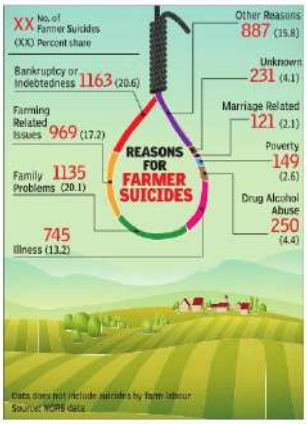
Table of Contents

1. Farmer Suicides in India: A Deepening Agrarian Distress

Introduction

India's farmers, the backbone of the economy, face a recurring tragedy of suicides despite rising GDP and farm output—revealing deep structural flaws in the rural economy.

A crisis in the field is not merely economic—it is a human tragedy demanding systemic reform.



Latest Data and Trends (NCRB 2023)

Key Statistics

• 2023: 10,786 farm-sector suicides (6.3% of total) — 4,690 cultivators, 6,096 labourers.
• Over 10,000 cases annually (2021–2023) reflect persistent rural distress.

Understanding the Crisis

- **Economic Factors:**
  High debt from informal credit, volatile crop prices, and rising input costs push farmers into distress.
- **Environmental Factors:**
  Erratic monsoons, climate change, and groundwater depletion reduce yield and income security.
- **Institutional & Policy Gaps:**
  Weak insurance, limited MSP coverage, and poor access to formal credit worsen vulnerability.
- **Socio-Cultural Dimensions:**
  Debt stigma, fragmented landholdings, and lack of social security deepen the crisis.
- **Policy & Trade Issues:**
  Trade liberalisation and corporate-driven policies hurt domestic farm prices and rural resilience.

Government Initiatives

Scheme/Policy	Objective
PM Fasal Bima Yojana (PMFBY)	Risk coverage against crop failure
PM-KISAN	₹6,000 annual income support
Kisan Credit Card (KCC)	Easy institutional credit
e-NAM	Digital marketplace integration
Soil Health Card	Rational fertilizer use
PM Gati Shakti, Rural Infra	Employment and connectivity

However, **implementation bottlenecks** and **low awareness** reduce their impact.

Structural Reforms Needed

• **Credit:** Expand institutional loans; support SHGs & FPOs.
• **Diversification:** Shift to pulses, millets, horticulture; promote value addition.
• **Risk Management:** Universal insurance, faster payouts, better irrigation.
• **Markets:** Revise MSP, improve storage & logistics.
• **Livelihoods:** Boost non-farm jobs, align MGNREGA to asset creation.
• **Social Safety:** Ensure health, pension, and mental health support.

Conclusion

Farmer suicides are a silent crisis threatening India's development. A $5-trillion economy cannot ignore rural despair; **inclusive, job-rich, farmer-centric growth** is essential. *True prosperity comes when farmers live with dignity, not die in despair.*

2. Unemployment in India: The Urgent Growth Challenge

Introduction: The Paradox of High Growth, Low Jobs

India's rapid growth coexists with high unemployment; Morgan Stanley (2025) warns growth must double to 12.2% to avert a demographic burden.

Understanding Unemployment in India

Unemployment: When willing, able individuals can't find work (tracked by PLFS).

Types:

- ***Open*** – No jobs despite readiness (urban youth).
- ***Disguised*** – Excess labour, low productivity (agriculture).
- ***Underemployment*** – Skills underused (graduate delivery agent).
- ***Seasonal*** – Work limited to seasons (farm labour).
- ***Structural*** – Skill-job mismatch (AI skills gap).

The Data Story: India's Unemployment in Numbers

Unemployment Snapshot (2025):

Overall 5.1%; youth 14.6%; urban female youth 25.7% (PLFS).

Despite ~6–7% GDP growth, job creation lags; 12%+ growth needed for full absorption (Morgan Stanley).

Youth Paradox:

Median age 28.4, yet high youth joblessness (17.6%), especially among urban females.

Structural skill–job mismatch risks turning demographic dividend into a burden.

The Twin Problem: Unemployment + Underemployment

India's jobs crisis is driven by poor job quality and underemployment—many work in low-productivity farm or informal roles. Even minimal or unpaid work counts as "employment," masking distress. With 603 million below the $3.65/day line, lack of quality jobs threatens poverty reduction and social stability.

Asia's youth unemployment is 16%, with India, China, and Indonesia struggling amid AI-driven disruption. India's jobs crisis stems from low labour absorption, weak manufacturing (15% of GDP), skill gaps (60% unskilled), rigid labour laws, export underperformance, and high informalization (80–85%).

The Way Forward: Reform, Reskill, and Reimagine

Boost employment via labour-intensive manufacturing, export integration, skill development (Industry 4.0, AI), MSME support, labour reforms, infrastructure projects, diversified rural work, increased women's participation, and startup-led high-skilled jobs.

Government Initiatives

Promote job-rich growth via Atmanirbhar Bharat, Make in India 2.0 (27 sectors), Digital/Startup/Skill India, PM Vishwakarma Scheme, labour code reforms, and PLI incentives.

Conclusion: Growth with Jobs, Not Jobless Growth

India's journey to a developed economy by 2047 hinges on **job-led growth**.

Achieving **12% GDP growth** demands urgent reforms, as growth without jobs risks **inequality and wasted demographic potential**.

True progress lies in **creating meaningful youth employment**, not just higher GDP.

3. EV Charging Infrastructure in India: Driving the Clean Mobility Revolution

Introduction

India promotes EV adoption via clean transport goals; PM E-Drive scheme (₹10,000 cr) funds 100% subsidies for charging and battery swapping infrastructure.

Current Status of EV Charging Infrastructure

India has <20,000 public EV chargers (2025), mostly in metros; infrastructure gaps limit adoption despite rising EV sales and incentives.

PM E-Drive Scheme: Key Features

PM E-Drive offers 100% subsidy (₹2,000 cr for chargers) for EV infrastructure in cities >1M, NCAP cities, and key highways; eligible entities include central/state ministries, PSUs, and private operators, allowing flexible operation and public-private partnerships.

Expected Impact on EV Ecosystem

PM E-Drive expands EV chargers, easing range anxiety, promoting EV adoption, reducing pollution in NCAP cities, supporting climate goals, and creating green jobs and business opportunities.

Challenges Ahead

- **Land Acquisition:** Urban space constraints make site selection challenging.
- **Grid Readiness:** Power networks must handle higher EV loads; smart grids needed to prevent outages.
- **Private Sector Participation:** Essential to complement PSUs; incentivize via PPPs and tax benefits.
- **Consumer Awareness:** Educate users on locations, pricing, safety, and efficiency to build trust.

Policy Context and Alignment

- **FAME II:** Provides financial incentives for EV purchase and charging.
- **State EV Policies:** Offer tax breaks, subsidies, and concessional land for charging points.
- **Integration with Smart Cities:** EV infrastructure aligns with **urban mobility modernization**, reducing congestion and emissions.
- **Climate Goals:** Contributes to India's commitment to **net-zero emissions by 2070**.

Way Forward

- **Public-Private Partnerships:** Foster collaboration between PSUs, private firms, and local authorities.
- **High-Density Corridors:** Prioritize smart cities, transport hubs, and highways for accessibility.
- **Technological Integration:** Promote fast-charging, battery swapping, and smart payments.
- **Grid & Renewable Integration:** Use solar power and smart grids to reduce electricity strain.
- **Consumer Engagement:** Awareness campaigns and apps for locating chargers and planning trips.

Conclusion

The PM E-Drive scheme's 100% subsidy for EV charging is crucial for India's clean mobility, accelerating EV adoption while supporting climate action, economic growth, and technology.

4. China's Growing Role in the Global Electrolyser Market: Implications for India's Green Hydrogen Mission

Context

India's green hydrogen goals face risks as **China controls ~85% of the global alkaline electrolyser market**, raising concerns of **import dependence and energy insecurity**, similar to the **solar PV experience**, highlighting the need for **Atmanirbhar, resilient supply chains**.

