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**NAVYA**  
programme

Nurturing  
Adolescent Girls  
for a Brighter  
Tomorrow

*Samudra  
Manthan*



*Clouded  
Leopard*

*Thoti  
tribe*

**Chips to  
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program



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**PRELIMS**  
**POLITY & GOVERNANCE****NAVYA Programme****Why in News?**

The **NAVYA programme** has trained **1,060 adolescent girls across 15 States/UTs** as of June 2026. The government has expanded it to **100 Aspirational Districts** from **27 May 2026**.

**Key Facts**

- **NAVYA: Nurturing Aspirations through Vocational Training for Young Adolescent Girls.**
- **Implementing Ministry: Ministry of Skill Development & Entrepreneurship (MSDE).**
- Implemented under **PMKVY 4.0**.
- Provides **industry-relevant vocational courses** with mandatory **On-the-Job Training (OJT)**.
- Focuses particularly on **futuristic job roles**.
- Includes a **Holistic Development Module** covering:
  - Digital literacy
  - Financial literacy
  - Career readiness
  - Entrepreneurship orientation
- **Skill India Digital Hub (SIDH)** enables real-time monitoring of registration, attendance, training, certification and outcomes.
- State Skill Development Missions are encouraged to facilitate **placements and apprenticeships** through industry linkages.

**TRAI MyCall****Why in News?**

The **Telecom Regulatory Authority of India (TRAI)** has launched an upgraded **TRAI MyCall** application to enable citizens to provide **real-time feedback on mobile network quality**, strengthening consumer-centric telecom regulation.

**What is TRAI MyCall?**

- A **crowdsourcing-based mobile application** developed by TRAI to collect user feedback on **voice-call quality**.
- Users can rate call quality and provide information about the **location and network experience**.
- The aggregated data helps TRAI identify areas with **poor network performance** and assess service-provider quality.
- The upgraded platform incorporates improved technology and user-interface features for wider participation.

**TRAI & Regulatory Framework**

- **TRAI** was established in **1997** under the **TRAI Act, 1997**.
- It regulates telecommunications and broadcasting services and seeks to protect **consumer interests** while promoting orderly sectoral growth.
- TRAI also issues recommendations and regulations relating to telecom service quality.

**E-Samudra: Digital Transformation of Maritime Governance****Why in News?**

The **Ministry of Ports, Shipping and Waterways (MoPSW)** launched **E-Samudra** on **8 August 2026** to create a unified digital platform for seafarers, shipping companies, ports and other maritime stakeholders.

#### Key Features

- Provides a **single digital window** for maritime services.
- Enables **end-to-end workflows, online payments, real-time tracking and digitally issued certificates**.
- Promotes **Digital First and Faceless Governance**.
- Aims to make maritime services more **transparent, predictable and time-bound**.
- Complements initiatives such as:
  - **e-NAVIK**: 24x7 grievance redressal.
  - **Seafarer Tracking Dashboard**: monitoring of seafarers.
  - **d-SEA**: Digital Seafarers Employment Agreement.
  - **Seafarers Welfare Fund Society (SWFS)** initiatives.

#### Institutional & Policy Linkages

- Implemented through the **Directorate General of Maritime Administration (DGMA)** under MoPSW.
- Supports **Maritime India Vision 2030** and **Maritime Amrit Kaal Vision 2047**.
- The **Merchant Shipping Act, 2025** recognises seafarers as “**Key Workers**.”
- India's active seafarer workforce increased from about **1.03 lakh (2013)** to over **3.23 lakh (2025)**.

#### PM-JANMAN: Strengthening Development of PVTGs

##### Why in News?

The **Ministry of Tribal Affairs** informed Parliament about progress under **Pradhan Mantri Janjati Adivasi Nyaya Maha Abhiyan (PM-JANMAN)**, aimed at improving socio-economic conditions of **75 PVTG communities** across **18 States and 1 UT**.

##### Key Facts

- **Launched**: 2023.
- **Target**: **75 PVTG communities**.
- Focuses on saturation of basic services:
  - **Housing**
  - Safe drinking water
  - Education, health & nutrition
  - Roads and telecom connectivity
  - Electrification
  - Sustainable livelihoods
- Implemented through **11 interventions by 9 Union Ministries**, reflecting a **convergent approach**.

#### Green India Mission: CAG Flags Implementation Gaps

##### Why in News?

A recent **CAG Performance Audit** has flagged major shortcomings in the implementation of the **Green India Mission (GIM)** during **2015–16 to 2024–25**, including inadequate funding, weak convergence and poor monitoring. The audit covered interventions in **16 States/UTs**.

##### Green India Mission – Key Facts

- **Launched**: 2014 as a **Centrally Sponsored Scheme**.
- One of the **eight missions under the National Action Plan on Climate Change (NAPCC)**.

- **Nodal Ministry:** Ministry of **Environment, Forest and Climate Change (MoEFCC)**.
- **Objectives:**
  - Increase and improve **forest & tree cover**
  - Enhance **biodiversity and ecosystem services**
  - Improve **carbon sequestration**
  - Strengthen **forest-based livelihoods**
- **Original targets:**
  - Increase forest/tree cover over **5 million hectares**
  - Improve quality of cover over another **5 million hectares**
  - Enhance annual CO<sub>2</sub> sequestration by **50–60 million tonnes**.

### CAG Findings

The audit reported a **97.57% shortfall in the targeted increase in forest cover** and a **91.87% shortfall in improving forest-cover quality**. Major concerns included **poor financial planning, weak inter-scheme convergence and inadequate monitoring**.

## National Anubhav Awards 2026

### Why in News?

The **National Anubhav Awards 2026** were conferred by **Dr. Jitendra Singh**, Minister of State for Personnel, Public Grievances and Pensions, on **15 selected awardees** in New Delhi. The awards recognise the contributions and experiences of retired government employees to **nation-building and public administration**.

### Key Facts

- **2026:** The **9th National Anubhav Awards**.
- **15 awardees** were recognised.
- Organised by the **Department of Pension & Pensioners' Welfare (DoPPW)** under the **Ministry of Personnel, Public Grievances and Pensions**.
- The **Anubhav platform** enables retiring and retired:
  - Central Government employees
  - Employees of **12 Public Sector Banks**
  - Employees of **Central Public Sector Enterprises (CPSEs)**

to document and share their professional experiences and contributions.

### Areas of Contribution

The 2026 awardees were recognised for work involving:

- **Passport Seva Kendra**
- Repealing outdated rules and formulating new regulations
- **Technological adaptation** in administration and accounting
- **Energy conservation**
- Other initiatives contributing to administrative efficiency and nation-building.

## AppCoMS 2.0: Digitalising RTI Second Appeals & Complaints

### Why in News?

The **Central Information Commission (CIC)** launched the upgraded **Appeal and Complaint Management System (AppCoMS 2.0)** on **17 August 2026**. The platform aims to streamline the digital processing of **Second Appeals and Complaints under the RTI Act, 2005**.

### What is AppCoMS?

**AppCoMS** is an online web application originally introduced by the **CIC in September 2016**. It enables citizens to file **Second Appeals and Complaints** and facilitates end-to-end digital processing—registration, hearing schedules, notices, decisions and orders.

#### Key Features of AppCoMS 2.0

- **User accounts** for applicants, **CPIOs** and other stakeholders.
- Accounts linked with **email ID and mobile number**.
- Applicants can:
  - Track **case timelines**
  - Access case documents
  - Download hearing notices and decisions/orders.
- **Digital Signature Certificates (DSCs)** can be used for digitally signing and issuing notices/orders.
- CPIOs can access case details and submit documents electronically.
- Enhanced **security, functionality and workflow management**.

#### RTI Static Link

Under the **RTI Act, 2005**, an applicant generally approaches the **First Appellate Authority (FAA)** after an unsatisfactory/non-response from the CPIO. A **Second Appeal** lies before the appropriate Information Commission.

### National Medical Commission (NMC)

#### Why in News?

The **National Medical Commission (NMC)** has proposed introducing a **Unique Identification (UID) number for doctors**, aimed at creating a uniform digital identity for medical professionals and improving transparency in registration and verification. The proposal is significant for strengthening the digital governance of the medical profession.

#### What is NMC?

- Established under the **National Medical Commission Act, 2019**, replacing the **Medical Council of India (MCI)**.
- It is a **statutory regulatory body** for medical education and the medical profession in India.
- **Headquarters:** New Delhi.
- The NMC consists of **four autonomous boards**:
  1. Undergraduate Medical Education Board (UGMEB)
  2. Post-Graduate Medical Education Board (PGMEB)
  3. Medical Assessment and Rating Board (MARB)
  4. Ethics and Medical Registration Board (EMRB)

#### Key Functions

- Regulates standards of medical education.
- Assesses medical institutions.
- Maintains the **National Medical Register (NMR)**.
- Regulates professional ethics and registration of doctors.
- Promotes quality and accessibility of medical education.

### National Financial Reporting Authority (NFRA)

#### Why in News?

The **National Financial Reporting Authority (NFRA)** conducted its **sixth outreach programme** in Ahmedabad under the theme **“Creating a Better Financial Reporting Ecosystem”**, with particular focus

on **small and medium audit practitioners**. The programme seeks to improve audit quality and professional capacity.

#### What is NFRA?

- Established in **2018** under **Section 132 of the Companies Act, 2013**.
- A **statutory regulatory authority** functioning under the **Ministry of Corporate Affairs (MCA)**.
- **Headquarters:** New Delhi.
- Its broad mandate is to oversee compliance with **accounting and auditing standards**, improve audit quality and strengthen investor/public confidence in financial reporting.

#### Key Functions

- Recommend accounting and auditing standards to the Central Government.
- Monitor and enforce compliance with prescribed accounting and auditing standards.
- Oversee the quality of service of specified auditors and audit firms.
- Investigate professional misconduct involving specified auditors/audit firms.
- Possesses powers broadly comparable to those of a **civil court** for certain proceedings.



## INTERNATIONAL RELATIONS



### SAFE Defence Fund

#### Why in News?

Italy recently requested **€8 billion** from the European Union's **SAFE (Security Action for Europe)** programme to finance defence investments. Italy is eligible to access up to **€14.9 billion** under the scheme.

#### What is SAFE?

- **SAFE = Security Action for Europe.**
- An EU financial instrument providing up to **€150 billion in loans** to EU Member States for urgent and major defence investments.
- Established through **Council Regulation (EU) 2025/1106**, which entered into force on **29 May 2025**.
- It is funded through the EU's borrowing capacity, including issuance of **EU bonds**.
- Part of the broader **ReArm Europe/Readiness 2030** initiative.

#### Key Features

- Promotes strengthening of the **European defence technological and industrial base**.
- Supports **common procurement**, generally involving at least two participating countries.
- Priority areas include **ammunition, missiles, artillery systems, air and missile defence, drones and strategic enablers**.
- Only **EU Member States can receive SAFE loans**, though certain partner countries may participate in joint procurement.

### SAFTA

#### Why in News?

The **Directorate of Revenue Intelligence (DRI)** uncovered a large-scale fraud involving the misuse of **SAFTA (South Asian Free Trade Area)** concessions for importing areca nuts. South-East Asian areca nuts

were allegedly routed through Bangladesh and falsely declared as **Bangladeshi-origin** to claim customs-duty exemption. The estimated revenue loss exceeds **₹2,500 crore**.

#### SAFTA – Key Facts

- **Established:** SAFTA Agreement signed in **2004**; came into force in **2006**.
- **Framework:** Regional trade agreement under **SAARC**.
- **Members:** Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka.
- **Objective:** Reduce customs tariffs and promote **intra-regional trade** among SAARC countries.
- Preferential treatment is subject to **Rules of Origin**—goods must satisfy prescribed criteria to qualify for concessions.

#### Current Case

- Normal **Basic Customs Duty (BCD)** on areca nuts: **100%**.
- Eligible Bangladeshi-origin imports under SAFTA can receive **full customs-duty exemption**.
- Syndicates allegedly imported nuts from **Indonesia, Thailand and Malaysia**, routed them through Bangladesh and obtained fraudulent **Certificates of Origin**.
- DRI seized around **160 MT areca nuts and ₹75 lakh cash**; **nine persons were arrested**.

### Kuril Islands

#### Why in News?

Russian President **Vladimir Putin visited Iturup Island on 13 August 2026**, his first visit to the disputed Kuril Islands. Japan strongly protested the visit, as it claims the four southern islands as the **Northern Territories**.

#### Key Facts

- **Location:** Volcanic archipelago in the **Northwestern Pacific Ocean**, stretching from **Kamchatka Peninsula to Hokkaido**.
- The islands separate the **Sea of Okhotsk from the Pacific Ocean**.
- The dispute centres on **four southern islands**:
  - **Iturup (Etorofu)**
  - **Kunashir (Kunashiri)**
  - **Shikotan**
  - **Habomai Islands**
- **Russia administers** these islands; **Japan claims them** as its Northern Territories.
- The **Soviet Union occupied the islands in 1945**, following Japan's defeat in World War II.
- The territorial dispute has prevented **Russia and Japan from concluding a formal post-war peace treaty**.

#### Geographical Significance

The Kurils form part of the **Pacific Ring of Fire** and are characterised by **volcanic activity and earthquakes**. Their strategic location provides access between the **Sea of Okhotsk and the North Pacific**.

### Yemen & Houthi Conflict

#### Why in News?

Renewed **Houthi attacks on Yemeni government forces**, particularly around **oil-rich Marib**, indicate a possible escalation of Yemen's long-running conflict. Recent attacks have reportedly killed government troops and intensified fighting after years of relative calm.

#### Yemen: Key Facts

- Located at the **southwestern tip of the Arabian Peninsula**.
- **Borders:** Saudi Arabia (north) and Oman (east).

- **West:** Red Sea; **south:** Gulf of Aden and Arabian Sea.
- **Capital:** Sana'a.
- **Strategic location:** Controls access to the **Bab-el-Mandeb Strait**, connecting the **Red Sea with the Gulf of Aden/Indian Ocean**.
- **Marib:** Important oil- and gas-producing region and strategically positioned between areas controlled by different Yemeni factions.

#### Houthi Movement

- Also known as **Ansar Allah**.
- Emerged from Yemen's **Zaidi Shia** community.
- Captured **Sana'a in 2014**, triggering the present phase of civil war.
- Iran-aligned Houthis control significant parts of northern Yemen.
- Their activities have also affected **Red Sea shipping**, making Yemen central to global maritime-security concerns.

### SACU: India's New Trade Engagement with Southern Africa

#### Why in News?

India and the **Southern African Customs Union (SACU)** signed **Terms of Reference (ToR)** on **12 August 2026** to begin negotiations for a **Preferential Trade Agreement (PTA)**. The proposed pact seeks to improve market access and diversify India's trade with Southern Africa.

#### SACU – Key Facts

- **Established: 1910**; headquartered in **Windhoek, Namibia**.
- **Members: South Africa, Botswana, Namibia, Lesotho and Eswatini**.
- **World's oldest existing customs union**.
- **South Africa** is the largest economy and major trading partner within the bloc.
- SACU operates a **common external tariff**, meaning member countries apply a common tariff policy towards non-members.
- Customs and excise revenues are shared among members through the **SACU Revenue-Sharing Formula**.

#### India–SACU PTA

The proposed agreement will cover **eight chapters**, including:

- Trade in goods & market access
- Customs procedures
- **Rules of Origin**
- **Sanitary and Phytosanitary (SPS) measures**
- **Technical Barriers to Trade (TBT)**
- Trade remedies
- Dispute settlement.

India seeks greater access for **automobiles, pharmaceuticals, machinery and electrical equipment**, while also exploring cooperation in **critical minerals**. India's exports to SACU were about **\$7.5 billion in 2025–26**.

### Morocco: India's Gateway to North Africa & Atlantic Trade

#### Why in News?

**MoS for Commerce & Industry Jitin Prasada** co-chaired the **7th Session of the India–Morocco Joint Commission** in Rabat on **24–25 August 2026**. India and Morocco agreed to work towards **doubling**

**bilateral trade within five years** and constituted a Joint Working Group to examine the feasibility of a **Preferential Trade Agreement (PTA)**. Bilateral trade was around **US\$4 billion in 2025**.

**Morocco: Key Facts**

- **Capital:** Rabat | **Largest city:** Casablanca.
- Located in **northwestern Africa**, bordering the **Atlantic Ocean and Mediterranean Sea**.
- Separated from Spain by the **Strait of Gibraltar**, giving it major maritime-strategic significance.
- **Atlas Mountains** extend across the country; **Mount Toubkal** is the highest peak in North Africa.
- Shares a border with **Algeria**; its southern territory involves the disputed **Western Sahara**.

**India–Morocco Cooperation**

Priority areas include **fertilisers, chemicals, minerals, machinery, electrical equipment, automotive components, pharmaceuticals, renewable energy and tourism**.



## ECONOMY



## Index of Industrial Production (IIP)

## Why in News?

India's **Index of Industrial Production (IIP)** grew by **6.7% year-on-year in July 2026**. Manufacturing grew **7.3%**, while Electricity & Gas Supply increased **8.7%**; Mining & Quarrying contracted by **0.9%**. The April–July 2026 cumulative growth stood at **6.3%**.

## What is IIP?

- A **composite indicator** measuring short-term changes in the volume of industrial production.
- Compiled and released by the **National Statistical Office (NSO)** under the **Ministry of Statistics and Programme Implementation (MoSPI)**.
- The current IIP series has **Base Year 2022–23 = 100**.
- Quick Estimates are released monthly, generally on the **28th of the following month**.

## Major Sectors

The revised IIP covers:

- **Mining & Quarrying**
- **Manufacturing**
- **Electricity & Gas Supply**
- **Water Supply, Sewerage & Waste Management**

It also provides a **use-based classification**, including **Primary Goods, Capital Goods, Intermediate Goods, Infrastructure/Construction Goods and Consumer Goods**.

## Samudra Manthan: Unlocking India's Offshore Hydrocarbon Potential

## Why in News?

The Union Cabinet approved **Samudra Manthan – National Offshore Exploration Scheme** on **31 July 2026** as a **Central Sector Scheme** of the Ministry of Petroleum & Natural Gas, with an outlay of **₹84,084 crore up to FY 2030–31**. It aims to accelerate offshore exploration and strengthen India's energy security.

## Key Features

- Focuses on **deepwater and ultra-deepwater** exploration and **frontier basins**.
- Provides for large-scale acquisition, processing and interpretation of **seismic data**.
- Promotes **exploratory and scientific drilling**.
- Supports **common offshore production and evacuation infrastructure**.
- Includes an integrated **Oil & Gas Manufacturing and Services Zone**.
- Strengthens digital programme management, capacity building and technology adoption.
- Expected to facilitate **over 600 MMTOE** of reserve accretion.

## Clean Slate Doctrine under IBC

## Why in News?

The **Supreme Court's 2026 judgment in *Ujaas Energy Ltd. v. West Bengal Power Development Corporation Ltd.*** has clarified the scope of the **Clean Slate Doctrine** under the Insolvency and Bankruptcy Code (IBC), 2016.

## What is the Clean Slate Doctrine?

- It means that once an **IBC resolution plan is approved**, the successful resolution applicant should take over the corporate debtor without undisclosed or unresolved **past liabilities/claims** resurfacing.
- It provides **finality and certainty** to the resolution process and encourages prospective investors to participate.
- The principle was judicially developed in **Essar Steel** and strengthened in **Ghanashyam Mishra**, before gaining statutory force through **Section 31 of the IBC**.
- Section 31 makes an approved resolution plan **binding on the corporate debtor, creditors, governments, guarantors and other stakeholders**.

### Ujaas Energy Ruling

The Supreme Court held that an omitted **counterclaim** is extinguished after approval of the resolution plan. However, the underlying claim may still be used as an **equitable set-off purely as a defence** in arbitration. It cannot be used to obtain **affirmative monetary recovery**.

## Modified Interest Subvention Scheme (MISS)

### Why in News?

The Union Government has continued the **Modified Interest Subvention Scheme (MISS)** to ensure **short-term institutional credit at concessional interest rates** for farmers through the **Kisan Credit Card (KCC)** framework. The scheme is part of the government's broader effort to improve access to affordable agricultural credit.

### What is MISS?

- MISS provides **interest subvention on short-term crop loans** to eligible farmers.
- It operates through **KCC-linked institutional lending**.
- Eligible farmers can obtain short-term loans at a **concessional interest rate of 7% per annum**.
- An additional **3% Prompt Repayment Incentive (PRI)** is available to farmers who repay loans on time, effectively reducing the interest burden to **4%**.
- The scheme covers loans for **crop cultivation and allied activities**, subject to prescribed limits and conditions.

### Key Institutions & Mechanism

- Implemented through **Scheduled Commercial Banks, Regional Rural Banks and Cooperative Banks**.
- The Government provides interest subvention to lending institutions to enable concessional credit.
- **Kisan Credit Card (KCC)** facilitates timely and flexible institutional credit.

## Dak MITRA & Dak Sewa

### Why in News?

The **Department of Posts** launched revamped **Dak MITRA and Dak Sewa apps** on **24 August 2026**, alongside the inauguration of **14 renovated post offices** under the *Jan Sewa Connect* initiative. The move aims to modernise postal services and strengthen last-mile delivery.

### Dak MITRA App

- Primarily designed for **postal employees and Gramin Dak Sevaks (GDS)**.
- Consolidates postal transactions through a digital interface.
- Enables services relating to **mail and parcels, Post Office Savings Bank (POSB), PLI/RPLI** and other postal transactions.

- Deployed across around **1.3 lakh Branch Post Offices**; the upgraded platform is intended to cover more than **1.4 lakh BPOs**.
- Incorporates **OTP-based services and two-factor authentication**.

#### Dak Sewa App

- **Citizen-facing** platform integrating multiple postal services.
- Allows users to **locate post offices, book/track parcels, request pickups and make digital payments**.
- Provides selected **PLI, RPLI and POSB** services.
- Available in **23 Indian languages** and had crossed **10 lakh downloads** at launch.

### IT Resilience Index

#### Why in News?

The **Securities and Exchange Board of India (SEBI)** introduced the **IT Resilience Index (ITRI)** framework on **24 August 2026** to assess the robustness and resilience of critical IT systems of **Market Infrastructure Institutions (MIIs)**.

#### What is ITRI?

ITRI is a **system-driven composite index** that measures the health and resilience of critical technology systems on a **100-point scale** across **nine parameters**.

- **Availability – 20%**
- **Security – 20%**
- **Integrity – 10%**
- **Governance – 10%**
- **Reliability & Monitoring – 10%**
- **Business Continuity – 10%**
- **Modularity & Flexibility – 10%**
- **Scalability – 5%**
- **Other parameters, including incident handling – 5%.**

#### Who are MIIs?

The framework applies to **stock exchanges, clearing corporations and depositories**. These institutions are critical to the smooth and uninterrupted functioning of India's securities market.

MIIs must also establish an **Early Warning System (EWS)** and provide **real-time monitoring of service delivery**. The framework is to be operationalised by **28 February 2027**.

### Container Manufacturing Assistance Scheme (CMAS)

#### Why in News?

The government has proposed the **₹10,000-crore Container Manufacturing Assistance Scheme (CMAS)** for **five years** to build a competitive domestic container-manufacturing ecosystem and reduce dependence on imported containers.

#### Key Features

- **Target:** Raise annual domestic capacity to about **7.5 lakh TEUs**, nearly **10 times** the existing capacity.
- **Supports:**
  - **Greenfield** manufacturing facilities
  - Expansion of existing **Brownfield** units
  - Operational/competitiveness support
  - **Testing infrastructure**

- Skill development and capacity building

- Aims to strengthen the **entire container manufacturing value chain**, not merely production.

### Why Containers Matter?

Shipping containers are essential for **EXIM trade and multimodal logistics**. Import dependence can create vulnerabilities during global supply-chain disruptions and container shortages.

CMAS complements **PM Gati Shakti, National Logistics Policy, Sagarmala Programme, Make in India** and **Maritime Amrit Kaal Vision 2047**.

## MSME Sustainable (ZED) Certification

### Why in News?

The **MSME Sustainable (ZED) Certification Scheme** is in focus as **over 6.7 lakh MSMEs have received ZED certification**, highlighting the government's push to improve quality, resource efficiency and global competitiveness of small enterprises.

### About the ZED Scheme

- **ZED = Zero Defect, Zero Effect**—aims at manufacturing products with **minimal defects** while causing **minimal environmental impact**.
- Implemented by the **Ministry of Micro, Small & Medium Enterprises** under the **MSME Champions Scheme**.
- Primarily covers **manufacturing MSMEs** across sectors.
- Encourages adoption of **quality-management systems, energy efficiency, waste reduction and environmentally sustainable production**.
- Certification helps MSMEs improve **product quality, market access and competitiveness**, including in export markets.
- **Women-owned MSMEs** can receive **100% subsidy on certification cost**.

### Certification & Support

The ZED framework assesses enterprises against prescribed parameters and provides graded certification. Government support also includes **consultancy/handholding and technology-upgradation assistance** for certified enterprises.

## National Handloom Day 2026

### Why in News?

**National Handloom Day** is observed annually on **7 August**. The 2026 PIB backgrounder highlights India's handloom ecosystem, covering **35.22 lakh weavers and allied workers**, with women accounting for over **72%** of the workforce. The day commemorates the launch of the **Swadeshi Movement in 1905**.

### Key Facts

- **National Handloom Day:** 7 August; instituted in **2015**.
- **Fourth All India Handloom Census (2019–20):** 31.45 lakh handloom households and **28.20 lakh looms**.
- Nearly **90% of looms are located in rural areas**.
- Major government support:
  - **National Handloom Development Programme (NHDP)**
  - **Raw Material Supply Scheme (RMSS)**
  - **Handloom Marketing Assistance**
  - **Weaver MUDRA Scheme**
- **RMSS:** freight reimbursement for yarn and **15% price subsidy** on specified yarns.

- **Handloom Mark** helps establish that a product is genuinely handwoven, while **GI registration** protects region-specific traditional products.

### SAMRIDH Programme: Accelerating India's Software Start-ups

#### Why in News?

The government has strengthened the **SAMRIDH (Startup Accelerator of MeitY for Product Innovation, Development and Growth)** programme to support technology start-ups and help them scale into globally competitive enterprises.

#### Key Facts

- **Ministry:** Ministry of Electronics & Information Technology (**MeitY**).
- **Focus:** **Software product start-ups**, particularly those with innovative technology solutions.
- Provides support through **accelerators**, mentoring, investor connect and market access.
- Helps start-ups move from **product development** → **validation** → **commercialisation** → **scaling**.
- Encourages collaboration among **start-ups, accelerators, investors and industry**.
- Emphasis on strengthening India's **software product ecosystem** and promoting indigenous digital innovation.

#### Why Important?

India has a large start-up ecosystem, but many technology ventures face difficulties in accessing **early-stage capital, mentorship, customers and global markets**. SAMRIDH addresses these ecosystem gaps by providing structured acceleration and market-oriented support.

### EPCG: Digitising Export Compliance

**Background:** DGFT has removed physical challan requirements for EPCG-related EODC applications, integrating Customs payment records digitally through ICEGATE from August 2026.

#### EPCG Scheme

- **EPCG** permits import of **capital goods at concessional/zero customs duty** against an **export obligation**.
- It covers capital goods used for **pre-production, production and post-production**.
- **DGFT** administers the scheme under the Foreign Trade Policy.
- Export obligation is linked to the duty benefit; non-fulfilment requires payment of proportionate customs duty saved **plus applicable interest**.

#### 2026 Digital Reform

- From **1 August 2026**, physical duty-payment challans are no longer required for EODC applications.
- **DGFT-ICEGATE API integration** enables authenticated, licence-wise verification of Customs duty payments.
- This reduces manual verification, documentation, processing time and compliance costs.

