlay:** Since 2014–15, projects worth ₹32,723 crore were approved across key fisheries schemes, expanding production and infrastructure.
- **Core Schemes:** Push driven through Blue Revolution, Pradhan Mantri Matsya Sampada Yojana (PMMSY) and Pradhan Mantri Matsya Kisan Samridhi Sah-Yojana (PM-MKSSY).
- **Welfare Coverage:** 34.71 lakh fishers covered under group accident insurance, improving security.
- **Credit Access:** 4.49 lakh Kisan Credit Cards (KCCs) issued, improving working formal credit inclusion.

Key Challenges of the Fisheries Sector

- **Post-Harvest Wastage:** Despite output reaching ~198 lakh tonnes (2024–25), India's perishable supply chains often lose ~5–10% due to inadequate storage/transport.
- **Economic Disparities:** Though small-scale fishers comprise 90% of the workforce, they contribute less than 10% of the marine catch, while mechanised fleets capture the bulk of profits.
- **Bycatch and FMFO Pressure:** Over 50% of trawl fishery hauls are low-value juvenile bycatch, often diverted to the fishmeal and fish oil industry, threatening long-term stock sustainability.
- **Regulatory Fragmentation:** Separate Marine Fishing Regulation Acts across coastal states create loopholes, allowing fishers to bypass restrictions.
- **US Demand Cliff:** After January 2026, exporters report an almost empty US order pipeline, which is critical as the US still absorbed ~35% of India's seafood exports ($2.8 billion) in FY25.
- **Shrimp Overdependence:** Frozen shrimp contributes over 70% of India's marine export earnings, exposing exporters to tariff shocks like the effective US duty of ~59.7%.

Way Forward

- **Unified Legal Framework:** Enact a national fisheries code with standardised MLS norms, gear restrictions, seasonal bans, and scientific catch limits.
- **Regulate Fishmeal Industry:** Impose quotas on fishmeal production and incentivise diversion of juvenile catch for inland broodstock development.
- **Global Ocean Cooperation:** Strengthen partnerships through IORA and FAO to combat Illegal, Unreported, and Unregulated (IUU) fishing and promote shared marine stewardship.
- **Value Addition:** Shift from raw frozen shrimp to processed and ready-to-eat seafood to improve margins and absorb tariff shocks; E.g., expansion of cooked shrimp segments under MPEDA support.
- **Farmer & Exporter Support:** Strengthen aquaculture insurance, disease surveillance, and cold-chain infrastructure; E.g., PMMSY interventions to stabilise farm incomes and reduce production risks.

India's Seafood Exports

Syllabus Mapping: GSIII, Indian Economy, Agriculture

Context

Despite steep US tariffs on shrimp, India's seafood exports recorded 16% growth in value and 12% in volume during April–October FY26, driven by rapid diversification.

Drivers of Export Resilience

- **Market Diversification:** Non-US markets offset losses, with seafood exports to China rising to 19% and Vietnam surging 110% in value during April–October FY26.
- **European Push:** The EU approved 102 additional Indian fishery units, strengthening access to a market that already absorbs 15.1% of India's seafood exports ($1.12 billion in FY25).
- **Product Strength:** Frozen shrimp, especially Vannamei shrimp, continues to anchor exports due to scale, quality consistency, and competitive production costs.
- **Asia-Europe Pivot:** Buyers in Asia and Europe increasingly source from India amid supply rebalancing, helping compensate for a 4% value decline in exports to the US in FY26 (April–October).

Indian Seafood Exports to the US

- **Tariff Disadvantage:** Indian shrimp faces an effective duty of 59.7% in the US, compared to 15–20% for Ecuador, Vietnam, and Thailand, eroding price competitiveness.
- **Market Dependence:** The US accounted for 35% of India's seafood exports ($2.8 billion) in FY25, making tariff shocks disproportionately damaging.

Current Status of Marine Fisheries in India

- **Global Standing:** India contributes 8% of global fish production, ranks 3rd in total fish output, 2nd in aquaculture, and 4th in global seafood exports.
- **Production & Potential:** Marine capture fisheries output remains largely stagnant at 3.6–3.8 million tonnes annually, against an estimated sustainable potential of 5.31 million tonnes.
- **Growth & Exports:** The fisheries sector recorded 10% average annual growth in recent years; marine exports stood at USD 7.45 billion in FY25.
- **Geographical Spread & Employment:** India has an 11,098 km coastline and a 2.37 million sq. km EEZ supporting the livelihoods of 16 million people.

Key challenges

- **US Demand Cliff:** After January 2026, exporters report an almost empty US order pipeline, which is critical as the US still absorbed ~35% of India's seafood exports ($2.8 billion) in FY25.
- **Shrimp Overdependence:** Frozen shrimp contributes over 70% of India's marine export earnings, exposing exporters to tariff shocks like the effective US duty of ~59.7%.
- **Compliance & Cost Pressures:** Non-tariff barriers are rising, as SPS compliance and certification costs can add 8–12% to export costs, disproportionately impacting MSME exporters.

Way Forward

- **Value Addition:** Shift from raw frozen shrimp to processed and ready-to-eat seafood to improve margins and absorb tariff shocks; E.g., expansion of cooked shrimp segments under MPEDA support.
- **Product Basket Expansion:** Promote exports of cuttlefish, squid, and finfish to reduce shrimp concentration; E.g., EU demand where non-shrimp products already contribute ~15% of India's seafood exports.
- **Farmer & Exporter Support:** Strengthen aquaculture insurance, disease surveillance, and cold-chain infrastructure; E.g., PMMSY interventions to stabilise farm incomes and reduce production risks.

Topic for Prelims (Agriculture)

Integrated Fertiliser Subsidy Claim System

Context

The government has launched a fully digital, integrated fertiliser subsidy claim process, enabling online handling of subsidy payments under the Digital India vision.

Current Status of Fertiliser Subsidy in India

- **Budget Size:** Fertiliser subsidy is about ₹1.68 lakh crore (FY 2025–26 BE); it was ~₹1.71 lakh crore (FY 2024–25 RE) and ~₹1.88 lakh crore (FY 2023–24 Actual).
- **Urea Dominance:** Urea subsidy is about ₹1.19 lakh crore (FY 2025–26 BE), while P&K (NBS) support is about ₹49,000 crore.
- **Fiscal Weight:** Fertiliser subsidy is roughly ~3%+ of total Union expenditure in FY26.

About the Integrated Fertiliser Subsidy Claim System

- **Nature:** End-to-end digital e-Bill system for fertiliser subsidy claims.
- **Coverage:** Processes fertiliser subsidy of ~₹2 lakh crore annually through a unified digital workflow.
- **Nodal Ministry:** Department of Fertilisers, Ministry of Chemicals & Fertilisers.

Key Features of the System

- **Real-Time Tracking:** Fertiliser companies can submit claims online & track payment status in real time.
- **Audit Trail:** Generates a centralised, tamper-proof digital audit trail for all subsidy transactions.
- **Standardised Processing:** Enforces first-in-first-out (FIFO) electronic workflow, ensuring fairness.
- **Faster Payments:** Enables the timely weekly release of fertiliser subsidies, improving cash flow.
- **System Integration:** Seamless linkage between Integrated Financial Management System (iFMS) and Public Financial Management System (PFMS).

Recirculatory Aquaculture System (RAS) Facility Inaugurated

Context

- The Smart Green Aquaculture Farm and Research Institute and the Recirculatory Aquaculture System (RAS) Facility were recently inaugurated in Hyderabad, Telangana.
- The facility is India's first commercial-scale tropical RAS-based aquaculture farm for rainbow trout.
  - It enables year-round tropical cultivation of rainbow trout and offers hands-on training in automation, biosecurity, and modern aquaculture systems.

About Recirculatory Aquaculture System (RAS)

- RAS is a land-based, closed-loop technology that filters and reuses water for fish farming in a controlled environment.
- **Water Management:** Advanced mechanical and biological filtration maintains optimal water quality while recycling about 90–99% of system water.
- **Key Components:** The system includes biofilters, mechanical filters, oxygenators, and UV/ozone units to control waste, toxins, and pathogens.
- **Key Benefit:** It enables high-density fish farming with minimal water use while reducing disease and biosecurity risks.
- **Government Support:** The Pradhan Mantri Matsya Sampada Yojana (PMMSY) provides financial assistance for establishing RAS units.

Himachal Pradesh Demands 100% Import Duties on Foreign Apples

Context

- Himachal Pradesh Chief Minister requested a 100% import duty on foreign apples to protect local growers.
- **Seasonal Ban:** The state sought a complete ban on apple imports during the peak domestic harvest season from July to November.
- **Policy Trigger:** The demand follows the recent tariff cut on New Zealand apples from 50% to 25% under a Free Trade Agreement (FTA).
- **Price Impact:** Cheaper off-season imports are driving down prices for domestic inventory.

Apple Production in India

- **Global Rank:** India is the world's fifth-largest apple producer, after China, the European Union (treated as a single bloc), the United States, and Turkey.
- **Production Volume:** Apple output rose by 6% in 2024-25, reaching 2.5 million metric tonnes.
- **Regional Share:** Jammu and Kashmir accounts for 70% of the output, followed by Himachal Pradesh at 20% and Uttarakhand at 10%.
- **Productivity Gap:** Indian apple yields average 6-8 tonnes per hectare, well below the global average of 40-60 tonnes.
- **Import Dependence:** India imports around 0.6 million metric tonnes annually.
- **Source Countries:** Turkey and Iran supply lower-cost apples, whereas New Zealand and Chile supply counter-seasonal varieties.
- **Cultivation Shift:** Farmers are shifting from traditional varieties like Royal Delicious to high-density Gala and Fuji plantations.

Goldilocks Farm Relief

Context

- The year 2025–26 witnessed a bumper crop due to moderate temperatures & surplus monsoon rainfall, which together helped keep food inflation low.
- Annual consumer food inflation averaged -0.2% in 2025, and fell further to -2.7% during Jul–Dec 2025, indicating supply-led price correction.

Goldilocks Combination

- Surplus & Rainfall: India saw above-normal monsoon rainfall (May–Oct 2025) plus moderate temperatures, creating near-ideal crop conditions and stabilising prices.
- **Temperature Advantage:** India's 2025 annual mean temperature anomaly was +0.28°C (1991-2020 baseline), far lower than +0.65°C (2024), reducing heat-stress losses.

Drivers of Reduced Food Inflation in 2025

Supply-Side Farm Conditions

- **Reservoir Buffer:** Before peak rabi sowing (end-Oct), water in 161 major reservoirs reached 90.8% of full storage, improving irrigation certainty and winter cropping outcomes.
- **Wheat Record Sowing:** Wheat area rose to 334.17 lakh ha this season, up from 328.04 lakh ha in the same period last year, boosting harvest expectations.
- **Rabi Crop Expansion:** Mustard increased from 86.57 to 89.36 lakh ha, rabi maize from 23.49 to 25.24 lakh ha, and masoor from 17.66 to 18.12 lakh ha.
- Heat Risk Benchmark: March heat spikes historically damage yields (e.g., 2002 mean anomaly +1.61°C all-India, +3.22°C in NW wheat belt), but current winter conditions reduce this risk.

Price Cooling in the Food Basket

- **Potato Price Collapse:** Potato wholesale prices in UP mandis fell to ₹600–700/quintal, compared to ₹1,200–1,300/quintal a year ago, reflecting large arrivals.
- **Broad Deflation:** CPI retail inflation in vegetables was -18.5% (Dec) and pulses -15.1%, showing broad food basket softening not limited to one crop.

Policy & External Cushion

- **Govt Stocks High:** Rice & wheat stock in government godowns stood at 95.4 million tonnes (Jan 1), nearly 4.5 times the required level, improving price-stabilisation ability.
- **Global Supply Strong:** 2025–26 projections show record output in major staples like wheat, rice, maize, soyabean and palm oil, reducing imported inflation risk.

Topics for Mains

Digital Addiction and Mental Health

Syllabus Mapping: GS 1- Society

Context

The Economic Survey 2025–26 has sounded a clear warning on digital addiction emerging as a silent but serious public health and social challenge in India.

Understanding Digital Addiction

- Digital addiction refers to persistent, excessive, and compulsive use of digital platforms, including social media, online gaming, streaming services, and real-money gaming, despite negative consequences on health, relationships, or daily functioning.
- The Survey emphasises that digital addiction is multidimensional, cutting across behavioural, psychological, social, and economic domains.

Causes of Rising Digital Addiction in India

- **Near-Universal Digital Access**: India's digital penetration has reached unprecedented levels, with internet connections touching nearly **97 crore** and over **85% of households owning smartphones**, making continuous online engagement almost unavoidable.
- **Addictive Platform Architecture**: Many digital platforms are deliberately designed around **high-stimulus features** such as autoplay, infinite scroll, and algorithmic content loops that promote binge-watching and prolonged screen time.
- **Always-On Digital Environment**: Young people increasingly inhabit an **intensely digital ecosystem** where education, entertainment, socialisation, and identity formation are mediated through screens, creating constant engagement cycles.
- **Instant Gratification and Dopamine Loops**: Social media and gaming platforms offer immediate rewards—likes, views, wins, and notifications—that trigger **dopamine-driven feedback mechanisms**, reinforcing habitual and addictive behaviour.
- **Psychosocial Drivers**: Peer influence, the quest for social validation, and the use of digital spaces as an escape from **loneliness, stress, academic pressure, and uncertainty** further deepen dependence on online platforms.

Impact of Digital Addiction

- **Social Media Addiction:** Research cited in the Economic Survey shows that excessive social media use is strongly linked to anxiety, depression, low self-esteem, and cyberbullying-related stress.
  - Compulsive scrolling and constant social comparison intensify feelings of inadequacy and isolation, particularly among adolescents and young adults during identity formation.
- **Gaming Disorder:** Online gaming addiction is associated with sleep disruption, behavioural aggression, social withdrawal, declining academic performance, and depressive symptoms, with adolescents being particularly vulnerable due to reward-based digital design targeting neurological sensitivity.
- **Online Gambling and Real-Money Gaming:** The Survey identifies online gambling as among the most harmful digital behaviours, linking it to financial distress, anxiety, depression, family conflict, and increased suicidal ideation, prompting India to introduce stricter safeguards under the Online Gaming (Regulation) Act, 2025.
- **Streaming and Short-Video Compulsion:** Patterns such as binge-watching and endless short-video loops are connected to poor sleep hygiene, reduced attention span, heightened stress, and mental fatigue.
- **Digital Addiction as a Development Issue**: The Survey reframes digital addiction not merely as a health concern but as a human capital and productivity challenge:
  - Sleep loss, attention deficits, and anxiety reduce learning outcomes and workplace efficiency.
  - Excessive digital use weakens community participation and social capital.
  - Rising mental health burdens impose long-term economic costs through healthcare spending and lost productivity.

Global Response to Digital Addiction

- The **World Health Organization (WHO)** has classified **Gaming Disorder under ICD-11,** acknowledging digital addiction as a legitimate mental health condition.
- **Australia**: Introduced one of the world's strictest measures by imposing a **nationwide ban on social media accounts for children below 16 years** to curb youth digital addiction.
- **South Korea**: Implemented the **'Shutdown' or 'Cinderella Law' (2011)** restricting minors from accessing online games after midnight; it was later replaced in 2021 by **parental control–based regulation**.
- **China**: Enforced a **gaming "fatigue system"** limiting minors to **one hour of online gaming per day on weekends and holidays**, backed by **real-name registration and penalties for overuse**.
- **Singapore**: Adopted a **community-based approach** through the **Media Literacy Council**, promoting responsible digital citizenship and cyber wellness in schools and public platforms.
- **United Kingdom**: Introduced the **Digital Resilience Framework** to help schools, policymakers, and technology companies embed digital resilience in education systems and product design.
- **Global School Restrictions**: Countries such as **South Korea, Brazil, France, Spain, Finland, Australia, Japan, and several U.S. states** have restricted smartphone use in schools through bans, limits, or curfews to protect student well-being.
- **Seoul (South Korea)**: The **'I Will Centres'** provide addiction prevention and recovery counselling, fostering a healthier internet culture among urban youth.

India's Response to Digital Addiction

- **CBSE Guidelines**: The CBSE has issued **safe internet use guidelines** for schools and school buses to promote responsible digital behaviour among children.
- **PRAGYATA Framework**: The **Ministry of Education's PRAGYATA guidelines** emphasise balanced digital education with specific attention to **screen-time regulation**.
- **NCPCR Guidelines**: The **National Commission for Protection of Child Rights (NCPCR)** has released guidelines on **screen-time limits, online safety, and child protection** in digital spaces.
- **Tele-MANAS Initiative**: Launched in **October 2022**, **Tele-MANAS** provides a **24/7 toll-free mental health helpline (14416)** across all States and UTs, with over **32 lakh calls handled**, supported further by a dedicated mobile app launched in 2024.
- **SHUT Clinic at NIMHANS**: The **Service for Healthy Use of Technology (SHUT) Clinic** at NIMHANS, Bengaluru, offers specialised care for **compulsive technology use**, particularly among adolescents and young adults, and conducts parental counselling sessions.
- **Online Gaming (Regulation) Act, 2025**: The Act addresses digital addiction and financial harm by **banning online money games involving wagering**, restricting advertisements, and introducing a **licensing framework for skill-based games** to curb compulsive gaming and related mental health risks.

Economic Survey's Recommendations to address digital addiction

- **Strengthen National Evidence Base**: Address the lack of comprehensive national data on digital addiction by leveraging the Second National Mental Health Survey (NMHS) led by NIMHANS to enable targeted interventions, better resource allocation, and integration of digital wellness into mental health policy.
- **Develop Standardised Digital Wellness Indicators**: Create a comprehensive monitoring framework covering screen-time patterns, sleep quality, anxiety and stress levels, academic/workplace performance, cyberbullying, online scams, and exposure to real-money gaming.
- **Expand Adult-Focused Interventions**: Introduce awareness programmes in colleges and workplaces, promote technology-free zones, 'buddy' or mentor systems, and encourage voluntary digital diets to rebuild offline social connections.
- **Scale Community-Based Digital Detox Support**: Establish device-free community spaces for severe cases, drawing from models such as Karnataka's 'Digital Detox Centre – Beyond Screens' for counselling and rehabilitation.
- **Create Offline Alternatives for Youth Engagement**: Develop offline youth hubs in urban slums and rural areas, while offering moderated online safe spaces through schools with supervised peer support and verified mental health resources.
- **Institutionalise Digital Wellness in Education**: Introduce a Digital Wellness Curriculum in schools focusing on screen-time literacy, cyber safety, and mental health, supported by cyber-safety drills, peer mentoring, and mandatory physical activity.
- **Empower Families and Caregivers**: Conduct parental workshops through schools and community centres to promote screen-time limits, device-free hours, shared offline activities, and effective use of parental control tools.
- **Adopt Age-Based and Design-Based Safeguards**: Consider age-based access limits and mandate platforms to enforce age verification, age-appropriate defaults, restrictions on autoplay, targeted advertising, and gambling features.
- **Promote Safer Devices and Network-Level Controls**: Encourage use of basic phones or education-only tablets for children, supported by ISP-level safeguards such as differentiated data quotas and default blocking of high-risk content.
- **Expand Tele-MANAS for Digital Addiction**: Broaden the scope of Tele-MANAS by training specialised counsellors and integrating services with schools and colleges to normalise help-seeking and enable early intervention.

UGC (Promotion of Equity in Higher Education Institutions) Regulations, 2026

Syllabus Mapping: GS II- Social justice

Context

The Supreme Court, exercising its powers under Article 142, has granted an interim stay on the UGC (Promotion of Equity in Higher Education Institutions) Regulations, 2026, thereby reinstating the 2012 regulations for the time being.