Why Green Hydrogen Matters for India

- Targets: **Net Zero by 2070**, **45% emission cut by 2030**.
- **NGHM (2023):** 5 MT green hydrogen/year, 60–100 GW electrolyser capacity, ₹8 lakh cr investment, 6 lakh jo bs.**Uses:** Refineries, fertilizer, steel, cement, shipping, mobility.
- **Exports:** Potential to EU, Japan, Korea.
- **Significance:** Cuts fossil dependence, boosts energy security, supports *Make in India* and clean transition.

China's Rising Dominance in the Electrolyser Market

- **China's dominance:** ~85% of global alkaline electrolyser capacity; produced 36.5 MT hydrogen in 2024, incl. 1.2 lakh t green H_2 (~50% global).
- **Cost edge:** ALK electrolysers 30–45% cheaper; 2024 prices fell 20–32%.
- **Integration:** Firms like LONGi, Envision, Sinopec link electrolyser and H_2 production via strong steel–nickel chains.
- **Global reach:** Expanding hydrogen projects in Europe & Middle East.

Why China's Rise Matters for India

- **Import risk:** Dependence on cheap Chinese electrolysers may repeat the solar PV setback.
- **Supply risk:** Reliance on imported platinum, iridium exposes India to global shocks.
- **Market distortion:** Chinese dumping can stifle domestic R&D and competitiveness.
- **Strategic concern:** Overdependence undermines technological and energy autonomy.

Challenges Ahead

- **Technology:** Dependence on foreign electrolyser designs (PEM, SOEC)
- **Finance:** High capital cost of electrolysers
- **Raw Materials:** Limited access to critical minerals
- **Infrastructure:** Lack of pipelines, storage, and safety standards
- **Water Use:** ~9 litres of water needed per kg of hydrogen

Way Forward for India

- **Manufacturing:** Boost local production via PLI, tax breaks, procurement
- **R&D:** Prioritize PEM, AEM, SOEC; launch Hydrogen Tech Mission
- **Minerals:** Secure supplies through FTAs, Africa–Australia partnerships
- **Finance:** Use green bonds, blended finance, and HPOs
- **Standards:** Form BIS norms for purity, safety, traceability
- **Partnerships:** Collaborate with EU, Japan, US for tech & markets

5. E-Waste Recycling in India: Closing the Loop for a Sustainable Future

India's digital surge and electronics manufacturing under *Atmanirbhar Bharat* have intensified the e-waste crisis, making sustainable recycling vital for resource recovery and environmental safety.

What is E-Waste?

E-waste comprises discarded electronics containing valuable metals and toxic substances; improper disposal leads to resource loss and environmental pollution.

India's E-Waste Burden

- **Global Rank:** 3rd largest e-waste producer (after China, USA)
- **Volume:** 4.17 MMT (2022); only one-third formally recycled
- **Industry Growth:** Electronics sector growing 16.6% CAGR (USD 215 bn → 540 bn by FY25)
- **Consumption:** 93.9 crore broadband users but just 4% of global electronics use
- **Trend:** Rapid growth driving e-waste surge

Why E-Waste Recycling Matters

- **Health:** Lead & mercury cause neurological, organ, and cancer risks.
- **Environment:** Open burning emits toxins & GHGs, polluting air, soil, and water.
- **Economy:** Precious metal loss; recycling boosts circular economy & jobs.

Policy Landscape

- **E-Waste Rules 2022 (MoEFCC, from Apr 2023):** EPR mandates producers to collect & recycle; targets metal recovery (Li, Co, Ni, Cu, Al).
- **Challenges:** Fake EPR credits, weak traceability, low recycler capacity.
- **Institutions:** CPCB audits; SPCBs inventory inconsistently.
- **Informal Sector:** Handles ~90% via unsafe methods; needs formalisation & training.

Recent Initiatives

- **₹1,500 crore Mineral Recycling Scheme (2024):** for critical minerals
- **Public-Private Hubs:** "mandi-style" aggregation for metal recovery
- **Corporate Push:** L&T, Reliance, Adani, Greenko entering recycling; global tech tie-ups (EU, Japan, US)

Gaps & Challenges

India's e-waste management faces weak data systems, low consumer awareness, technological gaps in metal recovery, dominance of informal recycling, and poor enforcement of EPR norms.

Way Forward

- **Policy:** Digital traceability, third-party audits, green credits, strict EPR compliance
- **Institutional:** Formalise informal recyclers, promote PPP recycling hubs
- **Behavioural:** Consumer awareness, take-back schemes
- **Technology:** Invest in hydro/biometallurgy, support startups

6. Monument Conservation in India: Policy Shift and Private Participation

Introduction

India's 3,700+ monuments, managed by ASI since 1861, face conservation delays due to limited staff, funds, and focus on major sites.

Policy Shift: Entry of Private Players

The government enables monument conservation through PPPs under the National Culture Fund, offering 100% tax exemption to donors. Approved agencies execute projects under ASI supervision, with 250 monuments selected initially.

Role of National Culture Fund (NCF)

- Established **1996**; Rs. 140 crore in donations received.
- Funded nearly **100 projects**, 70 completed (e.g., **Bhuleshwar Temple, Mandu Monuments, Hyderabad's British Residency**).
- Previously, donors provided funds only; now they can **directly hire implementing agencies** under ASI guidance.

Safeguards and Criticism

Safeguards:

- ASI supervises DPRs and ensures standards.
- Executing agencies must have experience with **heritage structures >100 years old**.
- Donors receive **recognition at sites**.

Criticism:

- Risk of **commercialisation** and **corporate branding overshadowing heritage**.
- Need to balance **efficiency and authenticity**.

Implications of Policy Shift

- Enables faster, wider conservation through corporate funding.
- Reduces state burden and boosts public engagement.
- Promotes global standards via professional architects.
- Extends "Adopt a Heritage" from amenities to core conservation.

Challenges Ahead

- Ensuring **authenticity** vs. commercialisation
- Monitoring **quality and compliance** of multiple private players
- Maintaining **ASI's supervisory capacity**
- Aligning **efficiency with heritage ethics**

Way Forward

- Robust **project monitoring and audits**
- Integrate **community engagement** and **education**
- Use **technology** (3D scanning, digital archiving)
- Expand **NCF participation** across monuments

7. Ensuring Drug Safety in India – Union Health Ministry's Push for Revised Schedule M Norms

Introduction

India faces drug quality concerns after fatal syrup cases; revised Schedule M norms aim to tighten GMP and ensure safety.

Background: The Triggering Incident

In 2024, over 10 children died in Rajasthan and Madhya Pradesh after consuming Coldrif syrup contaminated with toxic Diethylene Glycol. Similar incidents occurred earlier in Gambia (2022) and Uzbekistan (2023).

Understanding Schedule M

What is Schedule M?

Schedule M under the Drugs and Cosmetics Rules, 1945, prescribes GMP standards to ensure hygienic infrastructure, quality control from raw material to packaging, and global compliance for safe, export-ready drugs.

Revised Schedule M Norms (2024): Key Highlights

- **GMP** aligned with **WHO/PIC/S,** adds PQS & risk-based QRM/PQR
- Mandatory **digital validation & equipment checks**
- **Clear norms** for sterile/hazardous drugs, focus on training/docs
- MSMEs get **phased compliance** till Dec 2025

Government's Directives & Policy Push

- **Strict Enforcement:** Suspend or cancel licenses for non-compliance.
- **Enhanced Surveillance:** Real-time adverse event reporting via IDSP & IHIP.
- **Capacity Building:** Train inspectors, upgrade labs, and use digital dashboards.
- **Public Awareness:** Promote rational medicine use and prescription discipline.
- **Industry Support:** Provide technical aid, funding, and cluster-based facilities for GMP upgrades.