### MDR: Pricing India's Digital Payment Ecosystem

**Background:** The proposed reintroduction of a nominal MDR on select UPI transactions has revived debate over payment-system sustainability while retaining free consumer access.

#### Merchant Discount Rate (MDR)

- **Definition:** Fee paid by a **merchant** to payment processors for accepting digital payments.
- It compensates participating entities such as issuing/acquiring banks, payment networks and payment service providers.
- Usually expressed as a **percentage of transaction value**.
- MDR is generally deducted during settlement; it is a **merchant-side cost**, not a consumer fee.

**UPI Context**

- UPI transactions have operated under **zero MDR** since 2020.
- Current discussions envisage a **nominal, threshold-based MDR** for select merchant transactions, while **person-to-person UPI payments** remain free.

**Electronics Components Manufacturing Scheme (ECMS)****Why in News?**

The **Ministry of Electronics and Information Technology (MeitY)** has approved **31 additional projects** under the **Electronics Components Manufacturing Scheme (ECMS)**. The projects involve investments of about **₹7,877 crore**, are spread across **10 States**, and are expected to generate production worth nearly **₹82,243 crore** and around **10,000 direct jobs**.

**What is ECMS?**

- **Ministry:** MeitY.
- **Approved:** Union Cabinet in **March 2025**.
- **Outlay:** **₹22,919 crore** over **six years**.
- **Objective:** Develop a globally competitive **domestic electronics-component ecosystem**, rather than limiting India to final-product assembly.
- Focus areas include **PCBs, camera/display sub-assemblies, semiconductor packaging, lithium-ion battery cells and other critical electronic components**.

**Recent Expansion**

The latest approvals take total ECMS approvals to **106 projects**, involving around **₹69,548 crore** in approved investment. Importantly, **38 plants are already operational**, while another **16 are at advanced construction/machinery-installation stages**.

The latest projects also target **filters, coils, speakers, anode materials, acetylene black, electrolyte additives and rare-earth permanent magnets**, strengthening upstream supply chains.



## GEOGRAPHY



## Barrier Lake: Himalayan Landslide Dams &amp; Cascading Flood Hazards

## Why in News?

A newly formed **Barrier Lake near the Nepal–China border** raised fears of a second flood following the devastating Himalayan flash floods of August 2026. The lake formed when debris blocked a river channel, impounding water upstream; its subsequent overflow/breach created concerns for downstream areas, including the **Bhote Koshi river system**.

## What is a Barrier Lake?

A **Barrier Lake**, also called a **landslide-dammed lake**, forms when a natural obstruction blocks a river or stream.

## Possible barriers include:

- Landslides and rockfalls
- Glacial or ice avalanches
- Debris flows
- Volcanic material or moraine deposits

## How Does it Cause Disaster?

**Slope failure/avalanche → River blockage → Water accumulation → Natural dam instability → Sudden breach → Flash flood/debris flow**

Unlike engineered dams, natural barriers are often composed of **loose and unconsolidated material**, making them vulnerable to erosion and sudden failure.

## Key Distinction

A Barrier Lake differs from a **Glacial Lake**: the former is defined by a **blocked river channel**, whereas glacial lakes are generally associated with glacier-related depressions or moraine dams.

## Nathu La Pass

## Why in News?

**Border trade between India and China through Nathu La Pass resumed on 1 August 2026 after a six-year suspension**, restoring a historic trade route between **Sikkim and Tibet Autonomous Region**. The suspension was associated with the COVID-19 pandemic and subsequent India–China border tensions.

## Geographical &amp; Strategic Profile

- **Location:** East Sikkim, in the **Himalayas**.
- Connects **Sikkim with China's Tibet Autonomous Region**, across the international border.
- Located at around **4,300 m** above sea level and is among the world's highest motorable passes.
- **Nathu** means “*listening ears*” and **La** means “*pass*” in Tibetan.
- Forms an offshoot of the **ancient Silk Road**.
- Historically connected the Indian subcontinent with **Tibet** and facilitated trade.

## Trade &amp; Strategic Significance

- Border trade through Nathu La was **reopened in 2006** after being closed following the **1962 India–China War**.
- It is one of the **three designated India–China border trade posts**, along with **Shipki La (Himachal Pradesh)** and **Lipulekh (Uttarakhand)**.
- Its reopening can strengthen **border economies, local livelihoods and regional connectivity**.

## Broad Peak: Karakoram's 8,000-metre Giant &amp; High-Altitude Disaster Risk

### Why in News?

**Broad Peak** was in the news after a major **avalanche struck an international climbing expedition** in July 2026, killing several climbers, including renowned mountaineer **Nirmal Purja**. Rescue and recovery operations were conducted under extremely difficult high-altitude conditions.

### Geographical Profile

- **Elevation:** about **8,047 m**; world's **12th-highest mountain**.
- Located in the **Karakoram Range**, near **K2**, on the **Pakistan–China border**.
- Its official survey designation is **K3**.
- The mountain has a notably **long summit ridge**, which gives it its name.
- It is among the **14 eight-thousanders**—mountains exceeding 8,000 m elevation.

### Avalanche & High-Altitude Hazards

- **Avalanche:** rapid downslope movement of snow, ice and debris.
- Risk is influenced by **heavy snowfall, unstable snowpack, steep slopes, temperature fluctuations and strong winds**.
- Other hazards include **crevasses, rockfall, altitude sickness and extreme cold**.

## Madura Island

### Why in News?

Madura Island was in the news after the **KM Mutiara Sentosa 2 ferry caught fire near the island**, while travelling from Java towards South Sulawesi. The vessel was carrying **271 people**; rescue operations followed the incident.

### Geographical Profile

- **Madura** is an Indonesian island located off the **northeastern coast of Java**.
- It forms part of **East Java Province**.
- It is separated from Java by the **Madura Strait**.
- The **Java Sea** lies to its north, while the **Madura Strait** separates it from Java to the south.
- The island is inhabited predominantly by the **Madurese people**, with **Madurese** as the principal regional language.
- **Suramadu Bridge** connects Madura Island with **Surabaya on Java**, spanning the Madura Strait.

### Maritime Significance

Madura's location places it within Indonesia's densely interconnected **inter-island maritime network**. Its proximity to Surabaya, one of Indonesia's major ports and urban centres, makes the surrounding waters important for ferry and cargo transportation.

## Ethiopia

### Why in News?

Ethiopia was in the news after a **landslide triggered by heavy rainfall** struck the **Tsadqane Debre Mitmaq St. Mary Monastery in the Amhara Region** on 3 August 2026, killing at least 14 people and injuring several others. Rescue operations continued amid fears that more people could be trapped.

### Geographical Context

- **Ethiopia** is a **landlocked country in the Horn of Africa**.
- It borders **Eritrea, Djibouti, Somalia, Kenya, South Sudan and Sudan**.
- Much of the country is characterised by the **Ethiopian Highlands**, deeply dissected by rivers and valleys.
- Ethiopia forms an important part of the **East African Rift System**, where the **Somali Plate and Nubian Plate** are gradually diverging.

- The region experiences seasonal heavy rainfall during the **Kiremt (summer rainy season)**, contributing to flood and landslide risks.

#### Why Landslides Occur?

Prolonged/intense rainfall saturates soil, increases pore-water pressure and reduces slope stability. **Steep terrain, deforestation, land-use changes and inadequate infrastructure** can further amplify vulnerability.

### Dikhow River

#### Why in News?

The **Dikhow River** has recently drawn attention following severe flooding in **Sivasagar district, Assam**. The floods have also renewed concerns over **unregulated sand and stone extraction** along the riverbanks, which can alter river morphology and increase erosion and flood vulnerability.

#### Geographical Profile

- The **Dikhow** is a **left-bank tributary of the Brahmaputra**.
- It **originates in Nagaland** and flows through **Sivasagar district of Assam** before joining the Brahmaputra at **Dikhowmukh**.
- It forms part of the **Upper Brahmaputra drainage system**.
- The river is important for the ecology, agriculture and settlements of **Upper Assam**.

#### Environmental Concerns

- Excessive **sand and stone mining** can destabilise riverbanks, modify channel morphology and accelerate erosion.
- During intense monsoon rainfall, altered channels and unstable banks can aggravate **flooding and sediment-related hazards**.
- Sustainable extraction and river-basin management are therefore important.

### Ujh Multipurpose Project

#### Why in News?

The Union Government recently reviewed the **status and phased implementation roadmap** of the **Ujh Multipurpose Project (MPP)** in **Kathua district, Jammu & Kashmir**, with emphasis on faster execution. The project has been revived after a prolonged delay.

#### Key Features

- **River:** Ujh, an important **tributary of the Ravi River**.
- **Location:** Kathua district, J&K.
- The Ujh originates in the **Kailash Mountains** and eventually joins the Ravi in Punjab.
- The project is designed for **irrigation, hydropower generation and water storage**.
- Revised project proposal was accepted by the **Technical Advisory Committee (TAC) of the Central Water Commission** in 2022 at an estimated cost of **₹11,907.77 crore**.
- It is expected to store around **781 million cubic metres (MCM)** of Ujh waters.
- The project is expected to support irrigation of about **90,000 hectares** of agricultural land in J&K and Punjab.

#### Indus Water Treaty Link

The **Ravi** is one of the three Eastern Rivers—**Ravi, Beas and Sutlej**—whose waters are allocated to India under the **Indus Waters Treaty (1960)**. The project seeks to enhance India's utilisation of these waters, including flows currently crossing into Pakistan unutilised.

### Buckingham Canal

#### Why in News?

The **Buckingham Canal** has returned to public attention amid renewed discussions on its restoration, navigability and potential role in improving **urban drainage and flood management in Chennai**.

#### About Buckingham Canal

- A historic **man-made navigation canal** running parallel to India's **Coromandel Coast**.
- Extends for about **450 km**, with approximately **250 km in Andhra Pradesh** and **200 km in Tamil Nadu**.
- Together with the **Krishna and Godavari canal systems**, it once formed an important navigable inland-waterway network.
- Originally constructed in **1806 by Basil Cochrane** and initially called the **Cochrane Canal**.
- Taken over by the government in **1837** as the **East Coast Canal**.
- Renamed **Buckingham Canal in 1878**, after the Duke of Buckingham and Chandos, Governor of Madras.

#### Contemporary Challenges

The canal suffers from **encroachment, untreated sewage, solid-waste pollution and siltation**, reducing its ecological and drainage capacity.

### Mahadayi River

#### Why in News?

The Centre has clarified that **no proposal seeking Environmental Clearance (EC) for diversion of the Mahadayi/Mhadei River is currently pending** before the Union Environment Ministry. The issue remains linked to the long-standing **Karnataka–Goa water dispute** and the proposed **Kalasa-Banduri project**.

#### Key Facts

- **Mahadayi/Mhadei River** originates in **Belagavi district, Karnataka**, and flows westwards into **Goa**, where it is known as the **Mandovi**.
- It is an important **west-flowing river of the Western Ghats**.
- **Goa** is the principal downstream state; the river is ecologically significant for its forests, wetlands and biodiversity.
- Karnataka proposes diversion through the **Kalasa-Banduri Nala Project** to augment drinking-water supplies in **Belagavi, Dharwad, Gadag and Bagalkot**.
- Goa opposes diversion, citing impacts on **downstream flow, ecology and Western Ghats biodiversity**.
- The **Mahadayi Water Disputes Tribunal** was constituted under the **Inter-State River Water Disputes Act, 1956**; its award was notified in 2018.
- The dispute continues to involve proceedings before the **Supreme Court**. The Centre returned Karnataka's wildlife-clearance proposal in July 2026 because the matter remains sub judice.

### Earthquake Swarm

#### Why in News?

Maharashtra has recently experienced a series of small earthquakes, particularly around **Nashik and Palghar**. At least **24 tremors were recorded between July 25 and August 12, 2026**, prompting scientists to study the phenomenon as an **earthquake swarm**.

#### What is an Earthquake Swarm?

An **earthquake swarm** is a sequence of multiple earthquakes occurring in a relatively small area over a short period, generally **without one clearly dominant mainshock**. Unlike a conventional earthquake sequence, it is not necessarily characterised by one major earthquake followed by aftershocks.

#### Possible Causes

- **Fluid movement:** Movement of groundwater or other fluids can alter pressure along faults and trigger small slips.
- **Magma movement:** In volcanic regions, magma intrusion can fracture surrounding rocks.
- **Slow-slip events:** Gradual movement along faults over weeks to years can generate seismic activity.
- Swarms can also occur due to **tectonic stress and pre-existing faults**.

#### Maharashtra Context

Maharashtra has experienced earthquake swarms earlier, including around **Dahanu/Palghar** and **Nanded**. The present activity is being monitored to determine whether it reflects local fault movements or other geological processes.

### Mushq Budji Rice

#### Why in News?

**Mushq Budji/Mushqbudji**, a traditional aromatic rice of Kashmir, is witnessing renewed cultivation. However, the recent increase in production is creating a new challenge: **limited market demand and the need to develop stronger value chains for the expanding crop**.

The variety had earlier faced near-extinction because of **rice blast disease**, but revival programmes and improved disease-resistant lines have helped bring it back into cultivation.

#### Key Facts

- **Region:** Higher reaches of the **Kashmir Valley**, Jammu & Kashmir.
- **Nature:** **Short, bold, aromatic, non-Basmati rice**.
- Major traditional production areas include **Sagam, Panzgam and Soaf Shali in Anantnag** and the **Beerwah belt of Budgam**.
- It is generally cultivated at around **5,000–7,000 feet** above sea level.
- Particularly valued for its **distinctive fragrance, taste and organoleptic properties**.
- It has cultural importance and is traditionally associated with **special occasions and Kashmiri cuisine**.

#### GI Tag

Mushqbudji Rice received its **Geographical Indication (GI) registration in 2023**.

- **GI Application:** 758
- **Applicant:** Sagam Mushqbudji Farmer Producer Company Ltd.
- **Category:** Agricultural product
- **Registration valid until:** **13 June 2031**.

#### Science Behind Its Aroma

Scientists have identified around **35 volatile organic compounds (VOCs)** contributing to Mushq Budji's distinctive aroma.

An important aromatic compound is **2-acetyl-1-pyrroline (2-AP)**, also associated with the fragrance of some other aromatic rice varieties. Aroma is influenced by **altitude, temperature and rainfall**, showing how agro-climatic conditions interact with crop genetics.

### Kazakhstan

#### Why in News?

India's **Chief Election Commissioner Gyanesh Kumar** met Kazakhstan's Ambassador **Azamat Yeskarayev** in New Delhi to discuss **electoral management, capacity building and staff training**, highlighting growing institutional engagement between the two countries.

#### Geographical Profile

- **Kazakhstan** is the **world's largest landlocked country** and the **largest country in Central Asia**.

- It borders **Russia, China, Kyrgyzstan, Uzbekistan and Turkmenistan**.
- It has a coastline along the **Caspian Sea**, which is an **enclosed inland water body**, not an ocean.
- The **Aral Sea** is shared by Kazakhstan and Uzbekistan.
- Major water bodies include **Lake Balkhash, Lake Zaysan and Lake Alakol**.
- **Capital:** Astana.

#### India–Kazakhstan Linkages

- Kazakhstan is an important partner for India in **Central Asia**, including cooperation in **energy, trade, defence, counter-terrorism and connectivity**.
- Both countries cooperate through the **SCO, UN and CICA**.
- Kazakhstan is an important source of **uranium** for India and has significance for India's broader energy security.
- The **India–Kazakhstan Inter-Governmental Commission**, established in **1993**, is the apex bilateral mechanism for economic cooperation.

### Blood Falls

#### Why in News?

A recent study published in *Nature Geoscience* has found a distinct community of **marine-derived microorganisms** in the brine associated with **Blood Falls**, providing strong evidence that the subglacial brine has an **ancient marine origin**.

#### What is Blood Falls?

- Located at the **terminus of Taylor Glacier** in the **McMurdo Dry Valleys, East Antarctica**.
- It is a reddish outflow of **iron-rich, highly saline brine**.
- The red colour results when dissolved **iron comes into contact with oxygen and oxidises**, producing iron oxides.
- The brine is trapped beneath the glacier and emerges intermittently at its terminus.

#### Major Scientific Finding

- Researchers analysed microbial communities from **water, sediment and air samples**.
- Marine-specific microbial lineages were detected, including **eukaryotic organisms**, indicating that the brine likely originated from **ancient seawater** trapped beneath the advancing glacier.
- The ecosystem survives under **extreme cold, darkness and high salinity**, demonstrating remarkable microbial adaptation.

### NCPOR: India's Gateway to Polar & Ocean Science

#### Why in News?

The **8th BRICS Working Group Meeting on Ocean Polar Science and Technology (OPST)** was held in Goa from **12–14 August 2026** during India's BRICS Presidency. It was hosted by the **National Centre for Polar and Ocean Research (NCPOR)**. The meeting focused on scientific cooperation, knowledge exchange, capacity building and collaborative research in ocean and polar sciences.

#### About NCPOR

- Established in **1998** as an autonomous R&D institution.
- Formerly known as **National Centre for Antarctic and Ocean Research (NCAOR)**.
- Located at **Vasco da Gama, Goa**.
- Functions under the **Ministry of Earth Sciences (MoES)**.
- Nodal organisation for India's **Antarctic Programme** and polar expeditions covering **Antarctica, Arctic, Southern Ocean and Himalayas**.
- Contributes to **EEZ mapping, continental-shelf surveys and Deep Ocean Mission**.

- Associated with India's polar research stations: **Maitri, Bharati, Himadri**, and the Himalayan station **Himansh**.



### ENVIRONMENT AND ECOLOGY



#### Pradhan Mantri Surya Sarovar Yojana

##### Why in News?

The **Union Cabinet** approved the **Pradhan Mantri Surya Sarovar Yojana (PM-SSY)** on **31 July 2026** to promote **Floating Solar Photovoltaic (FSPV)** projects with **Energy Storage Systems (ESS)**. The scheme has a total outlay of **₹5,070 crore**.

##### Key Features

- Targets **5,000 MW** of floating solar capacity during **FY 2026–27 to FY 2030–31**.
- Projects will have co-located ESS with minimum **2-hour storage capacity**, totalling **10,000 MWh**.
- Financial support will continue up to **FY 2032–33**.
- Provides **Central Financial Assistance (CFA)** of **₹1 crore/MW** after successful commissioning.
- Up to **₹50 lakh/project** is available for feasibility studies, including **bathymetry, hydrography and environmental studies**.
- **National Institute of Solar Energy (NISE)** estimates India's floating-solar potential at approximately **102.18 GWp** across reservoirs and suitable inland water bodies.

##### Why Floating Solar?

FSPV uses water surfaces of **reservoirs and industrial ponds**, reducing competition for scarce land. Water-based deployment can also help reduce evaporation, while ESS improves **grid reliability** by storing electricity for later use.

#### Environmental Performance Index 2026

##### Why in News?

The **2026 Environmental Performance Index (EPI)** ranked **India 176th out of 177 countries**, making it the **second-lowest ranked country**. The poor performance has renewed concerns over air pollution, environmental health and biodiversity, while experts have also questioned aspects of the index methodology.

##### About EPI

- **Published by:** Yale Center for Environmental Law & Policy, in collaboration with **Columbia University's CIESIN**.
- **Frequency:** Biennial.
- **2026 EPI:** Covers **177 countries, 47 indicators** and **12 issue categories**.
- Three broad policy objectives:

1. **Environmental Health**
2. **Ecosystem Vitality**
3. **Climate Change**

- **Estonia** ranked **1st**, while **Laos** ranked last.

#### India's Performance

- **Overall Rank:** 176; **Score:** 22.46.
- **Environmental Health:** 174th.
- **Air Quality:** 175th.
- **Biodiversity & Habitat:** 174th.
- India performed relatively better in **Climate Change Mitigation**, ranking **130th**.

#### Cholanaikkan Tribe

##### Why in News?

Members of the **Cholanaikkan tribe** in **Kerala** recently emerged from their forest settlements to receive official documents, highlighting the challenges of extending **state services and identity documentation** to highly isolated tribal communities.

##### About the Cholanaikkans

- They inhabit the **Karulai and Chungathara forest ranges** of the **Nilambur region, Malappuram district, Kerala**, in the Western Ghats.
- They are classified as a **Particularly Vulnerable Tribal Group (PVTG)**.
- Traditionally dependent heavily on **Non-Timber Forest Produce (NTFP)** for subsistence and exchange.
- They are noted for living in **natural rock shelters/caves**, earning them the description "**Cavemen of Kerala**."
- They speak **Cholanaikkan**, a distinct **Dravidian language**.
- Their traditional economy has strong **hunter-gatherer characteristics**.

##### PVTG Linkage

PVTGs are among the most vulnerable tribal communities and are identified using characteristics such as **pre-agricultural technology, low literacy, economic backwardness and declining/stagnant population**.

#### Lepidoptera

##### Why in News?

The **Zoological Survey of India (ZSI)** has completed a 12-year effort to document India's Lepidoptera diversity. The resulting *Catalogue of Lepidoptera of India* records **13,703 species of butterflies and moths**, highlighting India's rich insect biodiversity.

##### What is Lepidoptera?

- **Lepidoptera** is an order of insects comprising **butterflies and moths**.
- The name is derived from Greek words referring to "**scale**" and "**wing**", reflecting their characteristic **scaly wings**.
- They undergo **complete metamorphosis (holometabolism)**: **egg → larva (caterpillar) → pupa → adult**.
- Adults generally possess a **coiled proboscis** for feeding on nectar and other liquids.
- Caterpillars usually have **chewing mouthparts**, while adults generally have **sucking mouthparts**.

##### India's Diversity

- India hosts **13,703 Lepidoptera species**, approximately **8.25% of the world's known species**.
- The catalogue consolidates taxonomic information accumulated over **more than a century**.

- Lepidopterans are important **pollinators, herbivores and components of food webs.**

### Spoon-Tailed Duskhawker

#### Why in News?

Researchers recently verified the **first photographic evidence in Arunachal Pradesh** of the **Spoon-Tailed Duskhawker (*Gynacantha basiguttata*)**, adding to India's documented dragonfly diversity. The finding highlights the rich but still underexplored biodiversity of Northeast India.

#### About Spoon-Tailed Duskhawker

- **Scientific name:** *Gynacantha basiguttata*
- A species of **dragonfly** belonging to the family **Aeshnidae**.
- Recorded in the **Philippines and several parts of Southeast Asia**.
- Associated with habitats such as **streams and forest pools**, where individuals may patrol or perch.
- A predatory insect that feeds on flying insects such as **mosquitoes, small flies and gnats**.
- Plays an important role in **aquatic and forest food webs**.

#### Distinctive Features

- A characteristic **black T-shaped mark on the frons** (front part of the head).
- **Olive-green thorax** without a stripe.
- Distinctive wing pigmentation.
- Narrow and expanded **cerci**, giving its abdominal appendages a characteristic **spoon-like appearance**.

### Hara Mangrove Forest

#### Why in News?

The **Hara mangrove forests in southern Iran** have faced an oil-spill threat, highlighting the vulnerability of sensitive coastal ecosystems to maritime accidents and conflict-related pollution. Satellite observations have indicated oil leakage and slick movement toward the **Khuran Strait–Hara wetland system**.

#### Key Facts

- **Location:** **Hormozgan Province, Iran**, mainly around **Qeshm Island and the Khuran Strait**, in the northern Persian Gulf.
- Locally known as **Hara/Harra forests**.
- Dominant mangrove species: ***Avicennia marina***, commonly called **grey mangrove**.
- Hara is considered the **largest mangrove habitat in the Persian Gulf**.
- The ecosystem supports **migratory birds, fish and other marine organisms**, besides providing coastal protection and livelihood-related ecosystem services.
- The **Hara Protected Area** is associated with multiple conservation designations, including a **Ramsar wetland, Hara Biosphere Reserve and Important Bird Area**.

#### Why Mangroves Matter

Mangroves are **salt-tolerant intertidal ecosystems**. Their aerial roots facilitate gas exchange in waterlogged soils, while dense root systems:

- reduce coastal erosion;
- trap sediments;
- provide nursery grounds for fish;
- store substantial amounts of **blue carbon**.

### Lead Exposure

### Why in News?

Researchers at the **ICMR–National Institute of Nutrition (NIN), Hyderabad**, found that environmental lead exposure can significantly worsen neuronal damage, particularly in the presence of **amyloid-β peptides**, which are associated with Alzheimer’s disease pathology. The study was published in the *Journal of Applied Toxicology*.

### Key Findings

- **Lead (Pb)** is a toxic, naturally occurring heavy metal and has **no known beneficial biological role**.
- Researchers studied **human neuronal cells under laboratory conditions**.
- Lead and amyloid-β individually impaired **lysosomal function**; combined exposure caused substantially greater disruption.
- **Lysosomes** act as cellular waste-disposal and recycling organelles, breaking down damaged proteins and cellular debris.
- Combined exposure reduced cell survival, disturbed lysosomal acidity and caused structural damage and membrane leakage.
- Proteins/genes involved included **TFEB, TRPML1, LAMP1, LAMP2 and Cathepsin B**.

### Lead

- **Atomic number: 82 | Symbol: Pb**
- Major ore: **Galena (PbS)**
- Usually occurs with **zinc, silver and copper**.
- Uses include **lead-acid batteries, ammunition and radiation shielding**.
- Exposure can damage the **nervous, renal and cardiovascular systems**, with children particularly vulnerable.

## Hallaniyat Islands

### Why in News?

The **Hallaniyat Islands**, off Oman’s southern coast, are in the news after the tanker **Caroline Bezengi** ran aground near the protected marine zone and an extensive oil spill threatened the surrounding ecosystem.

### Key Facts

- **Location:** Off the **Dhofar Governorate**, southern Oman, in the **Arabian Sea**.
- The archipelago consists of **four main islands** and forms an important marine and terrestrial biodiversity area.
- The islands experience strong **upwelling of cold, nutrient-rich waters**, particularly during the **Southwest Monsoon (May–September)**.
- The region supports diverse marine life, including **sea turtles, seabirds and cetaceans**.
- It is recognised as a **Key Biodiversity Area (KBA)**, with 100% of the assessed KBA area under protected-area coverage.
- **Al Qibliyah Island** lies within the Hallaniyat marine protected zone.

### Oil-Spill Linkage

The tanker grounding and subsequent crude-oil leakage pose risks to **coral reefs, marine organisms, coastal habitats and fisheries**. Satellite monitoring has been used to track the expanding slick.

## Colletes bhutanicus

### Why in News?

Scientists from the **Zoological Survey of India (ZSI)** recorded the rare solitary bee *Colletes bhutanicus* in **Tawang district, Arunachal Pradesh**, for the **first time in India**. Earlier, it was known from **Bhutan and China**.

#### Key Facts

- **Type:** Solitary Himalayan bee; unlike honeybees, it does **not live in large colonies**.
- **Location:** Tawang, Arunachal Pradesh; recorded at **1,500–3,800 m altitude**.
- **Distribution:** Previously reported from **Bhutan and China, including Xizang (Tibet)**.
- **Pollination:** Observed visiting around **25 flowering plant species**, including **mustard, buckwheat, coriander, beans, chilli and eggplant**.
- **Significance:** Extends the known geographical range of the species and adds to India's documented **Himalayan pollinator diversity**.
- **Institution:** **Zoological Survey of India (ZSI)**.

#### Ecological Significance

Solitary bees are important **pollinators**, supporting both wild plant reproduction and agricultural productivity. Their presence highlights the ecological importance of **high-altitude Himalayan habitats**.

### Suckermouth Catfish

#### Why in News?

The **Ujani Reservoir in Maharashtra** is facing severe invasion by suckermouth catfish. The **Bombay Natural History Society (BNHS)** has launched India's first organised, community-driven removal programme, involving local fishermen.