Key Features of the UGC (Promotion of Equity in Higher Education Institutions) Regulations, 2026

- **Expanded scope of discrimination:**
  - Defines discrimination as any **unfair, differential, or biased treatment**, whether explicit or implicit.
  - Covers grounds of **religion, race, caste, gender, place of birth, disability**, or any combination thereof.
  - Aligns with broader equality principles by including acts that **nullify or impair equality of treatment** in education.
- **Inclusion of OBCs:** Explicitly brings **Other Backward Classes (OBCs)** within the ambit of **caste-based discrimination**, addressing a key omission in the draft rules.

Clear definition of caste-based discrimination: Discrimination solely on the basis of **caste or tribe** against members of **Scheduled Castes (SCs), Scheduled Tribes (STs), and OBCs**.

- **Mandatory Equity Committees:** Requires every HEI to establish an **Equity Opportunity Centre (EOC)**.
  - Equity Committees must include representation from **SCs, STs, OBCs, women, and persons with disabilities**.
  - Chaired by the **head of the institution**.
- **Monitoring and reporting mechanisms:**
  - Equity Committees to **meet at least twice a year**.
  - EOCs to submit **bi-annual reports** on their functioning.
  - UGC to establish a **national-level monitoring committee** with representatives from statutory bodies.
- **Penalties for non-compliance:** Graduated punishments, including **being barred from offering degrees or academic programmes**.

  - Non-compliant institutions may face **withdrawal of UGC recognition**.
- **Focus on dignity and inclusion:** Prohibits actions or practices by any stakeholder that are **incompatible with human dignity**.
  - Emphasises **social inclusion and equal opportunity** as core institutional responsibilities.

Drivers of Caste Bias in Academic Institutions

- **Entrenched Social Structures:** Despite legal abolition, caste hierarchies continue to shape social and institutional power dynamics within universities.
- **Stigma Around Reservations:** Students and staff admitted or appointed through affirmative action policies are often labelled as undeserving, leading to alienation and hostility.
- **Weak Institutional Enforcement:** Many institutions fall short in properly implementing anti-discrimination mechanisms and ensuring accountability, allowing unfair practices to persist.

Consequences of Discrimination in Academia

- **Mental and Emotional Strain:** Persistent exclusion and harassment place heavy psychological burdens on students and faculty, increasing the risk of anxiety, depression, and in severe cases, self-harm.
- **Barriers to Academic Progress:** Limited access to mentorship, unequal evaluation, and social isolation restrict learning opportunities and career advancement for marginalized groups.
- **Deepening Inequality:** Unequal treatment reinforces underrepresentation in higher education and professional fields, perpetuating cycles of disadvantage.

State Action and Gaps

- **Legal Safeguards:** Constitutional provisions and reservation policies aim to protect marginalized communities, yet their on-ground implementation remains inconsistent.
- **UGC Guidelines:** While the UGC has issued multiple directives to curb discrimination, enforcement is often delayed or ineffective, and complaints mechanisms remain weak in many institutions.
- **Reform and Oversight:** Government initiatives such as scholarships, fee waivers, and institutional expansion exist, but critics argue they do not sufficiently address the deeper social and institutional roots of caste bias. Monitoring systems for grievance redressal are frequently inadequate.

Committee Findings and Pending Legislation

- **Thorat Committee (2007):** Reported that SC/ST students frequently encountered avoidance, discouragement, and differential treatment from faculty, but many of its recommendations were not implemented.
- **Mungekar Committee (2012):** Also documented systemic exclusion and discrimination faced by marginalized students on campuses.
- **Rohith Act**: Proposed in 2016 to specifically prevent caste-based discrimination against Dalit students in higher education, the bill remains unpassed.

Arguments in favour of the Regulations

- **Responds to Rising Caste Discrimination**: The Regulations were framed amid a sharp increase in reported caste-discrimination cases in higher education-from 173 (2019–20) to 378 (2023–24)—highlighting the failure of advisory norms and the need for strong, enforceable safeguards.
- **Addresses Systemic and Everyday Exclusion**: Evidence shows that caste discrimination operates not only at the stage of admissions but also through hostel segregation, classroom participation, evaluation bias, mentoring access, and social exclusion, undermining the dignity and equal opportunity of SCs, STs, and OBCs.
- **Shifts from Formal to Substantive Equality**: By recognising unequal starting points and structural disadvantages, the Regulations advance **substantive equality (equal conditions in practice)** rather than mere **formal equality,** aligning with constitutional values of justice, dignity, and social transformation.
- **Enhances Access, Retention, and Well-being**: Institutionalised equity support systems and grievance redressal mechanisms are expected to improve student retention, academic performance, and mental health outcomes among marginalised learners.
- **Strong Constitutional Backing**: The framework operationalises Articles 15(4), 15(5), and 46 of the Constitution, translating the State's social justice obligations into institutional governance norms.
- **Moves Beyond Advisory Frameworks**: Unlike the 2012 UGC advisory, which lacked enforceability, penalties, and timelines, the 2026 Regulations introduce binding obligations, monitoring, and sanctions, marking a shift from symbolic inclusion to accountable implementation.
- **International Best Practices**: Many global universities follow equity, diversity, and inclusion (EDI) frameworks. The Regulations are seen as aligning Indian universities with global academic governance norms, improving credibility and internationalisation.

Key Concerns and Critique

- **Due Process Deficit**: The Regulations lack clear procedural safeguards for inquiry and complaint evaluation, including provisions to deter or penalise false or malicious complaints, raising concerns of misuse and unfair targeting.
- **Administrative and Capacity Burden**: Smaller and private institutions argue that mandatory establishment of Equal Opportunity Centres, helplines, and rapid-response systems could overstretch limited financial, human, and administrative resources.
- **Threat to Institutional Autonomy**: Critics contend that the Regulations risk extending regulatory control into internal governance and academic spaces, potentially diluting institutional autonomy, a cornerstone of higher education.
- **Risk of Bureaucratisation:** The emphasis on committees and compliance formats may encourage box-ticking over genuine cultural change, increasing paperwork without commensurate outcomes.
- **Merit–Equity Tension**: Some critics fear that a strong equity emphasis could dilute academic merit or create perceptions of preferential treatment, especially in elite institutions concerned with rankings and competitiveness.
- **Effect on Academic Freedom:** Faculty apprehend that classroom discourse, grading, or research themes could be scrutinised through a disciplinary lens, leading to self-censorship and impacting freedoms under Article 19(1)(a).

- **Narrow Definition of Caste-Based Discrimination**: Legal challenges point out that Section 3(1)(c) confines caste discrimination to **SC, ST, and OBC categories**, excluding other forms of social exclusion and limiting inclusiveness.
- **Exclusionary Scope and Risk of Social Fragmentation**: The **Supreme Court of India** observed that the Regulations do not explicitly address discrimination based on region, language, or intra-caste dynamics, nor harassment faced by the general category.

India's Initiatives to Address Caste Discrimination in Education

Constitutional and Legal Safeguards

- **Article 15** empowers the State to make **special provisions**, including reservations for **SCs and STs** in admissions to educational institutions—public and private—strengthened by the **93rd Constitutional Amendment**.
- **Article 46**, as a Directive Principle, obligates the State to protect **SCs and STs from social injustice and exploitation**, forming the normative foundation of anti-discrimination policies.
- The **SC/ST (Prevention of Atrocities) Act, 1989** criminalises acts such as denying access to educational institutions or publicly humiliating members of SC/ST communities, providing a strong deterrent against caste-based exclusion.

Financial and Academic Access Measures

- **SHRESHTA** enables meritorious SC students to access quality **residential education in reputed private schools**, helping overcome segregation and early educational disadvantage.
- The **National Fellowship for SC/ST** supports M.Phil. and Ph.D. scholars financially, enhancing **academic independence and research continuity**.
- The **Top Class Education Scheme** fully funds SC/ST students in premier institutions such as **IITs and IIMs**, removing cost barriers to elite higher education.
- **PM-AJAY** focuses on constructing hostels for SC students, improving **safety, social inclusion, and retention** in higher education institutions.

Way Forward

- **Capacity Building over Compliance:** Instead of punitive measures, the UGC should provide grants and training modules to help institutions set up effective Equity Cells.
- **Independent Oversight:** Grievance committees should include external experts and civil society members to ensure impartiality and protect students from institutional backlash.
- **Standardization of Definitions:** Clear, objective benchmarks for what constitutes "discrimination" and "harassment" must be established to prevent misuse while protecting victims.
- **Bridging the Digital & Language Divide:** Equity must include bridging the "Digital Gap" and providing bilingual support for first-generation learners, ensuring they are not "excluded by medium."
- **Mental Health Integration:** Equity cells must work in tandem with campus counseling centers, recognizing that systemic discrimination often manifests as severe mental health crises among marginalized students.
- **Bottom-Up Buy-In:** Foster a culture of "Voluntary Inclusion" through student-led diversity clubs and peer-mentorship programs, making equity a "bottom-up" social movement rather than a "top-down" mandate.

Supreme Court Intervenes on Student Suicide Epidemic

Syllabus Mapping: GS I: Society

Context

The Supreme Court issued interim directions in Amit Kumar v. Union of India, drawing upon the recommendations of the National Task Force (NTF) constituted by the Court in 2025.

Key Observations of the Supreme Court

- **Alarming Trends:** Student suicides constitute a major cause of mortality in the 15–29 age group (Sample Registration System), with nearly 13,000 student suicide cases reported in 2022 (NCRB).
- **Rapid Expansion of Higher Education:** Processes of massification and privatisation have made India the second-largest system globally in terms of student enrolment, but this expansion has also reinforced structural and social inequalities within HEIs.

Report on Student Suicide: An Epidemic Sweeping India (2025)

The growing incidence of student suicides in India has emerged as a serious public health and social concern.

A recent IC3 Institute study titled "Student Suicide: An Epidemic Sweeping India" highlights that the pace of increase in student suicides exceeds both the overall rise in suicide cases and the country's population growth.

Key Findings of the Report

- **Faster growth among students:** While the total number of suicides nationwide has been rising at an annual rate of about 2 per cent, suicides among students have been increasing at nearly double that pace, around 4 per cent. The report also notes the likelihood of underreporting in student cases.
- **Overall numbers:** India recorded 1,64,033 suicide deaths in 2021 and 1,70,924 in 2022. Of these, student suicides accounted for 13,089 and 13,044 cases respectively. Students constitute roughly 7.6 per cent of all suicide deaths — a proportion comparable to that seen across several occupational categories such as salaried workers, farmers, the unemployed, and the self-employed.
- **Regional distribution:** In 2022, the highest counts were reported from Maharashtra, Tamil Nadu, and Madhya Pradesh, together contributing nearly one-third of the country's student suicide cases. These were followed by Uttar Pradesh and Jharkhand. Collectively, the southern States and Union Territories accounted for about 29 per cent of the total. Rajasthan, despite the prominence of Kota as an academic hub, ranked tenth.
- **Gender trends:** Male students formed 53 per cent of student suicide cases in 2022. Between 2021 and 2022, suicides among male students declined by around 6 per cent, whereas cases among female students rose by approximately 7 per cent. Over the past decade, the overall rise has been steep, with male student suicides increasing by about 50 per cent and female student suicides by nearly 61 per cent.

Major Factors Contributing to Student Suicides

- **Deficient Institutional Accountability:** Universities often treat suicides as individual failures rather than addressing systemic shortcomings. **Eg:** Prakriti Lamsal (KIIT Bhubaneswar, 2025) triggered student protests alleging institutional negligence after her suicide.
- **Financial burden:** Delays in scholarships, financial aid, or fee disputes create significant stress for students. **Eg:** BPharma student in Lucknow, 2025 took his life after being denied exams due to unresolved fee issues.
- **Fragmented Regulatory Framework:** Multiple overlapping policies like UGC Regulations, NEP 2020, and the Mental Healthcare Act often remain poorly enforced. **Eg**: Supreme Court interventions in 2026 noted scholarship delays, academic pressure, and lack of mental health support as systemic causes of student suicides.
- **Escalating Academic Demands**: Intense competition and high performance expectations impose sustained psychological stress.
- **Family and Societal Pressure**: Expectations to achieve high grades or follow prescribed career paths increase mental strain. Aacademic and societal pressure is a common factor behind suicidal ideation among students.
- **Mental Health Neglect and Stigma:** Limited awareness and social taboos discourage students from seeking professional help. **Eg:** PhD scholar at IIT Kanpur (2026) committed suicide under long-term stress without accessing counselling support.
- **Social Disengagement and Peer Influence:** Loneliness, peer comparison, and lack of supportive networks exacerbate feelings of despair.
- **Gaps in Institutional Support:** Inadequate counselling services and limited access to stress management weaken students' coping mechanisms.
- **Suicides Linked to Social Bias**: Rohith Vemula, a Dalit research scholar, and Payal Tadvi, a tribal medical student, died after reportedly facing sustained caste-based mistreatment, sparking widespread public debate on inequality in academic spaces.
- **Scale of the Problem:** Between 2004 and 2024, around 115 cases of suicide among Dalit students were recorded, with many accounts pointing to discrimination as a contributing factor.

Legal and Constitutional provisions for preventing student suicides

- **National Policy Direction:** The National Suicide Prevention Strategy (NSPS, 2022) sets a goal of achieving a 10% decline in suicide deaths by 2030. While this marks an important step, it remains less ambitious than the 33% reduction target under Sustainable Development Goal (SDG) 3.4, which focuses on lowering premature mortality.
- **Mental Health Support Infrastructure:** The Tele-MANAS helpline operates as a round-the-clock, toll-free mental health service, and has reportedly handled over 29.75 lakh calls since its launch, reflecting both its reach and the scale of demand for psychological support.
- **Sukdeb Saha vs. State of Andhra Pradesh (July 2025) case:**
  - **Recognition of Mental Well-Being as a Fundamental Right:** The Supreme Court affirmed that psychological health forms an essential part of the Right to Life and Human Dignity guaranteed by Article 21 of the Constitution.
  - **From Statutory to Constitutional Duty:** This judgment elevates mental health protection beyond the scope of the Mental Healthcare Act, 2017, placing a direct constitutional responsibility on the State and educational institutions to address systemic shortcomings that contribute to student distress.

Major global frameworks for prevention of suicide

WHO's LIVE LIFE Framework

- **Reduce access to lethal means:** Promote safety measures such as tamper-resistant ceiling fans, regulated pesticide storage, and firearm control.
- **Engage responsibly with media:** Encourage reporting that emphasizes recovery and help-seeking (Papageno Effect) rather than sensational coverage (Werther Effect)
- **Build life competencies:** Integrate social and emotional learning (SEL) into school curricula to strengthen coping and resilience.
- **Detect risk early:** Train community members, educators, and frontline workers as "gatekeepers" to identify warning signs and ensure follow-up support.

United Nations Sustainable Development Goals (SDGs)

- Target 3.4 seeks to cut early deaths from non-communicable conditions, including suicide, by one-third (33%) by 2030.
- India's Position / Gap:

India's NSPS aims for a 10% reduction by 2030, which is considerably less ambitious than the global SDG benchmark, indicating the need for faster progress and higher resource commitment.

WHO–UNICEF Collaborative Program

Helping Adolescents Thrive aims to strengthen schools and health systems in addressing the mental health needs of adolescents (ages 10–19) and reducing self-harm risks.

Academic and Institutional Initiatives (WHO / WMH / IASP)

- **World Mental Health International College Student (WMH-ICS) Project:** Conducts global research on student mental health to design affordable, digital, and web-based interventions.
- **International Association for Suicide Prevention (IASP):** A global civil society organization that promotes research, crisis response systems, and legal reforms, including the decriminalization of suicide.

Structural obstacles weakening India's response to student suicides

- **Governance and Policy Execution Failures:** The central challenge lies in the gap between court directives and national frameworks on one hand, and their real-world application on the other, driven by limited enforcement, weak oversight, and insufficient financial backing.
- **Shortfalls in Compliance:** Only about 40–50% of schools are believed to have appointed trained counsellors as required by Supreme Court guidelines. Non-adherence is especially common in private coaching centres, where practices such as public humiliation and rigid batch-based segregation often persist unchecked.
- **Chronic Resource Constraints:** Mental health accounts for roughly 0.5% of the total health budget, a level of funding that severely restricts the expansion of services, development of infrastructure, and recruitment of qualified professionals.
- **Targets Versus Ground Reality:** While the National Suicide Prevention Strategy (NSPS) aims for a 10% decline by 2030, this goal appears difficult to achieve amid rising case trends and inconsistent rollout. In addition, limited reach of Tele-MANAS in rural regions reduces the overall impact of an otherwise high-volume helpline.
- **Inter-Departmental Coordination Gaps:** Sustained prevention efforts depend on close collaboration among the Health, Education, and Social Justice ministries, yet siloed functioning and bureaucratic fragmentation continue to hamper unified action.
- **Barriers in School-Level Implementation:** Many institutions lack confidential reporting spaces, earmarked mental health funding, and structured, evidence-based programs to build emotional awareness and coping skills among students.
- **Normalization of Harmful Practices:** Harsh disciplinary methods and excessive academic pressure are often justified as "character-building," reinforcing self-blame among students and discouraging them from seeking support.
- **Exam-Centric Learning Environment:** The dominance of high-stakes entrance tests such as NEET and JEE prioritizes scores over holistic growth, intensifying competition and heightening psychological strain.
- **Weak Accountability Mechanisms:** Until recent judicial interventions, there were limited legal tools to hold institutional authorities responsible for negligence, such as failing to appoint mandated mental health staff.
- **Inadequate Data Systems:** Beyond headline figures from the NCRB, comprehensive, disaggregated, and timely data remains scarce, constraining targeted interventions and the identification of high-risk clusters.
- **Online Pressure and Imitation Effects:** Continuous exposure to digital platforms and sensational media reporting can amplify distress and trigger imitation or cluster suicides **(the Werther Effect),** posing monitoring and regulation challenges.
- **Social and Economic Exclusion:** Students from SC/ST/OBC communities often encounter higher vulnerability due to caste-based bias and financial insecurity, factors that general support programs frequently fail to address adequately.

Key Interim Directions Issued by the Supreme Court

- **Centralised Data Management:** Suicide-related data under the Sample Registration System, particularly for the 15–29 age group, must be centrally collated and maintained.
- **Mandatory Reporting by HEIs:** All higher educational institutions are required to report incidents of student suicides and submit annual compliance reports to relevant regulatory authorities.
- **Filling Institutional Vacancies:** Vacant posts, including those of Vice-Chancellors, Registrars, faculty members, and other senior administrative positions, must be filled within a period of four months.
- **Strict Adherence to Existing Norms**: HEIs must ensure full compliance with statutory requirements, including the establishment of Anti-Ragging Committees and Squads, Anti-Discrimination Officers, and Internal Complaints Committees.
- **Additional Measures:** Provision of qualified medical professionals in all residential institutions and clearance of pending scholarship dues within four months, among other directives.

Way Forward

- **Systemic Transformation:** Addressing student suicides calls for coordinated structural changes across governance, schools, families, and communities to ensure that young people are supported academically, emotionally, and socially.
- **Accountability and School-Level Change:**
  - Legal oversight must move swiftly, with institutions held formally responsible for lapses such as failing to appoint qualified counsellors or ignoring mandated safeguards.
  - **State initiatives like Tamil Nadu's Happiness Curriculum and Kerala's Student Police Cadet and Operation Sukoon** have reported 10–15% lower distress levels, offering replicable frameworks for wider adoption.
  - Governments must strictly implement the **Coaching Centre Regulation Guidelines (2024)**, including prohibitions on age-inappropriate admissions, forced residential arrangements, and student segregation that intensifies competition among younger learners.
- **Empowering Teachers, Families, and Communities:**
  - All educators should receive training in Psychological First Aid to help them identify early warning signs and respond appropriately
  - Parents, ASHA workers, and Anganwadi staff can be equipped as community-level "gatekeepers," enabling earlier intervention and localized support networks. International experience, including Finland's community-based approach, points to youth suicide reductions of around 25% through sustained local engagement.
- **Innovation and Cross-Sector Governance:**
  - Close coordination between the Ministry of Education and the Ministry of Health and Family Welfare is essential for a unified prevention framework.
  - CSR funding can be leveraged to improve campus safety infrastructure, while AI-driven tools—such as chatbots

and predictive systems—can help flag early indicators of distress.
  - Ethical and responsible journalism plays a critical role in preventing copycat incidents, with global evidence showing 10–13% declines where recovery-focused reporting (the Papageno effect) is promoted.
- The Ministry of Education, working with the Ministry of Electronics and Information Technology (MeitY), should finalize Digital Safety Guidelines and expand digital well-being initiatives to manage screen exposure and online academic stress.