Challenges in Implementation

- Uneven enforcement across States
- Limited manpower & testing capacity
- High compliance cost for small firms
- Poor data integration nationwide
- Low consumer & prescriber awareness

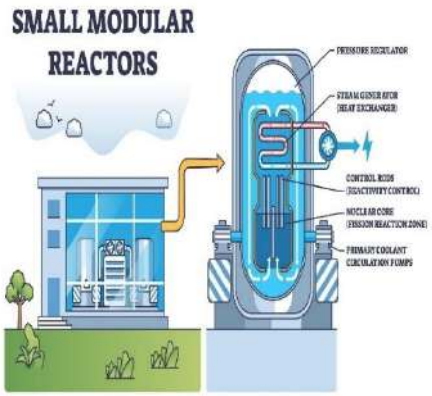
Way Forward

- **Uniform Enforcement:** Ensure coordinated Central–State compliance.
- **Institutional Strengthening:** Upgrade CDSCO, state regulators, and labs.
- **Digital Oversight:** Adopt AI-based monitoring and e-inspections.
- **Public Reporting:** Facilitate ADR reporting via apps and helplines.
- **Global Collaboration:** Partner with WHO and importers to rebuild trust.
- **Incentives:** Offer tax breaks/subsidies for MSMEs adopting GMP.

8. Small Modular Nuclear Reactors (SMRs): The Next Frontier in India's Clean Energy Transition

Introduction

India's Bharat SMR initiative aims to meet rising energy demand with clean, reliable modular nuclear power, marking a landmark step toward private participation in nuclear energy.



What are SMRs?

SMRs are 30–300 MWe compact reactors, factory-built for on-site assembly, offering modular scalability, passive safety, lower costs, and suitability for industries and remote regions.

India's SMR Push: The BSMR Initiative

Private firms will fund and operate SMRs under NPCIL oversight, with 16 sites planned and 5 reactors targeted by 2033; Budget 2025–26 allocates ₹20,000 crore for the Nuclear Energy Mission.

India's Technological Landscape

India is shifting from PHWRs to advanced PWR-based SMRs — BSMR (200 MWe), BSR (220 MWe), and SMR-55 (55 MWe) — aligning its reactor tech with global standards.

Opportunities for India

- **Clean Industrial Power:** SMRs can power industrial corridors, SEZs.
- **Energy Transition:** Substitute coal-based baseloads.
- **Strategic Autonomy:** Indigenous designs reduce external dependence.
- **Diplomacy Tool:** Nuclear cooperation under *Act East* and *Africa outreach*.

Challenges Ahead

- **High Initial Cost:** SMRs yet to achieve economies of scale.
- **Safety Concerns:** Public perception and regulatory capacity gaps.
- **Technology Access:** PWR tech transfer limitations due to nuclear export controls.
- **Waste Management:** Need for advanced disposal systems.
- **Regulatory Reform:** AERB and NPCIL must adapt to modular licensing.

Way Forward

- **Public-Private Partnership (PPP):** Shared risk, assured safety.
- **R&D Acceleration:** Collaboration with **BARC, IITs, and private R&D labs**.
- **Global Cooperation:** Leverage **IAEA & US DOE** frameworks.
- **Local Manufacturing:** Integrate with *Make in India* for SMR components.
- **Public Communication:** Build awareness on nuclear safety & benefits.

Conclusion

SMRs can drive India's clean energy revival by powering industries and data centres while advancing Net Zero and strategic self-reliance.

9. India's IIAS Presidency: Pioneering an International Governance Index

Introduction

India's IIAS Presidency (2025–28) and proposed International Governance Index aim to create transparent, evidence-based global metrics reflecting the Global South's perspective.

About International Institute of Administrative Sciences (IIAS)

- **Founded:** 1930, Brussels (non-profit)
- **Members:** 31 nations, 20 sections, 15 research centres
- **Focus:** Public administration & governance research
- **UN Link:** Collaborates with UN bodies (non-member)
- **India:** Represented by DARPG since 1998

Proposal: International Governance Index (IGI)

- **Objective:** Develop a transparent, data-driven Global Governance Index reflecting both Global North and South perspectives, reducing bias of perception-based Western indices.
- **Methodology:** Based on WGI–OECD–UN DESA frameworks; working group to design evidence-based, transparent, and inclusive scoring — launch planned at IIAS 2026 Conference.

Context: India's Performance in Existing Indices

Global indices often rank India low — e.g. **V-Dem (100/179, 2025)** calls it an "**electoral autocracy**," while **Freedom House** and **EIU** indices reflect Western bias. In **WGI (2023)**, India's percentile scores range from **21 to 68** across governance dimensions, highlighting mixed performance and perception skew.

Concerns with Existing Indices

- **Subjectivity:** Heavy reliance on perception surveys and expert opinions
- **Transparency Issues:** Unclear methodology and weightage allocation
- **Western Bias:** Limited consideration of **local contexts and developing country realities**

Proposed Way Forward

- Develop transparent, quantitative governance metrics covering administration, regulation, and service delivery.
- Collaborate with global bodies **(World Bank, OECD, UN DESA)** for credibility.
- **Strengthen Indian think tanks** for independent governance research.
- Ensure **inclusivity** by integrating perspectives from both developed and developing nations.

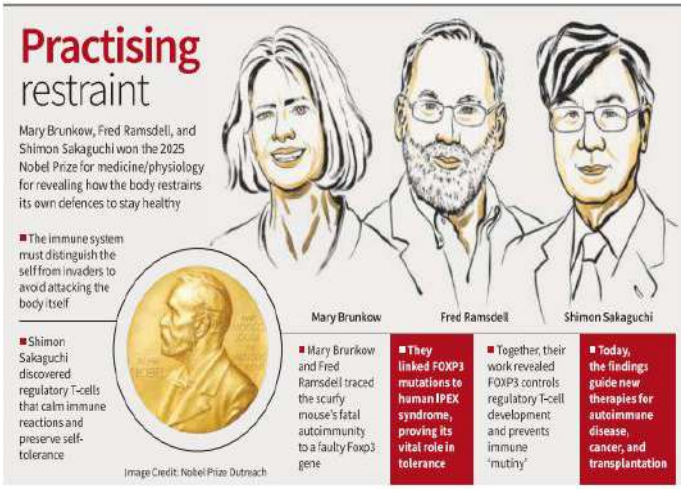
Significance and Implications

- Global: Offers an evidence-based alternative to biased indices, ensuring balanced global governance evaluation.
- Domestic: Promotes data-driven reforms and strengthens India's role as a governance thought leader.

Conclusion

India's **IGI initiative** under IIAS aims to provide a tr**ansparent, evidence-based governance measure, strengthening accountability, policy benchmarking**, and giving a **balanced platform** for all nations, highlighting India's leadership in global public administration.

10. Nobel Prize 2025 in Medicine: Unlocking the Secrets of the Immune System



Award Overview

2025 Nobel Prize in Medicine: Mary E. Brunkow, Fred Ramsdell, and Shimon Sakaguchi for discovering Regulatory T Cells (Tregs) and the FOXP3 gene — key to immune self-tolerance, with major implications for autoimmunity, cancer, and transplantation.

Background: The Puzzle of the Immune System

The immune system defends the body while avoiding self-attack through two tolerance layers:

• **Central Tolerance** – in the thymus, self-reactive T cells are destroyed early.

• **Peripheral Tolerance** – regulates escaped "rogue" T cells via **Regulatory T Cells (Tregs)**, the key discovery behind the 2025 Nobel Prize.

The Discovery Journey

Sakaguchi (1995) discovered **Regulatory T Cells (Tregs)** that prevent autoimmunity, while Brunkow and Ramsdell identified the **FOXP3 gene** as their master regulator — together uncovering how the immune system maintains self-tolerance.