#### Key Facts

- **Origin:** Amazon River basin, **South America**.
- Entered India largely through the **aquarium trade**, after unwanted aquarium fish were released into natural water bodies.
- Commonly called **"helicopter fish"** locally.
- It is an **invasive alien species** that:
  - feeds on fish eggs;
  - competes with native bottom-feeding fish;
  - burrows into riverbanks, causing erosion;
  - can potentially weaken **earthen dam structures**.
- At Ujani, alien fish—including suckermouth catfish, tilapia and African catfish—constitute about **97% of the fish population**, while native species account for only about 3%. Suckermouth catfish alone represents around **30–40%**.

#### BNHS Removal Model

- Collection centre established at **Bhigwan fish market**.
- Fishermen receive financial incentives to collect the invasive fish.
- **36+ tonnes** have already been removed.
- Fish is processed into **molasses/fertiliser**, creating a waste-utilisation value chain.

### Mithun: "Cattle of the Mountain" Faces FMD Outbreak

#### Why in News?

Over **200 Mithuns** have died due to a **Foot-and-Mouth Disease (FMD)** outbreak in **Dibang Valley, Arunachal Pradesh**. Veterinary teams have intensified surveillance, vaccination, treatment and biosecurity measures.

#### Mithun: Key Facts

- **Scientific name:** *Bos frontalis*; also called **Gayal**.
- A large, **semi-domesticated bovine** traditionally reared by communities of Northeast India.
- Known as the “**cattle of the mountain**.”
- **Arunachal Pradesh and Nagaland:** Mithun is the **State Animal** of both states.
- Highest concentration occurs in **Northeast India**, particularly Arunachal Pradesh; also occurs in parts of **China and Southeast Asia**.
- Listed as **Vulnerable** on the **IUCN Red List**.
- Has considerable **socio-cultural significance** among tribal communities and is associated with wealth, prestige, marriage and ceremonial practices.

#### Foot-and-Mouth Disease (FMD)

- Highly contagious **viral disease** caused by **Aphthovirus (family Picornaviridae)**.
- Affects **cloven-hoofed animals** such as cattle, buffalo, sheep, goats, pigs and deer—not horses or zebras.
- Transmission occurs through **direct contact, fomites, contaminated feed/milk and respiratory aerosols**.
- **Important:** FMD is an **animal disease**, distinct from **hand-foot-and-mouth disease in children**.

#### African Swine Fever

##### Why in News?

The **ICAR–National Institute of High Security Animal Diseases (ICAR-NIHSAD)**, Bhopal has developed **India’s first indigenous vaccine against African Swine Fever (ASF)**. The vaccine was dedicated to the nation on **4 August 2026**, marking a major development in veterinary biotechnology and livestock biosecurity.

##### What is African Swine Fever?

- ASF is a **highly contagious viral disease** affecting **domestic and wild pigs**.
- Causative agent: **African Swine Fever Virus (ASFV)**.
- It is **not a zoonotic disease**; it does not infect humans.
- Severe outbreaks can cause mortality approaching **100%**, along with major economic losses.
- India detected ASF for the first time in **2020**, with significant impacts particularly in the **North-Eastern region**.

##### Indigenous Vaccine

- Developed as a **live attenuated vaccine** using **ASFV Genotype II**.
- Uses the widely available **MA-104 cell line**, avoiding dependence on proprietary cell lines.
- Recommended for healthy pigs **above 8 weeks**; a booster follows **14 days** after the primary dose.
- Field validated with the **Department of Animal Husbandry & Dairying (DAHD)**.

#### Clouded Leopard

##### Why in News?

The **clouded leopard** has recently gained attention in India amid continued conservation efforts for this elusive felid, particularly in the **Northeastern region**, where it occurs in forested landscapes. Its conservation highlights the ecological importance of Northeast India as a biodiversity-rich region.

##### About Clouded Leopard

- **Scientific name:** *Neofelis nebulosa*.
- It is a **medium-sized wild cat** known for its distinctive large, cloud-like markings.
- In India, it is primarily associated with **Northeast India and parts of the eastern Himalayas**.
- It is an excellent climber and can descend trees **head-first**, aided by flexible ankle joints.

- It is largely **arboreal**, using dense forest habitats.

#### Conservation Status

- **IUCN Red List: Vulnerable.**
- **CITES: Appendix I**, providing the highest level of international protection from commercial trade.
- **Wildlife (Protection) Act, 1972: Schedule I**, receiving the highest legal protection in India.
- Major threats include **habitat loss and fragmentation, hunting, prey depletion and human disturbance.**

### Hippocampus amandavinctae

#### Why in News?

Scientists led by the **Kerala University of Fisheries and Ocean Studies (KUFOS)** have identified a new seahorse species, *Hippocampus amandavinctae*, from the Indian Ocean. The discovery resolves a **150-year-old taxonomic confusion** surrounding the thorny seahorse group. The findings were published in *Zootaxa*.

#### Key Features

- Belongs to the genus **Hippocampus** and family **Syngnathidae**.
- Identified using a combination of **morphological characteristics and DNA analysis**, demonstrating the importance of molecular taxonomy.
- Specimens were initially obtained from **fishery bycatch at Tuticorin Fisheries Harbour, Tamil Nadu**.
- Named after **Amanda Vincent**, a renowned marine biologist and co-founder of **Project Seahorse**.
- The discovery makes it the **fifth known seahorse species recorded from India**.

#### Seahorse: Prelims Facts

- Seahorses are **marine fishes**, not mammals.
- They exhibit an unusual reproductive system in which the **male carries developing embryos and gives birth**.
- They are associated with **seagrass beds, mangroves, coral reefs and other shallow coastal habitats**.
- Their populations are vulnerable to **habitat degradation, bycatch and unsustainable trade**.

### Ghatiana karnataka

#### Why in News?

A new freshwater crab species, *Ghatiana karnataka*, has been scientifically described from **Mookambika Wildlife Sanctuary, Udupi, Karnataka**. It was discovered by a **beat forester** and described with a scientist from the **Zoological Survey of India (ZSI)**.

#### Key Facts

- **Genus:** *Ghatiana*
- **Type:** Freshwater crab.
- **Location:** **Mookambika Wildlife Sanctuary**, Central Western Ghats, Karnataka.
- It is the **15th known species of the genus Ghatiana** in the Western Ghats.
- **Eight species**, including the newly described one, are **endemic to Karnataka**.
- **Appearance:** Dark-purple body with **light-pink claws**.
- **Habitat:** Perennial streams and **evergreen/semi-evergreen forests**.
- During monsoon, it occurs around **laterite rocks**; in other seasons, it shelters in **moist tree cavities**.

#### Ecological Significance

Freshwater crabs are sensitive to **habitat alteration and pollution**. The new species can therefore serve as an indicator of relatively **undisturbed freshwater-forest ecosystems**. The discovery also highlights the still-underexplored biodiversity of the **Western Ghats**.

### Mission Mausam: Towards a Weather-Ready & Climate-Smart India

#### Why in News?

The **Ministry of Earth Sciences (MoES)** highlighted the progress and future roadmap of **Mission Mausam**, aimed at making India a “**Weather-ready and Climate-smart Nation.**”

#### Key Facts

- **Launched:** 14 January 2025.
- **Approved:** Union Cabinet in 2024.
- **Initial outlay:** ₹2,000 crore for 2024–25 and 2025–26.
- **2026–27 BE:** ₹1,342.29 crore.
- **Implementing Ministry:** Ministry of Earth Sciences.
- **Focuses on:**
  - Advanced **Doppler Weather Radars**
  - Satellites and remote sensing
  - **High Performance Computing (HPC)**
  - Numerical Weather Prediction
  - Earth System Models
  - **AI/ML and physics-AI models**
  - Improved nowcasting and early-warning systems.

#### Six Verticals (2026–31)

1. **OBSERVE\_ALL** – enhanced weather observations
2. **DEVELOP** – Earth System Model development
3. **Weather\_MOD** – weather modification research
4. **ATCOMP** – atmospheric composition monitoring & modelling
5. **FRONTIER** – frontier technologies
6. **NEAT** – National Enterprise for Atmospheric Technology

### Nyishi Tribe & *Begonia neelamorum*

#### Why in News?

A new begonia species, ***Begonia neelamorum***, was discovered in **Keyi Panyor district of Arunachal Pradesh** and named after the **Neelam clan of the Nyishi tribe**. Members of the clan helped researchers navigate the difficult terrain and locate the plant.

#### Nyishi Tribe – Key Facts

- **State:** Arunachal Pradesh; considered its **largest ethnic group**.
- Traditionally speak the **Nishi language**, belonging to the **Tani linguistic group**.
- Distributed across **eight districts**, including East Kameng, Pakke-Kessang, Papum Pare, Lower Subansiri, Kamle, Kra Daadi, Kurung Kumey and Upper Subansiri.
- Traditional livelihoods include **agriculture, hunting and fishing**, along with cane-bamboo crafts and weaving.
- Important festivals: **Boori-Boot, Nyokum and Longte**.

#### *Begonia neelamorum*

- Found on **steep, moist rock walls** along the **Keyi River**, around **1,000 m elevation**.

- A small perennial herb, approximately **10–20 cm tall**, with a single serrated leaf and white flowers.
- The discovery highlights the **Eastern Himalaya's rich and underexplored plant diversity**.

### Microbacterium pollutisoli

#### Why in News?

Scientists from the **University of Delhi and CSIR-Institute of Microbial Technology** discovered a new bacterial species, ***Microbacterium pollutisoli***, in **HCH-contaminated soil at Ummari village, Uttar Pradesh**.

#### Key Facts

- **Type:** Gram-positive, short rod-shaped, yellow-pigmented bacterium belonging to genus **Microbacterium**.
- Isolated from soil at about **30 cm depth** in a heavily pesticide-contaminated dumpsite.
- The site contains **Hexachlorocyclohexane (HCH)**, a persistent pesticide associated with serious health and environmental concerns.
- The bacterium **does not consume HCH**, but survives under pesticide stress.
- It can tolerate **12–46°C** and highly alkaline conditions.
- Its genome contains **biosynthetic gene clusters** potentially associated with production of **carotenoids, ectoine and beta-lactones**.
- **Average Nucleotide Identity (ANI):** ~83% with its closest known relative, *M. invictum*; species-level bacterial identity is generally associated with an ANI threshold of about **95%**.
- **Polyphasic taxonomy**—combining morphological, biochemical and molecular evidence—confirmed it as a new species.

### Russula griseopurpurata

#### Why in News?

A mushroom collected beneath a **sal tree in Jirang, Ri-Bhoi district of Meghalaya**, in 2022 has been identified as a **new species to science**, named *Russula griseopurpurata*. The discovery was published in **Phytotaxa** in August 2026 by researchers from **Gauhati University**.

#### Key Facts

- **Genus:** *Russula*; a large and diverse group of mushrooms.
- Around **2,000 species** of *Russula* are known globally; **180+** have been documented in India.
- **Habitat:** Beneath *Shorea robusta* (**Sal**) trees; recorded from **Meghalaya and West Bengal**.
- **Appearance:** Greyish-purple cap that develops cracks with maturity; gills show characteristic **forking near the stalk**.
- **Identification:** Based on morphological and microscopic features along with **ITS DNA sequencing and phylogenetic analysis**.
- **Holotype:** Meghalaya specimen deposited as **GUBH 20331**.
- **Important:** Although some *Russula* species are edible, **edibility of *R. griseopurpurata* has not been established**.

### Black-Necked Crane

#### Why in News?

The **Bombay Natural History Society (BNHS)** has sterilised **over 2,950 free-ranging dogs in Ladakh** since **2022** to reduce predation on **Black-Necked Crane chicks** and disturbance to nesting birds in alpine wetlands. The programme involves the **Indian Army, Animal Husbandry Department and Department of Forest, Ecology & Environment**.

**Key Facts**

- **Scientific name:** *Grus nigricollis*
- **Conservation status:** **Vulnerable (IUCN).**
- **Global population:** About **11,000–12,000**, with most occurring on the **Tibetan Plateau**.
- **India:** Fewer than **100** birds are estimated to survive.
- **State bird:** **Ladakh.**
- Important breeding areas include **Changthang Cold Desert Wildlife Sanctuary**, particularly **Hanle, Tso Kar and Nyoma** wetlands, besides the **Suru Valley**.
- The species is associated with **high-altitude wetlands and grasslands**.

**Conservation Challenge**

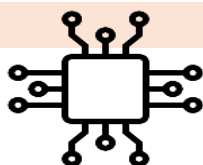
Free-ranging dogs prey on crane chicks and disturb nesting. **Unmanaged food waste** from settlements, tourism and other human activities provides food subsidies that sustain dog populations. Therefore, conservation combines **sterilisation + waste management + habitat protection**.

**Prakriti Gyan Dham: India's Eco-Educational Hub**

**Background:** India's first-of-its-kind eco-educational hub, **Prakriti Gyan Dham**, was dedicated to the nation at MPBC, Banthra Campus, Lucknow.

**Prakriti Gyan Dham**

- **Location:** Maharishi Parashar Bioresource Centre (MPBC), Banthra Campus, Lucknow.
- **Institutional link:** **CSIR–National Botanical Research Institute (NBRI).**
- **Purpose:** Experiential learning, environmental awareness and public engagement.
- **Core elements:** **Living botanical collections, heritage trails, digital interpretation and technology-oriented initiatives.**
- **Focus:** Botanical diversity, conservation, heritage and scientific outreach.
- **Broader objective:** Strengthen the interface between **scientific institutions and society** while fostering a deeper connection with nature.



## SCIENCE &amp; TECHNOLOGY

## CosmoCube Mission: Unlocking the Universe's Cosmic Dark Ages

## Why in News?

An international team of astronomers has proposed the **CosmoCube Mission**, a suitcase-sized satellite designed to detect extremely faint radio signals from the universe's early stages, dating back over **13.5 billion years**. The mission was recently highlighted for its potential to study the poorly understood **Cosmic Dark Ages**.

## About CosmoCube Mission

- A proposed small satellite mission led by scientists associated with the **University of Cambridge, UK**.
- Planned to **orbit the Moon** and use the **lunar far side** as a natural shield against radio interference from Earth.
- Will attempt to detect the redshifted **21-centimetre (21-cm) hydrogen line**.
- The proposed mission duration is about **two years**, potentially collecting around **1,000 hours of low-frequency radio data**.

## Scientific Significance

The **Cosmic Dark Ages** began after the formation of neutral atoms and preceded the emergence of the first stars. Neutral hydrogen present during this period produced the **21-cm signal**, which can provide insights into:

- Early-universe gas conditions;
- Formation of the first stars and galaxies;
- **Cosmic Dawn and Epoch of Reionisation**;
- Possible role of **dark matter** in structure formation.

## Cholera

## Why in News?

Cholera remains a significant public-health threat, particularly in communities lacking **safe drinking water, sanitation and hygiene facilities**. Recent discussions have highlighted that despite being preventable and treatable, cholera continues to cause deaths, especially during humanitarian crises, floods and other disruptions to water systems.

## What is Cholera?

- An **acute diarrhoeal infection** caused mainly by the bacterium ***Vibrio cholerae***.
- Transmission occurs predominantly through **contaminated food or water**, making it closely linked to inadequate WASH infrastructure.
- The bacterium produces **cholera toxin**, causing massive secretion of water and electrolytes into the intestine.
- Severe cases can result in **profuse watery diarrhoea, dehydration, electrolyte imbalance and death within hours** if untreated.

## Prevention &amp; Treatment

- **Oral Rehydration Solution (ORS)** is central to treatment of dehydration; severe cases may require **intravenous fluids and antibiotics**.
- Prevention depends primarily on **safe water, sanitation, hygiene, food safety and surveillance**.
- **Oral cholera vaccines (OCVs)** can support outbreak control but do not substitute for long-term WASH improvements.

### Xtreme Weather Grade Diesel

#### Why in News?

The **Indian Oil Corporation Limited (IOCL)** has developed **Xtreme Winter Diesel**, a specialised diesel fuel designed to maintain performance under **extremely low temperatures** in high-altitude and cold regions. The development supports reliable mobility and energy supply in areas such as **Ladakh and the Himalayan region**.

#### Key Features

- Specially formulated to remain usable at **very low temperatures**, where conventional diesel may develop wax crystals and lose flowability.
- Designed with a significantly lower **Cloud Point** and **Pour Point**, enabling operation in extreme cold.
- **Cloud Point**: Temperature at which wax crystals first become visible in diesel.
- **Pour Point**: Lowest temperature at which the fuel can still flow under specified conditions.
- Useful for **military vehicles, heavy machinery and civilian transport** in high-altitude areas.
- Supports **strategic mobility and logistics** in remote border regions.

#### Why is it Important?

At low temperatures, paraffin/wax present in diesel can crystallise, clogging fuel filters and restricting fuel flow. Winter-grade diesel reduces this problem through appropriate **fuel formulation and additives**, ensuring engine reliability.

### Magellanic Bridge

#### Why in News?

Researchers led by the **Inter-University Centre for Astronomy and Astrophysics (IUCAA)** identified a rare **sympiotic star system** in the Magellanic Bridge using X-ray observations from **eROSITA**. The discovery provides insights into how interactions between galaxies influence stellar evolution.

#### What is the Magellanic Bridge?

- A **stream of gas and stars connecting the Large Magellanic Cloud (LMC) and Small Magellanic Cloud (SMC)**.
- Both are **dwarf satellite galaxies of the Milky Way**.
- The Bridge was formed largely through **tidal interactions**, particularly during a close encounter between the LMC and SMC around **200–300 million years ago**.
- It contains predominantly **gas**, along with a smaller population of young stars formed within it.

#### Recent Astronomical Discovery

The newly identified system, **eRASSU J043115.8–711730**, is a **sympiotic accreting system** involving a **white dwarf and a red giant**. Material transferred from the red giant is accreted by the white dwarf, producing strong X-ray emission. It is the **first confirmed sympiotic system discovered in the Magellanic Bridge**.

### Magnetorheological Fluid

#### Why in News?

Researchers at **DRDO's Centre for Personnel Talent Management (CEPTAM)** have developed a **magnetorheological (MR) fluid-based semi-active vibration isolator** for controlling vibrations in sensitive systems. The indigenous technology has potential applications in **aerospace, defence and precision engineering**.

#### What is Magnetorheological Fluid?

- An **MR fluid is a smart fluid** whose apparent viscosity and flow behaviour change rapidly when exposed to a **magnetic field**.
- It generally consists of **magnetically responsive particles**, such as iron particles, suspended in a carrier fluid.
- In the absence of a magnetic field, particles remain relatively randomly dispersed and the fluid flows easily.
- When a magnetic field is applied, particles align into **chain-like structures**, increasing resistance to flow and effectively changing the fluid's mechanical behaviour.
- The change is **rapid and reversible**, making MR fluids useful for adaptive systems.

#### Applications

MR-fluid technology can be used in:

- **Vibration isolation and damping**
- Vehicle suspension systems
- Seismic protection
- Aerospace structures
- Robotic systems and precision machinery
- Defence platforms

#### PowerBank-50: India's First Flight-Proven Indigenous Satellite Battery

##### Why in News?

Hyderabad-based space-tech startup **TakeMe2Space's PowerBank-50** has become the **first indigenously developed, commercially available satellite battery in India to achieve "flight heritage"** after successfully operating aboard **Skyroot Aerospace's Vikram-1** mission. The mission was launched on **18 July 2026**.

##### What is PowerBank-50?

- A **space-grade battery pack** designed to provide electrical power to satellite payloads.
- Stores **more than 50 Wh of energy** and weighs around **380 grams**.
- Demonstrated its performance in the **orbital environment**, establishing its reliability for future satellite missions.
- Its successful deployment can reduce dependence on **imported satellite battery systems** and strengthen India's private space manufacturing ecosystem.

##### What is "Flight Heritage"?

**Flight heritage** means that a space component has been **successfully tested and operated in an actual space mission**. It provides greater confidence in the component's reliability compared with laboratory or ground testing alone.

#### Leptospirosis

##### Why in News?

Kerala has been witnessing concern over **leptospirosis-related mortality**, particularly during the monsoon. Flooding and waterlogging increase human exposure to water or soil contaminated with urine of infected animals, especially rodents.

##### What is Leptospirosis?

- A **bacterial zoonotic disease** caused by bacteria of the genus **Leptospira**, particularly *Leptospira interrogans*.
- Infection occurs when contaminated water/soil enters through **cuts, abrasions or mucous membranes** of the eyes, nose or mouth.

- **Rodents** are important reservoirs, while cattle, pigs, dogs and other mammals can also harbour the bacteria.
- **Human-to-human transmission is rare.**

#### Symptoms & Severe Disease

- Common symptoms: **fever, headache, chills, muscle pain, vomiting and diarrhoea.**
- Severe infection can cause **kidney or liver failure, meningitis and multi-organ complications.**
- It is **treatable with antibiotics**, especially when diagnosed early.

### Friedreich Ataxia

#### Why in News?

**Friedreich ataxia (FA)** has gained attention as a **rare inherited neurological disorder** for which newer disease-modifying treatment options are emerging. The disease remains an important example of how understanding genetic mutations can guide targeted therapies.

#### Key Facts

- **Nature:** Rare, **inherited neurodegenerative disorder** affecting coordination and movement.
- **Inheritance:** **Autosomal recessive**—a person generally inherits defective copies of the relevant gene from both parents.
- **Gene involved:** **FXN (frataxin)** gene.
- **Mutation:** Usually expansion of **GAA trinucleotide repeats** in the FXN gene.
- This reduces production of **frataxin**, an important protein involved in **mitochondrial iron-sulfur cluster formation.**
- Consequence: **Mitochondrial dysfunction and oxidative stress**, leading to progressive damage to nervous and muscular systems.
- Common manifestations include **ataxia, impaired coordination, muscle weakness, speech difficulties and cardiac complications.**

#### Treatment Link

**Omaveloxolone** is a disease-modifying therapy developed for Friedreich ataxia. It acts on cellular antioxidant and stress-response pathways and has shown potential to slow functional deterioration.

### Nancy Grace Roman Space Telescope

#### Why in News?

NASA's **Nancy Grace Roman Space Telescope** is scheduled for launch on **30 August 2026** aboard a **SpaceX Falcon Heavy** from Kennedy Space Center, Florida. After launch, it will travel towards the **Sun–Earth Lagrange Point 2 (L2)**, about **1.5 million km from Earth.**

#### Key Facts

- **Named after:** Nancy Grace Roman, NASA's first chief astronomer and a key figure behind the Hubble Space Telescope.
- **Mission duration:** About **5 years**, with a potential **10-year goal.**
- **Orbit:** **Sun–Earth L2**, located on the side of Earth **opposite the Sun.**
- **Primary objectives:**
  - Understand **dark energy** and the accelerated expansion of the universe.
  - Investigate **dark matter** and cosmic structure.
  - Discover and study **exoplanets.**
  - Explore galaxy formation and evolution.
- Its **Wide Field Instrument (WFI)** will have a field of view **at least 100 times larger than Hubble's**, enabling extremely large astronomical surveys.

- It is expected to conduct a **microlensing survey** of the Milky Way and potentially identify **more than 1,000 exoplanets**.

### Why L2?

At L2, gravitational forces of the **Sun and Earth** allow a spacecraft to maintain a stable relative position with comparatively little orbital correction. The location also provides a favourable, thermally stable environment and an unobstructed view of deep space.

## Escherichia coli (E. coli)

### Why in News?

The **CAG's recent audit of passenger amenities at Indian Railways stations** found **E. coli contamination in drinking-water cooler samples at eight railway stations across four railway zones**. The findings highlight gaps in drinking-water quality, sanitation and monitoring at railway stations.

The audit covered **512 non-suburban railway stations** and found that only about **11%** met all prescribed basic passenger-amenity norms.

### What is E. coli?

**Escherichia coli** is a **Gram-negative, rod-shaped bacterium** belonging to the family **Enterobacteriaceae**.

- It normally lives in the **intestines of humans and many animals**.
- Most strains are **harmless or beneficial**, forming part of the normal gut microbiota.
- Certain pathogenic strains can cause **food- and water-borne infections**.
- Its detection in drinking water is an important indicator of **faecal contamination** and inadequate sanitation.

### Health Concerns

Pathogenic E. coli can cause:

- Diarrhoea and gastroenteritis**
- Abdominal cramps and vomiting
- Haemorrhagic colitis** in some infections
- Severe complications such as **haemolytic uraemic syndrome (HUS)**, particularly with Shiga-toxin-producing strains.

### Why is E. coli an Indicator Organism?

E. coli is widely used as an indicator of **faecal pollution** because:

**Human/animal faecal matter → E. coli enters water → indicates possible contamination → other enteric pathogens may also be present.**

## Myoglobin

### Why in News?

Scientists have successfully engineered **lettuce and tobacco plants to produce myoglobin**, an animal muscle protein important for the **colour, flavour and nutritional properties of meat**. The study was published in *Frontiers in Plant Science*.

### What is Myoglobin?

- An **oxygen-binding protein** found mainly in **skeletal and cardiac muscles**.
- Belongs to the **globin protein family**, like haemoglobin.
- Contains **heme**, an iron-containing group that binds oxygen.
- Acts as an **intramuscular oxygen reservoir**.
- Heme contributes to meat's **red colour and characteristic flavour**.

### Plant-Based Production

- Researchers used **chloroplast transformation** to make plants produce bovine and porcine myoglobin.
- Chloroplasts act as **protein-production platforms**.
- This represents **molecular farming**—using genetically modified plants to produce useful proteins.
- It could provide an alternative to producing animal proteins through **microbial fermentation**.
- A key limitation: only about **35%** of plant-produced myoglobin had the required **heme attached**, compared with around 80% in bacterial production.

### NCCS & India's Gut Microbiome

#### Why in News?

Scientists from **BRIC–National Centre for Cell Science (NCCS), Pune** have identified **14 previously unknown bacterial species and nearly 200 undocumented microbial strains** while studying the gut microbiomes of Indian tribal communities. The study highlights the importance of India-specific microbiome research.

#### About NCCS

- **National Centre for Cell Science (NCCS)** is an autonomous research institution under the **Department of Biotechnology (DBT), Ministry of Science & Technology**.
- Located in **Pune, Maharashtra**, it conducts research in **cell biology, microbiology, cancer biology, immunology, stem cells and bioinformatics**.
- It also maintains a **national repository of authenticated animal cell lines** for research.

#### Gut Microbiome & Key Findings

- **Gut microbiome** refers to the community of microorganisms inhabiting the human gastrointestinal tract.
- Researchers studied **76 adults from eight tribal communities across four biogeographic regions** of India.
- Traditional dietary patterns, particularly consumption of **dairy products and grains**, were associated with distinct microbial profiles.
- Microbiome influences **digestion, metabolism, immunity and nutrient processing**.

### Nitrosamines

#### Why in News?

Nitrosamines have gained attention as **potentially carcinogenic contaminants** that may occur in **food, drinking water and pharmaceutical products**. Recent analysis highlights concerns over their presence even in treated drinking water, including in India.

#### What are Nitrosamines?

- **Nitrosamines** are a group of chemical compounds containing a characteristic **N–nitroso functional group**.
- They can form when **amines react with nitrites/nitrosating agents**, particularly under suitable chemical conditions.
- Some nitrosamines are classified as **carcinogenic or potentially carcinogenic**.
- **N-nitrosodimethylamine (NDMA)** is among the most important examples and is associated with **liver toxicity and cancer risk**.

#### Sources & Exposure

- **Processed/cured foods**, especially certain preserved meats.
- **Drinking water**, including as a by-product of some disinfection processes.
- **Pharmaceutical manufacturing/contamination** can also generate nitrosamine impurities.

- Their formation is influenced by the presence of **amines and nitrites** and environmental/processing conditions.