Conclusion

As **Mahatma Gandhi** observed, a nurturing home and a principled parent are the strongest foundations of learning. In this spirit, the State must assume a protective role, shielding young people from avoidable despair. Each day, the country loses nearly 38 promising lives to this preventable tragedy.

If left unresolved, this quiet crisis could shrink India's demographic dividend window by 8–10 years, undermining the vision of **Viksit Bharat @2047.** Only when education becomes a source of empowerment rather than pressure will the "heaven of freedom" envisioned by Tagore truly take shape.

Menstrual health as a Constitutionally protected right

Syllabus Mapping: GS II: Social Justice, Health

Context

In a significant ruling in **Dr. Jaya Thakur vs. Union of India,** the Supreme Court affirmed that access to menstrual health is an integral part of the fundamental right to life under Article 21. The Court directed all schools to provide complimentary sanitary products and ensure the availability of separate, gender-specific sanitation facilities.

Conceptual Framework of the right to menstrual health

- The Supreme Court broadened the interpretation of the Right to Life by recognizing menstrual hygiene management (MHM) as essential to human dignity and educational participation. It emphasized that menstruation, as a natural biological process, should not result in systemic disadvantage or denial of learning opportunities.
- By constitutionalizing this right, the Court clarified that the provision of sanitary products and adequate sanitation is a legal responsibility of the State, rather than a welfare measure, aimed at safeguarding privacy, dignity, and equal access to education for adolescent girls.

About Menstrual health

Dimension of menstrual health	Description/ Key aspects
Overall Definition	• Menstrual health is a holistic state of physical, mental, and social well-being related to the menstrual cycle. It goes beyond menstruation itself and includes managing periods safely, comfortably, and with dignity.
Physical & Biological Well-being	• Regular and predictable menstrual cycles. • Access to safe, hygienic, and effective menstrual products and materials.
Mental & Emotional Well-being	• Freedom from stigma, shame, and emotional or psychological stress associated with menstruation.
Social & Cultural Well-being	• Ability to participate fully in education, work, sports, and social or religious activities without discrimination or restriction. • Protection from harmful cultural practices such as isolation, food restrictions, or limited mobility.
Access to Information & Healthcare	• Timely, accurate, and age-appropriate education about menstruation from before menarche through all life stages. • Understanding links between the menstrual cycle and overall health, including fertility, nutrition, bone health, and iron levels.

Constitutional Provisions

- **Article 21 (Right to Life and Dignity):** The judgment linked personal dignity to the availability of safe and private menstrual facilities, noting that deprivation often leads to embarrassment, health risks, and school absenteeism.
- **Article 14 (Equality Before Law):** The absence of MHM infrastructure was recognized as a gender-based impediment that undermines fair educational competition.
- **Article 21A (Right to Education):** The ruling underscored that menstrual poverty should not become a factor pushing students out of the formal education system.

Key Directions Issued by the Court

- **Provision of Free Sanitary Products:** All public and private schools are required to distribute biodegradable sanitary napkins (meeting ASTM D-6954 standards) to girls in Classes 6–12.
- **Sanitation Infrastructure**: Institutions must maintain operational, gender-segregated, and accessible toilets, with assured water supply and hygiene materials.
- **MHM Support Units**: Schools are to establish dedicated menstrual support corners stocked with emergency supplies such as spare clothing, undergarments, and disposal pouches.
- **Monitoring and Compliance**: District Education Officers are mandated to conduct periodic reviews and gather anonymous student feedback. Non-compliant private institutions risk regulatory action, including loss of recognition.

Significance of Legal Recognition

- **Continuity in Schooling:** By addressing monthly absenteeism linked to lack of facilities, the ruling seeks to reduce learning disruptions.
  - **Illustration**: Reports from 2025 suggest that girls in rural regions often miss several school days each month due to inadequate menstrual support.
- **Protection of Human Dignity:** The decision affirms the right to privacy and reduces stigma, empowering students to seek assistance without fear of shame.
  - **Illustration**: The Court observed that social hesitation frequently prevents girls from voicing their needs, reinforcing the importance of institutional support.
- **Public Health Outcomes:** Access to hygienic products lowers the risk of infections associated with unsafe menstrual practices.
  - **Illustration**: Studies from 2024–25 indicate a correlation between poor MHM and increased reproductive health issues in underserved urban communities.
- **Advancing Gender Parity:** Removing menstruation-related barriers promotes equal educational and social opportunities for female students.
  - **Illustration**: Addressing menstrual poverty helps prevent biological factors from shaping long-term economic and social mobility.
- **Environmental Considerations:** The emphasis on biodegradable materials aligns school sanitation practices with national sustainability and waste management policies.

Challenges to Menstrual Health

- **Entrenched Stigma and Social Taboos:** Menstruation is frequently treated as something secretive or "unclean," resulting in limits on movement, diet, religious involvement, and social engagement. In certain regions, customs such as temporary isolation still exist, reinforcing feelings of shame and exposing individuals to health and safety risks.
- **Inadequate Access to Affordable Menstrual Products:** Period Poverty: Many people cannot regularly afford sanitary pads, tampons, or reusable alternatives and instead rely on unsafe substitutes like old cloth, ash, or leaves, which are hard to sanitize and raise the risk of reproductive tract infections.
- **Cost and Policy Barriers:** Although taxes on some menstrual products were removed in 2018, price differences and affordability gaps persist across regions.
  - Distribution Gaps: Remote and rural communities often face irregular or limited supply of quality menstrual materials.
- **Insufficient Sanitation and Privacy**: A lack of clean, private, and well-equipped toilets in schools, workplaces, and households—complete with water, secure doors, and disposal facilities—makes safe menstrual management challenging.
- **Waste Disposal Constraints:** Even where products are available, systems for discreet and hygienic disposal are often missing, contributing to environmental and public health concerns.
- **Limited Healthcare Recognition:** Conditions such as polycystic ovary syndrome (PCOS), endometriosis, and severe menstrual pain are frequently normalized or overlooked, leading to delayed diagnosis and prolonged discomfort.

Initiatives taken to promote menstrual health

- **Menstrual Health Promotion Scheme:** Focuses on spreading awareness about menstrual well-being, improving the availability of sanitary products, and encouraging environmentally responsible methods for their disposal.
- **National MHM Guidelines:** Issued under the Swachh Bharat Mission, these guidelines aim to strengthen menstrual hygiene awareness, particularly in rural and underserved communities.
- **Pradhan Mantri Bharatiya Janaushadhi Pariyojana:** Through Janaushadhi Kendras, the program supplies affordable "Suvidha" oxo-biodegradable sanitary pads at a subsidized rate of ₹1 per pad, increasing accessibility for women and girls.
- **Beti Bachao Beti Padhao (BBBP):** Promotes public awareness around menstrual health and the safe use of sanitary products as part of its broader gender empowerment goals.
- **Samagra Shiksha Initiative:** Supports the installation of sanitary pad vending machines and eco-friendly incinerators in schools to improve access and safe disposal.

Way Forward

- **Educational Integration:** Incorporate age-appropriate menstrual health education for all students through national and state curricula.
- **Technology-Enabled Facilities:** Install vending machines and discreet disposal units within restrooms to enhance privacy.
- **Community Outreach:** Engage frontline health and childcare workers to extend awareness programs to families and local communities.
- **Digital Oversight:** Introduce real-time tracking platforms for inventory management and inspection reporting.
- **Local Manufacturing Support:** Encourage women-led self-help groups to produce eco-friendly sanitary products, improving affordability and availability.

Topic for Prelims

Uneven distribution of secondary schools: Economic survey (2025-26)

Context

The Economic Survey 2025–26 assesses progress toward the NEP 2020 target of raising Expected Years of Schooling to 15. It flags the uneven distribution of secondary schools, especially in rural areas, as a key cause of low retention. High dropout rates are linked to economic pressures and domestic responsibilities. The Survey also calls for internationalising higher education and strengthening State capacity.

Key points

- **NEP 2020 Target:** Aim to raise Expected Years of Schooling (EYS) from 13 to 15 years under the 5+3+3+4 schooling structure (ages 3–18.2).

- **Core Challenge:** Uneven distribution of secondary schools limits retention of students, especially at higher grades.
- **Availability of Secondary Schools:** Only 17% of schools in rural areas offer secondary education.
  - About 38% of schools in urban areas offer secondary education.
- **Out-of-School Adolescents:** Nearly 2 crore children aged 14–18 are out of school (PLFS 2023–24)
  - The largest share of out-of-school children is at the secondary level.
- **Net Enrolment Ratio (NER):** Secondary age-specific NER is 52.2%, indicating low retention beyond Grade VIII.
- **Main Reasons for Dropouts: Economic necessity:** 44% drop out to supplement household income.
  - **Gendered impact:**
    - » Over 67% of boys cite income support as the main reason.
    - » 55% of girls cite domestic and care responsibilities.
- **Skilling and Vocational Education:** Only 0.97% of adolescents (14–18) received institutional skills.
  - 91.94% received no formal skills training.
  - The survey stresses the urgent need for school-based vocational and skills education.
- **Higher Education Reforms:** Push to "internationalise" higher education.
  - Emphasis on building State capacity and academia-industry collaboration.
  - Over 81% of higher education enrolments are in State institutions.
- **Regulatory Reform:** Viksit Bharat Shiksha Abhishthan Bill, 2025 aims to replace fragmented and overlapping regulations.
- **Institutional Expansion:** India has 23 IITs, 21 IIMs, and 20 AIIMS.
  - Two international IIT campuses established in Zanzibar and Abu Dhabi.
- **Government View:** Education reforms linked to improved enrolments, innovation index, and inclusive growth

Supreme Court Judgment on the Right to Education (RTE) Act, 2009

Syllabus Mapping: GS2: Social Justice, Education

Context

The Supreme Court reaffirmed the obligation of schools to reserve 25% of seats for children belonging to economically weaker and disadvantaged groups, in accordance with Section 12(1)(c) of the RTE Act, 2009.

Key Directions Issued by the Court

- **Framing of Rules by Governments:** Both Central and State Governments were directed to formulate and notify rules under Section 38 of the RTE Act to ensure effective implementation of Section 12(1)(c).
- **Consultative Rule-Making Process:** The rule-making exercise must involve consultations with the National Commission for Protection of Child Rights (NCPCR), State Commissions for Protection of Child Rights (SCPCRs), and the National and State Advisory Councils.
- **Monitoring and Grievance Redressal:** The NCPCR and SCPCRs, established under the Commissions for Protection of Child Rights Act, 2005, are entrusted with oversight, monitoring, and redress of complaints related to the enforcement of the RTE Act.

Overview of the RTE Act, 2009

- **Constitutional Basis**
  - **Article 21A:** Guarantees free and compulsory education for all children aged 6–14 years as a Fundamental Right.
  - **Article 51A(k):** Imposes a Fundamental Duty on parents or guardians to ensure educational opportunities for children in the 6–14 age group.
  - **Article 45:** As a Directive Principle, mandates the State to provide early childhood care and education to children below six years.
- **Legislative Objective:** The Act was enacted to operationalise Article 21A of the Constitution.
- **Key Provisions:**
  - **Section 3:** Confers upon every child between 6 and 14 years the right to free and compulsory education in a neighbourhood school until completion of elementary education.
  - Obligates governments and local authorities to establish neighbourhood schools and ensure adequate infrastructure, qualified teachers, and learning resources.
  - Provides for reimbursement by the State to schools for per-child expenditure incurred under the Act.

Significance of the Judgment

- **Advances Substantive Equality**: Encourages social inclusion and integration by enabling children from diverse socio-economic backgrounds to study together from an early age.
- **Operationalises Constitutional Fraternity:** Translates the abstract ideal of fraternity into an enforceable and practical framework within the education system.
- **Strengthens the Common School System:** Reaffirms the vision articulated by the Kothari Commission, promoting a unified and egalitarian schooling structure.

Pradhan Mantri Matru Vandana Yojana

Context

The flagship **Pradhan Mantri Matru Vandana Yojana** has completed nine years since its launch.

About Pradhan Mantri Matru Vandana Yojana (PMMVY)

- **Type & Launch**: Centrally Sponsored **Direct Benefit Transfer (DBT)** scheme launched in **2017**.
- **Objectives**:
  - Provide **partial wage loss compensation** through cash incentives so women can rest before and after childbirth (first child).

  - Promote **health-seeking behaviour** among Pregnant Women & Lactating Mothers (PW&LM).
- **Coverage**:
  - For women from **socially and economically disadvantaged sections**.
  - Applicable for **first two living children**, with the **second child benefit allowed only if it is a girl**.
- **Monetary Benefits**:
  - **₹5,000** provided from early pregnancy till childbirth.
  - Additional **₹1,000** under **Janani Suraksha Yojana** after institutional delivery.
- **Installment Structure**:
  - **₹1,000** – At pregnancy registration.
  - **₹2,000** – On completing 6 months of pregnancy + at least one antenatal check-up.
  - **₹2,000** – After birth registration + first cycle of immunization (BCG, OPV, DPT, Hepatitis-B).
- **Special Provision**: Miscarriage or stillbirth cases are treated as **fresh cases** for benefit eligibility.

PANKHUDI portal

Context

The PANKHUDI Portal was launched by the Union Minister for Women and Child Development.

About PANKHUDI Portal

- It is a single-window, integrated digital platform that facilitates CSR and voluntary partnerships for women and child development, enabling transparent contributions, proposal tracking, and outcome monitoring across priority social sectors.
- **Nodal Ministry:** Ministry of Women and Child Development.
- **Key Features:**
  - Provides a **single digital interface** for individuals, NRIs, NGOs, corporate entities, CSR contributors, and government agencies to collaborate.
  - Focuses on **nutrition, health, Early Childhood Care and Education (ECCE), child welfare and protection, and women's safety and empowerment**.
  - **Digitally supports** implementation of **Mission Saksham Anganwadi & Poshan 2.0, Mission Vatsalya, and Mission Shakti** through structured and predefined workflows.
  - Strengthens infrastructure and service delivery across over 14 lakh Anganwadi Centres, around 5,000 Child Care Institutions, nearly 800 One Stop Centres, about 500 Shakhi Niwas, and more than 400 Shakti Sadan.

YUVA AI For ALL Course under IndiaAI Mission

Context:

On the occasion of National Youth Day celebrated on 12th January, 2026, Ministry of Electronics & IT (MEITY) launched National AI Literacy Program and its flagship course YUVA AI For All Course.

About YUVA AI For ALL Course

- It is a national AI literacy initiative of Government of India to build foundational Artificial Intelligence (AI) awareness among students and youth across the country.
- Launched under IndiaAI Mission under the Ministry of Electronics & Information Technology (MEITY).
- YUVA AI for ALL courses does not assume or require any prior technical background. Thus, providing an inclusive entry point for AI learning.
- Designed as modular lessons with short assessments.
- Free of charge for greater reach.
- Curriculum covered: What is Artificial Intelligence, The Technology behind Artificial Intelligence, Using Artificial Intelligenceto Learn, Create,think and plan, ArtificialIntelligenceEthics and The Future ofArtificial Intelligence
- Available in 11 Indian languages - Assamese, Bengali, Gujarati, Hindi, Kannada, Malayalam, Marathi, Odia, Punjabi, Tamil and Telugu.
- Available on leading learning platforms such as FutureSkillsPrime, iGOTKarmayogi, DIKSHA and other popular ed-tech portals.
- On completion of the course, every learner will get an official certificate from Government of India under IndiaAI mission & MEITY for Foundational AI 101 Course.
- **Objectives of YUVA AI For ALL Course**
- Achieve large scale adoption & mainstreaming of AI literacy.
- Promote responsible, inclusive & ethical understanding of AI.
- A replicable model for large-scale digital literacy campaigns.

SCIENCE & TECHNOLOGY

Topics for Mains

How space research has transformed healthcare

Syllabus Mapping: GS-3- Applications of S&T in Everyday Life

Context

- Space exploration demands **highly reliable, compact and efficient technologies** for survival in extreme environments. These innovations have also found **civilian applications in healthcare**, improving diagnostics, treatment and access to medical services on Earth.

Scale of Space-to-Healthcare Spillovers

- Under the US space programme, **NASA** has documented **over 2,000 technology spinoffs since 1976** benefiting everyday life.
- India's **Indian Space Research Organisation**, despite a smaller budget, has transferred **over 350 technologies** to Indian industry, many in biomedical and healthcare sectors.

Applications of healthcare technologies developed:

- **Diagnostics and Medical Imaging:** Digital image-processing techniques used in **CT scans, MRIs, ultrasounds and mammography** originated in planetary and astronomical image analysis.
  - **E.g.** Infrared sensors, initially used for stellar temperature measurement, enabled **infrared ear thermometers**.
- **Miniaturised Diagnostics and Lab-on-Chip Devices:** The need to conduct blood tests in **microgravity environments** led to compact blood analysers.
  - These evolved into **lab-on-chip and point-of-care diagnostic devices**, enabling rapid testing outside conventional laboratories.
- **Wearables and Continuous Health Monitoring:** Modern wearables tracking **heart rate, ECG, respiration and movement** trace their origins to astronaut biotelemetry systems.
  - **E.g.** Non-invasive metabolic and glucose monitoring techniques were explored for in-flight astronaut health.
  - Smart textiles with embedded sensors evolved from **spacesuit biomonitoring technologies**.
- **Infection Control and Hospital Safety**
  - **E.g.** Closed spacecraft environments led to advances in **air and water purification systems**, including HEPA filters and catalytic oxidisers.
  - Antimicrobial materials developed for spacecraft cabins are used in **catheters, implants and clinical surfaces**.
- **Telemedicine and Healthcare Access:** Satellite-based communication systems enabled **telemedicine, teleradiology and specialist consultations** in remote areas.
  - **E.g.** In India, ISRO's **VSAT-enabled mobile medical units** improved healthcare delivery in underserved regions.
- **Medical Logistics and Supply Chains:** Solar-powered vaccine refrigerators developed for off-grid space-related operations are used in **immunisation programmes**.
  - Drone-based medical delivery systems rely on **satellite navigation and communication**, technologies refined through space missions.
- **Rehabilitation, Prosthetics and Assistive Devices:** Exercise systems for astronauts influenced **robotic rehabilitation and physiotherapy technologies**.
  - Space-grade materials improved **prosthetics and orthotic devices**, making them lighter and more durable.
  - NASA-assisted research contributed to early **cochlear implant development**.
- **Biomedical Research and Clinical Practice:** Astronaut studies on **bone loss, muscle atrophy and cardiovascular changes** informed treatment of osteoporosis and prolonged bed rest.
  - E.g. Space radiation research improved **cancer risk assessment and radiotherapy safety**.