Why This Discovery Matters

A. Understanding Autoimmune Diseases

- Autoimmune diseases like Type 1 Diabetes, Rheumatoid Arthritis, Multiple Sclerosis, and Lupus arise from self-attacking immunity; boosting Tregs can help restore immune balance.

B. Revolutionising Cancer Immunotherapy

- Cancer cells exploit Tregs to evade immunity; blocking Tregs can unleash immune attacks on tumors, complementing Nobel 2018 breakthroughs like CTLA-4 and PD-1 inhibitors.

C. Improving Organ Transplants

- One of the biggest transplant challenges = **rejection by host immunity**.
- Fine-tuning Tregs could help induce **immune tolerance** to foreign organs, reducing dependence on lifelong immunosuppressants.

D. Precision Medicine

- Treg modulation = foundation for **customised immune therapies**, balancing suppression and activation depending on disease context.

Broader Implications

- Redefined immunology from destruction to **balance (immune homeostasis).**
- Enabled breakthroughs like **CAR-Treg, FOXP3 gene therapy, and AI-driven immune modelling.**
- Critical for tackling **autoimmune diseases** and **advancing cancer immunotherapy.**

Concluding Insight

The **2025 Nobel Prize in Medicine** reminds us that the immune system's true power lies not just in attack, but in **restraint**. By unveiling the "**peacekeepers**" within our immunity, science takes a decisive step towards **precision, compassion, and balance in medicine**.

11. SECURITIES TRANSACTION TAX (STT)

Introduction

The Supreme Court's 2025 review of the Securities Transaction Tax (STT) challenges its constitutionality over alleged double taxation and fairness in India's financial system.

What is Securities Transaction Tax (STT)?

STT, introduced in **2004**, is a direct, **transaction-based tax** on buying or selling listed securities—collected at **trade time** to ensure **transparency and curb tax evasion**.

Objectives and Rationale

Pre-2004, capital gains taxes were evaded through **underreporting**; STT introduced in **2004** ensured traceable, automatic tax collection at trade points—**simplifying compliance and curbing evasion**.

Impact on different Investors

- **Long-Term Investors**: Accept STT for its simplicity vs. complex capital gains process.
- **Day Traders/HFTs**: Oppose it for raising costs and cutting margins, especially in derivatives.
- **Retail Traders**: Criticize it as unfair since even loss trades are taxed.
- **Fact**: STT yields ₹30,000+ crore annually—stable revenue for the Centre.

News in Focus: Supreme Court Review (2025)

- **Date**: Oct 6, 2025 | **Context**: Petition challenges STT's constitutional validity (Finance Act, 2004). Grounds:
- **Fundamental Rights**: Violates Articles 14, 19(1)(g), 21 — unequal, restrictive, arbitrary.
- **Double Taxation**: STT + Capital Gains = same transaction taxed twice.
- **Unjust Levy**: Applied even on losses; no refund/credit mechanism.
- **Petitioner's Claim**: STT has become an unfair, burdensome tax beyond its original anti-evasion purpose.

Critical Analysis

Advantages:

- Transparent and easy to administer.
- Reduces tax evasion.
- Steady revenue source.

Disadvantages:

- No linkage with profitability.
- Increases cost of trading.
- No refund mechanism for loss-makers.

Way Forward:

- Consider **TDS-like offset system** for losses.
- Periodic **review of STT rates** to ensure competitiveness.
- Integrate STT with **Capital Gains regime** to avoid double taxation perception.

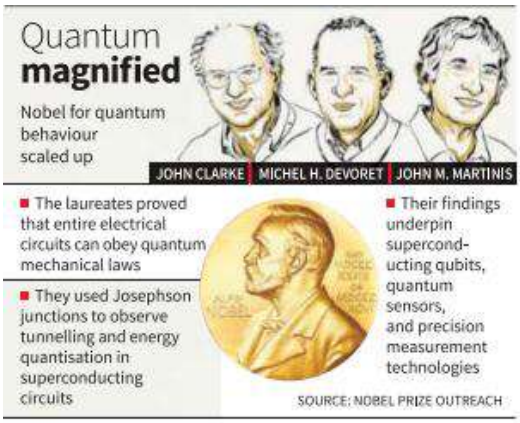
12. Nobel Prize in Physics 2025: How Quantum Circuits Became Real

Overview

2025 Physics Nobel: John Clarke, Michel Devoret & John Martinis — for showing quantum effects in macroscopic superconducting circuits, paving the way for quantum computing and related technologies.

The Central Idea

They proved macroscopic superconducting circuits show quantum tunnelling and energy quantisation, making them practical quantum systems.



Understanding the Quantum Concepts

Particles can pass through barriers without enough energy. The laureates proved whole circuits can also tunnel, confirming macroscopic quantum tunnelling.

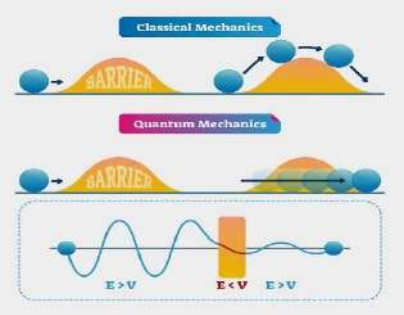
Energy Quantisation

Atoms absorb or emit energy in fixed quanta. The laureates recreated this in circuits, observing discrete energy jumps like an artificial atom.

The Heart of the Discovery — *The Josephson Junction*

Josephson Junction: Two superconductors separated by an insulator where Cooper pairs (electron pairs moving without resistance) tunnel through, creating a sudden quantum voltage jump.

Clarke, Devoret, and Martinis solved quantum fragility using **ultra-cold, noise-free circuits, confirming quantised energy levels** and controllable quantum behaviour in macroscopic systems — creating **superconducting qubits** and bridging quantum and classical worlds.



Real-World Applications

- **Quantum Computing:** Superconducting qubits power processors (Google, IBM), enabling faster solutions in **AI**, **cryptography**, and **drug discovery**.
- **Quantum Sensors:** Detect tiny magnetic or gravitational changes; used in **MRI**, **geology**, and **GPS-free navigation**.
- **Quantum Amplifiers:** Boost faint **cosmic or dark matter signals** without adding noise.
- **Metrology: Josephson junctions** define **volt** and **ampere** with quantum precision.
- **Quantum Communication:** Convert **microwaves to light**, linking **quantum chips** via **optical networks**.

India's Context: Quantum Push

India's ₹6,000 crore **National Quantum Mission** (2023–2031) aims to build **50–1000 qubit quantum computers**, boost **quantum communication, sensors, and materials**, with ISRO and DRDO testing QKD satellites.

Conclusion

The **2025 Nobel Prize in Physics** celebrates how human ingenuity transformed **quantum laws** into real-world technology. By bringing **quantum mechanics** to visible systems, Clarke, Devoret, and Martinis ushered in the **Quantum Age** of computing, sensing, and communication.

13. India–UK Relations Enter a New Growth Phase

With PM Keir Starmer's visit to India, the two nations are expanding cooperation across **trade, defence, education, and innovation** under **Vision 2035**, strengthening a modern strategic partnership.

Overview

UK PM Keir Starmer will visit India for two days for talks with PM Modi, attend the Global Fintech Summit, and strengthen strategic ties—his first visit since taking office, following Modi's July 2025 UK trip that sealed the India–UK FTA.

Foundations of the Partnership

The 2025 **India–UK FTA**, building on **2022 talks**, aims to double **USD 56 billion** trade by 2030, boosting textiles, IT, and services. CETA grants duty-free access to **99% of Indian exports**, while the **Double Contribution Convention** exempts Indian professionals from UK social security for 3 years, aiding **75,000+ workers**.

- **Defence:** Co-production roadmap (incl. jet engines), joint drills, and tech-sharing to deepen security ties.
- **Education:** 1.7L Indian students; UK campuses in India; degree recognition; YPS & Chevening enable talent exchange.
- **Research:** £300–400 mn joint R&D in quantum tech, clean energy, AI, health; Net Zero Centre for decarbonisation.
- **Culture:** Film co-production and cultural pacts boost creative collaboration.
- **Diaspora:** 2.6% of UK population; 65k Indian firms; new consulates & flights strengthen trade and mobility.