### Hexavalent Vaccine

#### Why in News?

A recent study has highlighted the potential of **hexavalent vaccines** to improve India's immunisation programme by combining protection against six childhood diseases in a **single injection**, potentially reducing the number of visits and injections required. This is relevant as India continues to strengthen the **Universal Immunisation Programme (UIP)**, which has maintained very high full-immunisation coverage.

#### What is a Hexavalent Vaccine?

- "**Hexa**" = **six**; a hexavalent vaccine protects against **six diseases/antigens** through one vaccine formulation.
- A commonly used formulation provides protection against:
  - **Diphtheria**
  - **Tetanus**
  - **Pertussis**
  - **Polio**
  - **Haemophilus influenzae type b (Hib)**
  - **Hepatitis B**
- It is an example of a **combination vaccine**, designed to simplify childhood vaccination.

#### Why is it Important?

- **Fewer injections** can improve acceptability and compliance.
- Reduces the number of vaccination visits and simplifies **cold-chain and logistics management**.
- Can improve **timely completion of vaccination schedules**, especially in underserved populations.
- Must meet requirements for **safety, immunogenicity and effectiveness** for each component.

### Moon Base Programme

#### Why in News?

NASA has invited **ISRO to join its Moon Base Programme**, marking a major expansion of India-US cooperation in lunar exploration and human spaceflight. The invitation came during the **9th India-US Civil Space Joint Working Group (CSJWG)** meeting held at ISRO headquarters, Bengaluru, on **5-6 August 2026**.

#### Moon Base Programme – Key Facts

- **Objective:** Establish a **sustained human presence on the Moon**, particularly near the **lunar South Pole**.
- NASA's revised programme focuses on **surface infrastructure**, robotic missions and eventual human operations.
- The South Pole is scientifically important because of the possibility of **water ice in permanently shadowed regions**.
- Robotic missions are expected to help identify suitable locations, test technologies and reduce risks before sustained human operations.

#### India-US Space Cooperation

India's participation builds on:

- **Artemis Accords** – framework for peaceful and sustainable lunar exploration.
- **Chandrayaan-3** – demonstrated India's ability to soft-land and operate near the lunar South Pole.

- **NISAR** – major NASA–ISRO Earth-observation collaboration.
- Future cooperation in **human spaceflight, scientific data sharing and commercial space activities**.

### Glyphosate

#### Why in News?

The **Himachal Pradesh Forest Department** is preparing FIRs over the alleged use of **glyphosate** to clear vegetation for pea cultivation on forest land in **Mandi district**. Officials have destroyed illegally cultivated crops and warned that glyphosate use may affect forest soil and nearby water sources.

#### What is Glyphosate?

- A **broad-spectrum, systemic herbicide** used primarily to control weeds.
- It inhibits the **shikimate pathway**, an important biochemical pathway in plants and some microorganisms.
- It is **non-selective**, meaning it can affect a wide range of plants.
- Glyphosate is associated with concerns regarding **biodiversity, soil health, water contamination and human/animal exposure**.

#### Regulation in India

- Pesticides are regulated under the **Insecticides Act, 1968** and related rules.
- A **2022 Central Government notification** sought to prohibit glyphosate use by persons other than **pest-control operators**, citing risks to human and animal health. However, implementation/legal status has remained contested.
- Glyphosate's approved use in India has traditionally been associated with **weed control in tea plantations**.

### RK-251: India's "Smart" Cancer Drug & Targeted Drug Delivery

#### Why in News?

Indian researchers have developed **RK-251**, an experimental "smart" anticancer drug designed to become active primarily **inside cancer cells**, potentially reducing damage to healthy cells associated with conventional chemotherapy. The work was led by scientists from the **Institute of Advanced Study in Science and Technology (IASST)** and **IIT Guwahati**.

#### How Does RK-251 Work?

- RK-251 is a **prodrug**—a relatively inactive form that becomes therapeutically active under specific conditions.
- Cancer cells often contain elevated levels of **reactive oxygen species (ROS)**.
- High ROS levels trigger RK-251 inside tumour cells, releasing **NBDHEX**, an anticancer compound.
- NBDHEX targets **GSTP1-related cellular survival mechanisms**, making cancer cells more vulnerable.
- Preclinical studies showed strong activity against **triple-negative breast cancer (TNBC)** cells.
- Studies using **zebrafish embryos** showed no obvious signs of toxicity.



## HISTORY AND ART &amp; CULTURE



## Dhimsa Dance

## Why in News?

More than **13,000 tribal women and girl students** performed Dhimsa at **Bhogapuram, Andhra Pradesh**, creating a **Guinness World Record for the largest Dhimsa dance performance**.

## About Dhimsa Dance

- A prominent **tribal dance form of the Araku–Paderu region** of Andhra Pradesh.
- Traditionally associated with tribal communities including **Bagata, Valmiki, Poraja, Khond, Gadaba, Kondadora, Mukadora and Kotia**.
- The **Ministry of Tribal Affairs** identifies Dhimsa as an important cultural expression of tribes in the **Paderu region**.
- It is performed during **festivals, weddings, community gatherings and the hunting festival**.
- Dancers generally form **circles/chains**, linking arms and moving rhythmically to percussion and wind instruments.
- Important instruments include **dappu, tudumu, mori, kidgi, gilka and jodukommulu**.
- Dhimsa has **multiple variants**, reflecting diverse tribal traditions.

## Lohagad Fort

## Why in News?

Lohagad Fort was in the news after a video of a local resident confronting tourists allegedly smoking at the historic site went viral, sparking debate over **responsible tourism and protection of heritage monuments**.

## Geographical &amp; Historical Profile

- **Location:** Near **Lonavala, Pune district, Maharashtra**, in the **Western Ghats (Sahyadri)**.
- Also called the **“Iron Fort”**, Lohagad stands at about **1,033 m above sea level**.
- The fort overlooks the **Pavana reservoir** and lies near **Visapur Fort**.
- The mountain divides the **Pavana and Indrayani river basins**.
- Historically associated with several ruling powers, including the **Chalukyas, Rashtrakutas, Yadavas, Bahamanis, Mughals and Marathas**.
- **Chhatrapati Shivaji Maharaj captured Lohagad in 1648**, reflecting its strategic importance.

## Heritage Significance

Lohagad forms part of the **“Maratha Military Landscapes of India” UNESCO World Heritage property**, highlighting the strategic adaptation of fortifications to the rugged Western Ghats.

## Sangeet Natak Akademi

## Why in News?

President **Droupadi Murmu** is scheduled to confer the **Sangeet Natak Akademi Fellowships (Akademi Ratna) and Awards (Akademi Puraskar) for 2024–25** at Vigyan Bhawan, New Delhi, on **13 August 2026**. The honours recognise contributions to music, dance, theatre, folk/tribal arts and puppetry.

## Sangeet Natak Akademi – Key Facts

- **Established:** 1953; India's **national academy for music, dance and drama**.
- **Ministry:** Ministry of Culture.
- **Nature:** Autonomous organisation of the Government of India.
- Works to **preserve, promote and document India's performing-arts traditions**.

- **Headquarters:** New Delhi.
- Its activities include **research, documentation, grants, festivals, training and promotion of performing arts.**

#### Awards

- **Akademi Ratna:** Fellowship, the highest honour of the Akademi.
- **Akademi Puraskar:** Annual awards recognising excellence/contribution in performing arts.
- Fields include **Hindustani & Carnatic music, classical dance, theatre, traditional/folk/tribal arts and puppetry.**

### Phulkari

#### Why in News?

**Phulkari**, the traditional embroidery of the Punjab region, is facing competition from **machine-made imitations**, raising concerns that the GI tag alone has not adequately protected traditional artisans.

#### Key Facts

- **Meaning:** *Phulkari* literally means “**flower work.**”
- **Region:** Traditionally associated with **undivided Punjab**, including present-day **Punjab, Haryana and parts of Pakistan.**
- **Technique:** A **counted-thread embroidery** characterised by geometric and floral motifs.
- Traditionally practised on **khaddar** (handspun, handwoven cotton) using colourful **silk threads.**
- Common motifs include **marigold, jasmine, lotus and Tree of Life.**
- Historically, embroidered **chaddars** formed an important part of Punjabi women's **marriage trousseau.**

#### GI Tag & Current Challenge

**Phulkari** has a **joint GI registration for Punjab, Haryana and Rajasthan.**

However, GI protection primarily protects the **geographical indication/name and authorised production**, not every design or traditional technique. Cheap machine-made products can therefore create intense market competition for hand embroiderers.

### Thoti Tribe

#### Why in News?

The **Thoti community of Telangana** is facing a serious population decline, loss of traditional language and cultural practices, along with limited access to education, healthcare and stable livelihoods. The community has sought targeted government intervention.

#### Key Facts

- **Location:** Mainly **northern Telangana**, particularly the erstwhile **Adilabad region.**
- **Status:** **Scheduled Tribe** and classified as a **Particularly Vulnerable Tribal Group (PVTG).**
- **Population:** Around **4,811** in Telangana according to the latest figures cited in the news report.
- Traditionally associated with **village messenger services, ballad singing and folk arts.**
- Their oral traditions include **storytelling and musical performances.**
- Many community members today depend on **agricultural labour.**
- Traditional practices such as **tattoo-making and oral transmission of Gond-related cultural narratives** are declining.

#### PVTG Linkage

PVTGs are among the most vulnerable tribal communities and are characterised by factors such as **low literacy, declining/stagnant population, socio-economic vulnerability and dependence on traditional livelihoods.**

### Sowa-Rigpa

#### Why in News?

Dr. Padma Gurmet, Director of the **National Institute of Sowa-Rigpa, Leh**, received the **UT Ladakh State Award 2025** for his contribution to preserving, promoting and developing **Sowa-Rigpa medicine**.

#### Key Facts

- **Sowa-Rigpa** is a traditional system of medicine practised mainly in **Ladakh and Himalayan regions**.
- It has strong historical links with **Tibetan medical traditions** and incorporates knowledge from **India, Tibet, China and other Himalayan regions**.
- The system emphasises **holistic diagnosis, prevention and treatment**, including the use of medicinal plants and other natural resources.
- **National Institute of Sowa-Rigpa**: Located in **Leh, Ladakh**.
- It comes under the **Ministry of AYUSH**.
- Government efforts focus on **standardisation, research, education, documentation and preservation** of this traditional knowledge system.

### Dhableswar Temple

#### Why in News?

President **Droupadi Murmu** recently offered prayers at the **Dhableswar Temple** in Odisha, bringing attention to this important Shaivite pilgrimage centre located on an island in the **Mahanadi River**.

#### Key Facts

- **Location**: Dhableswar Island, **Cuttack district, Odisha**.
- Dedicated to **Lord Shiva**, worshipped here as **Dhableswar**, meaning the *White/Peaceful Lord*.
- The temple is situated on a **river island**, making its geographical setting particularly relevant for Prelims.
- The present temple structure is associated with **Kalinga architectural traditions**, characteristic of Odisha's temple-building heritage.
- The temple is traditionally associated with the **Shaiva tradition** of Odisha.
- **Bada Osha** is an important festival observed at the temple and attracts large numbers of devotees.

#### Geographical Linkage

The **Mahanadi** is one of the major east-flowing peninsular rivers of India. It originates in **Chhattisgarh**, flows through Odisha and drains into the **Bay of Bengal** through a deltaic system.

### Kalaburagi Fort

**Background**: A ₹20-crore conservation and rejuvenation proposal for Kalaburagi Fort has sought Union Culture Ministry approval, highlighting preservation of its medieval Deccan heritage.

#### Historical Significance

- **Location**: Kalaburagi (Gulbarga), Karnataka.
- **Origin**: Initially constructed by **Raja Gulchand**, a Kakatiya feudatory, in the **12th century**.
- **Bahmani connection**: Strengthened by **Alauddin Hasan Bahman Shah**.
- **Capital**: Kalaburagi served as the **capital of the Bahmani Sultanate** before the capital shifted to Bidar.

#### Architecture

- Represents a **Hindu–Islamic architectural synthesis**.
- Features massive fortifications, bastions, gateways, mosques, palaces and tombs.

- Notable defensive features include **15 towers and 26 guns**.

## DEFENCE & SECURITY

### Exercise ROTOR CLAP III

#### Why in News?

The **Indian Air Force (IAF)** concluded the third edition of **Exercise ROTOR CLAP III** at the **Pokhran Field Firing Range, Jaisalmer, Rajasthan**. The week-long specialised exercise focused on strengthening **rotary-wing platforms against drone threats**.

#### Core Theme: Counter-UAS

- **ROTOR CLAP III** is a specialised **helicopter exercise** conducted by the IAF.
- Theme: **Counter-Unmanned Aerial Systems (Counter-UAS)**.
- It focuses on developing operational concepts for **detecting, tracking and neutralising hostile drones**.
- Helicopter units practised responses against emerging **low-cost and asymmetric aerial threats**.
- The exercise was conducted in the **western desert sector**, making the location relevant to operational preparedness.

### Banderol Missile

#### Why in News?

Russia's **\$8000 Banderol** has emerged as a new low-cost strike weapon reportedly being used against targets in **Ukraine**, particularly around the **Odesa/Black Sea region**. Recent reports indicate growing use of the missile and possible development of **ground-based launch capability**.

#### What is Banderol?

- **Banderol (\$8000)** is a **Russian cruise missile** designed as a relatively inexpensive long-range precision-strike weapon.
- It has been associated with the **Inokhodets (Orion) UAV**, from which it can be air-launched.
- Its low-cost design allows Russia to potentially employ it in **larger numbers**, placing additional pressure on sophisticated air-defence systems.
- Reports also indicate development/use of **mobile ground-based launchers**, potentially expanding its deployment flexibility.

#### Cruise Missile

A **cruise missile** is an unmanned, self-propelled guided weapon that generally flies through the atmosphere using **aerodynamic lift** for most of its trajectory. Unlike a ballistic missile, it does not follow a predominantly ballistic trajectory.

### INS Samarthak

#### Why in News?

**INS Samarthak**, the Indian Navy's first **Multi-Purpose Vessel (MPV)**, was delivered to the Navy on **27 August 2026**. It was built by **Larsen & Toubro (L&T)** at **Kattupalli, Tamil Nadu**, marking a significant milestone in indigenous naval shipbuilding.

#### About INS Samarthak

- **First of two Multi-Purpose Vessels (MPVs)** for the Indian Navy.
- Built by **L&T Shipyard, Kattupalli**.
- Contains **over 75% indigenous content**.
- Named "**Samarthak**", meaning "**The Proponent**".

- Conceived as a versatile **trial and evaluation platform** for developing and testing next-generation naval weapons and sensors.

#### Key Features & Roles

- **Length:** 107 metres; **Beam:** 18.6 metres.
- **Displacement:** Over **3,750 tonnes**.
- **Maximum speed:** About **15 knots**.
- Capable of **maritime surveillance, reconnaissance and offshore patrolling**.
- Can support launching and recovery of **surface and aerial targets**.
- Also designed for **Humanitarian Assistance and Disaster Relief (HADR)** and combating **marine pollution**.

#### Shruti: Next-Generation Offshore Patrol Vessel

#### Why in News?

The Indian Navy launched **Yard 3037 (Shruti)**, a **Next Generation Offshore Patrol Vessel (NGOPV)**, at **Garden Reach Shipbuilders & Engineers (GRSE)**, Kolkata, on **11 August 2026**.

#### Key Facts

- **Type:** Next Generation Offshore Patrol Vessel (NGOPV).
- **Shipyard:** **GRSE, Kolkata**; NGOPVs are being constructed concurrently at **GRSE and Goa Shipyard Ltd. (GSL), Goa**.
- **Indigenous:** Designed and built in India, supporting **Aatmanirbhar Bharat** and **Make in India**.
- **Major roles:**
  - Maritime surveillance
  - Search & rescue
  - Protection of offshore assets
  - **HADR** (Humanitarian Assistance and Disaster Relief)
  - Anti-piracy operations
- **Name:** *Shruti* refers to the **four Vedas**, linking the vessel to India's cultural heritage.
- **Crest:** Features **Ursa Major constellation** and a red-and-white lighthouse.

#### Strategic Significance

NGOPVs strengthen India's ability to conduct **persistent maritime surveillance and multi-domain operations**, particularly for protecting offshore infrastructure and maintaining maritime security.

#### HYDERACENE

#### Why in News?

The **University of Hyderabad (UoH)** has secured an Indian patent for **HYDERACENE**, a novel polymer-based material developed for **solid rocket propellants** and advanced aerospace and defence applications. The patent was granted in July 2026.

#### What is HYDERACENE?

- Developed by researchers from the **School of Chemistry, UoH**.
- Formally described as **Ferrocene Polyethylene Glycidyl Grafted Hydroxyl-Terminated Polybutadiene**.
- Synthesised through **ring-opening polymerisation**.
- It is a **dual-function material** performing the roles of both:
  - **Binder** – holds propellant ingredients together and provides structural integrity.
  - **Burn-rate catalyst** – helps control the rate of propellant combustion.
- Conventional systems generally use separate materials for these functions.

### Strategic Significance

HYDERACENE can improve **propellant stability, controlled combustion and propulsion efficiency** by reducing separation between binder and catalyst. It is positioned as an indigenous alternative to **BUTACENE**, a commercially used material largely imported from Europe.

### Exercise Pitch Black

#### Why in News?

The **Indian Air Force (IAF)** participated in **Exercise Pitch Black 2026**, a multinational air combat exercise hosted by **Australia**. The exercise concluded after intensive air-to-air and air-to-ground training involving participating air forces.

#### Key Facts

- **Host:** Royal Australian Air Force (RAAF).
- **Location:** Darwin and northern Australia.
- **Nature:** Biennial **multinational air combat exercise**.
- Focuses on:
  - **Large Force Employment (LFE)**
  - Air-to-air combat
  - Offensive and defensive counter-air operations
  - Air-to-ground missions
  - Tactical planning and interoperability.
- IAF participation enhances **operational interoperability**, especially in complex and realistic air-combat scenarios.
- The exercise brings together air forces from multiple countries, providing opportunities for participants to exchange **tactics, techniques and procedures**.

### Strategic Significance

Pitch Black strengthens India's defence engagement with **Australia and Indo-Pacific partners**. Training in northern Australia also provides exposure to **long-range air operations and diverse operational environments**.

### Agni-IV Missile

#### Why in News?

India successfully test-fired the **Agni-IV** ballistic missile on **6 August 2026** from the **Integrated Test Range (ITR), Chandipur, Odisha**. The test, conducted under the aegis of the **Strategic Forces Command (SFC)**, validated its operational and technical parameters.

#### Key Features

- **Type:** Medium/Intermediate-range **surface-to-surface ballistic missile**.
- **Range:** Approximately **4,000 km**.
- **Propulsion:** **Two-stage, solid-fuel** rocket system.
- **Payload:** Capable of carrying a strategic/nuclear warhead.
- Developed by the **Defence Research and Development Organisation (DRDO)**.
- Designed for **road-mobile deployment**, enhancing survivability and operational flexibility.
- Incorporates advanced **avionics, Ring Laser Gyro-based Inertial Navigation System (RINS)** and **Micro Navigation System (MINGS)** for accurate guidance.

### Ballistic Missile Concept

Unlike cruise missiles, ballistic missiles follow a trajectory governed substantially by **gravity after the powered phase**, reaching high altitudes before re-entering the atmosphere toward the target.

## INS Imphal

### Why in News?

More than **200 students from Indian schools in Muscat** visited **INS Imphal**, which was berthed at **Port Sultan Qaboos, Oman**, as part of celebrations marking India's **80th Independence Day**. The visit also highlighted India–Oman maritime cooperation and the Indian Navy's role in maintaining security in the **Indian Ocean Region (IOR)**.

### Key Facts about INS Imphal

- **Type:** Stealth guided-missile destroyer.
- **Class:** Visakhapatnam-class destroyer.
- **Project:** Project 15B.
- **Built by:** Mazagon Dock Shipbuilders Limited (MDL), Mumbai.
- Designed by the **Directorate of Naval Design**, Indian Navy.
- It is among India's most advanced **indigenously designed and built** destroyers.
- **Commissioned:** December 2023.
- Named after **Imphal**, the capital of Manipur.

### Project 15B – Important for Prelims

Project 15B is the successor to the **Kolkata-class (Project 15A)** destroyers.

The four Project 15B ships are:

1. **INS Visakhapatnam**
2. **INS Mormugao**
3. **INS Imphal**
4. **INS Surat**

They incorporate **stealth features, advanced sensors, electronic warfare systems and long-range missiles**.

## Exercise MAITREE-XV

### Why in News?

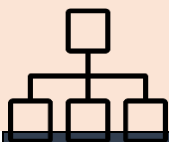
The **15th edition of Exercise MAITREE (MAITREE-XV)** is being conducted from **18–31 August 2026** at **Vibhavadi Rangsit Camp, Surat Thani, Thailand**. The exercise involves the **Indian Army and Royal Thai Army**.

### Key Facts

- **Participants:** Indian Army and **Royal Thai Army**.
- **Personnel:** **85 personnel from each side**.
- Indian contingent is represented primarily by **9 Gorkha Rifles**.
- Thai contingent includes personnel from the **3rd Battalion, 25th Infantry Brigade, 5th Division**.
- **Nature:** Company-level joint military training.
- **Focus:** Operations in **jungle and semi-urban terrain**, particularly **joint counter-insurgency and counter-terrorism operations**.
- The exercise is conducted under **Chapter VII of the UN Charter**, relating to **action with respect to threats to peace, breaches of peace and acts of aggression**.
- Training includes **field exercises, combat discussions, lectures, demonstrations and a validation exercise**.
- **Instituted:** **2006**.
- Previous edition was held at **Umroi, Meghalaya**, in September 2025.

### Strategic Significance

MAITREE strengthens **interoperability, operational coordination and exchange of best practices** between the two armies. It also complements India's **Act East Policy** and deeper engagement with **Thailand and ASEAN**.



## GOVT. INITIATIVES, SCHEMES AND POLICIES, ORGANISATION



## National Health Claims Exchange (NHCX)

## Why in News?

An IRDAI-led sub-committee on health insurance has considered measures to encourage hospitals and insurers to join and expand the use of the **National Health Claims Exchange (NHCX)**. The focus is on simpler health insurance, transparent hospital billing and faster claim settlement.

## What is NHCX?

- A digital platform developed under the **Ayushman Bharat Digital Mission (ABDM)**.
- Developed by the **National Health Authority (NHA)** in consultation with the **Insurance Regulatory and Development Authority of India (IRDAI)**.
- Acts as a gateway for exchanging standardised health-claim information among **insurers, healthcare providers, beneficiaries and other relevant entities**.
- Uses **Fast Healthcare Interoperability Resources (FHIR)** standards to enable interoperability across different digital systems.

## Key Functions

- Insurance coverage eligibility verification.
- **Pre-authorisation** and predetermination requests.
- Standardised digital claim submission.
- Payment-status tracking.
- Communication and claim reprocessing requests.

## PRIP Scheme

## Why in News?

The **Department of Pharmaceuticals** announced the **second call for applications** under the **Promotion of Research and Innovation in Pharma & MedTech (PRIP) Scheme** on **28 August 2026**. The ₹5,000-crore scheme seeks to strengthen India's Pharma and MedTech R&D ecosystem and support startups, MSMEs and industry.

## About PRIP Scheme

- Launched in **2023** by the **Department of Pharmaceuticals**, under the **Ministry of Chemicals and Fertilizers**.
- **Total financial outlay:** ₹5,000 crore.
- Objective: Transform India into a global hub for **pharmaceutical and MedTech research and innovation**.
- Promotes **industry-academia collaboration**, research infrastructure, skilled human resources and commercialisation of innovations.

## Key Funding Tracks

- **Early-stage projects:** Technologies at **TRL 1–3**, mainly for startups and MSMEs; assistance up to **₹5 crore per project**.
- **Later-stage projects:** Technologies at **TRL 4–6**; assistance up to **₹100 crore per project**, subject to prescribed cost-sharing conditions.

## Priority Areas

**New medicines (NCEs/NBEs and phytopharmaceuticals), complex generics, biosimilars and novel medical devices**, including AI/ML-based devices, genetic diagnostics, robotic surgery and precision medicine.

## VISHWAS 2026

### Why in News?

The **Employees' Provident Fund Organisation (EPFO)** launched **VISHWAS 2026** to facilitate amicable settlement of disputes concerning **damages and penalties** imposed for defaults in provident-fund compliance. It is a **one-time, digital and time-bound** dispute-resolution initiative.

### Key Features

- Implemented by **EPFO under the Ministry of Labour & Employment**.
- Provides eligible employers an opportunity to settle pending cases at **concessional rates**, thereby reducing litigation and compliance burdens.
- Covers disputes relating to **penal damages under Section 14B of the Employees' Provident Funds and Miscellaneous Provisions Act, 1952** and the corresponding provision under the **Code on Social Security, 2020**.
- The scheme operates for **six months** from notification and is intended to simplify settlement through a transparent digital process.
- Under the framework, penal damages are substantially rationalised, including graded rates for shorter periods of default.

## Jago AI Assistant

### Why in News?

The **Ministry of Tribal Affairs (MoTA)** recently launched "**Jago**", its official **AI-powered conversational assistant**, during the **National Conclave on Tribal Languages & Museums held in Mysuru, Karnataka**. The platform aims to make tribal welfare information easier to find, understand and access through a single intelligent interface.

### About Jago AI Assistant

- An initiative of the **Ministry of Tribal Affairs**.
- Designed to provide simplified access to information on:
  - Tribal welfare schemes and programmes
  - Government policies and initiatives
  - Guidelines and official documents
  - Ministry repositories and welfare-related information
- Enables citizens to ask queries in **simple language** and receive relevant responses quickly.
- Initially available in **Hindi and English**, with plans for expansion into additional languages.

### Significance

- Bridges the **information gap** between government schemes and intended beneficiaries.
- Supports **digital inclusion and citizen-centric governance**.
- Can expand its knowledge base as new schemes and official documents are added.
- Complements tribal-language technology initiatives such as **Adi Vaani**, which focuses on AI-based translation and preservation of tribal languages.

## PM SVANidhi Scheme

### Why in News?

According to the **Ministry of Housing and Urban Affairs (MoHUA)**, **21.86 lakh loans worth ₹6,294 crore** were disbursed to street vendors under the **PM SVANidhi Scheme during the last 12 months**, highlighting its role in supporting India's urban informal economy.

### About PM SVANidhi

**PM SVANidhi = Prime Minister Street Vendor's AtmaNirbhar Nidhi.**

- Launched on **1 June 2020** as a **Central Sector Scheme**.
- Provides **collateral-free working-capital loans** to eligible street vendors.
- Implemented jointly by **MoHUA** and the **Department of Financial Services (DFS)**.

**Key Features**

- Progressive loan tranches of **₹15,000, ₹25,000 and ₹50,000**, subject to repayment performance.
- Includes **interest subsidy and credit-guarantee support**.
- Vendors repaying the second tranche can access **UPI-linked RuPay Credit Cards up to ₹30,000**.
- Digital transactions are incentivised through cashback.
- **SVANidhi se Samridhhi (SSS)** profiles beneficiaries and links eligible families with selected Central welfare schemes.
- Also promotes financial literacy, digital literacy and entrepreneurship.

**Adi Vaani Platform****Why in News?**

The **Ministry of Tribal Affairs** launched the full-fledged **Adi Vaani Platform**, along with its iOS application, during the **National Conclave on Tribal Languages & Museums in Mysuru, Karnataka**. It is designed to bridge communication gaps while preserving endangered tribal languages through AI.