Healthcare Technologies Developed by ISRO

- **Satellite-Based Telemedicine Networks** – ISRO enabled real-time consultations between rural hospitals and urban super-specialty centres using satellite communication.
- **VSAT-Enabled Mobile Medical Units** – Portable clinics using ISRO satellites deliver diagnostics and healthcare services in remote and inaccessible regions.
- **ISRO Smart Limb Prosthetic** – A low-cost, lightweight bionic limb developed using space-grade materials to aid amputees.
- **Endoscopic Diagnostic Probes** – Indigenous probes assess mucosal health and support early disease detection in gastro-intestinal disorders.
- **Cancer Detection Sensors** – Capacitive sensors developed for space applications adapted to detect malignancy in leukocytes.
- **Artificial Polyurethane Foot** – Durable, affordable prosthetic foot designed for Indian conditions using advanced material technology.
- **Low-Cost Heart Assist Pump** – A cardiac support device using rocket-grade materials to assist patients with left ventricular failure.

Significance of Space-Derived Healthcare Technologies for India

- **Bridging Rural–Urban Healthcare Gaps** – Satellite telemedicine and mobile medical units bring specialist care to remote, tribal and underserved regions.
- **Affordable and Indigenous Medical Solutions** – Space-driven innovation promotes low-cost, reliable medical devices suited to Indian conditions, reducing import dependence.
- **Strengthening Public Health Systems** – Earth-observation and satellite data improve disease surveillance, disaster response and health planning.
- **Improving Access to Advanced Diagnostics** – Miniaturised and portable diagnostic technologies enable early detection even in low-resource settings.
- **Enhancing Health Logistics and Supply Chains** – Satellite navigation and solar-powered cold chains ensure efficient vaccine and medical supply delivery.

- **Boosting Self-Reliance and Innovation Ecosystem** – Technology transfers from ISRO support startups, industry and Atmanirbhar Bharat in the health sector.

Light Water Reactors

Syllabus Mapping: GS-3- Nuclear Technology

Context

The Department of Atomic Energy (DAE) is prioritising the expedited development of a 900 MWe indigenous LWR, with design work initiated in 2015.

About Light Water Reactors

- The light-water reactor (LWR) is a type of thermal-neutron reactor that uses normal water, as opposed to heavy water, as both its coolant and neutron moderator.
- There are three varieties of light-water reactors: the pressurized water reactor (PWR), the boiling water reactor (BWR), and (most designs of) the supercritical water reactor (SCWR).

Difference Between LWRs and PHWRs

Aspect	LWRs	PHWRs
Moderator	Light water (H_2O)	Heavy water (D_2O)
Coolant	Light water	Heavy water
Fuel	Enriched uranium	Natural uranium
Enrichment Requirement	Required	Not required
Global Presence	Dominant worldwide	Limited outside a few countries
Construction Cost	Generally lower due to scale	Higher due to heavy water use
Fuel Flexibility	Limited	High (thorium, LEU blends possible)

Why is India pushing for LWRs

- **Global Dominance:** LWRs account for over 85% of global civil nuclear reactor capacity, making them the standard technology in international markets.
- **Design and Cost Advantages:**
  - Use normal (light) water as both coolant and moderator.
  - Simpler engineering overlaps with conventional thermal power technologies.
  - Benefit from economies of scale, resulting in lower construction costs and higher thermal efficiency.
- **Export Imperative:** An Indian LWR would strengthen India's bargaining power with foreign vendors and support export ambitions.

Concerns with LWRs

- **Cost and Tariffs**: Imported LWR projects involve higher capital costs, potentially leading to higher electricity tariffs in the Indian context.
- **Indigenous Capability Risk:** Excessive reliance on imports could undermine domestic PHWR manufacturing capacity.
- **Fuel Access:** LWRs require enriched uranium, which is readily available internationally but historically constrained for India.

Significance of India's Dual-Track Approach

- **Integrated Strategic Vision:** As India opens its nuclear power sector to private participation and explores reactor exports and small modular reactors (SMRs), it is pursuing a dual-track nuclear strategy that combines LWRs and PHWRs.
- **Strengthening India's Credibility:** A diversified reactor portfolio enhances India's standing as a credible and reliable nuclear supplier, particularly for emerging economies in the Global South seeking affordable and scalable clean energy solutions.
- **Advancing Clean Energy Transition and Energy Security**: The dual-track approach supports India's clean energy transition by expanding low-carbon power generation while reducing dependence on fossil fuels and improving long-term energy security.
- **Energy diplomacy:** Nuclear capabilities increasingly function as a tool of energy diplomacy, complementing India's outreach through infrastructure development and digital public goods to strengthen strategic partnerships.

Heavy Water

- Heavy water (D_2O) is water in which hydrogen atoms are replaced by deuterium, an isotope of hydrogen containing one proton and one neutron.
- It is an excellent neutron moderator, slowing down neutrons without absorbing them significantly, making it ideal for use in Pressurised Heavy Water Reactors (PHWRs).
- Heavy water enables the use of natural uranium as nuclear fuel, eliminating the need for uranium enrichment.
- It can also produce plutonium suitable for nuclear weapons if misused.
- Owing to this dual-use nature, heavy water is classified as a strategic nuclear material under international non-proliferation regimes.
- Its production, transfer, and export are monitored under frameworks such as the International Atomic Energy Agency (IAEA) safeguards system.

Can international patent law handle a permanent presence in space?

Syllabus Mapping: GS-3 IPR issues

Context:

Permanent human presence in space is becoming a reality, driven by survival-critical technological innovation. This raises a key legal question about how ownership of inventions created beyond Earth's territorial boundaries should be governed.

Why the Present Patent System Does Not Work in Outer Space

- **Territorial Foundation of Patent Law**
  - Patent law is based on **territorial jurisdiction**, granting exclusive rights within defined national boundaries.
  - Infringement is determined by locating where an invention is **made, used or sold**.

- **Absence of Sovereign Boundaries in Space:** Outer space has **no national territory or sovereign control** under international space law. This removes the geographical anchor on which patent enforcement depends.
- **Jurisdiction by Registration is Inadequate:**
  - Under international space law, states retain jurisdiction over space objects registered under their authority, not over physical locations.
  - Article VIII of the Outer Space Treaty links legal control to the state of registry.
  - As a result, inventions aboard registered space objects are treated as occurring within the registering state's legal territory.

The International Space Station (ISS) Model

- The ISS uses a **module-based jurisdiction system**, where each module falls under the legal authority of its contributing state.
- Article 21 of the ISS Intergovernmental Agreement extends domestic patent law to respective modules.
- This model works due to **clear segmentation, stability and fixed infrastructure**.

Limits of the ISS Model for Lunar and Planetary Bases

- Permanent lunar or planetary settlements will involve **shared habitats and integrated systems**, not neatly divided modules.
- Innovation may occur incrementally through shared data, autonomous systems and real-time problem-solving.
- Registration-based jurisdiction fails to reflect **actual contribution, operational control or collaborative innovation**.

- **Non-Appropriation Principle in Space Law**
  - **National appropriation is prohibited** under Article II of the Outer Space Treaty, meaning no state can own the Moon, Mars or any part of outer space.
  - **Patents create a legal tension** because, while they do not claim territory, they grant exclusive control over technologies that may be essential for survival in space.
- **Patents as De Facto Exclusion**
  - In permanent settlements, patented technologies may control access to water, energy or life-support systems.
  - Exclusive patent rights could effectively **restrict survival-critical activities**, contradicting the principle of open access. This creates tension between **private innovation incentives and collective human interest**.
- **Flags of Convenience in Space**
  - Registration-based jurisdiction enables **regulatory arbitrage**, similar to maritime flags of convenience.
- **Unequal Rule-Making Power**
  - While over 110 states are party to the Outer Space Treaty, only a few shape space-related IP practices.
  - Most countries act as **rule-takers**, not rule-makers, in evolving space governance.
  - This deepens inequalities in access, innovation benefits and legal influence.
- **Limits of Cooperative Frameworks**
  - Frameworks like the Artemis Accords promote coordination and interoperability.
  - However, coordination does not resolve **ownership, enforcement or dispute settlement** in IP law.
  - Operational agreements cannot substitute for binding legal jurisdiction.
- **Temporary Presence Doctrine**
  - Article 5 of the Paris Convention limits patent enforcement for patented articles in transit on Earth.
  - It protects freedom of movement across borders for ships, aircraft and vehicles.
  - Its applicability to space objects, docking stations or orbital platforms remains **legally unresolved**.

What Does "Flags of Convenience" Mean?

- In maritime law, ships are often registered in countries with **weaker regulations or lower costs**, even if the ship's owner is from another country.
- This practice is called **flags of convenience**, as it helps operators avoid stricter laws.

Problem of Regulatory Arbitrage

- Companies or states can **develop technologies in countries with strong patent laws**, benefiting from legal protection and research ecosystems.
- They can then **deploy those technologies on space objects registered in countries with weaker patent enforcement**.
- This allows them to escape stricter patent obligations while still using the innovation.

Why This Is a Concern

- It **undermines patent systems** in countries that invest heavily in innovation and legal protection.
- It encourages **legal loopholes instead of genuine technological advancement**.

Implications for India

- India's growing role in space exploration places it in a strong position to shape **equitable space governance norms**.
- A clear national space law and proactive engagement in global IP discussions are essential.
- India can bridge innovation incentives with **inclusive, humanity-centric legal frameworks**.

Way Forward: Reforming Patent Law for Outer Space

- **Dedicated Space IP Framework:** Create a separate international legal regime for space-based inventions, moving beyond Earth-centric territorial patent principles.
- **Contribution-Based Ownership:** Grant patent rights based on actual technological contribution and innovation, rather than mere registration of space objects.
- **Shared-Use Exceptions:** Limit patent exclusivity for technologies essential to life support, safety and survival in permanent space habitats.
- **Temporary Presence Clarity:** Clearly extend the temporary presence doctrine to space activities such as docking, transit and multinational operations.
- **Prevent Flags of Convenience:** Establish minimum global patent standards to stop misuse of weak registration regimes in space operations.

- **Inclusive Rule-Making:** Ensure wider participation of developing countries in shaping global space intellectual property governance frameworks.
- **Licensing and Patent Pools:** Encourage shared licensing mechanisms to balance innovation incentives with collaboration and affordability in space missions.
- **Alignment with Space Law:** Harmonise patent rules with non-appropriation and common-benefit principles of international space law.
- **India's Leadership Role:** India should adopt a national space law and lead efforts toward equitable and cooperative space IP governance.

ISRO and the next big challenge

Syllabus Mapping: GS-3 Space Technology

Context

Indian Space Research Organisation (ISRO) has achieved major milestones in lunar, solar, and Earth-observation missions while preparing for human spaceflight and next-generation launch systems. At the same time, concerns are being raised about capacity constraints, governance clarity, and competitiveness in a liberalised space sector.

Recent Achievements of ISRO

- **Chandrayaan-3 (2023):** Successful soft landing on the Moon, placing India among countries with proven lunar-landing capability.
- **Aditya-L1 (Jan 2024):** India's first solar observatory reached the Sun-Earth L1 point.
- **NISAR Mission (2025):** NASA–ISRO joint Earth-observation mission for climate and disaster monitoring.
- **SpaDeX (Dec 2024):** Successful demonstration of **Space Docking**—a critical precursor for building the Bharatiya Antariksh Station (BAS).
- **RLV-LEX-03 (June 2024):** Completion of autonomous landing tests for "Pushpa," proving the feasibility of reusable launch vehicles.
- **Future roadmap:** 7 launches planned by March 2026, including uncrewed **Gaganyaan** mission.

Reasons Behind the Success

- **Low-Cost Innovation:** ISRO continues to utilize its "frugal engineering" model, but with increasing complexity (e.g., the modular design of Chandrayaan-4).
- **Strategic Reforms:** The 2020 reforms led to the creation of Indian National Space Promotion and Authorisation Centre (IN-SPACe) as regulator and NewSpace India Limited (NSIL) as commercial arm, allowing ISRO to focus more on R&D while offloading commercial launches.
- **Global Collaboration:** Deepening ties with NASA (NISAR) and JAXA (LUPEX/Chandrayaan-4) have provided access to advanced sensors and shared funding.

Challenges

- **Capacity and Execution Constraints:** The **heavy focus on "big-ticket" missions** (Gaganyaan, Chandrayaan-4) creates a "Sovereignty Trap," where routine satellite replenishment and private sector support get delayed.
  - **E.g.,** In 2025, ISRO managed **only 5 launches despite a target of 8.**
  - Private launch firms (Skyroot, Agnikul) still depend on ISRO for test stands and launch pads, meaning if one ISRO mission hits a snag, the entire ecosystem stalls.
- **Infrastructure and Industrial Limitations:** Insufficient **integration facilities, test stands, and supply-chain depth** for structures, avionics, and propulsion.
  - Private launch providers still depend heavily on ISRO infrastructure, limiting work offloading.
  - Medium-lift dependence (PSLV/GSLV) restricts competitiveness in a global market moving towards **heavy-lift and reusable systems**.
- **Governance and Legal Ambiguity:** Under the 1972 UN Liability Convention, the government (ISRO) is liable for any private mission failure. **Without a National Space Law**, **private entities hesitate to scale** due to insurance and liability uncertainties..
  - Despite 2020 reforms, ISRO continues to be treated as a **default regulator and technical certifier**.
  - Overlapping roles between ISRO, **IN-SPACe**, and **NSIL** reduce institutional clarity.
- **Competitiveness and Financial Constraints:** Global space sector is shifting towards High-frequency launches, Partial reusability & Rapid satellite manufacturing.
  - While the space budget rose to **₹13,415 crore in 2025-26**, private investment saw a global cooling in 2024.
  - NGLV development demands **large capital, advanced manufacturing, and deep industrial ecosystems**, which are still evolving in India.

Way Forward

- **NGLV (Soorya):** Transitioning to the Next-Generation Launch Vehicle, which targets a 30-tonne payload to Low Earth Orbit (LEO) with a reusable first stage.
- **Space Activities Bill:** Passing comprehensive legislation to give IN-SPACe statutory authority.
- **Industrial Offloading:** Shifting the production of established rockets like the PSLV to the HAL-L&T consortium, allowing ISRO scientists to focus solely on R&D.
- **VC & Technology Funds:** The operationalization of the **₹1,000-crore Venture Capital Fund** by IN-SPACe (targeted to support 40 startups over 5 years) aims to bridge the gap between prototypes and scalable products.

Topics for Prelims

India's First State-Funded BSL-4 Laboratory

Context

India has taken a major step toward strengthening biosecurity with the foundation stone laying of its first state-funded Bio-Safety Level-4 (BSL-4) biocontainment laboratory in Gandhinagar, Gujarat.

About India's State-Funded BSL-4 Facility

- It will be the **second civilian BSL-4 facility** in India and the first fully funded and controlled by a state government.
- Implemented under the **Gujarat State Biotechnology Mission (GSBTM)**
- It functions under the **Gujarat Biotechnology Research Centre (GBRC)**, which previously played a key role in decoding India's early SARS-CoV-2 genome
- The facility is being developed in compliance with international biosafety norms prescribed by the Centers for Disease Control and Prevention (CDC), National Institutes of Health (NIH), Department of Biotechnology (DBT), and Indian Council of Medical Research (ICMR).
- The laboratory complex will include:
  - BSL-4, BSL-3, and BSL-2 laboratories for human pathogens
  - ABSL-4 and ABSL-3 laboratories for animal and zoonotic disease research
  - Advanced utilities, waste decontamination systems, and biosecurity infrastructure

Global & National Context of High-Containment Labs

- **India:**
  - One civilian BSL-4 lab currently operational at **National Institute of Virology (Pune)**
  - A defence BSL-4 facility established by **Defence Research and Development Organisation (DRDO)** in Gwalior
  - Limited ABSL-4 capability, with ICAR-NIHSAD slated for upgradation
  - India has also expanded its broader biosafety ecosystem through:
    - » Virus Research and Diagnostic Laboratory (VRDL) network under the Ministry of Health
    - » BSL-2 and BSL-3 labs across ICMR, DBT, ICAR, CSIR, and DST-supported institutions
- **Globally:** Around **69 BSL-4 laboratories** are operational or under development worldwide, concentrated in advanced economies due to high costs and safety requirements.

About Biosafety Laboratories

Biosafety Level (BSL)	Containment Level	Typical Pathogens Handled	Primary Uses & Applications
BSL-1	Basic containment; minimal risk to humans and environment	Non-pathogenic or well-characterised microbes (e.g., E. coli K-12)	Teaching laboratories, basic microbiology research, routine training, and educational demonstrations
BSL-2	Moderate containment; agents pose moderate health risk	Common infectious agents causing mild to moderate disease (e.g., influenza virus, hepatitis A, Salmonella)	Clinical diagnostics, routine microbiology research, vaccine research (non-high risk), and handling patient samples
BSL-3	High containment; serious or potentially lethal pathogens, usually airborne	Tuberculosis (Mycobacterium tuberculosis), SARS-CoV-2, avian influenza, plague	Research on airborne pathogens, advanced diagnostics, vaccine and drug development, outbreak investigation
BSL-4	Maximum containment; extremely dangerous and exotic pathogens with no known treatment	Ebola, Marburg, Nipah, Lassa fever, Crimean-Congo Hemorrhagic Fever	Research on deadly viruses, development of vaccines and therapeutics, high-risk pathogen surveillance, national biosecurity and biodefence

Need for a State-Level BSL-4 Laboratory

- Enhances **national preparedness** against pandemics and biosecurity threats.
- Enables **real-time response** to emerging and re-emerging infectious diseases
- Strengthens India's capacity to study **zoonotic diseases**, where animal-to-human transmission is critical.
- Reduces dependence on limited central facilities, easing research bottlenecks.
- Supports indigenous development of **vaccines, diagnostics, and therapeutics**.

CERN team tracks a fragile nucleus

Context:

ALICE experiments show fragile deuterons form after violent LHC collisions via short-lived resonances.

ALICE Collaboration

The ALICE Collaboration (A Large Ion Collider Experiment) is one of the four major particle physics experiments at the CERN Large Hadron Collider. It focuses on studying the physics of strongly interacting matter at extreme energy densities to understand the early universe's conditions and the formation of quark–gluon plasma.

Key facts

- **Founded:** 1993
- **Headquarters:** Geneva, Switzerland
- **Member institutions:** ~175 from 39 countries
- **Primary goal:** Study of quark–gluon plasma via heavy-ion collisions

About the Experiment:

- The experiment sought to resolve the mystery of how **deuteron**, a fragile particle, do not break apart immediately in LHC collisions. But they are regularly observed in LHC experiments.

- **Two Possible Theories**
- **Direct emission**: Deuterons form immediately during collision.
- **Coalescence**: Proton and neutron form first, then join later.
- **Outcome of the experiment:** ALICE found that pions and deuterons often appeared with linked motion. This meant the deuteron was formed **after** the Δ(1232) particle decayed, using the proton or neutron produced in that decay. Because this happens slightly later and away from the most violent region, the fragile deuteron survives.
- **Important Result**
- About **62% of deuterons** formed after Δ decays.
- Including other resonances, nearly **80% formed via coalescence**.

What are Pions

- **Pions** are the lightest **mesons**, made of one **quark and one antiquark**.
- It act as **force carriers** between protons and neutrons inside atomic nuclei.
- Commonly produced in **high-energy particle collisions** and cosmic-ray interactions.
- Important in **particle physics experiments** and in explaining **nuclear binding**.

About Δ(1232) resonance

- It is a very **short-lived excited version of a proton or a neutron** that quickly decays.
- It decays into a pion and a proton or neutron
- Produced in high-energy particle collisions, such as those at the LHC.
- Plays a key role in nuclear and particle interactions, especially in pion production.
- Important for studying strong nuclear force and nucleus formation mechanisms.