Vision 2035: Strategic Blueprint

- **Launched during PM Modi's 2025 UK visit**.
- **Key Pillars:**
    1. Economic growth and trade expansion
    2. Education, skills, and talent mobility
    3. Technological innovation and research
    4. Defence cooperation
- **Objective:** Forge a **comprehensive, long-term India–UK partnership** for sustainable development, innovation, and global stability.

Conclusion

India–UK relations are entering a **new growth phase**, leveraging trade, defence, education, science, culture, and diaspora ties under **Vision 2035**, establishing a **21st-century strategic partnership** and reliable global cooperation.

14. Heatwaves in India: Understanding the Rising Temperatures

"A heatwave is not just a weather phenomenon—it is a signal of climate change, urbanisation, and environmental stress impacting human health, agriculture, and economy."

Overview

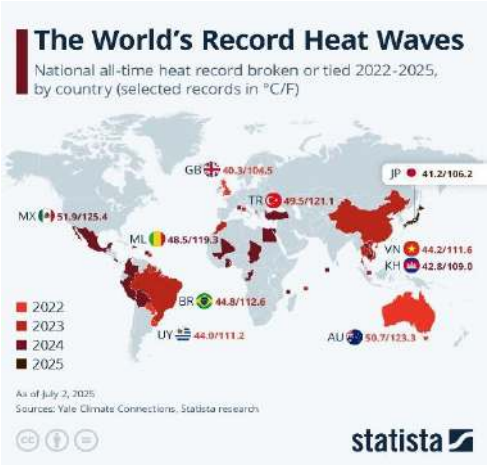
Heatwaves are prolonged periods of extreme heat. In Delhi 2025, IMD corrected a 52.9°C sensor error at Mungeshpur; actual NCR temps ranged 45–49°C. Such events are rising in frequency and intensity globally.

Key Terms

Term	Meaning
Heatwave	Period of abnormally high temperatures relative to normal for a region.
Urban Heat Island (UHI)	Urban area significantly warmer than surrounding rural areas due to human activity.
Automatic Weather Station (AWS)	Instrument that records and transmits weather parameters without human intervention.

Why Heatwaves Occur

- **Meteorological:** Intense solar radiation, hot westerlies from Rajasthan, low rainfall, and peak summer heating (May–June).
- **Urban:** UHIs from concrete, dense buildings, AC heat, and lack of greenery/water bodies trapping and amplifying heat.



Global Context of Heatwaves

- **Carbon Brief Study (2013–2023): ~40% of the Earth** recorded its **highest-ever daily temperatures**, including parts of Antarctica.
- **Global Warming Impact:** Average land temperature rose **1.59°C** above pre-industrial levels; global average including oceans is **1.1°C higher**.

Heatwaves in India: Trends and Data

- **Annual temperature rise:** ~0.7°C since 1900 (below global average).
- **Severe heatwaves:** Becoming more frequent and intense (e.g., February 2023 winter heatwave).
- **Urban hotspots:** Delhi, Jaipur, Ahmedabad, Lucknow face extreme peaks due to **urban heat islands**.

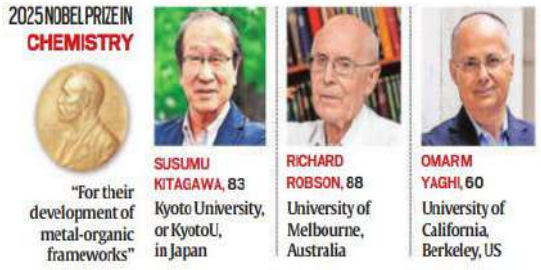
Impacts of Heatwaves

Impacts: Heatwaves cause health issues (heatstroke, dehydration), crop and water stress, power and infrastructure strain, and major productivity and economic losses.

Mitigation & Preparedness

- **Early Warning:** IMD alerts and real-time monitoring via AWS.
- **Urban Planning:** More green cover, water bodies, cool roofs, reflective pavements, and shaded spaces.
- **Public Awareness:** Hydration, restricted outdoor work, cooling shelters, and adjusted school/work timings.
- **Policy Measures:** State Heat Action Plans and climate adaptation in city planning.

15. 2025 Nobel Prize in Chemistry: Revolution through Metal–Organic Frameworks (MOFs)



Awardees: Susumu Kitagawa, Richard Robson, and Omar Yaghi — honoured for developing **Metal–Organic Frameworks (MOFs)**, ultra-porous materials with wide applications in energy, environment, and catalysis.

What are Metal–Organic Frameworks (MOFs)?

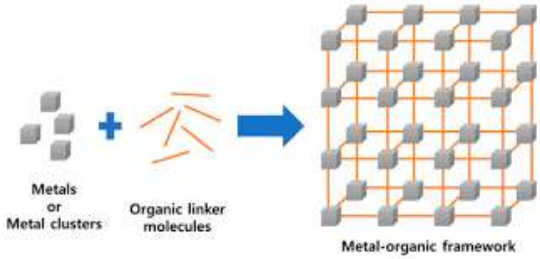
Definition (in simple terms):

MOFs: Crystalline, sponge-like materials made by linking metal ions (nodes) with organic linkers (connectors), forming a 3D porous framework capable of storing or filtering gases and liquids.

How MOFs Are Built

Metal ions act as centres and organic ligands as linkers; their combination determines pore properties.

Example: **MOF-5 (zinc + benzene-dicarboxylate)** — highly stable (up to 300°C) with an enormous surface area per few grams.



The Chemistry Behind MOFs

MOF bonding follows the **octet rule**: metals donate and organic ligands accept electrons. Atomic valency shapes the 3D structure, while carbon's versatility enables ring and chain linkers.

The Nobel Laureates and Their Contributions

- **Robson (1970s–80s):** Created early porous metal frameworks using copper, though unstable.
- **Kitagawa (1990s):** Built the first stable, flexible 3D MOFs ("soft MOFs").
- **Yaghi (1990s–2000s):** Advanced tunable, durable MOFs via Reticular Chemistry; developed benchmark MOF-5.

Why MOFs Matter: Applications and Impact

- **Environment:** MOFs capture CO_2 (CALF-20), harvest water (MOF-303), and purify pollutants (UiO-67, MIL-101, ZIF-8).
- **Energy:** MOF-177, NU-1501 store H_2/CH_4; boost battery and fuel-cell catalysts.
- **Health:** Enable drug delivery and biosensing.
- **Industry:** Act as high-surface catalysts for petrochemical and polymer synthesis.

Challenges and Limitations

- **Scalability:** MOFs are complex and expensive to produce at industrial scale.
- **Durability:** Some degrade in moisture or acidic environments.
- **Recycling:** Safe recovery after use remains an issue.
- **Regulation:** Need for safety standards in biomedical and environmental applications.

Conclusion

The 2025 Chemistry Nobel highlights a shift from molecules to frameworks — with MOFs offering solutions for carbon capture, clean energy, water purification, and healthcare, making them true **building blocks of a sustainable future**.

16. Delhi's Air Pollution: Tracking the Real Polluters

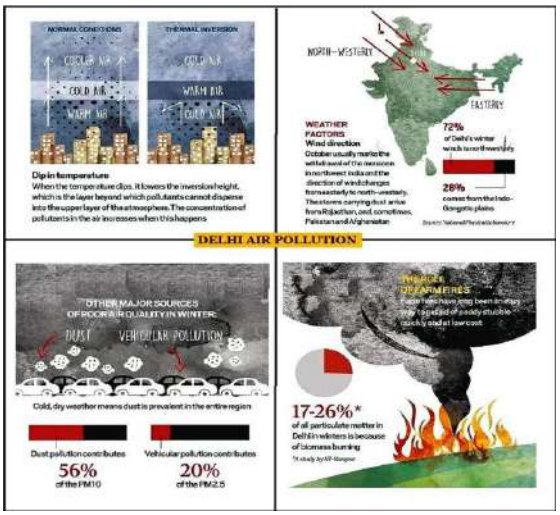
Why in News?