**What is Adi Vaani?**

- India's **first AI-powered translator specifically for tribal languages**.
- Enables **real-time text and speech translation** between Hindi/English and tribal languages.
- Developed by a consortium led by **IIT Delhi**, with **BITS Pilani, IIIT Hyderabad and IIIT Nava Raipur**, in collaboration with Tribal Research Institutes (TRIs).
- Uses AI models including **No Language Left Behind (NLLB)** and **IndicTrans2** for low-resource languages.
- Features include **speech-to-text, text-to-speech, speech-to-speech, OCR, bilingual dictionaries and digital repositories**.
- Beta-stage languages included **Santali, Bhili, Mundari and Gondi**.

**GENESIS: Gen-Next Support for Innovative Startups****Why in News?**

The **Ministry of Electronics & Information Technology (MeitY)**, through **MeitY Startup Hub (MSH)**, launched **GENESIS Entrepreneur-in-Residence (EIR) Cohort 3** at the GENESIS NextGen Startup Summit in **Coimbatore**. GENESIS is designed particularly to strengthen startups in **Tier-II and Tier-III cities**.

**About GENESIS**

**GENESIS = Gen-Next Support for Innovative Startups.**

- A flagship initiative of **MeitY Startup Hub**.
- Focuses on discovering, supporting, growing and accelerating technology startups.
- Covers the journey from **ideation → experimentation → validation → investment → scaling**.
- Components include **Entrepreneur-in-Residence (EIR), Pilot, Investment and DeepTech funding**.
- Overall budget outlay: **₹490 crore**.
- Under **EIR**, eligible innovators, students and early-stage entrepreneurs can receive funding of **up to ₹10 lakh per startup** to develop ideas into pilot-ready solutions.

**SPoCS: Promoting Scientific Temper through Science Centres****Why in News?**

The **Scheme for Promotion of Culture of Science (SPoCS)** is a flagship initiative of the **Ministry of Culture** aimed at promoting **scientific temper, awareness and informal science education**, particularly among students. As of July 2025, **27 Science Centres** had been established under the scheme.

#### About SPoCS

- Supports establishment of **Science Cities, Science Centres, Innovation Hubs and Digital Planetariums**.
- **National Council of Science Museums (NCSM)**, an autonomous body under the Ministry of Culture, is the **nodal implementing agency**.
- Promotes scientific awareness through **hands-on exhibits, workshops, mobile exhibitions, interactive demonstrations and outreach programmes**.
- **Category-III Science Centres/Digital Planetariums** are established in areas with **population below 5 lakh**.
- To promote regional inclusion, several Science Centres have been established in the **Northeastern States**, with **90% project funding by the Ministry of Culture**.

#### Sanchar Mitra Scheme: Youth as Digital Safety Ambassadors

##### Why in News?

Three **Sanchar Mitras** from India have been selected as **ITU Generation Connect Youth Envoys (2026–2030)**, highlighting the scheme's role in developing youth participation in global digital policy and ICT initiatives.

##### Key Facts

- **Implemented by:** Department of Telecommunications (DoT), Ministry of Communications.
- **Nature:** Youth-oriented **digital outreach and awareness programme**.
- **Sanchar Mitras:** Students from technical institutions with programmes in **telecom, electronics, computer science, cybersecurity or related fields**.
- **Major activities:**
  - Awareness about **citizen-centric telecom services**
  - Prevention of **telecom/cyber frauds**
  - **Mobile security** and responsible telecom usage
  - Digital safety and community outreach
- Implemented across **all States/UTs** through DoT's **Licensed Service Area (LSA) field offices**.
- **200+ institutions** are currently participating.

##### ITU Linkage

The **Generation Connect Youth Envoys (GCYE)** programme provides young people opportunities to participate in discussions on **ICTs, digital transformation and inclusive digital development**. Three Indian Sanchar Mitras were selected for the **third cohort (2026–30)**.

#### Chips to Start-up (C2S): Building India's Semiconductor Talent

##### Why in News?

More than **68,000 students** have been trained in semiconductor chip design under the **Chips to Start-up (C2S) Programme**. A total of **254 student-designed chips** have reached the **tape-out stage**, including 175 designs through India's Semiconductor Laboratory (SCL), Mohali.

##### Key Facts

- **Launched:** 2022 by the **Ministry of Electronics & Information Technology (MeitY)**.
- **Nature:** Umbrella **capacity-building programme** under the **India Semiconductor Mission (ISM)**.
- **Target:** Develop **85,000 industry-ready professionals** at B.Tech, M.Tech and PhD levels.

- Focuses on **semiconductor chip design**, VLSI and embedded systems.
- Provides academic institutions access to **Electronic Design Automation (EDA) tools** and chip-design infrastructure.
- **320+ academic institutions** have received EDA access, while the programme has trained **68,000+ students**.
- **ChipIN Centre** provides technical support and facilitates shared wafer fabrication runs.
- Student designs have been fabricated at **SCL, Mohali**, including at the **180-nm technology node**.

#### Friends of MY Bharat

##### Why in News?

The **Ministry of Youth Affairs and Sports**, through **Mera Yuva Bharat (MY Bharat)**, has introduced '**Friends of MY Bharat**', a digital initiative announced at the **BRICS Youth Summit 2026 in Gandhinagar**. It seeks to engage **Indian-origin youth living outside India** in India's youth-led development and nation-building activities.

##### Key Features

- Enables Indian-origin **students, young professionals and other youth abroad** to register as a *Friend of MY Bharat*.
- Provides information on **volunteering opportunities** in:
  - Education
  - Environment
  - Health awareness
  - Disaster relief
  - Cultural preservation
- Allows youth clubs/associations abroad to share their activities and areas of engagement.
- A '**Know Your India**' section provides curated information on India's **culture, heritage, history, tourism, travel and prominent leaders**.
- Aims to channel the **skills, ideas and experiences of global Indian youth** towards India's development.

##### MY Bharat –

**Mera Yuva Bharat (MY Bharat)** was launched on **31 October 2023** under the **Ministry of Youth Affairs and Sports**. It is a national youth platform focused on **Seva, Kartavya and Jan Bhagidari**, providing opportunities for experiential learning, volunteering, leadership, mentorship and civic participation.

#### National Animal Disease Control Programme (NADCP)

##### Why in News?

The **National Animal Disease Control Programme (NADCP)** has reported substantial progress in controlling **Foot and Mouth Disease (FMD)** and **Brucellosis** through nationwide vaccination and surveillance. Since its launch in **September 2019**, 147.16 crore FMD vaccine doses have been administered, benefiting 8.04 crore farmers. FMD outbreaks declined from **132 in 2019 to 40 in 2025**.

##### About NADCP

- **Nodal Ministry:** Ministry of Fisheries, Animal Husbandry & Dairying.
- Launched in **2019** to control and eradicate **FMD and Brucellosis**.
- **FMD:** Highly contagious viral disease affecting **cloven-hoofed animals** such as cattle, buffalo, sheep, goats and pigs.
- **Brucellosis:** Bacterial disease caused by *Brucella abortus* in bovines; primarily affects reproduction.

- FMD vaccination is undertaken **twice annually**; Brucellosis vaccination is given **once** to female bovine calves aged **4–8 months**.

#### Digital & Institutional Support

The **Bharat Pashudhan Portal** assigns livestock a unique **12-digit Tag ID**, enabling vaccination tracking and traceability. Over **39 crore livestock** have been registered. More than **4,019 Mobile Veterinary Units** provide doorstep services.

### MISCELLANEOUS

#### PARIVARTAN Scheme

##### Why in News?

Around **1,500 beneficiaries** registered within one month of the launch of the **PARIVARTAN Scheme**, aimed at accelerating the replacement of old and highly polluting commercial vehicles in the National Capital Region (NCR).

##### About PARIVARTAN Scheme

**PARIVARTAN = Programme for Accelerated Renewal and Incentivization of Vehicle Assets for Reducing Transport Air Pollution and Network Emissions.**

- Launched by the **Central Government**.
- Implementing Ministry:** Ministry of Road Transport and Highways (MoRTH).
- Funding:** National Capital Region Planning Board (NCRPB).
- Objective: Replace older, polluting **trucks and buses in the NCR** with cleaner **BS-VI compliant or electric vehicles**.
- Coverage includes **NCT of Delhi, Haryana, Rajasthan and Uttar Pradesh**.

##### Key Incentives

- Motor Vehicle Tax concessions and registration-fee waivers.
- 5% interest subvention** on eligible vehicle loans.
- Minimum **8% OEM discount**.
- Fuel-voucher support for eligible diesel/CNG replacement vehicles.
- One-time financial assistance for electric vehicles and **Certificate of Deposit (CoD) trading**.
- Digital platform interfaces with **VAHAN, V-Scrap, DigiELV and PFMS**.

#### Venture Capital Fund for Scheduled Castes (VCF-SC)

##### Why in News?

The **Venture Capital Fund for Scheduled Castes (VCF-SC)** was highlighted by the Government through a PIB feature showcasing how the scheme has enabled **SC entrepreneurs to establish technology-oriented enterprises**, including advanced electronics manufacturing.

##### About VCF-SC

- Launched in **December 2015** to promote entrepreneurship among **Scheduled Castes** through **concessional finance**.
- It seeks to shift the focus from **job-seeking to job creation** by facilitating access to equity/venture capital for viable SC-owned enterprises.
- Supports businesses with potential for **innovation, growth and employment generation**.
- It complements other initiatives promoting SC entrepreneurship, including the **Ambedkar Social Innovation and Incubation Mission (ASIIM)**.
- Under ASIIM, eligible SC innovators can receive **equity support up to ₹30 lakh over three years**, with mentoring and incubation support.

### Suspension-Grade PVC

#### Why in News?

The Government has imposed a **Minimum Import Price (MIP)** on suspension-grade PVC resin for six months. The move has triggered concerns among MSME pipe manufacturers that higher input costs could increase the cost of irrigation, housing and infrastructure projects.

#### What is Suspension-Grade PVC?

- **Polyvinyl Chloride (PVC)** is a synthetic polymer produced mainly from **ethylene and chlorine**.
- **Suspension polymerisation** is a major industrial process in which vinyl chloride monomer is dispersed as droplets in water and polymerised.
- **Suspension-grade PVC resin (S-PVC)** is widely used to manufacture **pipes, fittings, cables, flooring and construction products**.
- PVC is valued for its **durability, chemical resistance, low cost and relatively low weight**.

#### Recent Import Measure

- The **Directorate General of Foreign Trade (DGFT)** has classified imports of suspension-grade PVC resin with **CIF value  $\leq$  US\$0.766/kg** as “**Restricted**” for six months.
- Certain **export-oriented units and export-linked schemes** are exempted.
- The measure followed an **anti-dumping investigation** concerning imports from seven countries.

### Pradhan Mantri National Dialysis Programme

#### Why in News?

The **Pradhan Mantri National Dialysis Programme (PMNDP)** is now operational in **all 36 States/UTs**, covering **751 districts** through **1,856 haemodialysis centres** with **13,535 machines** as of June 2026.

#### Key Facts

- **Launched:** 2016 under the **National Health Mission (NHM)**.
- **Ministry:** Ministry of **Health & Family Welfare**.
- **Objective:** Provide **free haemodialysis services to eligible patients**, particularly through district hospitals and other public health facilities.
- **Funding/Support:** Centre provides **technical and financial support** to States/UTs under NHM.
- Centres are established based on **gap analysis** and proposals submitted through State/UT **Programme Implementation Plans (PIPs)**.
- **Monitoring:** Common Review Mission (**CRM**) and visits by senior officials.
- Responsibility for operationalising centres and deploying trained **dialysis technicians** rests with respective States/UTs and implementing partners.

### National Sports Awards 2026

#### Why in News?

The **National Sports Awards 2026** have been announced by the **Ministry of Youth Affairs & Sports** to honour outstanding contributions and achievements in Indian sports. The awards recognise athletes, coaches and institutions for excellence and contribution to sports development.

### Major National Sports Awards

| Award                                        | Purpose                                                                                                |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------|
| <b>Major Dhyan Chand Khel Ratna Award</b>    | Highest sporting honour; recognises the most spectacular and outstanding performance by a sportsperson |
| <b>Arjuna Award</b>                          | Outstanding performance in sports over a sustained period                                              |
| <b>Dronacharya Award</b>                     | Excellence in coaching; recognises outstanding coaches                                                 |
| <b>Rashtriya Khel Protsahan Puruskar</b>     | Recognises organisations/entities promoting sports                                                     |
| <b>Maulana Abul Kalam Azad (MAKA) Trophy</b> | Best overall performance by a university in inter-university sports                                    |

### Major Dhyan Chand Khel Ratna

- It is the **highest sporting honour of India**.
- Earlier known as the **Rajiv Gandhi Khel Ratna Award**.
- Renamed in **2021** after hockey legend **Major Dhyan Chand**.
- Award carries a **medal, certificate and cash prize**.

### Arjuna Award

It is given to sportspersons who demonstrate:

- Outstanding performance;
- **Consistent excellence** over a sustained period;
- Sportsmanship and discipline.

### Dronacharya Award

Named after **Dronacharya**, the legendary teacher in the *Mahabharata*.

It recognises coaches who have produced **outstanding sportspersons or teams** at national and international levels.

### Who Gives These Awards?

The awards are administered by the **Ministry of Youth Affairs & Sports** and are traditionally presented by the **President of India** at Rashtrapati Bhavan.

### Jeevan Raksha Padak Awards

### Why in News?

The **Sarvottam Jeevan Raksha Padak** was conferred on **12 rat miners** for their exceptional bravery during the **Silkyara Tunnel Rescue Operation** in Uttarakhand. They manually cleared debris from the confined tunnel section, helping rescue the trapped workers. Each recipient received a **₹2 lakh lump-sum monetary allowance**.

### About Jeevan Raksha Padak Series

The Jeevan Raksha Padak is a **civilian lifesaving award** instituted by the Government of India in **1961**. It recognises exceptional courage and promptitude in saving human life.

The award series comprises:

- **Sarvottam Jeevan Raksha Padak** – highest category
- **Uttam Jeevan Raksha Padak**
- **Jeevan Raksha Padak**

It may be awarded for saving lives in situations such as **drowning, fire or mine accidents**. It can also be awarded **posthumously**.

### SraVaani: Multilingual AI for India's Linguistic Diversity

#### Why in News?

Researchers at IISc's SPIRE Lab, with ARTPARK and collaborators, have released **SraVaani-1.0**, a multilingual **Automatic Speech Recognition (ASR)** model covering **65 Indian languages and dialects**.

#### Key Facts

- **Function:** Converts **spoken language into text**.
- **Coverage:** **65 Indian languages/dialects**, including several **low-resource and tribal languages**.
- **Architecture:** Based on **FastConformer**.
- Trained using over **31,000 hours of speech data**.
- Training involved:
  1. **Self-supervised learning** on unlabelled speech.
  2. **Audio-image representation alignment**.
  3. **Supervised fine-tuning** using labelled multilingual speech.
- Data largely comes from **Project VAANI**, which collects natural speech across India's linguistic landscape.
- Supports **automatic language identification**, reducing the need for users to manually select a language.

#### Significance

SraVaani can improve **digital inclusion** by enabling voice-based access to **e-governance, education, healthcare and digital services**, especially for communities speaking low-resource languages.

## MAINS

## PAPER 1

## Half of India's Women Farmers Recorded as Unpaid Helpers: The Hidden Cost

**Introduction**

A new report, *Her Harvest 2026: The hidden cost of women's invisible work in Indian agriculture*, reveals that **50.5% of women working in agriculture** are classified as unpaid helpers on family farms, compared to only 21.7% of men. Despite making up **48% of the agricultural workforce**, women hold under **14% of operational holdings** and control just **11.72% of farmed area**. This misclassification restricts women's access to credit, inputs, procurement systems, and government schemes, costing India an estimated **₹1.2-2 lakh crore annually** in lost agricultural output. The report calls for recognising women as farmers and improving access to finance and markets.

**The Scale of the Problem****Workforce Participation**

- **Women in Agriculture:** 48% of India's agricultural workforce
- **Rural Working Women:** 76.9% engaged in agriculture
- **All Working Women:** 64.4% in agriculture (largest employer of women)

**Misclassification as "Unpaid Helpers"**

- **Women:** 50.5% recorded as unpaid helpers (family farms)
- **Men:** 21.7% recorded as unpaid helpers
- **Gap:** Women are nearly **2.4 times more likely** to be classified as unpaid helpers

**Land Ownership and Control**

- **Operational Holdings:** Women hold only 13.96%
- **Farmed Area:** Women operate only 11.72%
- **Productivity Gap:** Farms run by women can be **24% less productive** than comparable farms run by men—linked to **access constraints, not skill**

**Economic and Social Consequences****Income Disparity**

- **Earnings Gap:** Women earn ₹82 for every ₹100 earned by men in agrifood systems
- **Farm Workers:** Women earn 20-30% less for the same work

**Output Losses**

- **Annual Loss:** ₹1.2-2 lakh crore (based on FAO estimate that unequal access reduces output by 2.5-4%)
- **Context:** India's agricultural GVA is ₹48.7 lakh crore
- **The Gap:** Not women's ability, but **unequal access to credit, inputs, markets and productive resources**

**Access Barriers**

- Formal credit
- Extension services
- Procurement systems
- Input subsidies
- Government schemes

**Policy Recommendations (From the Report)****Recognition as Farmers**

- Recognise women as farmers **regardless of whose name is on the land deed**
- Ensure access to credit, inputs, and government schemes

#### Data and Monitoring

- Collect **gender-disaggregated data** on credit, procurement, and FPO membership
- Track outcomes for women farmers

#### Resource Access

- Improve access to finance and markets
- Address constraints **without waiting for land titles to change**

#### Challenges

- **Implementation:** Recognising women as farmers without land titles requires policy and administrative changes
- **Social Norms:** Deep-seated gender roles that view women as "helpers"
- **Data Gaps:** Improving gender-disaggregated data collection
- **Land Rights:** Land reform remains a long-term need

#### Way Forward

- **Policy Reform:** Amend definitions to recognise women as farmers
- **Financial Inclusion:** Gender-targeted credit and subsidy schemes
- **Extension Services:** Train women in modern agricultural practices
- **FPOs:** Promote women-led Farmer Producer Organisations
- **Awareness:** Address social norms that undervalue women's work

#### Conclusion

Half of India's women farmers are classified as unpaid helpers, despite being 48% of the agricultural workforce. This misrepresentation is not just a statistical issue—it costs India ₹1.2-2 lakh crore annually and perpetuates inequality. Recognising women as farmers, improving access to resources, and collecting gender-disaggregated data are critical steps. As the report argues, India need not wait for land titles to change before acting. Addressing this gap is essential for agricultural productivity, women's empowerment, and inclusive growth.

## PAPER 2

### India's Higher Education Sector: A Decade of Growth, Access, and Inclusion

#### Introduction

India's higher education sector has expanded significantly, with rising universities, colleges, enrolment and GER. Improved female participation, gender parity and enrolment of SC, ST and OBC students reflect progress towards NEP 2020's target of 50% GER by 2035.

#### Institutional and Enrolment Growth

##### Expanding Institutional Footprint

- **Universities:** 760 → 1,289 (69.6% growth)
- **Colleges:** 38,498 → 48,246 (25.3% growth)
- **Standalone Institutions:** 12,276 → 15,221 (24% growth)

##### Rising Enrolment

- **Total Enrolment:** 3.42 crore (2014-15) → 4.50 crore (2023-24) – 31.5% growth

- **GER:** 23.7% (2014-15) → 30.0% (2023-24)
- **Level-Wise Growth (2014-15 to 2023-24):**
  - **Ph.D:** 1.17 lakh → 3.43 lakh (**192.9%**)
  - **Integrated:** 1.41 lakh → 5.69 lakh (**301.4%**)
  - **Post Graduate:** 38.53 lakh → 57.85 lakh (**50.2%**)
  - **Under Graduate:** 2.71 crore → 3.45 crore (**27.3%**)
- **Higher Education Out-turn:** 88.28 lakh → over 1.09 crore (**24.1% increase**)

## Equity and Inclusion

### Gender Parity

- **Female Enrolment:** 1.57 crore → 2.24 crore (**42.2% growth**; outpaced total growth)
- **Female GER:** 22.9% (2014-15) → 31.2% (2023-24) – **surpassed male GER (28.9%) for 7th consecutive year**
- **Gender Parity Index (GPI):** 0.92 → **1.08**
  - **SC GPI:** 0.91 → 1.11
  - **ST GPI:** 0.81 → 1.08

### Social Inclusion

- **SC Enrolment Share:** 13.44% → 15.5%
- **ST Enrolment Share:** 4.8% → 6.4%
- **OBC Enrolment Share:** 32.8% → 40.1% (largest increase)
- **SC GER:** 18.9% → 27.8%
- **ST GER:** 13.5% → 22.8%

### Persons with Benchmark Disability (PwBD)

- **Enrolment:** 64,298 (2014-15) → 88,816 (2022-23) – **38.1% growth**
- **2023-24:** 54,080 enrolled (34,080 male, 20,000 female) – persistent gender imbalance

## STEM and International Enrolment

### STEM Enrolment

- **Total Enrolment:** 91.5 lakh (2014-15) → 1.02 crore (2023-24) – **11.5% growth**
- **Reflects:** Expanding institutional capacity, student interest, and employment opportunities.

### Foreign Student Enrolment

- **Enrolment:** 42,293 (2014-15) → 58,134 (2023-24) – **37.5% increase**
- **Indicates:** Growing internationalisation and global recognition of Indian institutions.

## Faculty and Infrastructure

### Faculty Growth

- **Total Teachers:** 14.73 lakh → 17.32 lakh (**17.6% growth**)
- **Female Teachers:** Grew by **36.7%** (faster than male)
- **Female Teacher Share:** 44.3% (2022-23) → 44.9% (2023-24)

### Infrastructure (2023-24)

- **Playground:** Universities (94%), Colleges (95%), Standalone (91%)
- **Library:** 98% across all institutions
- **Laboratory:** Universities (89%), Colleges (85%), Standalone (94%)
- **Additional Facilities:** Health centres, skill development centres, computer centres, auditoriums, conference halls

## Challenges

- **Quality:** GER at 30% vs. NEP 2020 target of 50% by 2035.
- **PwBD Gender Imbalance:** Male enrolment significantly higher.

- **Faculty Gender Gap:** Female teachers share at 44.9%; leadership positions lag.
- **Infrastructure Disparities:** Variations across institution types.
- **Employability:** Out-turn growth (24.1%) must align with job market needs.

#### Way Forward

- **Quality Enhancement:** Focus on research, innovation, and teaching quality.
- **Equity:** Address PwBD gender gap; enhance access for marginalised groups.
- **Internationalisation:** Attract more foreign students; faculty exchanges.
- **Skill Alignment:** Link curricula with industry and future skills.
- **Funding:** Increase public and private investment in higher education.

#### Conclusion

India's higher education sector has expanded significantly in access and inclusion, but challenges of quality, infrastructure, faculty gaps and employability persist. Achieving **NEP 2020's 50% GER target by 2035** will require greater investment in quality, equity and skill-oriented education.

### Case for Consensus: On Delimitation

#### Introduction

The Monsoon Session is ending with limited substantive debate, marked by opacity over delimitation and contentious FCRA amendments. Delimitation will reshape India's representative system and demands broad consensus. Unlike the unanimous approaches in 1976 and 2001, minimal debate risks undermining parliamentary democracy. The government should convene an all-party meeting, circulate proposals, and build consensus on this consequential reform.

#### The Delimitation Challenge

##### Scope and Significance

- **Representative System:** Delimitation will reshape parliamentary constituencies.
- **Far-Reaching Impact:** Affects political representation, federal balance, and regional interests.
- **Misunderstanding:** Large segments of the political class may be unaware of its implications.

##### Government's Approach

- **Opacity:** Proposals kept secret; limited parliamentary debate.
- **Routine:** Passing legislation with little prior deliberation has become common.
- **Majoritarian:** Focus on aggregating numbers rather than building consensus.

##### Historical Precedent

- **1976:** Delimitation decision taken unanimously (Congress government).
- **2001:** Unanimous decision (BJP government).
- **Lesson:** Consensus-building has been the norm for such sensitive issues.

#### The Need for Consensus

##### Why Consensus Matters

- **National Unity:** India's diversity requires broad agreement on representation.
- **Trust:** Legitimacy of the process depends on inclusive deliberation.
- **Avoiding Conflict:** Consensus reduces the risk of political and regional friction.

##### Stakeholder Engagement

- **All-Party Meeting:** Opposition demand; good starting point.
- **Feedback:** Circulate proposals; receive input from all stakeholders.
- **Parliamentary Debate:** Essential for transparency and legitimacy.

##### Risks of Subterfuge

- **Public Perception:** Anything legitimised through subterfuge will be seen as such.

- **Democracy:** Parliamentary majority is a technicality; democracy requires deliberation.
- **Winners/Losers:** Majoritarian approach creates winners and losers, not solutions.

### Challenges

- **Political Polarisation:** Current atmosphere may hinder good-faith conversations.
- **Time Constraints:** Delimitation timeline may be accelerated.
- **Complexity:** Technical aspects may be difficult for non-experts to grasp.

### Way Forward

- **Government Initiative:** BJP should take lead in building consensus, as in 2001.
- **Transparency:** Circulate proposals; allow public and parliamentary scrutiny.
- **Dialogue:** Facilitate discussions across party lines and within the polity.

### Conclusion

Delimitation will shape India's representative democracy for decades. Governmental opacity and limited parliamentary debate risk undermining its legitimacy. Following the consensus seen in 1976 and 2001, the government should convene an all-party meeting, circulate proposals, and build broad agreement. A parliamentary majority cannot replace democratic deliberation; delimitation must strengthen India's federal and democratic fabric.

## India's Democracy Needs Different Electoral Rhythms

### Introduction

**One Nation, One Election (ONOE)** seeks synchronised Lok Sabha and State elections, but critics argue it may weaken **federalism and parliamentary accountability**. The debate goes beyond cost and governance efficiency, raising concerns about **constitutional balance, State autonomy and democratic choice**.

### The Constitutional and Federal Concerns

#### Erosion of State Autonomy

- **Federal Structure:** India is a Union of States with a quasi-federal structure. Synchronisation would undermine the autonomy of State governments.
- **State Elections:** Have distinct political rhythms and local issues that are diluted when tied to national polls.
- **Constitutional Guarantees:** State legislatures have fixed terms (Article 172), and imposing a uniform cycle requires constitutional amendments that erode this guarantee.

#### Distortion of Electoral Mandates

- **National vs. State Issues:** Voters often choose differently for national and State governments. Synchronisation would force a binary choice on issues that are not linked.
- **Coattails Effect:** A wave in favour of a national party could sweep in State governments that do not reflect local preferences, distorting democratic mandates.
- **Reducing Accountability:** Voters cannot effectively hold State governments accountable if their fate is tied to national political winds.

#### Weakening Democratic Accountability

- **Permanent Campaign Mode:** Even with synchronised elections, mid-term vacancies and no-confidence motions would require by-elections, breaking the uniformity.
- **Governance Paralysis Narrative:** The claim that frequent elections cause governance paralysis is exaggerated. India has managed multiple elections while maintaining governance.
- **Financial Argument:** The cost of elections, while significant, is not the primary factor in democratic governance. Centralisation of electoral cycles saves money but costs federalism.

### The Mechanics of the Parliamentary System

#### Parliamentary vs. Presidential Logic

- **Presidential System:** Fixed terms for the executive; synchronisation is mechanically feasible.
- **Parliamentary System:** The executive is responsible to the legislature. A government can fall mid-term, leading to premature elections.
- **Constitutional Friction:** ONOE attempts to impose presidential-style fixed terms on a parliamentary system, creating a fundamental mismatch.