Significance of the ALICE Experiment

- **Improved understanding of nucleus formation:** The experiment shows deuterons form after collisions via coalescence, correcting earlier assumptions about instant nucleus formation in high-energy reactions.
- **More accurate cosmic-ray models:** Knowing how light nuclei form helps scientists realistically model cosmic-ray collisions with interstellar matter and interpret observational data correctly.
- **Stronger dark-matter signal identification:** Accurate models prevent confusing ordinary nuclear production with rare dark-matter signatures, reducing false positives in indirect dark-matter searches.
- **Link between collider physics and space phenomena:** Results connect laboratory experiments at the LHC with natural high-energy processes occurring throughout the universe.
- **Broader impact on astrophysics and cosmology** Insights improve understanding of matter formation in the universe and support studies of cosmic evolution and fundamental forces.

Mycorrhizal Systems

Context

American scientist Toby Kiers has been awarded the Tyler Prize for Environmental Achievement for her pioneering research that reveals how vast underground fungal networks regulate plant health, nutrient exchange, and Earth's climate systems.

About Mycorrhizal Systems

- Mycorrhizal networks are symbiotic associations between fungi and plant roots.
- These fungi form extensive underground webs that connect plants across ecosystems, enabling the exchange of nutrients, water, and chemical signals.
- Toby Kiers' research has shown that these networks are not passive conduits but economically strategic systems, where fungi and plants actively trade resources like carbon, nitrogen, and phosphorus

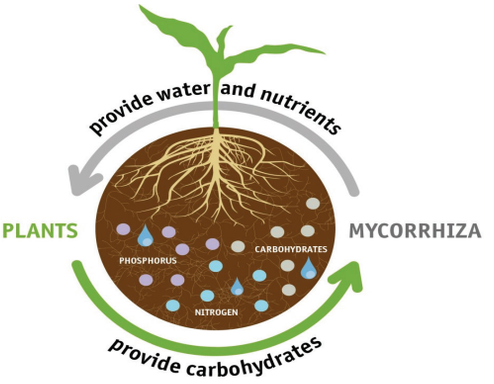
Examples of Mycorrhizal Systems

Type of Mycorrhiza	Plant Examples	Fungal Examples	Key Features
Arbuscular Mycorrhiza (AM / Endomycorrhiza)	Wheat, Rice, Maize, Sunflower, Legumes	Glomus, Rhizophagus, Acaulospora	Most widespread type; penetrates root cells; crucial for phosphorus uptake; dominant in croplands & grasslands
Ectomycorrhiza (ECM)	Pine (Pinus), Oak (Quercus), Eucalyptus, Birch	Amanita, Boletus, Laccaria, Russula	Forms sheath around roots (does not enter cells); common in forests; improves nitrogen & water uptake
Ericoid Mycorrhiza	Tea, Blueberry, Rhododendron, Heather (Erica)	Rhizoscyphus, Oidiodendron	Adapted to acidic, nutrient-poor soils; important in hill & heath ecosystems
Orchid Mycorrhiza	Orchids (Vanilla, Dendrobium, Orchis)	Rhizoctonia-like fungi	Essential for seed germination; orchids depend on fungi for early growth
Arbutoid Mycorrhiza	Strawberry tree (Arbutus)	Russula, Amanita	Intermediate form between ecto- and endomycorrhiza; found in Mediterranean ecosystems
Ectendomycorrhiza	Willow, Poplar	Wilcoxina	Combines features of ecto- and endomycorrhiza; occurs in stressed or disturbed soils

Significance of Mycorrhizal Systems

- **Climate regulation:** Mycorrhizal fungi store large quantities of carbon in soils, making them critical for climate change mitigation.
- **Ecosystem stability:** They enhance plant resistance to drought, disease, and nutrient stress.
- **Biodiversity conservation:** Underground networks support diverse plant communities by redistributing nutrients.

- **Rethinking agriculture:** Insights challenge chemical-intensive farming and promote soil-centric, regenerative practices.



India's Potential

- India's forests, grasslands, and agro-ecosystems host rich but under-studied fungal diversity crucial for soil fertility and crop resilience.
- Mycorrhizal fungi can significantly support climate-smart agriculture, especially in drought-prone and degraded regions.
- Integrating fungal ecology aligns with national priorities such as sustainable agriculture, soil health cards, natural farming, and land restoration under climate commitments.

Tyler Prize

- Often called the "Nobel Prize for the Environment," the Tyler Prize honours individuals whose work delivers transformative insights for environmental protection and sustainability.
- The prize is administered by the University of Southern California and was established by John and Alice Tyler in 1973.

National Technology Assessment Framework

Context

The Principal Scientific Adviser to the Government of India has unveiled the National Technology Readiness Assessment Framework (NTRAF).

About National Technology Readiness Assessment Framework

- The framework aims to serve as the **operational backbone for various R&D funds** launched under national missions.
- **Key Features:**
  - **Enable funding bodies:** To allocate resources with greater precision and de-risk early-stage technologies for private investment.
  - **Rigorous methodology to assess projects:** Across the 9 Technology Readiness Levels (TRL) - ranging from Proof of Concept (TRL 1-3) to Prototype Development (TRL 4-6) and Operational Deployment (TRL 7-9).
  - **Global Best Practices**: Adapted from global standards (such as NASA) but tailored to the specific needs of the Indian R&D ecosystem.
  - **Objectivity over Subjectivity:** Replaces qualitative estimation with a structured, evidence-based checklist for every stage of development.
  - **Sector-Specific Nuances:** Includes specialised annexures for distinct sectors like Healthcare & Pharmaceuticals and Software, acknowledging that development pathways differ across domains.
  - **Self-Assessment Tool:** Empowers Project Investigators to realistically gauge their standing and identify technical gaps before seeking funding.

Hydrokinetic Turbine Technology

Context

The Tripura government has identified 10 river sites to generate around 185 MW of power using Hydrokinetic Turbine Technology.

About Hydrokinetic Turbine Technology

- An emerging hydropower technology that generates electricity from the **kinetic energy of flowing water currents**.
- Does not require significant water head or large civil structures.
- **Difference from Conventional Hydropower:**
  - Unlike dams or barrages, hydrokinetic turbines are **installed directly in river channels**.
  - Operate with **practically zero potential head**, relying only on water flow velocity.
  - Avoids construction of dams, diversion weirs, or reservoirs.
- **Advantages:**
  - **Environmental:** Causes **minimal disruption to river flow and aquatic ecosystems**.
    - » Maintains natural river morphology and biodiversity.
  - **Energy:** Provides a **clean and sustainable energy source**.
    - » Reduces dependence on **fossil fuels** and lowers carbon emissions.
  - **Scalability and Flexibility:** Suitable for **small, decentralised power generation** as well as **large multi-turbine installations**.
    - » Can be deployed across varied riverine environments.
  - **Operational and Maintenance:** Fewer mechanical components and **robust debris protection systems**.
    - » Results in **lower maintenance costs** and improved long-term reliability.

Remote Sensing

Context

Remote-sensing technology allows engineers and scientists to map land, forests, water bodies, and minerals without physically touching the ground.

About Remote Sensing

- It is the science of **collecting information about the Earth's surface and atmosphere without direct physical contact**.
- It relies on **sensors mounted on satellites, aircraft, or drones** to detect and measure reflected or emitted electromagnetic radiation.
- **Working:**
  - **Energy source** (Sun or active sensor) illuminates the Earth.

  - **Interaction with surface**: Radiation is reflected, absorbed, or emitted.
  - **Sensor detection**: Sensors capture this energy.
  - **Data processing & interpretation**: Images and data are analysed to extract information.
- **How Remote Sensing Identifies Objects:**
  - **Healthy vegetation:** Absorbs **red light** (photosynthesis), Reflects **near-infrared (NIR)** light.
  - **Water bodies:** Reflect visible green/blue light & absorb NIR and shortwave infrared.
  - **Rocks and minerals:** Each mineral reflects specific wavelengths detectable by advanced sensors
- **Key Applications of Remote Sensing:**
  - **Agriculture:** Crop health monitoring, yield estimation, drought assessment.
  - **Disaster Management:** Flood mapping, cyclone tracking, forest fire detection, earthquake damage assessment.
  - **Weather and Climate:** Weather forecasting, climate change monitoring, glacier and sea-level studies.
  - **Natural Resource Management:** Forest cover assessment, mineral and groundwater exploration.
  - **Urban and Regional Planning:** Land-use and land-cover (LULC) mapping, infrastructure planning.
  - **Environmental Monitoring:** Pollution tracking, biodiversity conservation, coastal zone management.
  - **Defence and Security:** Surveillance, border monitoring, reconnaissance.

BioMaterials

Context

As nations transition toward cleaner manufacturing processes for consumer goods such as plastics and textiles, biomaterials are emerging as the next frontier in materials engineering.

About Biomaterials

- **Biomaterials** are materials derived wholly or partly from **biological sources** (plants, microorganisms, biomass residues) or **engineered using biological processes**.
- They are designed to **replace, complement, or interact with conventional materials** such as petroleum-based plastics, fibres, and chemicals.
- Biomaterials are increasingly used to support **low-carbon, circular, and sustainable manufacturing systems**.
- Common examples include **bioplastics made from plant sugars or starch**, **bio-based fibres used in textiles**, and **medical biomaterials such as biodegradable sutures and tissue scaffolds.**

Type of Biomaterial	Key Characteristics	Infrastructure Requirement	Examples
Drop-in Biomaterials	Chemically identical to fossil-based materials	Compatible with existing manufacturing, recycling, and disposal systems	Bio-PET, Bio-PE
Drop-out Biomaterials	Chemically different from petroleum-based materials	Require new processing methods or end-of-life systems (industrial composting or specialised recycling)	Polylactic Acid (PLA), Polyhydroxyalkanoates (PHA)
Novel Biomaterials	Possess new or enhanced properties not found in conventional materials	Often require advanced processing and specialised applications	Self-healing materials, Bioactive implants, Advanced bio-composites

Nimeulside Drug

Context

The Union Government has banned the manufacture, sale and distribution of oral formulations of Nimesulide above 100 mg under Section 26A of the Drugs and Cosmetics Act, 1940.

Legal Basis of the Ban

- The ban has been imposed under **Section 26A of the Drugs and Cosmetics Act, 1940**.
- This provision empowers the government to prohibit drugs that pose **risk to human health**.
- The decision was taken in consultation with the **Drugs Technical Advisory Board (DTAB)**

Availability of Safer Alternatives

- The government noted that **safer and equally effective pain-relief drugs** are available in the market.
- Alternatives include other NSAIDs and analgesics with **better safety profiles**.
- This reduces the need to continue high-dose Nimesulide usage.

About Nimesulide Drug

- It is a **non-steroidal anti-inflammatory drug (NSAID)** with analgesic (pain-relieving) and antipyretic (fever-reducing) properties.
- It inhibits **enzyme cyclooxygenase-2 (COX-2)**, developed to reduce inflammation and pain with comparatively lower gastric side effects than traditional NSAIDs.
- **Major Risks: Hepatotoxicity (liver toxicity)** is the most serious adverse effect, including cases of acute liver failure.
- It is commonly used to treat **acute pain, inflammation and fever**.
- It has been widely prescribed and sold in India for several years.

Health Concerns Associated with Nimesulide

- High-dose oral Nimesulide has been linked to **serious adverse effects**, particularly **liver toxicity**.
- Medical evidence suggests increased risk of **hepatic injury**, especially with prolonged or high-dose use.
- These risks outweigh its therapeutic benefits at doses above 100 mg.

Dust Experiment

Context

ISRO has released details highlighting that cosmic dust particles strike the Earth at intervals of roughly every thousand seconds.

About Dust Experiment (DEX)

- DEX is the **first indigenously developed Indian instrument** designed to detect and analyse **high-velocity interplanetary dust particles**.
  - IDPs are **microscopic fragments** originating mainly from **comets and asteroids**.
- The instrument was flown onboard the **PSLV Orbital Experimental Module (POEM)** during the **PSLV-C58 mission**.
- **Developed by**: **Physical Research Laboratory (PRL), Ahmedabad**.

Quantum Electrodynamics

Context

Researchers from the National Institute for Fusion Science have presented a first-principles formulation explaining how classical electromagnetic fields emerge directly from QED.

What is QED?

- Quantum electrodynamics is a **relativistic quantum field theory** that describes **electrically charged particles** interacting through the **exchange of photons**.
- At the quantum scale, the **electromagnetic interaction** is fundamentally governed by QED.
- The **1965 Nobel Prize in Physics** was awarded to **Sin-Itiro Tomonaga, Julian Schwinger, and Richard P. Feynman** for their foundational contributions to QED.
- **Key applications:**
  - **Particle physics** and high-energy experiments
  - **Quantum optics**
  - **Semiconductor and laser technologies.**

Bio-Bitumen

Context

India has become the first country in the world to commercially produce bio-bitumen in road construction.

What is Bio-Bitumen?

- Bio-bitumen is a sustainable alternative to conventional bitumen, produced using **organic and renewable materials**. Traditional bitumen is a **black, adhesive material** obtained from the **distillation of crude oil**.
- **Raw Materials:** Derived from sources such as **agricultural residue, lignin, bio-char, and bio-oil**.
- **Usage:** Bio-bitumen can be used as a **partial substitute or additive** in bitumen binder mixes to reduce dependence on petroleum-based bitumen.
- **Benefits:**
  - Lowers **crude oil imports**
  - Helps tackle **stubble burning** by utilising agricultural waste
  - Supports the **bio-economy** and circular economy
- **Applications:** Used in **road construction (paving)** and **waterproofing** works.

White Dwarf System

Context

NASA's Imaging X-ray Polarization Explorer (IXPE) has, for the first time, investigated the internal structure of a white dwarf system using X-ray polarimetry.

About White Dwarf System

- A **white dwarf system** consists of a **white dwarf**, which is the dense, compact remnant of a **low- or medium-mass star** that has exhausted its nuclear fuel.
- The white dwarf is typically **Earth-sized but extremely massive**, formed after the star sheds its outer layers and collapses its core.
- Such systems often exist in **binary configurations**, where the white dwarf interacts with a companion star by **accreting matter**.
- White dwarf systems are important for studying **stellar evolution, X-ray emission, magnetic fields**, and phenomena like **novae and Type Ia supernovae**.

Spina Bifida

Context

Low awareness and lack of preventive public health measures have led to high prevalence of Spina Bifida in India, despite it being largely preventable through folic acid supplementation.

What is Spina Bifida?

- **Spina Bifida** is a **congenital neural tube defect** in which the spinal cord does not develop properly.
- It affects **over 25,000 children annually in India**
- Occurs within the **first 28 days of pregnancy**, often before a woman knows she is pregnant.
- Leads to **partial or complete paralysis of lower limbs**, often from birth.
- Associated complications include:
  - **Hydrocephalus** (excess fluid in the brain)
  - **Urinary and bowel incontinence**
  - **Orthopaedic deformities** (e.g., club foot)
- **No intellectual disability**—affected children can lead productive lives with proper medical care.
- Medical and surgical treatments exist, but **over 75% of affected children in India lack access to care**.

Folic Acid

- **Folic acid** is a **synthetic form of Vitamin B9**, essential for **DNA synthesis, cell division, and red blood cell formation**.
- It plays a critical role during **early pregnancy** in the proper development of the **neural tube**, which forms the brain and spinal cord.
- Common sources include **dietary supplements** and **fortified foods**; natural dietary folate is found in **green leafy vegetables, legumes, and citrus fruits**.

- Many countries mandate **folic acid fortification of food** (e.g., flour), reducing prevalence of spina bifida to **<1 per 1,000 births**.
  - In India, in contrast, the prevalence rate remains unacceptably high, at about 4 per 1,000, primarily because no such efforts have been undertaken.

Vehicle-to-Vehicle Communication Technology

Context

Union road transport and highways minister Nitin Gadkari announced that India will roll out vehicle-to-vehicle (V2V) communication technology.

About Vehicle-to-Vehicle (V2V) Communication Technology

- It is a wireless technology that enables vehicles to **exchange real-time information directly with one another** without human intervention.
- Each vehicle is equipped with onboard communication units that continuously broadcast and receive data such as speed, position, direction, braking status, and road conditions.
- **Significance:**
  - It will bring the number of road accidents significantly down
  - It will warn the drivers or vehicle systems about potential hazards before they are visible.

Aspect	V2V Communication	Advanced Driver Assistance Systems (ADAS)
Core principle	Vehicle-to-vehicle data sharing	Sensor-based perception
Dependency	Requires other connected vehicles	Works independently
Range of awareness	Beyond line of sight and sensors	Limited to sensor range
Infrastructure	Needs communication standards and penetration	Only onboard hardware
Decision basis	Shared external data	Local sensor inputs

Water vapour and heating of atmosphere

Context

A recent scientific study has highlighted that water vapour contributes more to atmospheric heating than aerosols.

How does water vapour heat the land more than aerosols?

- **Strong greenhouse behaviour:** Water vapour is a **powerful greenhouse gas** that efficiently absorbs **outgoing longwave (infrared) radiation** emitted by the Earth's surface and re-emits part of it back, leading to enhanced **surface and lower-atmospheric warming**.
- **Continuous radiative absorption:** Unlike aerosols, whose radiative effects vary widely with type (scattering vs absorbing), water vapour **consistently absorbs radiation across a broad range of infrared wavelengths**, making its heating effect more uniform and persistent.
- **Vertical distribution advantage:** Water vapour is abundant in the **lower troposphere**, close to the land surface, allowing it to directly influence **near-surface temperature and atmospheric heating rates**, whereas aerosols may be distributed at different altitudes.
- **Feedback amplification:** Increased temperatures lead to higher evaporation, which raises water vapour concentration, creating a **positive feedback loop** that further enhances warming—an effect aerosols do not produce at a comparable scale.
- **Aerosol limitation:** Many aerosols primarily **scatter incoming solar radiation**, which can cool the surface, while only absorbing aerosols (like black carbon) contribute to heating—and even then, their effect is generally weaker than that of water vapour.

YUVA AI For ALL Course under IndiaAI Mission

Context:

On the occasion of National Youth Day celebrated on 12th January, the Ministry of Electronics & IT (MEITY) launched the National AI Literacy Program and its flagship course YUVA AI For All Course.

About YUVA AI For ALL Course

- It is a national AI literacy initiative of Government of India to build foundational Artificial Intelligence (AI) awareness among students and youth across the country.
- **Launched under IndiaAI Mission** under the Ministry of Electronics & Information Technology (MEITY).
- It does not assume or require any prior technical background. Thus, providing an inclusive entry point for AI learning.
  - Designed as modular lessons with short assessments.
  - Free of charge for greater reach.
- **Curriculum covered:** What is Artificial Intelligence, The Technology behind Artificial Intelligence, Using Artificial Intelligenceto Learn, Create,think and plan, ArtificialIntelligenceEthics and The Future ofArtificial Intelligence
- **Available in 11 Indian languages** - Assamese, Bengali, Gujarati, Hindi, Kannada, Malayalam, Marathi, Odia, Punjabi, Tamil and Telugu.
- Available on leading learning platforms such as FutureSkillsPrime, iGOTKarmayogi, DIKSHA and other popular ed-tech portals.
- On completion of the course, every learner will get an official certificate from Government of India under IndiaAI mission & MEITY for Foundational AI 101 Course.

Objectives of YUVA AI For ALL Course

- Achieve large scale adoption & mainstreaming of AI literacy.
- Promote responsible, inclusive & ethical understanding of AI.
- A replicable model for large-scale digital literacy campaigns.

Greenwald Limit

Context:

China's Experimental Advanced Superconducting Tokamak (EAST), often called the "artificial sun," has achieved a major milestone in

nuclear fusion research by exceeding the longstanding Greenwald plasma density limit.