Delhi's winter pollution season has begun, with rising PM2.5 and PM10 levels. IITM Pune's Decision Support System is tracking sources and forecasting air quality, as cooler weather, shifting winds, and stubble burning are expected to worsen conditions.

What Chokes Delhi's Air?

Contrary to popular belief, **urban emissions dominate Delhi's air pollution**, not farm fires.

Source	Contribution to PM2.5	Notes
Transport	~70–80%	Largest source; vehicles emit NOx, PM, and VOCs.
Residential	4–5%	Includes cooking and heating emissions.
Industries	3–5%	Factories and small-scale industries within Delhi.
Stubble Burning	0–0.22%	Minimal during early October; monitored via **VIIRS satellite data**.



Delhi's Pollution Context

1. Sources of Pollution

- **Vehicles:** Rapid urbanisation, rise in private transport, diesel exhaust.
- **Industry:** Factories, brick kilns, power plants.
- **Residential:** Firewood, coal use, waste burning.
- **Stubble Burning:** Seasonal, wind-dependent impact.

2. Seasonal Dynamics

- **Winter (Oct–Jan):** Cold air and low winds trap pollutants.
- **Monsoon/Post-Monsoon:** Rain and winds disperse pollutants.
- **DSS Role:** Predicts spikes, aids timely mitigation.

Challenges in Delhi Air Quality Management

- **Outdated Data:** Uses 2021 inventory; lacks real-time updates.
- **Seasonal Use:** Operates only in winter, missing annual trends.
- **Source Attribution:** Overfocus on stubble burning skews policy.
- **Weak Enforcement:** Poor compliance with emission and traffic norms.

Policy and Governance Measures

- DSS provides source-wise data guiding **CAQM** actions.
- Enables early **air quality alerts** and **health advisories**.
- Supports emission controls like **traffic, industry, and dust management**.
- Uses **VIIRS** satellite data; needs regular updates for precision.

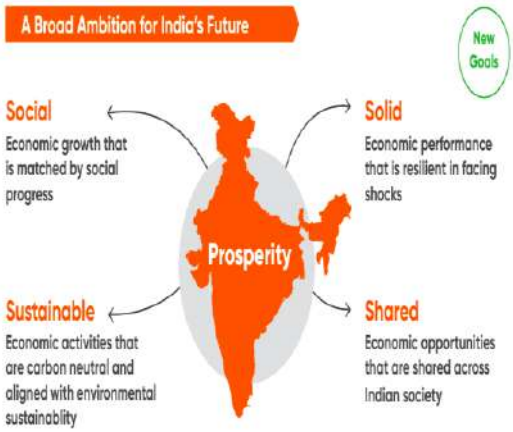
17. Indian Capital Must Realign with India's Growth Imperatives

Introduction

Indian capital must refocus inward—driving consumption, wages, and innovation—to build a resilient, $10-trillion self-sustaining economy amid global uncertainty.

The Current Landscape & Problems

- Private investment remains weak at **~9–10% of GDP** despite high public spending; **Q1 FY26 saw 87%** share in new intents but cautious execution.
- Firms' outward focus faces risks from **global instability and weak demand**.
- Stagnant real wages curb domestic **consumption, dampening investment appetite**.
- Low **R&D (0.64% of GDP; 36% private share)** limits innovation and value-chain advancement.



Strategic Imperatives

- **Reinvest Domestically:** Redirect private capital to manufacturing, clean energy, health, and digital infrastructure.
- **Wage-Led Growth:** Raise real wages, formal jobs, and equity to strengthen consumption.
- **Incentivize Capex:** Sustain low corporate tax rates, expand PLI, and improve logistics, credit, and business ease.
- **Boost R&D:** Raise GERD to 1.5–2% of GDP, expand private funding, tax credits, and industry–academia links.
- **Regional Equity:** Align investments with NIP, green and digital missions, and channel capital to lagging regions.

Risks & Challenges

- Risk aversion amid global volatility limits large domestic investments.
- State-level disparities in governance affect investor confidence.
- MSMEs face credit and funding constraints.
- Policy, labour, tax, and governance misalignment hinders project execution.

Way Forward: Policy Recommendations

- **Roadmap**: Long-term investment strategy with clear sectoral priorities.
- **Finance**: Deepen markets, boost risk capital & bonds.
- **Labour**: Reform laws, upgrade skills.
- **Innovation**: Incentivize R&D, protect IP.
- **States**: Improve land, power, and infrastructure.
- **Accountability**: Track via capex & R&D metrics.

Conclusion

India must shift from public-led to private-driven investment at home to sustain growth, jobs, and resilience—aligning enterprise with national purpose for inclusive, self-reliant progress.

18. India's Direction for Disaster Resilience: A Strategic Overview

Introduction

India is shifting from reactive disaster response to a proactive, resilience-focused strategy driven by institutional, financial, and community reforms.

Institutional Framework and Policy Evolution

- **PM's Ten-Point Agenda (2016):** Integrates DRR into development, focusing on early warning, technology use, and community preparedness.
- **NDMA (2005):** Central body under the DM Act for policy, coordination, and implementation of disaster mitigation and response.

Financial Innovations in Disaster Risk Reduction

15th Finance Commission (2021–26):

India allocated ₹2.28 lakh crore for disaster management—10% for preparedness, 20% for mitigation, 40% for response, and 30% for reconstruction—marking a shift to holistic DRR. Additionally, ₹1.6 lakh crore was earmarked for SDRF (2021–26), with 80% for response and 20% for mitigation.

Nature-Based and Technological Mitigation Strategies

India is leveraging **Nature-Based Solutions** and technology for **DRR**—using coastal restoration and glacier monitoring for risk reduction, alongside **AI-driven early warning systems** and **data analytics** to enhance forecasting and response.

Community Engagement and Capacity Building

India is strengthening community resilience through volunteer programs (Apda Mitra), institutional training via NIDM, and widespread school and public awareness initiatives to embed disaster preparedness at all levels.

International Cooperation and Leadership

India's DRR strategy extends to the global stage through:

- **Coalition for Disaster Resilient Infrastructure (CDRI):** A platform initiated by India to promote disaster-resilient infrastructure globally.
- **Active Participation in International Forums:** India engages in platforms like the G20, SCO, BIMSTEC, and IORA, contributing to and learning from international best practices in disaster management.

Conclusion

India's approach to disaster resilience represents a comprehensive model that integrates policy, technology, community engagement, and international cooperation. By shifting focus from reactive relief to proactive resilience, India is building a sustainable and inclusive disaster management framework. This model not only protects its citizens but also offers a template for other developing nations facing similar challenges.

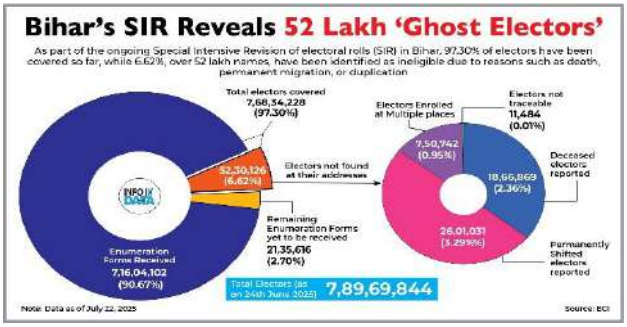
19. Special Intensive Revision (SIR) of Electoral Rolls – Ensuring the Purity of India's Voter List

Introduction

Free and fair elections form the bedrock of Indian democracy. To ensure accurate voter records and prevent fraud, the **Election Commission of India (ECI)** periodically updates electoral rolls. In 2025, it launched a **Special Intensive Revision (SIR)**, starting with Bihar, to enhance the accuracy and inclusivity of the voter database.