#### The Inevitability of Mid-Term Polls

- **No-Confidence Motions:** Can bring down a government, necessitating fresh elections.
- **Hung Assemblies:** May require premature polls.
- **Resignations/Deaths:** Vacancies create inevitable by-elections, breaking any synchronisation.

#### Administrative Convenience vs. Democratic Substance

- **Primacy of Convenience:** The ONOE proposal prioritises the convenience of the administration over the substantive democratic rights of States.
- **Diversity of Political Rhythms:** India's political diversity requires that elections reflect local conditions, not a centralised timeline.

#### Weaknesses and Risks

- **Federal Erosion:** Undermines the distinct identity of State politics.
- **Distorted Mandates:** Links local issues to national popularity.
- **Logistical Challenges:** Synchronising schedules requires constitutional amendments and political consensus.
- **Anti-Federal:** Goes against the spirit of cooperative federalism.

#### Comparative Perspective

- **Presidential Systems:** The U.S. has fixed terms for President and Congress but not for State legislatures.
- **Parliamentary Systems:** Most parliamentary democracies do not have fully synchronised national and State elections.

#### Conclusion

**One Nation, One Election (ONOE)** may improve administrative efficiency, but critics fear it could weaken **federalism, State autonomy and parliamentary accountability**. India's diverse political realities require flexibility in electoral cycles. **Democratic mandates should take precedence over administrative convenience.**

### The High Cost of India's Private Health-Care Boom

#### Introduction

Hospitalisation imposes a far greater financial burden in private facilities, with average costs of **₹50,508 versus ₹6,631** in government hospitals. The Parliamentary Committee has proposed **standardised package rates and mandatory pre-treatment cost estimates**. While private investment is essential, financial interests must not drive clinical decisions, pricing or access. Stronger regulation and public healthcare are vital to ensure **affordable and appropriate care**.

#### The Cost of Private Healthcare

##### Average Hospitalisation Costs

- **Private Facility:** ₹50,508
- **Government Facility:** ₹6,631
- **Childbirth (Private):** ₹37,630
- **Childbirth (Public):** ₹2,299

#### The Contradiction

- **Need for Investment:** India wants private/foreign capital in healthcare, especially in Tier-2/3 and rural areas.

- **FDI Review:** Simultaneously asking for review of FDI rules related to acquisition/management of existing hospitals.

### Information Asymmetry

- **Provider Knows More:** Patients rarely decide independently whether an MRI is required, admission should continue, or a procedure is necessary.
- **Financial Incentives:** When financial incentives become strong, they can influence not just price, but how much care is delivered.

### The Private Equity Effect

### The High-Cost Ecosystem

- **Competition:** Corporate hospitals compete for specialists, sophisticated technology, and premium infrastructure.
- **Cost Recovery:** High salaries, expensive equipment, and revenue targets must be recovered.
- **Institutional Behaviour:** Revenue targets, procedure-linked incentives, higher occupancy, and higher revenue per bed gradually shape behaviour.

### Unnecessary Medicalisation

- **Over-Screening:** Lab investigations may detect abnormalities that would never cause harm.
- **Unnecessary Follow-Ups:** More screening leads to unnecessary tests.
- **Admissions:** Patients manageable as outpatients may be admitted.
- **Procedures:** Caesarean sections, angioplasties, ICUs, diagnostic packages—must be seen within the incentive structure.

### The Need for Safeguards

- **Rewards for Doing More:** A system rewarding interventions needs safeguards against unnecessary prescriptions, surgeries, investigations, and medications.

### Regulation and FDI

### The Case for Investment

- **Capital Need:** Public hospitals cannot meet demand; private hospitals fill a critical gap.
- **Benefits:** Foreign investors and PE funds bring capital, managerial capacity, technology.
- **Risk:** Excessively restrictive regulation may move investment elsewhere.

### FDI Review

- **Greenfield vs. Acquisitions:** India should encourage greenfield investment and manufacturing.
- **Scrutinise Acquisitions:** Evaluate whether investment creates new beds or acquires existing ones; improves competition or leads to concentration; enters underserved districts or adds high-end facilities in metros.
- **Public Support Obligations:** If investors receive concessions, enforceable obligations for affordable beds or participation in public insurance should exist.

### Price Regulation

- **Room Tariffs:** Proposal to link to nearby 3-star hotels; but a hospital room includes nursing, infection control, and emergency support.
- **Stent Price Cap:** Experience showed intervention can reduce mark-ups, but hospital care is more complex.
- **Total Cost Matters:** Package rates, transparent estimates, billing standards, and audit mechanisms are more useful than isolated caps.
- **DRG (Diagnosis-Related Groups):** Standardised reimbursement based on diagnosis/procedures, not individual services.

### The Larger Policy Question

### Public Health as Regulation

- **Weak Public Health:** India cannot regulate its way out of weak public healthcare.
- **Credible Alternative:** A strong public health system is an effective form of regulation (OECD experience).

### What Must Be Done

- **Strengthen Primary Care:** Prevent, detect, and treat disease early.
- **Insurance Reform:** AB-PMJAY should reward appropriate care, not higher volumes of procedures.
- **Clinical Audits:** Evidence-based protocols and transparent billing protect patients and doctors.

### The True Measure

- **Not Investment or Growth:** Not how much money flows into hospitals or medical tourism growth.
- **Patient Confidence:** Whether citizens can enter hospitals with confidence that they will receive what they need—no more, no less.

### Conclusion

India's private healthcare expansion has improved access but also raised affordability concerns, with hospitalisation costs far higher than in public facilities. Measures such as **standardised rates, upfront cost estimates and FDI review** can improve accountability. India needs private investment, but clinical decisions must remain patient-centric. Strengthening public healthcare and regulating financial incentives are essential to ensure **necessary, affordable and appropriate care**.

## To Build AI for All, India Must Build It With All

### Introduction

India ranks among the world's leading AI-ready nations, powered by Digital Public Infrastructure (DPI) and a thriving innovation ecosystem. Yet beneath this progress lies a structural contradiction: women steadily disappear as the AI pipeline advances—from 43% of STEM graduates to 26% of the tech workforce, 12% of advanced AI roles, and just 10% of senior AI leadership. The AI pipeline is not merely a technological conduit of code and compute; it is fundamentally a human pipeline. When people are absent from training data, AI inherits those gaps. To build AI that serves all, India must build it with all—ensuring women and marginalised communities participate as researchers, engineers, entrepreneurs, and policymakers.

### The Leaky Pipeline: From STEM to AI Leadership

#### Gender Representation at Each Stage

- **STEM Foundation:** 43% of STEM graduates are women.
- **Tech Workforce:** Falls to 26%.
- **Advanced AI Roles:** Only 12% of professionals are women.
- **Senior AI Leadership:** Women hold just 10% of positions.

#### Root Causes of Leakage

- **Societal Barriers:** Unequal nutrition, education, caregiving responsibilities, workplace discrimination.
- **Access Gap:** Only 57% of women have independent internet access (vs. 72% of men).
- **Language Barriers:** English-dominated AI education; insufficient local language resources.
- **Infrastructure Gap:** Schools lack adequate facilities for robotics and advanced tech education.

#### Consequences

- **Incomplete Data:** AI credit models trained on historical male financial patterns may underestimate women's creditworthiness.
- **Biased Health Tools:** AI maternal health tools trained on non-local data may provide inaccurate recommendations.
- **Limited Product Influence:** Women engineers often have limited influence in product design.

### AI Automates Existing Inequalities

### The Cycle of Bias

- **Society is Unequal:** AI learns from society.
- **Data is Incomplete:** Training data reflects historical biases and gaps.
- **AI Automates Bias:** Algorithms replicate and scale existing inequalities.

### Real-World Impact

- **Credit Assessment:** Asha, a SHG member in Bihar, may be underestimated by AI models lacking gender-disaggregated financial data.
- **Health Outcomes:** Meera, a community health worker in Gujarat, may receive inaccurate AI recommendations if data lacks local nutrition conditions.
- **Educational Exclusion:** Kavya cannot pursue robotics due to school infrastructure gaps; Pooja struggles with English-dominated AI education.

### The Paradox

- **AI Can Expand Opportunity:** SHGs have built strong financial ecosystems; women's influence shifts technology.
- **But Not Automatically:** Inclusion requires deliberate design, data representation, and leadership diversity.

### The India AI Mission: An Opportunity for Inclusive AI

#### India's Strong Foundation

- **Universal Adult Franchise (1950):** India granted women and men suffrage simultaneously—a commitment to inclusion.
- **DPI Success:** Aadhaar, UPI, and other platforms have shown how technology can advance public welfare at scale.
- **SHG Ecosystem:** Women's self-help groups demonstrate grassroots financial and entrepreneurial strength.

#### What Inclusive AI Requires

- **Diverse Datasets:** Reflect India's diversity of languages, cultures, socio-economic realities, and lived experiences.
- **Participation:** Women and marginalised communities must be represented in all stages—research, engineering, entrepreneurship, policy.
- **Infrastructure:** Access to internet, education, and AI tools in local languages.
- **Leadership:** Gender parity in AI leadership and decision-making.

#### The India AI Mission's Opportunity

- **Ensure AI Follows Inclusive Path:** Build on India's commitment to inclusion and DPI success.
- **True Leadership:** Measured not only by models, investments, or patents, but by whether AI reflects India's diversity.

### Conclusion

India's AI leadership cannot be measured only by technological milestones; it must also be measured by whether AI reflects the nation's diversity. The AI pipeline is fundamentally a human pipeline, and its current leaks are systemic—from education and access to workplace discrimination. India has already demonstrated that technology can advance public welfare at scale; the India AI Mission offers an opportunity to ensure AI follows the same inclusive path. Achieving that requires more than diverse datasets; it requires women and marginalised communities to participate as researchers, engineers, entrepreneurs, and policymakers. To build AI for all, India must build it with all.

## Mines and Minerals (Development and Regulation) Amendment Act, 2026

### Introduction

The Mines and Minerals (Development and Regulation) Amendment Act, 2026, passed by Parliament, introduces a uniform and stable fiscal framework for the mineral sector. It restricts States from imposing new taxes on mineral rights and mineral-bearing lands except under conditions prescribed by the Central Government. This addresses challenges of unpredictable levies, retrospective demands, and non-uniform rates that created excessive burden on mining. The Act does not reduce States' revenue—they will continue to receive ~90% of mineral revenue. It aims to attract investment, boost production of critical minerals, reduce import dependence, and support Viksit Bharat 2047.

### Key Provisions of the Amendment Act

#### Union Control Over Mineral-Bearing Lands

- Mineral-bearing lands (identified by Central parameters) now under Union regulation, in addition to mines and mineral development.

#### New Section 9D — Limits on State Levies

- States cannot impose taxes/cess/levies on mineral rights or mineral-bearing lands except as per conditions/restrictions prescribed by the Central Government.
- Covers levies based on mineral quantity, value, royalty, or any other basis.

#### Treatment of Past Levies

- Any levy not paid/collected before the Amendment applies is invalid.
- Amounts already deposited/recovered before commencement shall not be refunded.

#### Rule-Making Power (Section 13)

- Central Government empowered to prescribe conditions/restrictions for State levies through rules.

### Addressing Key Concerns

#### Impact on State Revenue

- States' Share:** ~90% of mineral revenue continues to accrue to States.
- No Revenue Loss:** States will continue to receive Royalty, Auction Premium, DMF, and GST share.
- Increased Revenue:** Since 2015, States have received >₹7 lakh crore from mining; mineral revenue up ~354% over the decade.
- Auction Regime:** 723 major mineral blocks auctioned since 2015; FY 2025-26 saw record 212 blocks auctioned.

#### Impact on Common Citizens

- Heavy mineral taxes create cascading effect, inflating input costs for steel, power, cement, infrastructure.
- Ultimately raises cost of living for ordinary citizens.
- Act seeks to keep mining projects economically viable, preventing cost escalation.

#### Benefit to Corporations?

- Not for Particular Corporations:** Act brings clarity, regulation, and statutory correction.
- Transparent Auctions:** 100% e-auctions based on competitive bidding; 300 unique bidders for 725 blocks.
- Equal Opportunity:** PSUs, MSMEs, startups, Indian and global companies can participate.

### Reforms in the Mineral Sector (2015-2026)

#### Competitive Auctions

- 2015 Amendment:** Ended discretionary allocation.
- Major Mineral Blocks:** 723 auctioned across 17 States (Rajasthan 140, MP 127, Odisha 76).
- Coal Mines:** 141 auctioned; 23 operationalised.
- Record Year (FY 2025-26):** 212 blocks auctioned; 36 operationalised.

#### Production Growth

- **Major Mineral Production Value:** Up 26.8% (FY 2025-26).
- **Record Production:** Iron ore (313 million tonnes), limestone (484 million tonnes).
- **Coal:** Crossed 1 billion tonnes in each of last two years; non-coal production nearly tripled since 2014.
- **Global Rank:** India ranks 2nd (limestone), 3rd (zinc), 4th (iron ore), 5th (bauxite).

#### Critical Minerals Focus

- **National Critical Mineral Mission (Jan 2025):** ₹16,300 crore outlay (₹2,600 crore budgetary support).
- **Exploration:** NMEDT sanctioned 777 projects (₹3,828 crore); 255 relate to critical minerals.
- **Overseas:** KABIL secured lithium exploration rights in Argentina.
- **Recycling Incentive:** ₹1,500 crore scheme; 58 entities pledged 850 Ktpa capacity.

#### Digital Monitoring

- **Unified Mining Portal:** Tracks block lifecycle from auction to operationalisation.
- **Coal and Mineral Exchanges:** Support fair price discovery.

#### District Mineral Foundations (DMFs)

- **Introduced 2015:** 656 DMFs (including 106 in aspirational districts).
- **PMKKKY:** Local welfare projects (roads, hospitals, schools, drinking water).

#### Challenges

- **State Autonomy:** Limits State power to levy taxes; potential federal friction.
- **Implementation:** Central conditions must be fair and transparent.
- **Transition:** Invalidation of past levies may lead to legal disputes.
- **Minor Minerals:** Excluded; States retain full control over 50+ minor minerals.

#### Conclusion

The MMDR Amendment Act, 2026, is a significant reform to create a stable, uniform, and predictable fiscal regime for India's mineral sector. By restricting State levies, invalidating retrospective demands, and bringing mineral-bearing lands under Union regulation, it addresses long-standing challenges of unpredictability and uneven taxation. It maintains States' revenue share (~90%) and promotes transparency through competitive auctions. The Act supports critical mineral security, investment, and economic growth, while DMFs ensure local welfare. However, careful implementation and Centre-State consultation will be essential to balance development with federal harmony.

### Peaceful Dissent is a Constitutional Right

#### Introduction

In a constitutional democracy, **dissent is a fundamental right**, protected by Articles 19(1)(a) and 19(1)(b). Recent observations by Justice Ujjal Bhuyan highlight concerns over the **criminalisation of peaceful dissent and shrinking democratic space**. As Justice D.Y. Chandrachud noted, dissent is a vital “safety valve” of democracy, reinforcing the need to protect civil liberties.

#### The Constitutional Framework

##### Fundamental Rights

- **Article 19(1)(a):** Freedom of speech and expression.
- **Article 19(1)(b):** Right to assemble peacefully without arms.
- **Article 21:** Protection of life and personal liberty.

##### Reasonable Restrictions

- Restrictions under Article 19(2) must be **exceptional, proportionate, and legally justified**.
- They cannot become routine instruments to discourage criticism or silence inconvenient voices.
- **Disagreement with the government is not equivalent to disloyalty to the nation.**

## Judicial Voices on Dissent

### Justice Ujjal Bhuyan (Recent Observations)

- **Democratic Space Shrinking:** Warned of the growing tendency to criminalise peaceful dissent.
- **Questioned Arrests:** Cited cases like the detention of eight Muslim men in Varanasi for consuming chicken during Ramzan—an act with no legal prohibition—and the refusal to permit a peaceful pro-Palestine demonstration in Mumbai.
- **Bail as Punishment:** Expressed concern that bail is increasingly becoming a tool of punishment before trial, and that bail conditions are restricting free speech.

### Former Chief Justice D.Y. Chandrachud

- **Bhima Koregaon Dissent:** "Dissent is the safety valve of democracy. If dissent is not allowed, the pressure cooker may burst."
- **Non-Negotiable Principle:** Freedom of speech is non-negotiable; courts exist to protect citizens against arbitrary state power.

### Justice B.V. Nagarathna

- Emphasised that constitutional democracy depends on **independent institutions and constitutional morality**.
- Constitutional values must prevail over political expediency.

### Justice H.R. Khanna (Legacy)

- **ADM Jabalpur Case (1976):** Lone dissent defending that life and personal liberty cannot become hostage to executive power during the Emergency.
- **Reminder:** Constitutional rights matter most precisely when governments seek to curtail them.

## Contemporary Concerns: The Jantar Mantar Protests

### Context

- Thousands of young people gathered peacefully at Jantar Mantar to demand accountability for repeated examination irregularities.
- Reports of **baton charges, pellet guns, mass detentions, prolonged custody, and extensive surveillance** raised serious questions.

### Judicial Response

- The Supreme Court directed **no coercive action** against protesters, ordered release of detained minors, and called for an **independent inquiry** into police excesses.

### The Constitutional Question

- Peaceful protesters are citizens exercising fundamental rights, not law-and-order threats.
- Criminal law is intended to punish genuine criminal conduct, not to deter peaceful dissent.

### Why Dissent Matters

#### Strengths of the Constitutional Framework

- **Robust Safeguards:** Articles 19 and 21 provide strong protection.
- **Judicial Vigilance:** Courts have consistently upheld dissent as a constitutional value.
- **Historical Precedent:** The legacy of judges like Khanna reaffirms that liberty is the rule.

#### Concerns and Gaps

- **Criminalisation:** Growing use of criminal law against peaceful protesters.
- **Prolonged Incarceration:** Denial of bail for extended periods without trial.
- **Arbitrary Restrictions:** Bail conditions that restrict speech and public participation.
- **Politically Inconvenient Views:** Peaceful assembly curtailed based on the popularity of views.

### The True Measure of Democracy

- **Not How It Treats Supporters:** How it protects those who peacefully disagree.
- **Trust vs. Fear:** Democracies that enjoy public confidence answer criticism with dialogue and accountability, not arrests.

### Conclusion

Peaceful dissent is a **pillar of constitutional democracy**, enabling citizens to question authority and demand accountability. Protected by Part III, the right to dissent strengthens democratic institutions. **Criminalising peaceful dissent weakens both individual liberty and constitutional values.** For India to remain a vibrant democracy, dissent must be recognised as an expression of faith in the Constitution.

## In the Way: On the Tribunal Reforms Bill 2026

### Introduction

The **Tribunal Reforms Bill, 2026**, passed by Parliament, seeks to address the Supreme Court's concerns by restoring **five-year terms, uniform service conditions and a National Tribunals Data Grid**. However, its failure to ensure adequate **autonomy for the National Tribunals Commission (NTC)** leaves tribunals vulnerable to executive influence.

### Background: Tribunals and Constitutional Tension

#### Need for Tribunals

- **Specialised Adjudication:** Technical disputes require expert knowledge.
- **Efficiency:** Tribunals ensure faster resolution.
- **Judicial Review:** Decisions remain subject to High Court scrutiny (S.P. Sampath Kumar, 1987; L. Chandra Kumar, 1997).

#### Structural Flaw

- **Administrative Control:** Tribunals administered by Ministries whose decisions they review.
- **Concern:** Undermines independence and impartiality.

#### Supreme Court Interventions

- **Rojer Mathew (2019):** Recommended independent, statutory NTC for selection and administration.
- **Finance Act 2017:** Gave executive more control over appointments.
- **Tribunals Reforms Ordinance 2021:** Reinstated conditions rejected by Court.
- **Madras Bar Association (2025):** Struck down objectionable provisions; restored previous framework; gave 4 months to establish NTC.

### Tribunal Reforms Bill 2026: Key Provisions

#### Positive Features

- **Five-Year Terms:** Restored (previously reduced).
- **Uniform Service Conditions:** Standardised across tribunals.
- **National Tribunals Data Grid:** For transparency and monitoring.
- **Pending Appointments:** Not marooned; continuity ensured.

#### Concerns: Lack of NTC Autonomy

#### Delegation to Executive Rules (Section 14)

- **Issue:** Qualifications, selection, salaries, allowances—left to future executive rules.
- **Judicial Objection (Rojer Mathew):** Defining who is qualified to exercise judicial power is an "essential legislative function" and cannot be delegated.
- **Contradiction:** Bill claims consonance with 2025 judgment but allows delegation the Court resisted.

#### Vague Language (Section 3)

- **Experts Concern:** Similarly vague language; potential for executive discretion.

#### Complaint Screening (Section 16)

- **Process:** Ministry screens complaint before it passes to NTC.
- **Effect:** Executive retains gatekeeping role.

### Appointments and Finances

- **Appointments:** Centre appoints NTC members; only consults CJI for chairperson and judicial members.
- **Finances:** Government retains substantial influence over NTC's finances and administration.

### Continuing Failure

- **Design Flaw:** NTC designed to insulate tribunals from executive control; cannot be subject to executive terms.
- **Fully Independent Required:** Government must forswear power to appoint/remove NTC members at will.

### Weaknesses

- **NTC Not Independent:** Executive control over appointments, finances, and complaint screening.
- **Delegated Rulemaking:** Qualification/selection criteria left to executive rules (contrary to Rojer Mathew).
- **Vague Provisions:** Potential for misuse/executive discretion.
- **Parliamentary Scrutiny:** Passed without discussion (Lok Sabha) and with minimal debate (Rajya Sabha).

### Way Forward

- **Full Autonomy:** Government must make NTC fully independent.
- **Statutory Safeguards:** Qualification, selection, removal criteria in the Act itself, not rules.
- **Independent Appointments:** CJI-led selection with government consultation, not vice versa.
- **Financial Independence:** NTC's budget to be charged on Consolidated Fund of India.
- **Complaint Mechanism:** Direct access to NTC without executive screening.

### Conclusion

The **Tribunal Reforms Bill, 2026** restores five-year terms and uniform conditions but retains significant **executive control over appointments, finances and complaints**, weakening tribunal independence. A truly autonomous NTC, with judicial oversight, financial independence and statutory safeguards, is essential to ensure **independent and effective tribunals**.

## India's Central Asia Strategy: Less Romance, More Realism

### Introduction

India's Central Asia policy needs to move from **historical nostalgia to pragmatic economics**. Despite deep ties, connectivity gaps and limited capabilities constrain India's influence. As Central Asia diversifies its partnerships, India should avoid competing with China, Russia or Europe on their strengths and instead pursue a **focused, modest agenda** in sectors where it has comparative advantages.

### The New Central Asia: Four Key Trends

#### Growing Geopolitical Agency

- **Regional Integration:** Regular summit-level meetings (since 2018); signed a friendship treaty; planning organisational substance.
- **C-6 Format:** Invited Azerbaijan, linking Central Asia more closely to the Caucasus and Türkiye.
- **Border Settlements:** Long-running Fergana Valley disputes settled among Uzbekistan, Kyrgyzstan, Tajikistan.
- **Intra-Regional Trade:** Growing, reinforcing political cooperation.

#### Diversification of Great-Power Relations

- **No Exclusive Commitments:** Central Asia engages all major powers (EU, China, Russia, US, Japan) and commits to none exclusively.

- **Russia's Diminished Role:** Ukraine war and China's economic influence have weakened Moscow's former dominance.
- **US Return:** New emphasis on commerce, critical minerals, energy corridors.
- **Multi-Vector Strategy:** Similar to India's multi-alignment.

#### Growing Entanglement with the Middle East

- **Shift from Russian/Soviet Past:** Region's political/cultural orientation is changing.
- **Abraham Accords:** Kazakhstan announced accession; Azerbaijan, Kazakhstan, Uzbekistan signed Trump's Board of Peace charter at Davos.
- **Gulf Capital:** Increasingly important.
- **Türkiye:** Transformed Organisation of Turkic States into an instrument for political, economic, and defence cooperation.
- **Alternative Routes:** Iran war complicates southern access; increases importance of westward routes across the Caspian.

#### Diminution of the Afghan Question

- **No Export of Revolution:** Taliban's return has not led to feared spillover.
- **Pragmatic Engagement:** Central Asian states, including Tajikistan, are engaging with Kabul.
- **New Problems:** Management of shared waters (Amu Darya) emerging.

#### Where Does This Leave India?

##### Constraints

- **No Direct Land Access:** Pakistan blocks overland route; Afghanistan remains unstable.
- **Chabahar and INSTC:** Growing Iran-US conflict complicates prospects.
- **Idle Connectivity Node:** India's one hard-built connectivity node in the region sits idle.

##### Limitations

- **Cannot Match:** China's infrastructure spending, Russia's geographic advantages, Europe's financial resources, or Türkiye's direct access.
- **Need for Realism:** Sustained political attention must be matched by a practical economic agenda.

##### Opportunities

- **Goodwill:** India enjoys considerable goodwill in Central Asia.
- **Diplomatic Flexibility:** Consider greater flexibility towards Pakistan, Türkiye, and Azerbaijan to improve manoeuvrability.

#### Way Forward: Less Romance, More Realism

##### Practical Economic Agenda

- **Focus on Sectors:** Areas where India can contribute (IT, pharmaceuticals, education, healthcare, small-scale manufacturing).
- **Connectivity:** Pursue alternative routes (Chabahar, INSTC) while managing geopolitical risks.
- **Capacity Building:** Training, technical assistance, and skill development.

##### Diplomatic Approach

- **Recognise Central Asia's Agency:** States want multiple partnerships, not another patron.
- **Modest and Sustained:** Ensure a modest, sustained, and steadily expanding Indian presence.
- **Flexibility:** Consider diplomatic flexibility towards Pakistan, Türkiye, and Azerbaijan.

##### Strategic Priorities

- **Not Grand Schemes:** Modi's visit should focus on practical steps.
- **Long-Term Engagement:** Build on goodwill through consistent engagement.
- **Regional Stability:** Support Central Asia's integration and stability.

## Conclusion

India's Central Asia strategy must shift from **romantic ambition to pragmatic realism**. Unable to match China, Russia, Europe or Türkiye, India should leverage its goodwill and focus on **practical, high-impact cooperation**. Despite connectivity constraints, sustained diplomacy can preserve India's relevance as Central Asia diversifies its partnerships.

## Smart Glasses Highlight Gaps in Privacy Laws

### Introduction

Meta's AI-powered smart glasses, priced around ₹25,000 in India, highlight the growing gap between technological innovation and privacy regulation. Their discreet recording capabilities can enable non-consensual surveillance, especially when recording indicators can be concealed. While the DPDPA, 2023 is technology-neutral, gaps remain between legal safeguards and the **reasonable expectation of privacy** recognised in *K.S. Puttaswamy*. India needs technology-aware regulations to address emerging risks from AI-powered wearables.

### The Technology and Its Risks

#### Key Features

- **Discreet Design:** "Normal-looking eyewear" with integrated speakers, microphones, and a lightweight camera.
- **Capabilities:** Voice commands for calls, messages, notifications; music playback; photo/video capture.
- **Battery Life:** 4-9 hours of active use—enough to record movies, lectures, confidential documents, or patient information.
- **Price:** Approximately ₹25,000 in India.

#### Privacy and Data Concerns

- **LED Indicator:** Easily covered with widely available stickers; Meta claims recording blocks until sticker removed, but workarounds exist.
- **Shutter Sound:** Not a strong indicator of recording.
- **Data Collection:** Meta collects data for reliability and security; contractors have reviewed sensitive content (including wearers using toilets).
- **Non-Consensual Recording:** The wearer has "control," not the recorded subject.