About Greenwald Limit

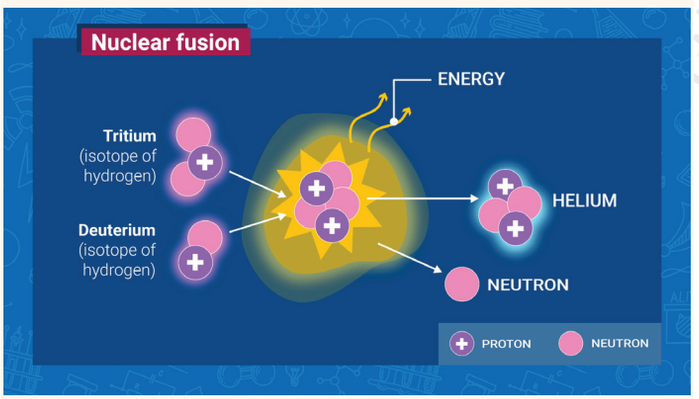
- The **Greenwald limit** is a **rule-of-thumb density ceiling** for plasma inside a **tokamak fusion reactor**.
- It states that **if plasma density becomes too high**, the plasma tends to become **unstable**, leading to disruptions and shutdowns.
- For decades, this limit constrained reactor design, as higher density plasma is crucial for achieving efficient fusion reactions.
- **Significance**
- Demonstrating stable plasma operation beyond the Greenwald limit indicates that it is **not a fundamental physical barrier**, but a **controllable engineering constraint**.
- Allows future reactors to operate with **denser fuel**, increasing fusion reaction rates and improving the chances of achieving **net energy gain**.

About Experimental Advanced Superconducting Tokamak (EAST)

- **EAST** is an advanced **tokamak fusion reactor** developed by China to simulate and study conditions required for sustained nuclear fusion.
- It uses **superconducting magnets** to confine ultra-hot plasma (over 100 million°C) for extended durations.
- EAST serves as a **testbed for next-generation fusion reactors**, including informing designs of international projects like ITER.

Nuclear Fusion

- Nuclear fusion is the process in which two light atoms (usually forms of hydrogen) combine to form a heavier atom, releasing a huge amount of energy.
- Unlike nuclear fission (used in current nuclear power plants), fusion does not split atoms but joins them together.



- **Significance of plasma density matters in fusion**
- For fusion to occur, fuel must be heated to extremely high temperatures, forming a **plasma** (ionized gas). **Higher plasma density** means:
  - More fuel particles in the reactor
  - More collisions between atoms
  - Higher chances of fusion reactions
- **Fusion as the"energy of the future"**
  - Fusion uses **abundant fuel** (hydrogen from water).
  - It produces **no greenhouse gas emissions**.
  - It generates **very little long-lived radioactive waste**.
  - There is **no risk of a runaway nuclear accident**, as the reaction stops if conditions are not perfectly maintained.

Artemis II Mission

Context:

NASA's Artemis II marks a major step in humanity's return to the Moon, being the first crewed mission under NASA's Artemis programme and the first time humans will travel to the Moon's vicinity since 1972.

About Artemis II Mission

- **Artemis II** is a **crewed test mission** designed to validate systems required for future lunar landings.
- It will test the **Space Launch System (SLS)** rocket and the **Orion spacecraft**, focusing on **life-support, navigation, and manual handling systems**.
- The spacecraft will **not land on the Moon**; instead, it will follow a **hybrid free-return trajectory**, flying around the Moon.
- Orion will travel **10,300 km beyond the Moon's far side**, the farthest humans have gone into space.
- After lunar flyby, Earth's gravity will guide Orion back for a **Pacific Ocean splashdown**.

About Artemis I Mission (2022)

- **Artemis I** was the **first mission** under NASA's Artemis programme.
- The mission tested NASA's **Space Launch System (SLS)** rocket and the **Orion spacecraft** in deep space.
- The objective was to verify **launch performance, propulsion, navigation, communication, and thermal protection systems**.
- Orion successfully **orbited the Moon** and traveled **over 432,000 km from Earth**, the farthest distance ever reached by a spacecraft designed to carry humans.

Apollo 17

- **Apollo 17** was the **final mission of NASA's Apollo programme** and the **sixth successful crewed lunar landing**.
- It landed in the **Taurus–Littrow Valley** on the Moon.
- Eugene Cernan became the **last human to walk on the Moon**.

NIPAH Virus

Context: Two patients were suspected of Nipah Virus in South 24 Parganas district in west Bengal.

About Nipah Virus

- Nipah virus is a **zoonotic virus**, meaning it spreads from **animals to humans (**Human-to-human transmission is also possible**)**.
- It belongs to the **Paramyxoviridae family**, under the **Henipavirus genus**.
- Transmission occurs through **direct contact** with infected **bats, pigs**, or **contaminated food**.
- Evidence of the virus has been found in the known natural reservoir (Pteropus bat species) and several other bat species in

a number of countries, including Cambodia, Ghana, Indonesia, Madagascar, the Philippines, and Thailand.

- Symptoms often start like the **common flu** and may lead to **severe respiratory and neurological issues**.
- No vaccine currently exists (**Ribavirin** may reduce mortality in encephalitis cases).

Common Zoonotic Diseases

Zoonotic Disease	Causative Agent	Animal Host / Reservoir	Mode of Transmission	Impact on Human Health
Rabies	Rabies virus	Dogs, Bats	Bite, scratch; saliva entering wounds	Encephalitis; almost always fatal if untreated
Avian Influenza	Influenza A virus	Birds (especially poultry)	Airborne exposure; direct contact with infected birds	Severe respiratory illness; death in severe cases
Ebola	Ebolavirus	Fruit bats, Primates	Direct contact with blood or bodily fluids	Hemorrhagic fever; high fatality rate
Zika Virus Disease	Zika virus	Mosquitoes (Aedes), Primates	Mosquito bites	Fever; congenital defects (microcephaly)
Brucellosis	Brucella species	Cattle, Sheep, Goats	Direct contact; consumption of unpasteurised milk	Undulating fever; arthritis; chronic fatigue

Futuristic Marine and Space Biotech

Context

Futuristic marine and space biotechnology is emerging as a strategic frontier for biomanufacturing.

About Futuristic Marine and Space Biotechnology

- **Marine biotechnology** explores microorganisms, algae, and marine life from **extreme ocean environments** (deep sea, high salinity, low light) to develop **bioactive compounds, enzymes, biomaterials, food ingredients, and biostimulants**.
- **Space biotechnology** studies biological systems (microbes, plants, human cells) under **microgravity and radiation** to enable **food production, health management, regenerative medicine, and closed-loop life-support systems**.

Need for Futuristic Marine and Space Biotechnology

- Unlocks **new sources of food, energy, chemicals, and pharmaceuticals**.
- Reduces pressure on **land, freshwater, and conventional agriculture**.
- Supports **long-duration human space missions** and advanced healthcare.
- Positions biotechnology as a pillar of the **Blue Economy and Space Economy**.

India's potential & current status

- India has a **2+ million sq km Exclusive Economic Zone (EEZ)** with rich marine biodiversity, yet its **share in global marine bio-outputs remains low**, indicating untapped potential.
- Domestic **seaweed and marine biomass production** is still modest, leading to imports of **agar, carrageenan, and alginates** used in food, pharma, cosmetics, and medical sectors.
- Key national initiatives pushing the sector:
  - **Blue Economy framework**
  - **Deep Ocean Mission**
  - **BioE3 Policy** (Biotechnology for Economy, Environment & Employment)
- The emerging ecosystem includes **private startups** (e.g., marine energy and climate-focused firms), **ICAR-CMFRI**, and **state-led initiatives**, working on scaling marine biomass into **high-value bio-products**.
- **ISRO's microgravity biology programme** conducts experiments on microbes, algae, and biological systems to study **food production, life-support regeneration, and human health in space**.

Global Futuristic Marine and Space Biotechnology

- **European Union:** Large-scale funding for **marine bioprospecting**, algae-based biomaterials, and bioactive compounds, supported by shared infrastructure like the **European Marine Biological Resource Centre**.
- **China:** Rapid expansion of **seaweed aquaculture and marine bioprocessing** at commercial scale.
- **United States:** Leads in **space biotechnology** through **NASA and the International Space Station**, focusing on protein crystallisation, stem cells, microbiome research, and regenerative medicine.

Magnetic Fields Mapped in Young Star Birth

Context

A new astrophysics study has traced the **role of magnetic fields in the birth of a young star**,

About the Study

- A recent observational study led by researchers at the **Indian Institute of Astrophysics (IIA)** has traced magnetic fields on multiple scales within the **L328 molecular cloud**, located about **700 light-years away** from Earth.
- The team mapped magnetic field lines from the large cloud scale down to the dense core where star formation is actually occurring.

About Molecular Clouds

- Molecular clouds are vast regions of interstellar space made up of gas (mainly molecular hydrogen) and fine dust.
- They are extremely cold, often just 10–20 K above absolute zero, and have moderate densities compared to other regions of space.
- Because of these conditions, molecular clouds act as the primary nurseries of star formation in galaxies.

- **Significance of studying molecular clouds**
  - They determine where, when, and how many stars are formed.
  - Their internal physics shapes the mass, type, and distribution of stars.
  - Understanding molecular clouds helps explain the evolution of galaxies, since stars drive galactic light, energy, and chemical enrichment.

Formation of Stars inside Molecular Clouds

- Star formation occurs when parts of a molecular cloud collapse under gravity. This collapse, however, is not governed by gravity alone. It depends on the delicate balance and interaction of three key forces:
  - **Gravity**: Gravity pulls gas and dust inward, causing dense regions within the cloud to contract and form a protostar.
  - **Turbulence:** Random motions within the cloud can either support the cloud against collapse or create local density enhancements that trigger star formation.
  - **Magnetic Fields:** Magnetic fields thread through molecular clouds and can slow down or regulate collapse by providing magnetic pressure and guiding the flow of material.
- Stars are born only when gravity becomes strong enough to overcome turbulence and magnetic resistance in a small region of the cloud.

Graviton

Context

Scientists from Stevens Institute of Technology, in collaboration with Yale University, have announced plans to build the world's first experiment explicitly designed to detect an individual graviton.

About Graviton

- In modern physics, fundamental forces are understood to be mediated by particles, such as photons for electromagnetism.
- Gravity, explained at large scales by general relativity, behaves like a wave (gravitational waves), but physicists hypothesise that at the smallest scale it may be composed of discrete particles called gravitons.
- While gravitational waves have been directly detected by instruments such as LIGO, individual gravitons have never been observed.

Significance of detecting Graviton

- Confirmation of the graviton would establish gravity as a quantum force, potentially bridging the long-standing divide between general relativity and quantum mechanics.
- Such a discovery could advance efforts toward a unified theory of physics, often referred to as a "theory of everything".

Challenges in Detecting a Graviton

- Gravity is the **weakest of the four fundamental forces**, vastly weaker than electromagnetism.
- Gravitons are expected to interact extremely weakly with matter, allowing them to pass through ordinary material almost without effect.
- Previous theoretical work suggested that any detector massive enough to catch a graviton would collapse into a black hole, making detection practically impossible.
- The energy carried by gravitons associated with observable waves is extraordinarily small, far below typical background noise levels

Solid–Liquid Hybrid State of Matter

Context

Scientists from Ulm University and University of Nottingham have reported evidence of a new solid–liquid hybrid state of matter at the nanoscale, challenging the traditional distinction between solid and liquid phases.

About the Newly Observed State of Matter

- The discovery does not refer to a macroscopic mixture like a gel or slush.
- It describes a single nanoparticle in which different regions exist simultaneously in solid-like and liquid-like states.
- As a result, the nanoparticle exhibits properties of both solids and liquids, along with novel behaviours unique to neither phase alone.

Conventional Understanding vs New Findings

- Traditionally, atoms in solids are considered **fixed in position**, while atoms in liquids move **rapidly and randomly**. The study shows that at the nanoscale, this distinction becomes blurred.
  - Even in a liquid nanoparticle, **some atoms can remain stationary**, influencing the overall phase behaviour.
- **Significance of the Findings:** The findings are especially relevant for heterogeneous catalysts, such as platinum on carbon. Platinum-based catalysts are widely used in:
  - Proton exchange membrane fuel cells
  - Direct methanol fuel cells
  - Hydrogen electric vehicles and stationary power generators
  - Hydrogenation reactions in pharmaceuticals and petrochemicals
  - Breakdown of organic pollutants in vehicle emissions

Reusable Rockets and the Commercial Space Revolution

Context

The global space economy is projected to exceed USD 1 trillion by 2030, driven by reduced launch costs, higher launch frequency, and the emergence of reusable rocket technologies.

About Reusable Launch Vehicles

- A Reusable Launch Vehicle (RLV) is the space-faring equivalent of an aircraft.
- Unlike traditional rockets that are discarded after a single use, an RLV is designed to launch vertically into space and glide back to Earth for an autonomous landing, allowing it to be refurbished and flown again.
  - **Design:** It must be lightweight yet robust enough to withstand the extreme thermal and mechanical stresses of spaceflight.
  - **Aeronautics:** As a "space plane," it has a low lift-to-drag ratio. This requires a steep descent angle and high landing speeds (approximately 350 kmph).
  - **Ideal Goal:** The ultimate objective is a "Single-Stage-to-Orbit" (SSTO) system, though current models typically use two stages.

Major RLV Projects

Project	Agency	Key Characteristics
Starship	SpaceX	**Fully reusable**; most powerful rocket ever built; "belly-flop" atmospheric entry; critical for NASA's Artemis Moon missions.
Falcon 9	SpaceX	**Partially reusable**; workhorse for ISS cargo and crew missions.
New Shepard	Blue Origin	Suborbital reusable vehicle designed for space tourism and research.
RLV-TD	ISRO (India)	A technology demonstrator series aimed at achieving a **Two-Stage-to-Orbit (TSTO)** reusable system.

Significance of Reusable Launch Vehicles (RLVs)

- **Cost Efficiency:** By enabling the repeated use of expensive rocket hardware, RLVs drastically lower the per-launch cost compared to traditional expendable rockets.
- **Increased Launch Frequency:** Reusability supports a higher launch cadence, which is essential for deploying large satellite constellations and maintaining frequent human spaceflight missions.
- **Economic Viability:** Lowering the financial barriers makes commercial space activities more profitable and accessible for private enterprises and research institutions.
- **Strategic Autonomy:** Developing indigenous RLV technology ensures a nation remains self-reliant and competitive in the rapidly evolving global space economy.
- **Technological Advancement:** The pursuit of reusability drives innovation in heat-shielding materials, autonomous landing systems, and precision navigation.

Challenges of Reusable Launch Vehicles (RLVs)

- **Material Fatigue:** Repeated cycles of launch and landing lead to structural wear and tear, limiting the number of times a vehicle can be safely reused.
- **Extreme Thermal & Mechanical Stress**: Spacecraft must endure intense heat during atmospheric re-entry and high pressure during ascent, requiring advanced shielding and robust airframes.
- **High Refurbishment Costs:** The expense of inspecting, repairing, and assuring the safety of a used vehicle can sometimes rival the cost of building a new one.
- **Safety Assurance**: Ensuring 100% reliability for repeated missions, especially for human-rated flights, requires rigorous and time-consuming testing protocols.
- **Turnaround Time vs. Reliability:** Balancing the need for rapid relaunch (to maintain high frequency) with the necessity of thorough maintenance remains a major operational hurdle.
- **Payload Penalty:** Carrying extra fuel, landing gear, and recovery systems increases the vehicle's "dead weight," which reduces the total amount of cargo it can carry into orbit.

Darwin's Bark Spider

Context

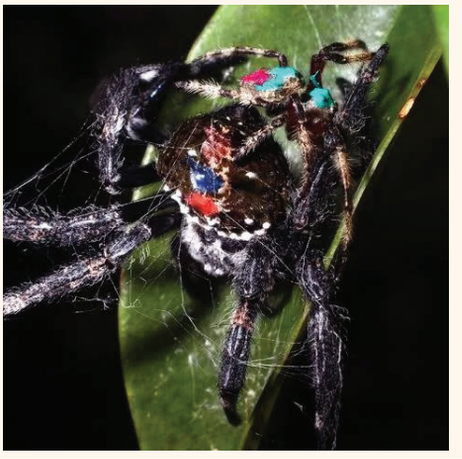
A recent study published in Integrative Zoology by a multi-national team of scientists explores why Darwin's bark spider produces the toughest biological material on Earth.

Key Findings:

- The spider's silk has a tensile strength of 1.6 gigapascals, outperforming steel and iron.
- Only large adult females produce this high-performance silk. Adult males and juveniles produce "cheaper," weaker silk because they lack the same ecological pressure.
- High-quality silk is rich in proline (an amino acid), making it metabolically expensive. Females "turn on" the machinery to produce it only when their body size necessitates massive webs.

About Darwin's Bark Spider

- First discovered in Madagascar in 2009.
- **Size:** They exhibit extreme sexual dimorphism. Females are large (approx. 18-22 mm), while males are tiny (approx. 6 mm), weighing about 1/10th as much.
- **Appearance**: They are masters of camouflage, with bumpy, grayish-brown bodies that mimic the bark of the trees they live on.
- They build the **largest orb webs ever recorded**, sometimes spanning up to 2.8 square meters.
- These spiders are unique because they spin their webs directly across rivers and lakes. They cast a single bridge line of silk that can stretch up to 25 meters to anchor on the opposite bank.



Small Language Models (SLMs)

Context

The Union Minister for Electronics and IT has said that the future of Artificial Intelligence (AI) will be shaped by smaller, efficient models rather than extremely large systems.

About Small Language Models (SLMs)

- SLMs are compact artificial intelligence systems built on simpler neural network architectures that can understand and generate natural language, similar to Large Language Models (LLMs), but at a smaller scale.

- SLMs typically operate with several million to around 30 billion parameters, whereas LLMs often have hundreds of billions or even trillions of parameters.
- Nearly 95% of global AI workloads are currently handled by SLMs due to their efficiency and practicality.
- Prominent examples include Llama, Mistral, Gemma, and Granite, which are widely used across industries.

Advantages of SLMs over LLMs

- **Cost Efficiency:** Smaller model size reduces computational and energy requirements, significantly lowering development and deployment costs.
- **On-Device Deployment:** Well-suited for edge and on-device applications where connectivity, memory, and power availability are limited.
- **Democratisation of AI:** Enables wider participation by startups, academia, and smaller organisations, fostering diversity in AI development.
- **Operational Benefits:** Easier monitoring and maintenance, improved data privacy and security, lower infrastructure needs, reduced latency, and better performance in domain-specific applications.

Limitations of SLMs

- **Lower Accuracy:** Compared to LLMs, SLMs generally offer reduced accuracy and versatility for highly complex or open-ended tasks.
- **Narrower Knowledge Base:** Training on smaller and more specialised datasets limits their general knowledge and adaptability.
- **Functional Constraints:** SLMs exhibit lower creativity, weaker large-scale data analysis capability, and reduced contextual depth compared to larger models.

Nationwide Launch of VoWiFi by BSNL

Context

Bharat Sanchar Nigam Limited (BSNL) launched **Voice over WiFi (VoWiFi)** services across all telecom circles in India, marking a major milestone in its network modernisation drive.

About Voice over WiFi (VoWiFi)

- VoWiFi, also known as **Wi-Fi Calling**, allows users to make and receive **voice calls and SMS over a Wi-Fi network** instead of a cellular network.
- Calls are made using the **same mobile number and default phone dialer**, without any third-party apps.

Key Technical Features

- **IMS-based service**: Built on IP Multimedia Subsystem architecture, ensuring reliability and quality.
- **Seamless handover**: Calls automatically switch between Wi-Fi and mobile networks without dropping.
- **Device compatibility**: Supported on most modern smartphones with Wi-Fi Calling enabled in settings.

Coverage and Availability

- Available **nationwide across all BSNL telecom circles**.
- Works wherever a **stable Wi-Fi connection** is available, including BSNL Bharat Fiber or other broadband services.
- Especially useful in **indoor locations, basements, offices, hilly and remote areas** with weak mobile signals.