Background: What is the Electoral Roll?

The electoral roll is the official list of eligible voters in a constituency, ensuring universal adult franchise, preventing duplication, and promoting transparent elections. Its preparation and periodic revision are mandated under the Representation of the People Act, 1950.



Legal Framework for Electoral Roll Revision

Section 21 of RPA, 1950

- **Powers of ECI:** To prepare, revise, and conduct regular or special updates of electoral rolls.
- **Supporting Rules:** RER 1960 governs procedures for voter registration, correction, and deletion.

Significance of Clean Electoral Rolls

SIR upholds **electoral integrity** by removing duplicates, promotes **inclusion** of genuine voters, enhances **administrative efficiency**, and aligns with **Supreme Court directives** affirming accurate rolls as vital for free and fair elections.

Challenges in Conducting SIR

- **Data Accuracy**: Aadhaar–voter ID mismatches.
- **Administrative Load**: High coordination burden across states.
- **Privacy Concerns**: Risks of data misuse in Aadhaar linking.
- **Awareness Gap**: Low rural and migrant participation.
- **Tight Timelines**: Limited time for verification before polls.

Technological Integration and Innovations

Tech tools like **ERMS, geo-tagged BLO mapping, NVSP portal, and AI-based duplicate detection** make the SIR process **faster, data-driven, and more transparent**.

The Way Forward

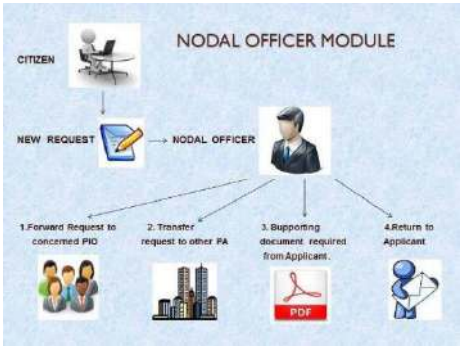
To make future revisions seamless and credible, the following reforms are essential:

- **Phased State-wise Scheduling** – Avoid administrative overburden.
- **Digital Integration** – Real-time verification using Aadhaar, NPR, and census data.
- **Targeted Awareness Drives** – Focus on women, youth, and migrant voters.
- **Booth-Level Empowerment** – Regular BLO training and performance tracking.
- **Institutional Monitoring** – State-level SIR dashboards for transparency.

20. Right to Information (RTI) Act, 2005 – Two Decades of Transparency and Accountability

Introduction

The **RTI Act (2005)** has advanced transparency and accountability but, at 20 years, faces systemic challenges requiring reform.



Background and Purpose of the RTI Act

- **Precedence:** Section 22 gives RTI Act priority over conflicting laws.
- **Public Interest Disclosure:** Section 8(2) permits release of sensitive info if public interest prevails.
- **Exemptions:** Bars disclosure on national security, sovereignty, foreign ties, or public order.
- **Information Authorities:** Central & State Information Commissions implement the Act.
- **Tenure & Salary:** 2019 amendment allows Centre to set terms, replacing fixed 5-year/65-year limit.

Achievements of RTI Act, 2005

The RTI Act promotes transparency by enabling access to MGNREGA, PDS, and local projects, exposing scams like Adarsh, 2G, and CWG, and fostering accountability and citizen activism.

Key Challenges Facing the RTI Act

- **Delays:** Many RTI cases take over a year; some states face decades-long backlogs.
- **Vacancies:** Several Commissions lack chiefs or are non-functional (e.g., Jharkhand, HP).
- **Autonomy Erosion:** 2019 amendment lets Centre control commissioners' tenure and pay.
- **Widened Exemptions:** OSA 1923 and DPDP 2023 restrict access to security and personal data.
- **Activist Threats:** RTI users face violence amid poor whistleblower protection.

Important Judicial and Legislative Interventions

- **Section 4 (Mandatory Disclosure):** Requires proactive disclosure by public authorities.
- **Supreme Court Oversight:** Ensures accurate rolls and timely implementation of RTI principles.
- **Amendments:**
    - **2019 RTI Amendment:** Reduces autonomy of commissioners.
    - **DPDP Act, 2023:** Limits personal information disclosure.

Recommended Reforms for Strengthening RTI

- **Information Commissions:** Fill vacancies, improve staffing, use tech and performance metrics.
- **Technology:** Enable AI drafting, blockchain verification, DigiLocker use, and real-time tracking.
- **Enforcement:** Enforce Sections 4 & 25, penalize delays by PIOs.
- **Activist Protection:** Implement Whistleblower Act, set up helplines and legal aid.
- **Autonomy:** Ensure parliamentary oversight and judicial review of appointments.

Conclusion

After 20 years, the RTI Act remains crucial for transparency but needs reforms in staffing, technology, enforcement, and activist protection to regain full effectiveness.

21. Expansion of National Agriculture Market (e-NAM)

Introduction

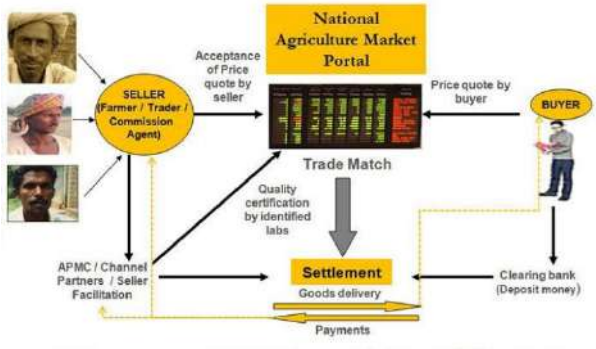
Launched in **2016**, e-NAM is a pan-India digital platform unifying agricultural markets. In 2025, **9 new commodities** were added, raising tradable products to **247** to boost **transparency and farmer income**.

Objectives of e-NAM

e-NAM aims to unify state mandis, ensure transparent price discovery, standardize procedures, assure produce quality through assaying, and provide stable prices for consumers.

Key Features of e-NAM

- Pan-India mandi network enabling inter-state trade.
- Quality-based pricing through assaying and grading.
- Single trading license and unified market fee.
- Direct digital payments to farmers.
- Real-time price and demand data for better decisions.
- Logistics and warehousing integration to cut losses.



Impact

- **Price Realization:** Farmers get better returns by accessing national markets.
- **Reduced Post-Harvest Losses:** Standardized trading and logistics reduce wastage.
- **Formalization of Trade:** Moves India towards **digital and transparent agricultural marketing**.
- **Consumer Benefit:** More **stable prices** and **better quality produce**.

Significance

- **Farmers:** Better prices, more buyers, quality-based incentives.
- **Economy:** Efficient markets, fewer intermediaries.
- **Governance:** Enhanced transparency, aligns with PM-KISAN and digital reforms.

Challenges and Way Forward

Challenges

- **Limited Awareness:** Many small farmers are unaware of e-NAM benefits.
- **Connectivity Issues:** Internet and digital literacy gaps hinder participation.
- **Infrastructure Gaps:** Assaying labs, storage, and transport remain inadequate in some areas.
- **State-Level Resistance:** Some APMCs are slow to implement reforms.

Way Forward

- **Awareness Campaigns:** Educate farmers on benefits and procedures.
- **Digital Infrastructure:** Expand internet connectivity and mobile-enabled trading.
- **Capacity Building:** Train mandis and farmers in online trading and quality assessment.
- **Integration with Logistics:** Partner with warehouses and transport providers to reduce post-harvest losses.
- **Policy Support:** Encourage more states to reform APMC Acts and fully integrate with e-NAM.

22. Pradhan Mantri Dhan Dhaanya Krishi Yojana & Mission for Aatmanirbharta in Pulses

Introduction

PM Modi launched PMDDKY and Pulses Mission on Oct 11, 2025, with ₹35,440 crore to boost productivity, farmer income, and agri self-reliance.