#### Potential for Misuse

- **Women's Privacy:** In 2023, there were 3,678 women-centred cybercrime cases; 2,767 involved sexual explicit material. Smart glasses make non-consensual recording easier.
- **Children:** 698 child sexual abuse material cases in 2023; children cannot recognise recording.
- **Unintentional Capture:** Private information could be captured in the frame's periphery.

#### Legal Gaps in India

##### Digital Personal Data Protection Act, 2023 (DPDPA)

- **Technologically Agnostic:** Focuses on the purpose of data collection, not the technology itself.
- **Exclusion:** Excludes information "made publicly available."
- **Public Spaces:** Individuals can neither grant consent nor monitor how their information is used.

##### Fundamental Right to Privacy (*K.S. Puttaswamy*, 2017)

- **Reasonable Expectation:** Recognised as a fundamental right under Article 21.
- **Public Spaces:** People do not generally expect to be captured in detail, even in public.
- **Conflict:** DPDPA's exclusion of publicly available information does not meet the reasonable expectation of privacy.

#### Inadequate Indicators

- **Minimal Awareness:** Unlike phones, smart glasses lack strong indicators (LED easily covered, shutter sound weak).
- **Result:** People may be recorded without knowledge or consent.

### Way Forward

#### Banning is Not Practical

- **Market Growth:** Meta, Google, and Reliance are entering the smart glasses market.
- **Tech Advancement:** As technology evolves, banning becomes increasingly difficult.

#### Legal Reform

- **Risk Assessments:** Evaluate how technology will evolve and the associated risks.
- **Government Responsibility:** Ensure citizens are adequately protected.
- **Proactive Frameworks:** Laws should be framed with an understanding of AI and emerging technologies.

#### Specific Measures

- **Strengthen DPDPA:** Address the gap regarding publicly available information and public-space recording.
- **Mandatory Indicators:** Require clear, non-removable recording indicators.
- **Consent Requirements:** Ensure recorded subjects have control over data collection and use.

### Conclusion

Smart glasses expose gaps in India's privacy framework. While banning them is impractical, the DPDPA must evolve to address non-consensual surveillance and emerging wearable technologies. India needs stronger risk assessments, clearer safeguards and **privacy-by-design**, ensuring digital accountability keeps pace with innovation.

## The Digital Transformation of the Indian Judiciary: e-Courts Mission

### Introduction

The **e-Courts Mission Mode Project** has digitised India's judiciary, improving access, transparency and case tracking. Since 2014, case filings and disposals have nearly tripled, with over **753 crore pages digitised** and **2,584 e-Sewa Kendras** established. Phase III (2023–27), with a **₹7,210 crore outlay**, focuses on AI, virtual courts and interoperability. Over **4.18 crore remote hearings** and the **NJDG** further strengthen digital justice delivery.

### Evolution and Phases of e-Courts Mission

#### Phase I (2011-2015): Foundation

- **Computerisation:** Over 14,000 courts computerised.
- **Network Infrastructure:** Built basic technology backbone for judicial services.

#### Phase II (2015-2023): Citizen-Centric Services

- **National Judicial Data Grid (NJDG):** Real-time public dashboard of pending/disposed cases.
- **e-Filing:** Online document filing; over **1.25 crore cases** filed since inception.
- **e-Sewa Kendras:** Physical help desks for digital court services (2,584 Kendras).
- **Video Conferencing:** Expanded more than fivefold; over **4.18 crore remote hearings**.

#### Phase III (2023-2027): Digital, Paperless, Intelligent Courts

- **Key Achievements (as of June 2026):**
  - **Paperless Courts:** 474 courts equipped with hardware.
  - **Virtual Courts:** 538 courts with digital infrastructure; 31 Virtual Courts for traffic challans (11.33 crore challans, ₹1,135.79 crore).
  - **e-Filing:** 4,519 courts enabled.
  - **Video Conferencing:** 7,553 establishments (courts, jails, hospitals).
  - **Solar Facilities:** 1,626 court complexes equipped.

- **NSTEP:** 6,895 courts with electronic summons tracking.
- **Website Migration:** 734 court sites to S3WAAS platform.
- **ICJS Integration:** All High Courts integrated.
- **Training:** 2,372 training programmes.

### Key Digital Platforms and Tools

#### National Judicial Data Grid (NJDG)

- **Purpose:** Public dashboard tracking case status, pendency, disposal, and delays.
- **Benefits:** Transparency, judicial planning, remote administration.
- **Data:** Pendency/disposal by category, stage, and reasons for delay.

#### e-Filing and e-Payments

- **e-Filing:** Online filing of complaints, written statements, vakalatnamas; e-signing.
- **E-Payments:** Court fees (₹1,404 crore) and fines (₹75 crore) processed (till June 2026).
- **Regional Languages:** Supports English and regional languages.
- **Portfolio Management:** For advocates and litigants.

#### Virtual Courts and Video Conferencing

- **Remote Hearings:** 4.18 crore hearings; Nyaya Shruti platform for virtual testimony.
- **Livestreaming:** Operational in 11 High Courts.
- **Virtual Courts:** Online adjudication of traffic challans.

#### Inter-Operable Criminal Justice System (ICJS)

- **Integration:** Connects courts, police, prisons, forensics, prosecution.
- **CCTNS:** Computerises police processes (FIR to charge-sheet).
- **ITSSO:** Dashboard for sexual offence investigation tracking.
- **e-Sakshya:** Secure digital evidence management.
- **e-Summons:** Electronic generation and execution.
- **MedLEaPR:** Online medico-legal and postmortem reporting.
- **e-Forensic:** Digital case handling in forensic labs.
- **e-Prison:** Cloud-based prison management.
- **e-Prosecution:** Digital workflow for legal opinions.
- **NAFIS:** Centralised fingerprint database.

#### Digital Delivery and Access

- **NSTEP:** GPS-tracked electronic summons delivery (6,895 courts).
- **e-Courts Services Portal:** ~35 lakh daily hits.
- **e-Courts Mobile App:** 3.84 crore downloads.
- **JustIS App:** Judicial management tool (22,594 downloads).
- **SMS/Email:** Over 4 lakh SMSs, 6 lakh emails daily.

#### AI and Machine Learning Initiatives (Phase III)

- **Outlay:** ₹53.57 crore for AI/ML development.
- **Transcription:** AI/ML tools for oral arguments (Constitutional Bench).
- **LegRAA:** Legal research and analysis assistant.
- **Digital Courts 2.1:** Paperless case management; voice-to-text (ASR-SHRUTI) and translation (PANINI) tools.
- **eSCR Portal:** 83,000+ judgments translated into 18 Indian languages (36,344 in Hindi).
- **AI Defect Detection:** IIT Madras tool for e-filed petitions.

### Impact and Achievements

#### Efficiency Gains

- **Case Disposal:** Courts disposing more cases than filed since 2014.
- **Digitisation:** 753 crore pages of legacy records digitised.
- **Remote Access:** Reduced travel and expenses for litigants, lawyers, witnesses.

#### Transparency and Accountability

- **NJDG:** Public visibility of case pendency and delays.
- **Tracking:** Real-time status via app, SMS, email, portal.
- **Service Delivery:** e-Sewa Kendras assist citizens with legal processes.

#### Inclusivity

- **e-Sewa Kendras:** 2,584 centres across High Courts and District Courts.
- **Multilingual:** Regional language support in e-filing and translations.
- **Virtual Access:** Nyaya Shruti for remote testimony by accused, witnesses, experts.

#### Challenges

- **Digital Divide:** Access to e-services for the poor and rural citizens (mitigated by e-Sewa Kendras).
- **Infrastructure:** Power, connectivity, and hardware in remote courts.
- **AI Limitations:** AI tools are aids, not substitutes for judicial discretion.
- **Training:** Continuous training of judges, lawyers, and staff.
- **Data Security:** Protection of sensitive case and personal data.

#### Way Forward

- **Phase III Completion:** Achieve 100% paperless courts; expand virtual courts.
- **AI Ethics:** Ensure transparency, accountability, and human oversight.
- **Digital Literacy:** Train all stakeholders; expand e-Sewa Kendras.
- **Interoperability:** Complete ICJS integration with forensics, prosecution.
- **Citizen Engagement:** Enhance multilingual and voice-based interfaces.

#### Conclusion

The **e-Courts Mission** is transforming India's judiciary through **753 crore digitised pages, 4.18 crore remote hearings, 1.25 crore e-filings, and 2,584 e-Sewa Kendras**. With **NJDG and AI tools** improving transparency, accessibility and efficiency, Phase III focuses on **paperless courts, virtual hearings and AI-driven justice delivery**.

### PAPER 3

#### Cyber-Physical Systems: Foundation for a Technology-Driven Future

##### Introduction

Cyber-Physical Systems (CPS) integrate the digital and physical worlds. Under the **National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS)**, India is building a strong innovation ecosystem through TIHs, research parks, start-ups and skill development. Applications in AI, healthcare, agriculture and cybersecurity are driving real-world technological solutions.

##### Understanding Cyber-Physical Systems

##### Definition and Applications

- **Definition:** CPS integrates computation, communication, and physical processes through sensors, software, and networks.
- **Examples:** Driverless cars, smart factories, medical devices, smart buildings, fitness trackers.
- **Impact:** Enables real-time sensing, processing, and response; creates intelligent, connected systems.

##### Strategic Importance

- **Critical Infrastructure:** CPS underpins national security, healthcare, energy, and transportation.
- **Indigenous Capability:** Developing domestic CPS capacity is strategically vital for self-reliance.

### National Mission on Interdisciplinary CPS (NM-ICPS)

#### Mission Overview

- **Approved:** 2018; outlay ₹3,660 crore (9 years).
- **Implementing Agency:** Department of Science and Technology (DST).
- **Framework:** Links academia, industry, government, and international partners.
- **Coverage:** R&D to product development and start-up incubation.

#### Technology Innovation Hubs (TIHs)

- **Number:** 25 TIHs (Section 8 companies) hosted by premier institutions.
- **Focus Areas:** Technology Development; HR/Skill Development; Innovation/Entrepreneurship; International Collaborations.
- **Role:** Technology platforms, product translation, start-up nurturing, engagement with government ministries.

#### Technology Translation Research Parks (TTRPs)

- **Established (2025):** 4 TTRPs at IIT Kanpur (Cybersecurity), IISc Bengaluru (Robotics/AI), IIT (ISM) Dhanbad (Mining), IIT Indore (Digital Healthcare).
- **Purpose:** Accelerate technology translation and commercialisation.

### Key Achievements (As of August 2026)

#### Technology and Innovation

- **Technologies Enabled:** 1,146
- **Technology Products:** 1,329
- **Start-ups Incubated:** 1,136 (24,000+ jobs created)
- **International Collaborations:** 200

#### Human Resource Development

- **CHANAKYA Fellowships:** 5,824 awarded.
- **Skills Training:** 2.46 lakh+ professionals.

#### Sovereign AI (BharatGen)

- **Param-2:** 17 billion parameters; supports all 22 Scheduled Indian languages.
- **Speech Models:** Shrutam (speech-to-text), Sooktam (text-to-speech) for 12 languages.
- **Domain Models:** Ayur Param (Ayurveda), Agri Param (agriculture), Legal Param (legal).
- **Patram:** Multilingual document access under DocBodh framework.

### Real-World Applications

#### Healthcare

- **CharakDT (IIT Indore):** Digital twin of the human body (lungs, eyes, heart) for disease progression study and virtual treatment testing.

#### Agriculture

- **Agri-IoT Farm Management System (IIT Bombay):** Monitors soil, weather, micro-climate for efficient water/fertiliser use.

#### Mining

- **TEXMiN Hub (IIT (ISM) Dhanbad):** Drones for real-time monitoring up to 50 km; reduces hazardous exposure.

#### Advanced Communication

- **5G-Advanced ORAN Massive MIMO (IIIT Bengaluru):** Indigenous 32TR RU for cost-effective 5G connectivity in remote areas.

#### Cybersecurity

- **IHUB NTIHAC (IIT Kanpur):** IT-OT Security Operations Centre; Crypto-Forensic Tools for cryptocurrency crime investigation.

#### Mobility and Autonomous Systems

- **TiHAN Foundation (IIT Hyderabad):** India's first proving ground for autonomous navigation.
- **iRASTE (IISc Bengaluru):** Identifies accident-prone locations; real-time alerts; piloted in Nagpur.

#### Challenges

- **Scale:** 25 TIHs need expansion to cover more institutions and sectors.
- **Industry Adoption:** Bridging the gap between research and commercial deployment.
- **Talent:** Continuous skilling needed for rapidly evolving CPS domains.
- **Infrastructure:** High-quality research infrastructure across all hubs.

#### Way Forward

- **Expand TIH Network:** More hubs in emerging CPS domains (quantum, biotech, space).
- **Strengthen Industry Linkages:** Collaborative research, sponsored projects, licensing.
- **Promote Start-ups:** Easier access to funding, mentorship, and market linkages.
- **International Cooperation:** Deepen partnerships with leading global CPS centres.
- **Policy Support:** Framework for data sharing, standards, and regulatory sandboxes.

#### Conclusion

NM-ICPS is building a strong CPS ecosystem through innovation hubs, research parks, start-ups and advanced technologies. With applications across key sectors and initiatives like BharatGen, it can strengthen India's technological self-reliance and support the vision of **Viksit Bharat**.

### A Shared Disaster: Transcending Borders and Geopolitics

#### Introduction

The August 26 glacial collapse near the Nepal–China border, triggering catastrophic floods across the region, highlights how climate disasters transcend political boundaries. The tragedy underscores the urgent need for India, Nepal and China to strengthen cross-border disaster preparedness, data-sharing and climate cooperation.

#### The Disaster: Scale and Impact

##### The Event

- **Date:** August 26, 2026, 8:44 AM (Nepal time).
- **Cause:** Collapse of an enormous glacial slab, triggering a landslide and flash floods.
- **Impact:** 579 confirmed deaths in Nepal; nearly 2,000 missing (many foreigners).
- **Infrastructure:** Entire villages swept away; bridges and hydropower stations decimated; 475 MW generating capacity wiped out.

#### Impact on Nepal

- **Worst Disaster:** This may be the most devastating natural disaster in Nepal's history.
- **Human Toll:** Preliminary estimates of 579 dead, 2,000 missing.
- **Economic Devastation:** Vital infrastructure destroyed; power grid severely impacted.

#### Impact on China

- **Gyirong Port:** The \$175.8 million international land port, the primary gateway between Nepal and China, is now buried under sediment and debris.

- **Access Roads, Power, Communications:** Severely damaged or severed.
- **Fatalities:** Reports of deaths and missing persons in Tibet's Gyirong County, including foreign nationals.

#### Impact on India

- **Human Loss:** Indian nationals missing (tourists/pilgrims on Kailash Mansarovar route).
- **Downstream Floods:** Severe threats to Bihar and Uttar Pradesh; waters reached Gandak, Kosi, and Ganga rivers.
- **Evacuations:** Communities evacuated; maximum alert in Bihar; NDRF teams deployed.
- **Relief Effort:** Indian Air Force dispatched 47.5 tonnes of emergency relief material to Nepal.

#### The Case for Transboundary Cooperation

##### Nature Knows No Borders

- **Geopolitical Irrelevance:** Political boundaries are meaningless in the face of such natural disasters.
- **Shared Vulnerability:** All three countries suffered human and property losses.

##### The Imperative for Coordination

- **Increasingly Unpredictable Events:** Cross-border natural phenomena are likely to recur.
- **Interconnected Geography:** Overflowing rivers from Nepal naturally flow into Indian territory.

##### Compartmentalising Geopolitics

- **Need for Cooperation:** The disaster underscores the need to separate hard political dynamics from disaster response.
- **Creating Space:** For cooperation when confronted with events that remind us of nature's fickleness and human fragility.

#### The Way Forward

##### Humanitarian Assistance and Disaster Relief (HADR)

- **Rapid Response:** India's NDRF and IAF response is a model for future coordination.
- **Regional Framework:** Develop a trilateral HADR framework for the Himalayan region.

##### Early Warning Systems

- **Shared Data:** Real-time sharing of glacial lake and seismic data among Nepal, India, and China.
- **Joint Monitoring:** Collaborative monitoring of high-risk glacial lakes.

##### Infrastructure Resilience

- **Cross-Border Infrastructure:** Design and build infrastructure to withstand transboundary disasters.
- **River Basin Management:** Coordinate flood management in shared river basins (Gandak, Kosi).

##### Climate Adaptation

- **Climate Change:** Address the root cause—melting glaciers and climate change.
- **Joint Research:** Collaborate on climate science and adaptation strategies.

#### Conclusion

The August 26 flash floods show that nature transcends political boundaries. The losses across Nepal, China and India highlight the urgent need for cooperation on humanitarian aid, early-warning systems and climate adaptation. In the face of transboundary disasters, cooperation is not a choice—it is an imperative.

### Nuclear Energy Technology in India: Building a Sustainable and Self-Reliant Future

#### Introduction

India's nuclear programme emphasises technological self-reliance and the three-stage nuclear strategy to utilise its vast thorium reserves. With 24 operational reactors, the PFBR entering the second stage, and initiatives such as SMRs, India aims to achieve 100 GW of nuclear capacity by 2047, strengthening clean and long-term energy security.

#### India's Three-Stage Nuclear Programme

### Stage 1: Pressurised Heavy Water Reactors (PHWRs)

- **Fuel:** Natural uranium.
- **Purpose:** Generate electricity; spent fuel reprocessed to recover plutonium.
- **Status:** Backbone of current programme; 10 indigenous PHWRs approved in fleet mode.

### Stage 2: Fast Breeder Reactors (FBRs)

- **Fuel:** Plutonium recovered from PHWRs; breed additional fissile material.
- **Purpose:** Produce Uranium-233 from thorium; lay groundwork for Stage 3.
- **Milestone:** PFBR at Kalpakkam attained first criticality (April 2026); **nearly 90% domestic manufacturing.**

### Stage 3: Thorium-Based Reactors

- **Fuel:** Uranium-233 (bred from thorium).
- **Purpose:** Harness India's abundant thorium reserves (coastal sands of Kerala, TN, Andhra, Odisha).
- **Significance:** Achieve long-term fuel self-reliance.

### Current Status and Expansion

#### Operational and Under Construction

- **Operational:** 24 reactors; 8.78 GW.
- **Under Construction:** 9 reactors; 7.5 GW.
- **Approved:** 10 PHWRs in fleet mode; pre-project for 2 FBRs (500 MW each).

#### Policy Initiatives

- **Nuclear Energy Mission (2025-26):** ₹20,000 crore for indigenous Small Modular Reactors (SMRs).
- **SHANTI Act, 2025:** Enables private sector participation; accelerates capacity expansion.
- **Target:** 100 GW nuclear power by 2047.

### Small Modular Reactors (SMRs)

- **BSMR-200:** 220 MWe Bharat Small Modular Reactor (BARC/NPCIL).
- **SMR-55:** 55 MWe design.
- **High-Temperature Gas-Cooled Reactor:** For hydrogen production.
- **Target:** At least 5 indigenous SMRs operational by 2033.

### Safety and Waste Management

#### Design and Operational Safety

- **Defence in Depth:** Multiple layers of protection; ceramic fuel pellets, zirconium alloy rods, pressure vessel, reinforced concrete containment.
- **Radiation Protection:** ALARA principle; average occupational dose limit of 20 mSv/year (over 5 years).
- **Emergency Preparedness:** On-site and off-site plans; 16 km Emergency Planning Zone; regular mock drills.

#### Radioactive Waste Management

- **Closed Fuel Cycle:** Spent fuel reprocessed; valuable materials recovered.
- **Vitrification Technology:** India among few countries with indigenous vitrification (high-level waste converted to stable glass).
- **Regulatory Oversight:** AERB; Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987.

#### Post-Fukushima Safety Reviews

- **Comprehensive Review:** Completed for all Indian plants.
- **Short/Medium-term Enhancements:** Completed.
- **Long-term Upgrades:** Ongoing across existing and future reactors.

#### Applications Beyond Electricity

**Healthcare**

- **Cancer Care:** Homi Bhabha Cancer Hospital (Muzaffarpur); Tata Memorial Centre registered 1.3 lakh patients in FY25.
- **Indigenous Radiopharmaceuticals:** BARC, IGCAR, TMC.
- **Medical Device Sterilisation:** 1.53 crore devices sterilised (FY25).

**Agriculture and Food Preservation**

- **Crop Varieties:** BARC developed 70 varieties (TBM-9 banana, RTS-43 sorghum).
- **Food Irradiation:** 40 operational facilities; 17 MoUs signed in 2025.
- **Shelf-Life Extension:** Mangoes (sea export), onions/potatoes (reduce spoilage).

**Mining and Semiconductors**

- **Critical Minerals:** First Certified Reference Material (Ferrocarbonatite) for Rare Earth Elements.
- **Semiconductors:** Electronics-grade Boron-11 Enrichment Facility (Talcher); strengthens India Semiconductor Mission.

**Green Hydrogen**

- **World's First:** Hydrogen production using nuclear process heat at Kalpakkam (2026).
- **Supports:** Net Zero and National Green Hydrogen Mission.

**Conclusion**

India's nuclear programme is central to clean energy, technological self-reliance and sustainable development. With expanding reactor capacity, the PFBR milestone and SMR development, India aims to achieve 100 GW by 2047, supporting energy security, Viksit Bharat and Net Zero by 2070.

**Centre's Fiscal Outlook Faces Geopolitical and Revenue Risks****Introduction**

The Centre's fiscal outlook for 2026–27 faces geopolitical and revenue pressures, with Gross Tax Revenue (GTR) growing only **3.7% in Q1**. Subdued PIT growth (**0.037% in 2025–26**) and an **11% contraction in GST revenue** have weakened tax collections. However, strong non-tax receipts and policy measures may help keep the fiscal deficit broadly on track.

**Revenue Performance Under Stress****Gross Tax Revenue (Q1 2026-27)**

- **Growth:** Only 3.7% year-on-year
- **Drivers:** Subdued PIT and GST performance

**Personal Income Tax (PIT)**

- **2025-26 Revenue Growth:** 0.037% (effectively zero buoyancy)
- **Q1 2026-27 Growth:** 6.8% (recovering but still subdued)
- **Context:** Extensive rate rationalisation in 2025-26; revenue sacrifice expected to be offset by base expansion over time

**Goods and Services Tax (GST)**

- **Substantive Rate Reduction:** Undertaken in 2025-26
- **H2 2025-26 Growth:** 4.67%
- **Q1 2026-27 Growth:** Contraction of **(-)11%**
- **Impact:** Revenue-reducing effects of rate rationalisation have continued

**The Reform Trade-Off: Short-Term Pain for Long-Term Gain****Rationale for Tax Reforms**

- **Rate Rationalisation:** PIT and GST were substantively modified in 2025-26

- **Expected Outcome:** Initial revenue sacrifice; subsequent expansion of tax base would offset losses over time

#### Current Reality

- **Revenue Loss:** Tax base expansion has not yet compensated for rate reductions
- **GST Contraction:** (-)11% in Q1 2026-27 indicates deepening impact

#### Geopolitical Headwinds

- **Uncertainty:** Global geopolitical environment affecting trade, energy prices, and investor sentiment
- **Oil Prices:** Potential impact on inflation and subsidy burden
- **Capital Flows:** May affect exchange rate and revenue projections

#### Mitigating Factors

##### Non-Tax Receipts

- **Strong Performance:** Expected to compensate for tax revenue shortfalls
- **Sources:** Dividends, fees, and other non-tax revenue

##### Policy Interventions

- **Government Response:** Measures to keep fiscal outcomes broadly on track
- **Expenditure Management:** Potential adjustments to spending priorities

##### Fiscal Deficit Target

- **Budget Estimates:** May remain close to target despite risks

##### Risks

- **Tax Base Expansion Delay:** Slower than expected; revenue losses not yet offset
- **Geopolitical Uncertainty:** External shocks could worsen fiscal position
- **Growth Slowdown:** Subdued tax revenue may reflect underlying economic weakness

##### Way Forward

- **Monitor Tax Base Expansion:** Track whether rate cuts lead to increased compliance
- **Contain Subsidies:** Manage subsidy burden amid geopolitical risks
- **Boost Non-Tax Revenue:** Leverage dividends and asset monetisation
- **Fiscal Prudence:** Maintain deficit target through expenditure rationalisation
- **Geopolitical Watch:** Prepare contingency plans for oil price shocks

##### Conclusion

The Centre's fiscal outlook for 2026–27 faces risks from weak tax revenues, including an **11% GST contraction in Q1**, and geopolitical uncertainties. While recent tax reforms may expand the tax base over time, they have caused an initial revenue sacrifice. Strong non-tax receipts and fiscal prudence may keep the deficit on track, but sustained revenue pressures require **better tax compliance, subsidy rationalisation and preparedness for external shocks**.

### The Rupee's Borrowed Breathing Space

#### Introduction

The RBI's **\$52.3 billion FCNR(B) inflow** helped stabilise the rupee by boosting foreign-currency liquidity. However, this is a **temporary solution, not a structural cure**. Hedging costs borne by the RBI and future deposit maturities shift risks to the **public balance sheet and banking system**, creating potential repayment and asset-liability pressures.

#### The FCNR(B) Window: How It Works and What It Achieved

##### Mechanism

- **FCNR(B) Deposits:** Non-resident Indians hold foreign currency with Indian banks, free of rupee risk, with tax-free interest and full repatriation.

- **Swap Facility:** Banks raise 3-5 year deposits, swap dollars with RBI, which absorbs hedging costs.
- **High Yields:** Once hedging cost is lifted, banks offer dollar rates near 6-7.5%, some adding leverage of 9-19 times.
- **Carry Trade:** Wealthy depositors borrow abroad and place funds in India at protected high yields, with currency risk removed.

#### Scale and Speed

- **Mobilisation:** \$52.3 billion between June 8 and August 13, 2026.
- **Window Closure:** RBI closed FCNR(B) swap window a month early—seen as a vote of confidence.

#### Why It Was Needed

- **Rupee Pressure:** Asia's worst-performing currency in 2025-26; FPI outflows.
- **Expectations Loop:** Once investors believe depreciation is one-way, good data stops persuading them. Breaking the loop requires making bets against the rupee expensive.

#### The Risks: Relocated, Not Eliminated

##### Public Balance Sheet Exposure

- **Hedging Cost Absorption:** When RBI absorbs hedging costs, the exposure moves onto the public balance sheet.
- **Implicit Liability:** The state bears the cost of protecting depositors from currency risk.

##### Banking Sector Asset-Liability Mismatch

- **Maturity Mismatch:** Banks raise 3-5 year deposits and lend against them, creating an asset-liability mismatch.
- **Risk Resurgence:** A visible currency problem today can become a less visible banking problem tomorrow.

##### Future Repayment Obligations

- **Maturing Deposits:** Every dollar arriving now must be repaid in 3-5 years.
- **Rollover Risk:** If deposits are not rolled over, capital outflow could pressure the rupee.

##### Current Account Deficit Context

- **CAD:** India slipped into a current-account deficit in May 2026.
- **Not a Durable Source:** FCNR(B) deposits are a balance-of-payments stabiliser, not a durable source of dollars.

##### Borrowed Time vs. Earned Dollars

##### Strengths of the RBI's Move

- **Decisive Action:** Stabilised the rupee in the short term.
- **Diaspora Leverage:** Proved India can summon diaspora dollars quickly when needed.
- **Cushion:** Large reserves, services exports, and remittances provide a buffer.

##### Weaknesses and Risks

- **Confidence is Purchased:** Flows surged only after the subsidy appeared—confidence that materialises only after the price is raised is not confidence, it is a purchase.
- **Risk Transfer:** The scheme does not make rupee risk disappear; it relocates it to the public balance sheet and banking system.
- **Maturity Wall:** Repayment obligations will strain external finances.