Benefits for Consumers

- **Improved call quality** even in low-signal zones.
- **Free service** with no additional charges for Wi-Fi calls.
- Reduces dependence on mobile towers in congested or difficult terrain.
- Enhances user experience without changing SIM or number.

India's Drug Standards Gain Global Recognition

Context

India has made a major leap in global drug regulation by rising from **123rd to 8th position** in contributions to the World Health Organization's pharmacovigilance system. This achievement reflects India's growing credibility in ensuring **drug safety, quality and regulatory vigilance**.

What is Pharmacovigilance

- Pharmacovigilance refers to the **detection, assessment and prevention of adverse drug reactions**.
- It focuses primarily on **Adverse Drug Reactions (ADRs)** that may not appear during clinical trials due to limited sample size or duration.
- It is central to **patient safety**, post-marketing surveillance and evidence-based drug regulation.
- Strong pharmacovigilance systems enhance **global trust** in a country's pharmaceutical products.

India's Global Leap in WHO Pharmacovigilance

- India's contribution to the **WHO global drug safety database** has improved dramatically since 2014.
- This rise indicates better **reporting of adverse drug reactions (ADRs)**, improved data quality and regulatory responsiveness.
- It places India among the **top global contributors** to drug safety monitoring.

Institutional Drivers of Success

- **Role of the Indian Pharmacopoeia Commission (IPC)** – Acts as the nodal body for setting drug standards and anchoring India's pharmacovigilance ecosystem. **Integration with Pharmacovigilance Programme of India (PvPI)** – IPC houses PvPI, enabling seamless linkage between drug standards, adverse drug reaction reporting and regulatory action.
- **Role of the Indian Pharmacopoeia**
  - The **Indian Pharmacopoeia** is India's official book of drug standards.
  - The **10th edition (IP 2026)** reflects scientific advances, global best practices and regulatory maturity.
  - It strengthens standardisation of medicines used in **national health programmes**.
- **Scientific Upgradation through IP 2026** – Inclusion of new monographs, blood component standards and critical medicines strengthens surveillance and quality assurance.

Indian Scientists Decode the Mpemba Effect Using Supercomputer Simulation.

Context

Indian scientists have achieved a global first by using **supercomputer-powered simulations** to capture and explain the **Mpemba effect**—the long-observed paradox where **hot water freezes faster than cold water**.

Why Can Hot Water Freeze Faster Than Cold Water?

- **Hot water cools differently, not just faster** – When water starts very hot, it loses heat in a more organised and efficient way compared to cold water.
- **Molecules behave differently at high temperature** – In hot water, water molecules are more active and rearranged, which later helps them settle into ice more quickly.
- **Hot water avoids "inefficient paths"** – Cold water may get stuck in slow, inefficient cooling stages, while hot water can bypass these stages.
- **Faster internal adjustment** – As hot water cools, its molecules quickly relax into structures that are easier to convert into ice.
- **Ice formation starts earlier** – Under certain conditions, hot water begins forming ice nuclei sooner than cold water.
- **Cooling history matters** – Freezing is influenced by how the water was heated and cooled, not just its starting temperature.
- **Freezing is not just about temperature** – It also depends on molecular motion, energy flow, and how water reorganises itself during cooling.

About Mpemba Effect

- The **Mpemba effect** is a counterintuitive phenomenon in physics where **hot water can freeze faster than cold water** under similar conditions.
- Named after **Erasto Mpemba**, a Tanzanian student who reported the observation in 1963.
- Occurs only under **specific conditions** and is **not always reproducible**.
- The exact mechanism is **not fully understood**, but several contributing factors are proposed.

Stem cell therapy cannot be offered as a clinical service for autism

Context:

The Supreme Court of India ruled that **stem cell therapy cannot be offered as a clinical service for Autism Spectrum Disorder (ASD)** outside approved and monitored clinical trials.

More about the Supreme Court Ruling:

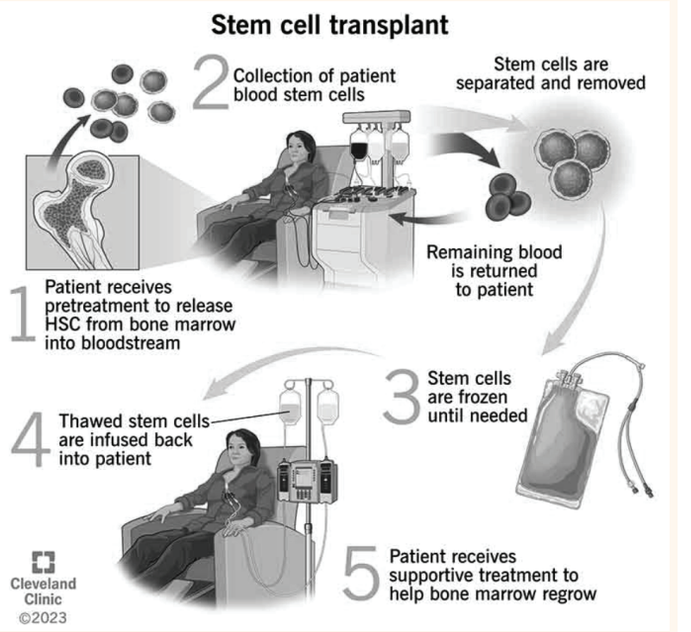
- Stem cell interventions for ASD can only be carried out **within regulated clinical trials or research settings**.
- Parents or caregivers **cannot demand** such therapies as a treatment option.
- Clinics offering stem cell therapy as a "cure" for autism are acting **outside the bounds of ethical medicine**.

About Autism

- Autism Spectrum Disorders (ASD), according to the World Health Organization (WHO), are a diverse group of conditions.
- It is a **neurodevelopmental condition** that affects how a person **communicates, behaves, and interacts** with others.
- Characteristics of autism may be detected in early childhood, but autism is often not diagnosed until much later.
- **Causes**: No single cause identified; likely due to a **combination of genetic and environmental factors**.
- **Diagnosis**: Usually diagnosed in **early childhood**, often by age 2–3.
  - Based on **behavioral assessments**, developmental history, and observation.
- **Management**: No cure, but **early intervention** (e.g., speech therapy, behavioral therapy) can greatly improve outcomes.
  - Support in education, social skills training, and sometimes medications for associated symptoms (like anxiety or hyperactivity).

Stem cell therapy

The use of stem cells to cultivate healthy adult cells in the laboratory for replacing damaged, defective, or degraded cells in the body.



- **Applications**
  - **Neurological disorders**: Effective in cases of neuronal degeneration, such as Alzheimer's or Parkinson's, since neurons do not naturally regenerate.
  - **Organ damage**: Useful for repairing organs damaged due to accidents, aging, etc.
  - **Blood disorders**: Beneficial for conditions like sickle cell anemia or beta-thalassemia, where defective blood cells are produced, requiring regular blood transfusions.
- **Approaches**
  - Transplantation of stem cells from a healthy donor.
  - Generating induced pluripotent stem (iPS) cells to grow healthy adult cells.

– Using gene-edited stem cells derived from the patient's own body.

- **Regulations in India**: According to the National Guidelines for Stem Cell Research (NGSCR) 2017, only bone marrow transplants or hematopoietic stem cell transplants are approved for blood disorders, including blood cancers and thalassemia.

India–EU Cooperation on Peaceful Uses of Nuclear Energy

Context:

- During the **16th India–EU Summit (January 27, 2026)**, India and the European Union reaffirmed strategic cooperation in science, technology and clean energy.
- The commitment was part of the **India–EU Joint Comprehensive Strategic Agenda** adopted at the Summit.

Cooperation on Peaceful Uses of Nuclear Energy

India–Euratom Agreement

- India and the EU committed to expanding collaboration under the **India–Euratom Agreement**, signed in **July 2020**.
- Focus is strictly on **peaceful and non-military applications** of nuclear science and technology.

About India–Euratom Agreement

It was signed in **July 2020**, to strengthen India–European Union cooperation in the **peaceful uses of nuclear energy**.

The agreement provides a structured framework for scientific, technological and research collaboration in nuclear science while fully respecting international non-proliferation commitments.

What is Euratom?

- **European Atomic Energy Community** (Euratom) is a specialised EU body established to coordinate nuclear research, safety standards and peaceful nuclear development among EU member states.
- It focuses on **civil nuclear cooperation**, not military applications.

Objectives of the India–Euratom Agreement

- Promote **peaceful, safe and secure uses of nuclear energy**.
- Enhance **joint research and development** in nuclear science and technology.
- Support **knowledge-sharing and capacity building** in nuclear safety and radiation protection.
- Strengthen cooperation in **advanced nuclear technologies** and applications.

International Thermonuclear Experimental Reactor (ITER)

- India and the EU agreed to **strengthen cooperation in ITER**, the global fusion-energy project.
- ITER aims to demonstrate **nuclear fusion as a safe, sustainable and clean energy source**.
- Cooperation enhances India's role in **next-generation energy technologies**.

About ITER

- **International Thermonuclear Experimental Reactor (ITER)** is the world's largest experimental project aimed at proving **nuclear fusion** as a viable energy source.
- It seeks to replicate the process that powers the **Sun and stars** to produce clean energy on Earth.

Location and Membership

- ITER is located at **Cadarache, France**.
- Members include the **EU, India, China, Japan, Russia, South Korea, and the United States**.
- Together, these members represent **over half of the world's population**.

Primary Objective

- To demonstrate that **fusion energy can produce more energy than it consumes**.
- ITER aims to achieve **500 MW of fusion power with only 50 MW input (Q ≥ 10)**.
- It is an experimental reactor, **not a commercial power plant**.

Technology Used

- Uses **magnetic confinement fusion** through a **tokamak** design.
- Extremely strong magnetic fields confine hot plasma at **over 150 million°C**.
- Fusion fuel used: **deuterium and tritium (hydrogen isotopes)**.

India's Role in ITER

- India is a **full partner since 2005**.
- Contributes key components such as:
  - Cryostat (world's largest vacuum chamber)
  - Cooling systems
  - Power supplies
- Gains access to **advanced fusion technology and expertise**.

ITER and India–EU Cooperation

- ITER is a major pillar of **India–EU nuclear and energy cooperation**.
- Reinforced under the **India–Euratom Agreement (2020)**.
- Supports joint efforts towards **clean energy transition**.

Research & Innovation Cooperation: Horizon Europe

- Both sides agreed to expand cooperation under **Horizon Europe**, the EU's flagship research funding programme.
- Collaboration will be strengthened through:
  - **Co-funding mechanisms**
  - **Coordinated research calls**

About Horizon Europe

- **Horizon Europe** is the European Union's flagship **research and innovation funding programme**.
- It supports cutting-edge research to address **global challenges and competitiveness**.

Three Main Pillars

1. Excellent Science

- Funds frontier research through the **European Research Council (ERC)**.
- Supports researcher mobility via **Marie Skłodowska-Curie Actions (MSCA)**.
- Invests in world-class research infrastructures.

2. Global Challenges and European Industrial Competitiveness

- Focuses on clusters such as: Health, Climate, energy and mobility
- Encourages solutions-oriented and interdisciplinary research.

3. Innovative Europe

- Supports breakthrough innovations through the **European Innovation Council (EIC)**.
- Helps startups and SMEs scale up disruptive technologies.

PSLV-C62 mission

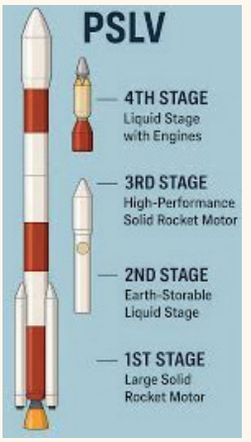
Context:

ISRO's PSLV-C62 mission lifted off from Sriharikota carrying the EOS-N1 satellite along with 15 co-passenger satellites. Within minutes, ISRO said the mission had "encountered an anomaly during end of the PS3 stage

Nature of the Anomaly in PSLV-C62

- ISRO confirmed an **anomaly near the end of the third stage (PS3)**.
- According to ISRO Chairman the vehicle showed **increased roll-rate disturbances**, leading to **loss of attitude control**.
- As a result, the rocket **deviated from its intended trajectory** and could not deploy satellites into orbit.
- This was the **first PSLV failure involving foreign customer satellites**, affecting ISRO's **commercial launch credibility**.
- **Impact on Defence: EOS-N1**, a **DRDO surveillance satellite**, was the primary payload.

PS3 Stage: A Recurring Concern



- The **PS3 (third stage)** is a solid rocket motor responsible for imparting critical velocity before orbital insertion.
- In **PSLV-C61 (May 2025)**, failure also occurred during PS3 operation due to a **drop in chamber pressure**.
- Thus, **two consecutive PSLV missions failed at the same stage**, raising systemic reliability concerns.

Concern raised:

- The **PSLV-C61 FAC(Failure Analysis Committee) report**, though submitted to the PMO, has **not been released publicly**.
- This marks a departure from past practice, where ISRO released **summaries of FAC findings** (e.g., GSLV-F10 in 2021).
- **No constitution of FAC for PSLV-C62** with transparent timelines.

Role of the Failure Analysis Committee (FAC)

- The **FAC is not a standing body**; it is constituted **after major mission failures**.
- Members include **ISRO scientists, academic experts, and sometimes former ISRO chairmen**.
- The FAC reconstructs the failure using telemetry and subsystem data and recommends **corrective actions before "return to flight"**.

BHASHINI Samudaye

Context:

- **The Ministry of Electronics and Information Technology (MeitY)** organised **BHASHINI Samudaye: Strengthening India's Language AI Ecosystem.**

About BHASHINI Samudaye

- It is a collaborative ecosystem initiative bringing together Language experts, Academic institutions, Civil society organisations and Data practitioners
- Objective: Co-create, govern, and scale multilingual AI solutions for India.

About Bhashini

- Bhashini (short for BHASHa INterface for India) is a national AI-driven language technology initiative launched by the Ministry of Electronics and Information Technology (MeitY)
- It serves as the backbone of the National Language Translation Mission, providing real-time translation and speech tools
- Developed under the Digital India Bhashini Division, the platform exemplifies India's effort to build inclusive digital public infrastructure

Structure and components

Bhashini operates as a digital ecosystem of AI and Natural Language Processing (NLP) services:

- BhashaDaan: A citizen crowdsourcing program collecting text, voice, and image data to improve AI models.
- BhashaSangam: The central translation and speech engine providing open APIs for developers.
- BhashaSetu: An integration layer linking Bhashini's tools to apps and portals for real-time translation.
- BhashaNidhi: A national repository of validated multilingual datasets supporting public and private innovation.

Doomsday clock

Context

The Doomsday Clock has been reset to 85 seconds to midnight, the closest it has ever been

About Doomsday Clock

- The Doomsday Clock is a symbolic indicator maintained by the **Bulletin of the Atomic Scientists**.
- Midnight represents **global catastrophe**, while the distance from midnight reflects how close humanity is to self-destruction.
- It was first introduced in **1947**, primarily to highlight **nuclear risks**, and later expanded to include **climate change, biosecurity, and emerging technologies**.

Why Has the Clock Been Moved to 85 Seconds?

- **Escalating Nuclear Risks:** Ongoing conflicts involving nuclear-armed states and the weakening of arms control frameworks have increased the chances of intentional or accidental nuclear escalation.
- **Climate Change as a Threat Multiplier: I**nadequate global climate action amid rising extreme weather events is intensifying risks to food, water, and human security while fuelling conflict and displacement.
- **Emerging Technologies and AI Risks:** Rapid advances in artificial intelligence, cyber warfare, and autonomous weapons heighten the risk of miscalculation, disinformation, and loss of human control over critical systems.
- **Erosion of Global Governance:** The weakening of multilateral institutions and arms control mechanisms has reduced the world's capacity for coordinated responses to existential global threats.

HISTORY, ART & CULTURE

Topics for Mains

Ratnagiri Excavations

Context

After a gap of nearly 60 years, the Archaeological Survey of India has resumed excavations at Ratnagiri in Odisha's Jajpur district, aiming to uncover material evidence of its cultural and religious links with Southeast Asia.

2024–25 Excavation Discoveries

- **Colossal Buddha heads:** Three massive heads (up to 1.5 m tall) with intact facial features-rare due to historical iconoclasm. Sculptures display curly hair patterns not seen at other Indian Buddhist sites.
- **New shrine complex:** Discovery of an unknown chaitya/shrine complex south of the monasteries.
- **Monolithic elephant:** A 5-foot-long elephant sculpture, stylistically comparable to the Ashokan elephant at Dhauli.

About Ratnagiri

- Located in the Assia hill range of Odisha, Ratnagiri lies on a hillock between the Brahmani River and Birupa River, both tributaries of the Mahanadi.
- Along with Udayagiri and Lalitgiri, it forms Odisha's famous **"Diamond Triangle" of Buddhist sites.**
  - Buddhist Triangle Sites of Odisha have been included in the Tentative List of UNESCO World Heritage sites.
- **Historical timeline**
  - **Period of prominence**: 5th–13th century CE, peaking between the 7th and 10th centuries.
    - » Flourished under the Bhaumakara Dynasty (8th–10th century CE).
    - » Linked by tradition to Gupta ruler Narasimha Gupta Baladitya.
  - **Decline:** Began **after the 13th century with foreign invasions, though activity continued till the 16th century.**
- **Archaeology**
  - **Monastery 1:** Famous for some of the finest stone carvings in India, including an ornate chlorite doorway with depictions of Lakshmi and Vajrapani.
    - » Unique roof design: The only Buddhist monastery in India known to have had a curvilinear (Rekha Deula–type) roof, typical of Odishan temple architecture.
  - **Votive stupas**: Over 700 votive stupas, representing 22 Buddhist deities, indicating intense pilgrimage activity.
  - **Colossal Buddha**: A 12-foot seated Buddha in Bhumisparsha Mudra (earth-touching gesture) housed in the main shrine.
- **Ratnagiri and Southeast Asia**
  - **Ancient Kalinga (Odisha**) maintained a**ctive sea trade with Java, Sumatra, Bali, and Borneo**, remembered today through the Baliyatra festival.
  - **Dharani inscriptions:** Stone tablets inscribed with Sanskrit dharanis in Kutila script, widely transmitted to Southeast Asian Buddhist centres.
  - Tantric icons of **Tara and Avalokitesvara** at Ratnagiri influenced Buddhist art of the **Srivijaya Empire in Indonesia.**
- **Significance**
  - Ratnagiri evolved from a Mahayana centre into a leading hub of **Vajrayana (Tantric) Buddhism.**
  - Tibetan sources such as Pag Sam Jon Zang identify it as a key centre for the **Kalachakra Tantra tradition.**
  - Due to its scholastic influence, Ratnagiri is often referred to as the **"Nalanda of the East."**

Lalitgiri (Cuttack, Odisha)

- Located on Nandapahad hillock in the Assia hill range, Lalitgiri shows unbroken Buddhist occupation from the 2nd–3rd century BCE to the 13th century CE.
- Excavations revealed a Theravada stupa with relic caskets (khondalite, steatite, silver, and gold), an apsidal chaityagriha, and four monasteries.
- Finds include an inscribed sealing naming Sri Chandraditya Vihara, along with artefacts and icons of Theravada, Mahayana, and Vajrayana, reflecting doctrinal continuity and synthesis.

Udayagiri (Jajpur, Odisha)

- Also in the Assia hill range on the right bank of the Birupa, Udayagiri ("Sunrise Hill") is a major Buddhist centre recorded since 1870.
- ASI excavations uncovered Madhavapura Mahavihara with a large monastic complex and a Mahastupa bearing inscribed Dhyani Buddhas (10th–11th century CE).
- The Simhaprastha Mahavihara revealed a double-storied monastery with pradakshinapatha, vaulted windows, and an upper shrine chamber, highlighting advanced monastic architecture.