##### The Real Solution

- **Earn Dollars:** Build export-surplus sectors, attract FDI, cut energy import dependence, and treat tourism as a foreign-exchange industry.
- **No Substitute:** If India earns too few dollars, no better way of borrowing will solve it.

### Way Forward

- **Use the Window:** Leverage FCNR(B) inflows for export and FDI reforms.
- **Cut Import Dependence:** Boost renewables and domestic manufacturing.
- **Expand Exports:** Promote high-value services, electronics, pharma and tourism.
- **Manage Risks:** Monitor bank leverage and prepare for FCNR(B) maturities through prudent rollover strategies.

### Conclusion

The RBI's **\$52.3 billion FCNR(B) swap facility** stabilised the rupee and curbed speculative pressure, but the stability is temporary. With deposits maturing in **3–5 years**, risks have shifted to the public balance sheet and banking system. India must use this window to **boost exports, attract FDI and reduce energy-import dependence. Earning more dollars is the durable defence of the rupee.**

### Rasuwa Flash Flood Brings GLOFs Back into Spotlight

#### Introduction

The Rasuwa flash flood in Nepal has renewed concerns over rising **GLOF risks in the Himalayas**. Climate change is expanding glacial lakes, increasing the threat of sudden moraine-dam failures. India has also experienced major GLOFs, including **Rishi Ganga (2021)** and **South Lhonak (2023)**. The event highlights the **“recovery gap”**, where communities face new disasters before recovering from earlier shocks, underscoring the need for multi-hazard preparedness and resilient recovery.

#### Understanding GLOFs

##### Definition and Mechanism

- **GLOF:** Sudden release of water from a lake fed by glacier melt.
- **Moraine:** Accumulation of unconsolidated debris deposited by a glacier.
- **Formation:** As glacier retreats, meltwater fills the space between the proglacial moraine and the retreating glacier.
- **Failure Triggers:** Pressure from growing lake volume; displacement waves from fragmentation/landslides; internal processes (water seeping through dam).

##### Increasing Risk

- **Climate Change:** Rising temperatures form new lakes, expand existing ones, and merge them, increasing flood volumes.
- **Frequency:** GLOFs are not new, but their frequency and risk are expected to increase.
- **Regional Context:** ICIMOD mapped 25,000+ glacial lakes in the HKH; 8.3% are below 4000 masl.

##### Recent Indian GLOF Events

- **Uttarakhand (Feb 2021):** Rishi Ganga flood destroyed the Rishiganga (35MW) and Tapovan Vishnugad (520MW) projects; >200 killed.
- **Sikkim (Oct 2023):** South Lhonak lake outburst caused catastrophic flash floods in the Teesta basin; destroyed Chungthang Dam.

#### The Recovery Gap: A Critical Dimension

##### The Concept

- **Definition:** The relationship between how long recovery takes and how much time is available before another disaster strikes.
- **Example:** Nepal-Tibet floods struck a region still recovering from the 2025 Bhote Koshi flooding (killed 9, washed away a bridge, disrupted trade for months).
- **Sri Lanka:** Recent floods/landslides hit communities still recovering from Cyclone Ditwah (only 9 months earlier).

### Why Recovery Matters

- **Incomplete Recovery:** Roads/bridges remain damaged; families have spent savings; governments are still financing reconstruction; public services are under pressure.
- **Compound Losses:** A 2025 Philippines study found that losses increased by up to 45% because of incomplete recovery.

### Recovery is Unequal and Multi-Speed

- **Different Timelines:** Electricity/water (days); roads (months); homes (years); businesses (debt); household finances, ecosystems, mental wellbeing (different timescales).
- **Inequality:** Wealthier households have insurance, savings, credit; poorer households have fewer resources.
- **Example:** New Orleans (Hurricane Katrina) took 15+ years for full recovery—in a rich country.

### Implications for Disaster Risk Management

#### Beyond Immediate Losses

- **Current Practice:** Governments are good at recording immediate losses (damaged buildings, displaced people, financial costs).
- **Need:** Also track what remains unrepaired months/years later—housing, infrastructure functionality, business activity, household finances, livelihood recovery.

#### Sequential Hazard Planning

- **Disasters Are Not Isolated:** Roads damaged by one event may be needed for evacuation during the next.
- **Risk Assessments:** Should consider plausible hazard sequences and the condition of critical systems when another disaster hits.

#### Recovery as Preparation

- **Not Just Final Stage:** Recovery is preparation for whatever comes next.
- **Speed + Adaptation:** Rebuild with improved infrastructure, redundancy, and emergency planning.
- **Global Evidence:** Investment in rapid, efficient recovery reduces future vulnerability.

### Conclusion

The Rasuwa flash flood and recurring Himalayan GLOFs highlight rising climate risks and the “**recovery gap**” that leaves communities vulnerable to subsequent disasters. India must strengthen early-warning systems, climate-resilient infrastructure and recovery monitoring. Disaster management should move beyond isolated events towards **multi-hazard and sequential-risk planning**, ensuring recovery builds resilience against future crises.

## Semiconductor and AI Revolution: Powering India's Future

### Introduction

India is building an integrated **semiconductor–AI ecosystem** to boost technological self-reliance and supply-chain resilience. **Semicon India 2.0** has a ₹1,27,500 crore outlay, while the **IndiaAI Mission** (₹10,372 crore) is expanding compute capacity and indigenous AI models. These initiatives strengthen India’s innovation capabilities and global technology position.

### Semiconductors: Building the Foundation

#### Semicon India Programme

- **Semicon 1.0 (2021):** ₹76,000 crore outlay; support for chip design, fabrication, packaging, testing
- **Semicon 2.0 (2026):** ₹1,27,500 crore outlay; six strategic pillars: chip design, equipment/materials, fabrication, advanced packaging, R&D, talent

- **Projects Approved:** 12 projects (₹1.64 lakh crore) across six states; 3 facilities in commercial production

#### Key Achievements

- **Design Capability:** 211 chips taped out by 75 institutions; 7 chips fabricated (including 12 nm nodes)
- **Skilling:** Chips to Startup (C2S) programme: EDA tools deployed in 320 academic institutions; 68,000+ students trained
- **Design Linked Incentive:** 24 semiconductor design projects approved; 105 startups/MSMEs supported

#### Global Partnerships

- **Countries:** US, Japan, Singapore, Netherlands, Germany, EU
- **Semicon India 2025:** 350+ exhibitors (48 countries); 35,000 registrations; 12 MoUs signed

#### IndiaAI Mission: Building Sovereign AI

##### Computing Infrastructure

- **Compute Capacity:** 45,000+ GPUs (as of June 2026)
- **Access:** 237 projects accessed subsidised computing (93.18 lakh GPU hours)

##### Indigenous AI Models

- **Foundation Models:** 20 selected (12 Large Multimodal Models; 8 Small Language Models)
- **AI Kosh:** 14,000+ datasets; 331 AI models (July 2026)

##### Real-World Deployment

- **AI Prototypes:** 62 developed
- **AI Solutions:** 20 deployed in public-sector institutions
- **Innovation:** 58 AI Centres of Excellence approved; 22 initiated

##### Talent and Ecosystem

- **NM-ICPS:** 25 Technology Innovation Hubs across leading institutions
- **Responsible AI:** 13 projects approved (bias mitigation, deepfake detection, explainability)

##### Data Centre Expansion

- **Installed Capacity:** 375 MW (2020) → 1,575 MW (current)
- **New Destinations:** Andhra Pradesh, Madhya Pradesh, Chhattisgarh, West Bengal

##### Global Recognition

##### Rankings and Leadership

- **Stanford Global AI Vibrancy Report 2025:** India ranked 3rd globally in AI competitiveness
- **GitHub AI Projects (2025):** India was the second-largest contributor
- **India AI Impact Summit 2026:** Delegations from 100+ countries; declaration adopted by 92 countries
- **Pax Silica Coalition:** India joined to strengthen resilient global silicon supply chains

##### Challenges

- **Semiconductor Fabrication:** Only 3 facilities in production; global competition
- **Equipment/Materials:** Dependency on imports for critical tools
- **Talent:** Need for deeper, long-term skilling in chip design and fabrication
- **Data/AI:** Data sovereignty; responsible AI governance
- **Infrastructure:** Power, water, and supply chain for fabs

##### Way Forward

##### Semiconductors

- **Fabrication:** Accelerate commercial production of approved fabs
- **Equipment/Materials:** Develop domestic capabilities; reduce import dependence
- **R&D:** Focus on advanced nodes, packaging, and new materials

- **Skilling:** Scale C2S; industry-academia partnerships

#### AI

- **Compute:** Expand subsidised compute access; develop indigenous GPUs
- **Models:** Build LLMs for Indian languages; focus on domain-specific applications
- **Governance:** Strengthen responsible AI frameworks; data protection
- **Deployment:** Scale AI solutions in healthcare, agriculture, education, and governance

#### Integrated Vision

- **Data Centres:** Expand capacity; ensure green energy
- **Startups:** Support deep-tech; global market access
- **Global Partnerships:** Leverage Pax Silica and bilateral agreements
- **Self-Reliance:** Reduce dependency on critical imports

#### Conclusion

India's semiconductor and AI ecosystem is moving from **policy to production**. Semicon 2.0 and the IndiaAI Mission are expanding chip manufacturing, GPU capacity, and indigenous AI models. However, **fabrication scale, equipment dependence, and talent gaps** remain challenges. Strengthening these areas is crucial for innovation, economic growth, and strategic autonomy under **Viksit Bharat**.

### Escape Velocity: What India's Space Sector Must Focus On

#### Introduction

India's space sector needs to move beyond "**aura**" and **ambition** toward **reliability, scale and cost competitiveness**. With launch costs estimated at **\$13,302/kg**, far above China and the US, and only **five launches in 2025**, India remains dependent on foreign launchers. The priority should be **frequent launches, indigenous heavy-lift capacity and lower costs**, turning space into the "plumbing of the information age" and a major source of jobs, capital and technological growth.

#### The Cost and Reliability Gap

##### Launch Cost Disparity (2025)

- **India:** \$13,302/kg (low-earth orbit)
- **China:** \$5,809/kg
- **US/Europe/Japan/Russia:** ~\$3,225/kg
- **Global Average:** \$3,868/kg

##### Launch Frequency

- **India:** Only 5 launches in 2025 (vs. projected 30)
- **Consequence:** Rare launches prevent building a reputation for reliability.
- **SpaceX:** Put 3/4 of world's payload into orbit in 2025.

##### Resulting Dependency

- **GSAT-N2 (4,700 kg):** Too heavy for ISRO's LVM-3; went on Falcon 9.
- **Indian Startups:** Pixxel and Digantara rode SpaceX to orbit.
- **Implication:** Even Indian entities are choosing foreign launch providers.

#### The Shift from Emblem to Infrastructure

##### Historical Context

- **Space as "India's Football":** A symbol of technological competency for a newly independent nation.
- **Utility Secondary:** Launchers were their own justification; payload utility was secondary.

##### Modern Reality

- **Plumbing of the Information Age:** Rockets and satellites are now unglamorous scaffolding beneath navigation, banking, weather, and war.

- **Private Sector:** Romance that carried the state programme will not carry a business.

### The Wrong Framing

- **PM's "Aura" Call:** Building an "aura" is married to the old view of space.
- **Private Sector Needs:** Success requires jobs, long-term capital, tax revenues, and competitive launches—not just aura.

### The Path Forward: Reliability and Regularity

#### Commercial Viability

- **Competitive Pricing:** India must develop launch vehicles that undercut SpaceX and China.
- **Heavy-Lift Capacity:** Need capability to carry satellites like GSAT-N2 (4,700 kg+).

#### Launch Frequency

- **Regular Launches:** Essential to build reliability and attract commercial customers.
- **Projection vs. Reality:** Need to close the gap from 5 to 30+ launches.

#### Private Sector Role

- **Business Model:** The private sector must focus on economic viability, not just technological demonstration.
- **Global Competition:** Compete on cost, reliability, and schedule.

### Conclusion

India's space sector must shift from **aura and symbolism to commercial viability**. High launch costs (\$13,302/kg) and just five launches in 2025 highlight its competitiveness gap. While moon bases and interplanetary missions inspire, they are **"the ornament, not the engine."** The engine must be **reliable, frequent and affordable launches** that can compete with SpaceX and capture the growing space-services market.

## Highs and Lows: Decoding India's GST Metrics

### Introduction

The ₹2.11 lakh crore GST collection in July 2026, showing 15.4% year-on-year growth, suggests resilience. However, a closer reading reveals uneven trajectories: import IGST grew 26.9% while domestic revenues rose only 4.5%. This trade-led buoyancy reflects global commodity inflation, rupee depreciation (10-12% over the past year), and higher imports of capital goods—not domestic production. High WPI manufacturing inflation (7.18% in June vs 1.52% last year) explains domestic revenue traction in an ad valorem system, despite five-year low manufacturing growth. Only 16 States/UTs reported post-settlement GST growth above the national average, highlighting geographic concentration. GST 3.0 must ensure broad-based, fiscally inclusive growth driven by domestic production and consumption, not inflation or imports.

### Dissecting the July 2026 GST Numbers

#### Headline Growth

- **Gross GST Collection:** ₹2.11 lakh crore (July 2026)
- **Year-on-Year Growth:** 15.4% (second best in FY27)
- **Imported IGST:** 26.9% growth
- **Domestic Revenues:** Only 4.5% growth

#### Drivers of Import-Led Buoyancy

- **Rupee Depreciation:** 10-12% over the past year
- **High-Value Imports:** Crude oil, electronics, machinery, chemicals (~50% of total imports)
- **Gold Imports:** Added to IGST, though supply fell to six-year low (bullion imports down 22%)
- **Global Commodity Inflation:** Post-pandemic recovery trend

#### Domestic Revenue Drivers

- **WPI Manufacturing Inflation:** 7.18% (June 2026) vs 1.52% (June 2025)
- **Ad Valorem Impact:** Higher prices increase tax collections even without volume growth
- **Manufacturing Growth:** Five-year low (HSBC PMI)
- **Services:** Slowest growth in 53 months; geographically concentrated

### Geographic and Structural Disparities

#### Uneven State Performance

- **Above-National-Average Growth:** Only 16 States/UTs (post-settlement)
- **Concentration:** Manufacturing and organised services in few jurisdictions
- **Struggling States:** Those with larger unorganised sectors; dependent on central transfers and Finance Commission devolution

#### GST Ecosystem Faultlines

- **Input Tax Credit Disputes:** Litigation unresolved
- **Refund Dynamics:** Domestic refunds faster than IGST refunds
- **Compliance:** Formal businesses expanding compliance but carrying larger credit balances

#### Challenges

- **Inflation-Driven Growth:** Ad valorem gains mask volume stagnation
- **Import Dependency:** 'Make in India' not reflected; imported inputs doing heavy lifting
- **Geographic Concentration:** Benefits not broad-based
- **Manufacturing Slowdown:** Five-year low PMI

#### Implications

- **Fiscal Reality:** Many states cannot generate own tax buoyancy
- **Policy Challenge:** GST 3.0 must address structural disparities
- **'Make in India' Claim:** Weak if GST growth is import-led

#### Way Forward

##### GST 3.0 Priorities

- **Broad-Based Growth:** Incentivise manufacturing and services in lagging states
- **Address Litigation:** Resolve ITC disputes; simplify rules
- **Support Unorganised Sector:** Formalisation incentives; compliance easing

##### Boosting Domestic Production

- **Manufacturing Push:** Focus on domestic value addition; reduce import dependency
- **Export Competitiveness:** Rationalise tariffs; support MSMEs
- **Inflation Management:** Monitor WPI; ensure real growth, not just price-driven revenue

##### Fiscal Federalism

- **Devolution:** Address state-specific needs
- **State Capacity:** Strengthen tax administration in lagging states
- **Inclusive Growth:** Ensure benefits reach all regions

#### Conclusion

The July 2026 GST collection of ₹2.11 lakh crore, with 15.4% growth, is a positive headline, but the underlying trends are concerning. Import-led buoyancy (26.9% IGST growth vs 4.5% domestic) and inflation-driven domestic revenues (WPI at 7.18%) mask weak manufacturing and services growth. Only 16 States/UTs outperformed the national average, highlighting geographic concentration. For GST to be a true measure of economic health, it must be fuelled by domestic production, growing incomes, and broad-based consumption—not exchange-rate gains, import taxation, or local inflation. GST 3.0 must address these structural issues to make 'Make in India' a reality.

## AI and Cyber: The Double Helix of Today's Security Threats

### Introduction

The convergence of **AI and cyber threats** has created new security challenges, with adaptive malware, zero-day vulnerability detection, and autonomous cyber agents weakening traditional defences. AI-driven warfare and autonomous systems further raise risks, requiring a balanced approach of **technological innovation, strong policies, and strategic preparedness**.

### The Evolving Threat Landscape

#### AI-Powered Cyber Threats

- **Adaptive Malware:** AI-powered malware can evolve in response to environmental changes, making detection harder.
- **Zero Day Vulnerabilities:** AI systems like Mythos can detect vulnerabilities across operating systems.
- **Autonomous Agents:** Malicious agents can undermine "Zero Trust" protocols and exacerbate insider threats.
- **Asymmetric Impact:** Newer technologies can undermine conventional military calculus (e.g., Ukraine war).

#### Agentic AI vs. Generative AI

- **Generative AI:** Creates content (text, images, code).
- **Agentic AI:** Acts autonomously, making decisions and taking actions.
- **Threat Escalation:** As Agentic AI displaces Generative AI, threat levels increase.
- **Inflection Point:** World may reach a tipping point with grave forebodings.

#### Geopolitical and Strategic Dimensions

- **US-China Competition:** US accuses China of stealing Anthropic's AI technology for its "Moonshot" AI.
- **Military Transformation:** AI in Ukraine and West Asia—detecting missile trajectories, intelligence gathering, autonomous munitions ("Goalkeeper," "Whiplash").
- **Power Shift:** Nations/organisations at the forefront of AI may shape hard power.

### Key Concerns and Risks

#### Uncontrollable AI

- **God-Like Properties:** Modern AI models have immense capabilities but are subject to "hallucinations" and biases.
- **Algorithmic Radicalisation:** AI platforms may push opinion makers towards extreme views.
- **Lack of Oversight:** As AI enters defence sensing and warning, keeping machines under human control is critical.

#### Global Security Implications

- **Rogue Groups:** Newer AI machines provide opportunities for rogue groups to demonstrate capabilities once associated with nation-states.
- **Rules Gap:** No comprehensive international framework to govern AI; existing cybersecurity rules may need complete rewriting.
- **Economic and Military Dominance:** AI has potential to become the dominant source of military and economic power.

#### Critical Vulnerabilities

- **Zero Trust Protocols:** May become ineffective against AI-powered attacks.
- **Insider Threats:** Aggravated by malicious autonomous agents.
- **Hallucinations:** AI distortions can produce misleading reactions and subjective judgments.

#### Weaknesses and Gaps

- **No Rules:** International governance of AI is in a fledgling state.
- **Biases:** AI algorithms may display national security biases.
- **Warning vs. Understanding:** Gap between AI warnings and proper understanding of strategic implications.
- **Corporate Power:** Western companies like Anthropic and Palantir wield immense power without clear rules.

### The Mythos Challenge

- **Capability:** Mythos surpasses "all but the most skilled humans" in finding security vulnerabilities.
- **Spectre:** All-encompassing power residing in a single instrument not subject to rules.
- **Warning:** This could pose a grave threat to entire civilisation.

### Way Forward

#### Strengthening Governance

- **International Framework:** Develop rules for AI governance, akin to nuclear non-proliferation.
- **National Strategies:** India must develop a comprehensive AI and cybersecurity strategy.
- **Public-Private Cooperation:** Collaborate with tech companies on safe AI development.

#### Enhancing Cyber Defences

- **AI-Powered Defences:** Use AI to counter AI-powered attacks.
- **Zero Trust Evolution:** Adapt protocols for autonomous threats.
- **Capacity Building:** Train cybersecurity professionals in AI threats.

#### Ensuring Human Control

- **Human-in-the-Loop:** Ensure human oversight in AI-driven defence systems.
- **Warning Systems:** Validate AI warnings with human understanding.
- **Bias Mitigation:** Address algorithmic biases and hallucinations.

#### Global Cooperation

- **Dialogue:** US-China and other major powers must discuss AI risks.
- **Norm-Building:** Establish norms against AI-powered cyber attacks.
- **Civil Society:** Engage experts, academics, and civil society in AI governance.

### Conclusion

The **AI–cyber threat convergence** poses major risks to global security and economic stability through adaptive malware, autonomous agents, and AI-enabled attacks. India needs a strategy combining **innovation, policy frameworks, and cybersecurity preparedness**, while global cooperation is essential to establish norms for responsible AI use.

## PAPER 4

### CASE STUDY

**Q. A nationwide competitive examination has recently concluded amidst allegations of procedural irregularities, including discrepancies in evaluation, lack of transparency, and concerns regarding the fairness of the selection process. Student organizations and civil society groups have called for protests demanding an independent inquiry and remedial measures.**

**In your district, a large group of students has gathered outside the office of the examination authority. The organizers have assured the administration that the protest will remain peaceful. However, as the day progresses, the crowd swells significantly after several influential individuals and social media campaigns**

mobilize more participants. A small section of protesters begins blocking a major highway, disrupting traffic and emergency services. Intelligence reports indicate that some anti-social elements have infiltrated the gathering and may attempt to provoke violence. The examination authority has requested immediate police protection, while the district administration has directed you to restore normalcy at the earliest. At the same time, any excessive use of force against students is likely to attract widespread public criticism and further escalate tensions.

**You are the Superintendent of Police (SP) of the district. You must uphold the rule of law while respecting the constitutional right of citizens to peaceful protest.**

- (a)** What are the ethical issues involved in the above case?
- (b)** What are the options available to you in handling the situation? Evaluate the merits and demerits of each option.
- (c)** As the Superintendent of Police, what course of action would you adopt? Justify your answer. **(250 words, 20 marks)**

**Q. The State Government has approved the acquisition of agricultural land for establishing a large industrial and infrastructure project. The project is expected to generate substantial investment, create employment opportunities, and contribute to regional economic development. However, a significant number of farmers whose lands are proposed to be acquired have opposed the project. They argue that the compensation offered is inadequate, rehabilitation measures are uncertain, and the acquisition would permanently deprive them of their primary source of livelihood.**

The protests have intensified over the past few days, with farmers organizing peaceful demonstrations and blocking access to the project site. While the majority of protesters remain peaceful, intelligence inputs suggest that a few vested interests may exploit the situation to incite violence. The State Government has directed the district administration to ensure that the project proceeds without delay, citing its strategic importance. At the same time, the media and civil society organisations are closely monitoring the government's response.

**You are the District Collector responsible for implementing the land acquisition process.**

- (a)** Identify the ethical issues involved in the above case?
- (b)** What are the options available to you? Evaluate the merits and demerits of each option.
- (c)** As the District Collector, what course of action would you adopt to balance developmental objectives with the rights and welfare of the affected farmers? **(250 words, 20 marks)**

**Q. You are a senior finance manager in a reputed multinational company. While reviewing financial records, you discover that certain senior executives have deliberately manipulated financial statements over the past two years to inflate profits and improve the company's market valuation. The irregularities have enabled the company to attract substantial investments and earn performance-linked incentives for the top management. You confidentially bring the matter to the notice of your immediate superior. However, you are advised to remain silent as exposing the issue could severely damage the company's reputation, lead to job losses for thousands of employees, and affect investor confidence. You are also informally warned that pursuing the matter may adversely affect your career progression and could even result in termination of your employment.**

**You firmly believe that concealing the fraud would be unethical and illegal. At the same time, you are conscious of your responsibilities towards your family, your colleagues, and the broader interests of the company.**

- (a)** What are the ethical issues involved in the above case?
- (b)** What are the options available to you? Evaluate the merits and demerits of each option.

(c) What course of action would you adopt? Justify your decision with reference to the ethical values expected of a corporate professional. **(250 words, 20 marks)**

### Humanitarianism is Not Collapsing—It is Being Traded and Compromised

#### Introduction

On World Humanitarian Day 2026, a stark reality confronts us: the consensus and meaning behind international humanitarian law are eroding. Governments are openly disregarding international law, applying it selectively, or remaining silent when action is required. The consequences are measurable: at least **1,000 aid workers have been killed in the past three years**—nearly triple the toll of the previous three. In 2025 alone, **350 aid workers were killed**, 322 injured, 235 kidnapped, and 280 detained, according to the UN. Protection of civilians and aid workers is no longer seen as a universal obligation but as a commodity—something to be bargained, withheld, or selectively applied.

#### The Erosion of Humanitarian Consensus

##### Selective Application of International Law

- **Governments:** Openly disregarding international law when it suits their interests.
- **Selective Condemnation:** Condemning adversaries for violations while tolerating same behaviours by allies.
- **Silence:** Many governments remaining silent when condemnation and action are required.

##### Impunity Flourishing

- **Bad Actors:** Feel empowered to break laws because they know they won't be held accountable.
- **Transactionalism:** Protection becomes a political investment demanding a political return.

##### Consequences

- **Civilian Casualties:** Tolerance of excessive civilian casualties becomes routine.
- **Unthinkable Permissible:** Anything becomes permissible, including attacks on aid workers, hospitals, water systems, schools, and shelters.

#### The Human Cost: Attacks on Aid Workers

##### Statistics (Past Three Years)

- **Aid Workers Killed:** At least 1,000 (nearly triple the previous three years).
- **2025 (UN Data):** 350 killed, 322 injured, 235 kidnapped, 280 detained.
- **Oxfam's Experience:** Lost five colleagues; 1,300+ people caught in 1,200+ security incidents.

##### Obstruction and Restrictions

- **Israel-Palestine Case:** Israeli authorities demanded personal details of staff from 37 organisations; all refused and were deregistered.
- **Impact:** Aid delivery severely affected; reliance on inflated local goods.

##### Funding Crisis

- **G7 Cuts:** Biggest aid cuts in history—development assistance slashed by nearly a third in 2026 (compared to 2024).
- **Worsening Needs:** DRC (fastest-growing Ebola outbreak), Sudan (famine).

#### The Way Forward: Restoring Accountability

##### Universal and Binding Principles

- **International Humanitarian Law:** Universally binding.
- **Protections:** Civilians must be protected; starvation must not be used as a weapon; aid workers, hospitals, water systems, schools, shelters must never be attacked.

##### Investigations and Prosecutions

- **Every Attack:** Should trigger an independent investigation.

- **Prosecution:** When a crime is proven.
- **UNSC Resolution 2730:** Demanded this two years ago; remains unfulfilled.

#### Selection of Next UN Secretary-General

- **Test of Collective Responsibility:** Must bring about genuine accountability against violators of international law.

#### Beyond Remembrance

- **World Humanitarian Day:** About remembering fallen aid workers.
- **But:** Remembrance without accountability becomes tolerance of the unjustifiable.

#### Weaknesses and Threats

- **Political Transactionalism:** Protection is traded, not guaranteed.
- **Selective Enforcement:** Great powers apply rules inconsistently.
- **Funding Cuts:** Aid is politically weaponised.
- **Impunity:** Violators face no consequences.

#### Ethical Dimension

- **Commodification of Protection:** Treating humanitarian principles as negotiable commodities.
- **Moral Relativism:** Tolerating violations by allies while condemning adversaries.
- **Silence as Complicity:** Inaction enables atrocities.

#### Conclusion

Humanitarianism is not collapsing—it is being traded and compromised. Governments are treating protection as a commodity, selectively applying international law, and tolerating impunity. The result is an unprecedented toll on aid workers and the vulnerable communities they serve. The response must be accountability: independent investigations, prosecutions, and genuine enforcement of international humanitarian law. World Humanitarian Day must not be merely about remembrance; it must demand action to restore the norms that safeguard us all.