Rakhigarhi

Context

The Chief Minister of Haryana recently allocated ₹500 crores for the redevelopment of Rakhigarhi as a Global Heritage site.

About Rakhigarhi

- Situated in **Hisar district of Haryana**, along the now-dry **Drishadvati (Ghaggar-Hakra) river system**.
- The site was excavated by **Amarendra Nath of ASI**.
- **Largest known IVC site in India** (larger in area than Mohenjo-daro within Indian territory).
- **Major Findings of Rakhigarhi:**
  - **Urban Settlement Pattern:** Evidence of a **Mature Harappan planned township**.
    - » Houses built with **mud bricks and burnt bricks**.
    - » Presence of a **well-developed drainage system**, reflecting advanced urban planning.
  - **Seals and Pottery:** Discovery of a **cylindrical seal** bearing **five Harappan script characters** and an **alligator motif**, a rare find.
    - » Well-developed **ceramic industry**, dominated by **red ware**, including Dish-on-stand, Vases, Perforated jars.
  - **Ritual Practices:** Excavation of **animal sacrificial pits** lined with mud bricks.

» Presence of **triangular and circular fire altars** on mud floors, indicating **ritualistic and ceremonial activities**.

– **Burials and Social Life:** Discovery of **extended burials**, possibly belonging to a **very late phase (even medieval)**.

» Excavation of **female burials with rich grave goods**, including Pottery, Jasper and agate beads & Shell bangles

» Indicates **social stratification and funerary customs**.

– **Other Antiquities:** Stone blades, Terracotta and shell bangles, Beads of semi-precious stones, Copper objects, Animal figurines, Terracotta toy cart frame and wheel, Bone points and Inscribed steatite seals and sealings.

100 Years of CPI

Context

The Communist Party of India (CPI) is marking 100 years of its formation on 26th December 2025.

About CPI

- **Origin:** December 26, 1925 (Kanpur/Cawnpore conference)
- **Ideology:** Marxism–Leninism, Democratic Socialism, Anti-imperialism
- **Political position:** Left-wing
- **Background:**
  - Emerged from the influence of **Russian Revolution (1917) and** Marxist ideas of **class struggle and socialism**
- **Objectives (as envisioned in 1925):**
  - End **British colonial rule** in India.
  - Establish a **Workers' and Peasants' Republic**.
  - **Socialisation of means of production and distribution**.
  - Protection of workers', peasants' and marginalised sections' rights.
- **Role in India's Freedom Struggle:**
  - Active participation in: **Trade union movement** (through AITUC) & **Peasant struggles**
  - Faced colonial repression: **Kanpur Bolshevik Case (1923)** & **Meerut Conspiracy Case (1929)**
  - Led mass movements like: **Tebhaga movement (Bengal) & Telangana peasant struggle.**
- **Post-Independence Role:** Adopted a **parliamentary democratic path.**
  - Formed or participated in governments in Kerala, West Bengal & Tripura.
  - **The 1964 split resulted in formation of CPI (Marxist)**, due to ideological and strategic differences.

BHASHINI Samudaye

Context

BHASHINI Samudaye is being organised in New Delhi by the Ministry of Electronics and Information Technology (MeitY).

About BHASHINI Samudaye

- **BHASHINI Samudaye** is a **collaborative ecosystem initiative** under the **BHASHINI programme** aimed at enabling the **co-development, governance, and scaling** of **Indian-language artificial intelligence solutions**.
- It brings together **academia, civil society organisations, startups, researchers, and technology developers** to build and deploy language AI tools, datasets, and services across India's diverse linguistic landscape.
- **Institutional Framework**
  - The initiative is spearheaded by the **Digital India BHASHINI Division (DIBD)** under MeitY.
  - It forms a key component of the **Mission BHASHINI**
- **Key Features**
  - **Ecosystem-driven AI governance:** Promotes a **participatory governance model**, involving researchers, State governments, NGOs, startups, and domain experts in shaping language-AI development.
  - **BHASHINI platform and APIs:** Provides **interoperable APIs** for **real-time translation**, **speech-to-text**, and **text-to-speech** services in multiple Indian languages.
  - **BhashaDaan initiative:** Enables **citizen participation** in contributing text, speech, and translation data to create **open, representative Indian-language datasets**.
  - **Ethical and inclusive data framework:** Emphasises **consent-based, standardised, and inclusive data collection**, ensuring linguistic diversity and social equity.
  - **Live use-case showcases:** Demonstrates practical applications of language AI in **governance, education, justice delivery, and public services**.

Mission BHASHINI (earlier known as National Language Translation Mission (NLTM))

- It is a public digital platform using AI for real-time translation across India's many languages, aiming to bridge the digital divide and ensure access to government services and digital content in native tongues.
- It supports all 22 Scheduled Languages and tribal languages through technologies like NLP, speech recognition, and machine translation.
- Led by MeitY, it involves collaboration with government, startups, and industry to create an ecosystem for multilingual solutions.

Jharkhand Megaliths

Context

Jharkhand has initiated a high-level diplomatic and cultural outreach to secure UNESCO World Heritage status for its extensive megalithic landscapes

About Jharkhand Megaliths

- Jharkhand hosts one of the **largest and most distinctive megalithic traditions** in the world, spread across districts such as **Ranchi and Hazaribag**.
- The state lies on the **Singhbhum Craton**, among the **oldest stable landmasses on Earth (over 3.3 billion years old)**, providing a rare geological–cultural continuum.
- Unlike many global megalithic sites that are purely archaeological, Jharkhand's megaliths represent a **living cultural tradition**, actively maintained by **indigenous communities** such as the **Munda**.
- **Chokahatu (Ranchi district)** is regarded as the **largest living megalithic landscape in the Indian subcontinent**, where new memorial stones continue to be added.

- At **Pakari Barwadih (Hazaribag)**, aligned monoliths track **solar movement and equinoxes**, placing Jharkhand within the global history of **prehistoric astronomy**, comparable to sites like **Stonehenge (UK)**.

About Megaliths

- **Megaliths** are **large stone structures** erected using single or multiple stones, generally **without mortar**.
- Derived from Greek: **mega** (large) + **lithos** (stone).
- Mostly associated with **burial practices, memorials, ritual spaces, and astronomical observations**.
  - Chronology varies globally but broadly ranges from the **Neolithic to Iron Age**.
  - In India, Megalithic Culture mainly belongs to the Iron Age with some exceptions, such as of Chalcolithic-Megalithic sites.
- The first excavated Megalithic site in India was the site of Adichanallur in the Tirunevelly district, Tamil Nadu

Types of Megaliths in India

Category	Type	Key Features	Examples
Polylithic Type (Multiple stones)	**Dolmen**	Table-like burial structure with upright stones and a flat capstone; often covered with earth or stones	Hire Benkal, Karnataka
	Cairn	Man-made heap of stones; funerary, ritual, or astronomical purpose	Ottiyambakkam, Tamil Nadu
	Cromlech	Stone circle or arrangement of large stones; ritual or burial association	South India (general)
	Cist	Stone-lined burial chamber, sometimes associated with other monuments	Brahmagiri, Karnataka
Monolithic Type (Single stone)	**Menhir**	Single upright standing stone; memorial or ritual marker	Ellarigudem, Telangana
	Stone Circle	Standing stones arranged in circular or elliptical form	Junapani, Madhya Pradesh

Shikshapatri Dwishatabdi

Context

Prime Minister, in a video message at the Shikshapatri Dwishatabdi Mahotsav, noted that the occasion marks the completion of 200 years of Bhagwan Swaminarayan's Shikshapatri.

About Shikshapatri Dwishatabdi

- **Author:** Personally written by **Bhagwan Swaminarayan** (Sahajanand Swami).
- **Composition Date:** Completed on **Maha sud 5, Samvat 1882** (February 11, 1826).
- **Language:** Originally written in **Sanskrit** (later translated into Gujarati by Nityanand Swami).
- **Structure:** A concise "Epistle of Precepts" consisting of **212 verses** (shlokas).
- **Primary Objective:** To provide a comprehensive moral, social, and spiritual code of conduct for all followers, regardless of their station in life.

About Bhagwan Swaminarayan

- **Birth:** Born as **Ghanshyam Pande** on **April 3, 1781** in **Chhapaiya**, Uttar Pradesh. His birth coincides with Rama Navami.
- **Nilkanth Varni (Renunciation):** At age 11, after the passing of his parents, he left home to embark on a **7-year spiritual journey** on foot across India. During this time, he practiced intense austerities and was known as **Nilkanth Varni**.
- **Sahajanand Swami:** He eventually settled in Loj, Gujarat, where he met his guru, **Ramanand Swami**. He was initiated as a sadhu and named **Sahajanand Swami**.
- **Succession:** At age 21, he was appointed as the head of the fellowship (the Uddhav Sampraday) by Ramanand Swami. Shortly after his guru's passing, he introduced the **"Swaminarayan" Mahamantra**, after which he became known as **Bhagwan Swaminarayan**.

Navya-Vishishtadvaita

Bhagwan Swaminarayan propounded a unique philosophy often called **Neo-qualified Non-dualism**, which identifies five eternal and distinct realities:

- **Jiva:** The individual soul.
- **Ishwar:** Cosmic deities/entities.
- **Maya:** The power of God that creates the material world and causes ignorance.
- **Brahman (Aksharbrahman):** The divine abode and the ideal devotee of God.
- **Parabrahman (Purushottam):** The supreme, independent, and all-powerful God.

Early 8th-Century Telugu Inscription Discovered in Andhra Pradesh

Context

An early 8th-century Telugu inscription has been discovered at Pitikayagulla in Andhra Pradesh

Key Highlights of the Inscription

- The inscription is dated to the **early 8th century CE,** making it one of the earliest known Telugu inscriptions identified in the region.
- The inscription was engraved on a stone slab erected in front of the historic **Pitikesvara temple** at Pitikayagulla.
- Epigraphists interpret the inscription as recording the construction of a new embankment (nava katta).
  - The work is attributed to **Pranimilli Achari**, identified as a sculptor or craftsman, indicating the active role of artisans in public infrastructure during that period.
- **Significance:**
  - Written in early Telugu using a transitional script, the inscription highlights the shift from Prakrit and Sanskrit influences toward an independent Telugu literary tradition.

- The inscription records local administrative or social details, offering insights into regional governance, land relations, and social organisation during the early medieval period.
- The discovery fills a critical gap between earlier Brahmi-based inscriptions and later, more evolved Telugu records, aiding scholars in tracing the chronological development of Telugu epigraphy

Bulleh Shah

Context

A shrine of the 17th-century Sufi poet Bulleh Shah was vandalised by miscreants in Mussoorie, Uttarakhand, sparking widespread outrage and calls for the protection of Sufi heritage.

About Bulleh Shah

Early Life and Education

- Bulleh Shah was born as Syed Abdullah Shah Qadri in 1680 in the Punjab region (in present-day Pakistan), in an upper-caste Syed family with ancestors from Uch Gilaniyan, Bahawalpur.
- His father, Shah Muhammad Dervish, a teacher and preacher, gave him early education in languages and spiritual texts.
- He later pursued higher learning in Kasur, a prominent scholarly centre, and subsequently in Batala and Lahore under the Qadiri Sufi tradition, particularly guided by Shah Inayat Qadri, a liberal Sufi philosopher.

Sufism

- Originated in present-day Iran, drawing influences from Indian religious traditions.
- Emphasized Wahdat-ul-Wajud (Unity of God), considering love as the only path to spiritual realization.
- Advocated for inner purity rather than strict adherence to rituals like Namaz (prayer), Hajj (pilgrimage), or celibacy.
- Used music, dance, and poetry to attain a state of ecstasy, bringing them closer to God.
- Sought to reduce tensions between Shias and Sunnis, offering a more inclusive spiritual path.
- The term 'Sufi' is derived from 'Suf', meaning wool, as early Sufis wore woolen garments.
- Followed the tradition of 'Piri' (Sufi saint or teacher) and 'Muridi' (disciple), with saints appointing their successors, known as 'Wali'.

Philosophical and Literary Contributions

- **Poetic innovation:** Bulleh Shah is regarded as one of the greatest Punjabi poets.
  - He wrote extensively in Punjabi using colloquial language, making profound spiritual concepts accessible to ordinary people.
  - His corpus includes kafis (classical form of Sufi poetry) and other poetic forms.
  - His poetry focused on universal love (ishq), divine oneness, humanism, social equality, and self-realisation.
  - He was critical of shallow religiosity, caste discrimination, and social hierarchies, advocating compassion, inner awakening and unity beyond religious identities.
- **Cultural impact:** Bulleh Shah's work enriched Punjabi literature by elevating folk idioms and metaphors, influencing musical and devotional traditions across South Asia.
  - His verses have inspired songs and cultural performances and remain popular in both classical and contemporary renditions.

Tulu language

Context

Coastal MLAs urged Karnataka Legislative Assembly to declare Tulu as second official language.

About Tulu

- **Language family and classification:** It is a **Dravidian language** that branched early from Proto-South Dravidian and retains several archaic linguistic features not found in Tamil–Kannada.
- **Geographical distribution:** Tulu is primarily spoken in **Tulu Nadu**, comprising **Dakshina Kannada and southern Udupi districts of Karnataka** and the **northern part of Kasaragod district of Kerala**. Smaller pockets exist in parts of Chikkamagaluru and Shivamogga districts.
- **Ethnolinguistic identity:** Native speakers are known as **Tuluvas**, and the cultural region is informally referred to as **Tulu Nadu**, known for a distinct linguistic and cultural identity.
- **Linguistic features:** Tulu has unique grammatical constructions such as the **pluperfect and future perfect tenses without auxiliary verbs**, a feature rare among Indian languages and comparable to some European languages.
- **Scripts used:** Historically, Tulu was written in the **Tigalari script** (also called Tulu script). In modern times, **Kannada script** is commonly used, with occasional use of Malayalam script in Kerala.
- **Literary tradition:** Tulu has a rich **oral literature**, especially epic ballads called **pardana**. Famous examples include the **Epic of Siri** and the legends of **Koti and Chennayya**, which reflect social values and folk history
  - Written Tulu literature includes medieval texts such as **Sri Bhagavato** and **Kaveri** (17th century), composed in the Tigalari script.
- **Inscriptions and antiquity:** The oldest Tulu inscriptions date back to the **7th–8th century CE**, found around Barkur and Kundapura. These inscriptions indicate early literary and administrative usage.
  - Ancient Tamil Sangam texts such as **Akananuru** (c. 300 BCE) and works of poet **Mamular** mention **Tulu Nadu**, suggesting the antiquity of the Tulu language and culture (over 2,300 years old).
- **Speakers and demographics:** According to the **2011 Census**, India has about **1.85 million native Tulu speakers**.

Ministry of Culture- Year End Review 2025

Context

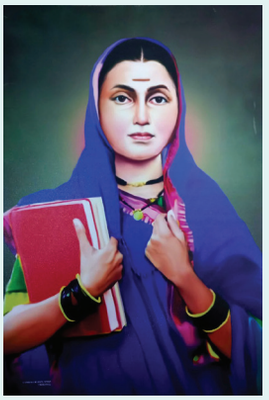
The Ministry of Culture released its Year-End Review 2025, highlighting a landmark year marked by heritage preservation, cultural revival, international recognition, and mass public participation across India.

Key Highlights of Cultural and Heritage Initiatives in 2025

Theme / Initiative	Key Highlights
Heritage Repatriation	The sacred **Piprahwa Buddha relics** (1898) were prevented from being auctioned abroad and repatriated to India after 127 years through coordinated legal and diplomatic efforts.
Civilisational Integration	**Kashi Tamil Sangamam 3.0** celebrated the historical and cultural links between Tamil Nadu and Kashi, aligning with the Ek Bharat Shreshtha Bharat initiative (earlier editions: 2022, 2023).
Literary Heritage Revival	Revival of the **Kambh (Kamba) Ramayana,** a 12th-century Tamil epic by Kambar, which reinterprets Valmiki's Ramayana through Chola-era socio-religious values.
Global Heritage Recognition	India secured UNESCO World Heritage status for the **Maratha Military Landscapes,** becoming India's 44th WHS and elevating India to 6th globally in number of World Heritage Sites.
Cultural–Ecological Linkages	**Project Gaja-Lo**k, a transnational INTACH initiative, documented the cultural symbolism of Asian elephants, linking ecology with cultural heritage through exhibitions and dialogues.
Manuscript Heritage	**Gyan Bharatam** was launched to preserve, digitise, and disseminate India's manuscript wealth; the initiative culminated in the Delhi Declaration under the Viksit Bharat 2047 vision.

Personality in news

Savitri Bai Phule

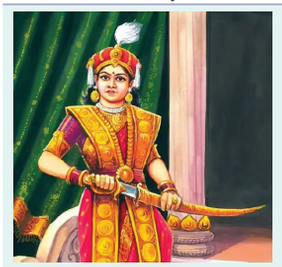


News: 3rd January marks the birth anniversary of Savitri Phule.

About Savitri Bai Phule

- Born on **January 3, 1831**, in a small village in **Satara district, Maharashtra**.
- A pioneering **social reformer, poet**, and **freedom fighter**.
- Became the **first female teacher in India**.
  - In **1852**, the **British government recognized her** as the **best teacher**.
- Along with her husband **Jyotirao Phule** (he **established Satyasodhak Samaj in 1873)**, she opened **India's first girls' school** in **Pune in 1848**.
- Established two key institutions:
  - **Native Female School, Pune**
  - **Society for Promoting the Education of Mahars, Mangs**, and other marginalized communities.
- Founded **Mahila Seva Mandal (1852)** to raise awareness about **women's rights** and social justice across all castes.
- In **1863**, started **Balhatya Pratibandhak Griha**, India's **first home to prevent female infanticide**, offering shelter to widows and victims of sexual violence.
- **Literary Contributions**
  - Authored two significant poetry collections:
    - **Kavya Phule (1854)**
    - **Bavan Kashi Subodh Ratnakar (1892)**
  - **Poem: "Go Get Education"**

Rani Velu Nachiyar

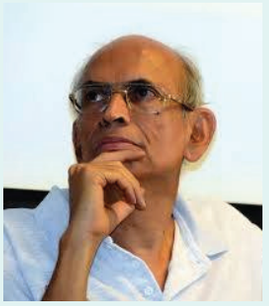


News: The Prime Minister paid tribute to Rani Velu Nachiyar on her birth anniversary.

About Rani Velu Nachiyar

- Queen of the **Sivaganga estate** in present-day Tamil Nadu.
- Known by Tamils as Veeramangai.
- Contribution:
  - Regarded as the **first Indian queen to wage war against British colonial rule**.
  - Led armed resistance against the **British East India Company** after her husband's death.
  - Built alliances with **Hyder Ali of Mysore** and local chieftains to strengthen her forces.
  - Organised one of India's earliest **women-led military units**, known as **Udaiyaal Padai**.
  - Successfully **recaptured Sivaganga** from British control in the late 18th century.

Madhav Gadgil



News: Madhav Gadgil, the pioneering scholar and iconic people's conservationist, passed away.

About Madhav Gadgil

- Born in **1942**, Pune.
- **Contribution:**
  - Founder of the **Centre for Ecological Sciences (CES)** at the **Indian Institute of Science (IISc), Bengaluru**.
  - Former **Chairman of the Centre for Ecological Sciences**, IISc.
  - **Chairman of the Western Ghats Ecology Expert Panel (WGEEP)** (2010–2011), constituted by the Ministry of Environment and Forests.
  - The panel produced the **Gadgil Committee Report**, which:
    - Recommended declaring the **entire Western Ghats as an Ecologically Sensitive Area (ESA)**.
    - Proposed a **graded zoning system (ESZ I, II, III)** based on ecological vulnerability.
    - Emphasised **bottom-up, participatory environmental governance** involving local communities.
- **Award: Padma Bhushan (1981)** for contributions to environmental science.