Pradhan Mantri Dhan Dhaanya Krishi Yojana (PMDDKY)

PMDDKY aims to transform 100 low-performing farm districts with ₹24,000 crore (2025–31) by boosting productivity, crop diversity, and access to credit and irrigation.

Key Features

- **Integrated Planning:** Converges 36 schemes across 11 ministries for efficiency.
- **Timeline:** Rabi 2025–26 to 2030–31.
- **Focus:** Crop diversification, irrigation, finance, and climate-smart farming.
- **Technology:** Uses digital land records, soil data, and satellite mapping.

Mission for Aatmanirbharta in Pulses

- **Objective:** Achieve self-sufficiency in pulses by 2030–31, reducing imports and stabilizing prices.
- **Outlay:** ₹11,440 crore.
- **Targets:** Area 310 lakh ha; production 350 lakh tonnes; yield 1,130 kg/ha by 2030–31.
- **Focus Crops:** Tur, Urad, Masoor, Gram, and Moong.
- **Strategy:** Expand irrigation, promote high-yield varieties, cluster farming, better storage, MSP, and exports.
- **Significance:** Could save ₹20,000 crore annually and boost price stability.

Expected Outcomes

- **Economic:** Higher productivity, income, and forex savings; boost to rural agri-entrepreneurship.
- **Social:** Reduced regional gaps, more jobs, and farmer empowerment.
- **Environmental:** Promotion of climate-resilient, water-efficient, and sustainable farming.

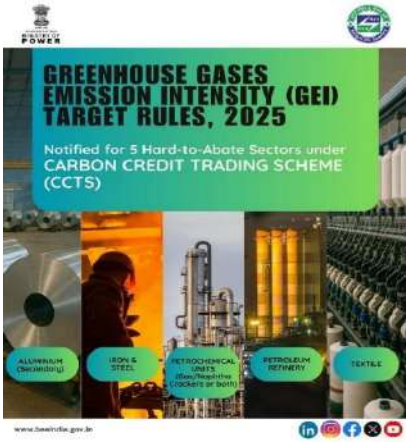
Challenges Ahead

- **Coordination Issues:** Managing 36 inter-ministerial schemes is complex.
- **Credit Gaps:** Small farmers lack timely, affordable finance.
- **Climate Risk:** Pulses vulnerable to erratic rainfall.
- **Market Weakness:** Limited MSP/procurement may deter crop shift.
- **Monitoring:** Real-time district dashboards needed.

Way Forward

- **District Agriculture Transformation Plans (DATPs):** Custom plans for low-performing districts
- **PPP:** Promote agritech startups, FPOs, and CSR projects
- **Export Zones:** Link pulses and diversified crops to exports
- **Nutrition Linkages:** Connect pulses mission with Poshan Abhiyaan & Mid-Day Meal Scheme
- **Digital Monitoring:** Geo-tagging, drones, and AI for real-time tracking

23. Greenhouse Gas Emission Intensity Target Rules, 2025



Introduction

India's **GEI Target Rules, 2025** set binding emission cuts for cement, aluminium, pulp & paper, and chlor-alkali sectors—shifting from voluntary efficiency to market-based climate compliance.

Background & Context

India's **GEI Rules** align with Paris goals, linking industry emission cuts to the **CCTS carbon market**, converting compliance into economic opportunity.

Coverage and Scope

India's **GEI Rules** align with Paris goals, linking industry emission cuts to the **CCTS carbon market**, converting compliance into economic opportunity.

Linking GEI Targets with Carbon Market

- **Mechanism:** Compliant units earn tradable carbon credits; non-compliant ones buy credits or pay penalties.
- **Significance:** Promotes clean tech, energy efficiency, and turns emission cuts into economic gains.

Strategic Significance

- **Climate:** Aids 2070 net-zero, boosts green tech and carbon capture.
- **Economic:** Generates revenue, cuts energy costs, aligns with global markets.
- **Governance:** Ensures accountability, strengthens BEE–MoEFCC–CPCB synergy.
- **Global:** Mirrors EU/China models, making India a regional carbon market hub.

Challenges in Implementation

Challenge	Explanation
Measurement & Reporting	Accurate emissions data collection and verification needed
Capacity Gaps	Smaller units may lack funds/technical expertise
Market Liquidity	Carbon market success depends on active participation
Regulatory Coordination	Effective collaboration between BEE, MoEFCC, and CPCB is critical

Way Forward

- **Broader Sectoral Inclusion:** Extend to steel, textiles, and chemicals.
- **Technology Adoption:** Incentivise low-carbon innovations and process efficiency.
- **Financial Support:** Provide credit lines and technical assistance for smaller industries.
- **Digital Monitoring:** Use AI, IoT, and drones for real-time compliance tracking.
- **International Linkages:** Facilitate integration with global carbon markets to generate foreign revenue.

Conclusion

The **GEI Target Rules, 2025** set **legally binding emission targets**, link performance to a **carbon market**, and promote **technological innovation**, driving **sustainable industrialisation** and positioning India as a **global carbon market leader**.

24. India's Engagement with the Taliban: Pragmatism Amid Geopolitical Shifts

Introduction

India engages the Taliban pragmatically, without recognition, focusing on **humanitarian aid, security, and infrastructure**, safeguarding its **strategic and developmental interests** amid shifting geopolitics.

Historical Context of India–Taliban Relations

India's engagement with the Taliban began during the **1999 IC-814 hijacking** but remained minimal due to Pakistan's dominance. After the **Taliban's 2021** return, India adopted a cautious, pragmatic approach—acknowledging the regime as the de facto authority without formal recognition, advocating inclusivity (especially women's rights), and extending humanitarian aid such as **wheat, vaccines, and medicines**.

Deepening Engagement (2022–2025)

- **Diplomatic Engagement**: Regular visits since 2022; Kabul mission reopened as an embassy; first Taliban FM visit to India in Oct 2025.
- **Trade & Connectivity**: Enhanced trade through Chabahar Port; continued humanitarian shipments; collaboration in sports like cricket.
- **Development Cooperation**: Ongoing Indian projects in all 34 Afghan provinces in infrastructure, health, and education.

Balancing Diplomacy with Principles

- **Human Rights Stand:** India criticizes Taliban's curbs on women and education while balancing ethics with strategy.
- **Conditional Aid:** Assistance is tied to adherence to global norms, using aid as leverage without formal recognition.

India's Strategic Gains

- **Continuity in Development Projects** – Ensures completion of schools, hospitals, and roads.
- **Humanitarian Leadership** – Positions India as a **reliable partner** for Afghan people.
- **Counterterrorism Advantage** – Maintains intelligence and security channels.
- **Regional Connectivity & Trade** – Strengthens role via **Chabahar Port** and cross-border projects.
- **Diplomatic Leverage** – Gains influence in **regional forums** and negotiations.

Challenges and Risks

Challenge	Implication
Women's Rights & Governance	India must avoid endorsing Taliban's regressive policies
Security Risks	Potential misuse of visas or infiltration by extremists
Diplomatic Sensitivity	Non-recognition limits full diplomatic engagement
Regional Rivalries	Pakistan, China, and US influence complicates strategy

25. Unified Markets Interface (UMI): RBI's Leap into Tokenised Financial Markets

Introduction

RBI launched the Unified Markets Interface (UMI) to enable blockchain-based asset tokenisation and CBDC settlements, advancing India's fintech leadership.

Understanding the Concept

Unified Markets Interface (UMI):

An RBI digital platform enabling tokenisation, trading, and settlement of assets via wholesale CBDC, similar to how UPI unified retail payments.

Asset Tokenisation:

Converts assets like bonds or gold into blockchain-based tokens, enabling fractional ownership, greater liquidity, transparent records, faster settlements, and lower transaction costs.

Integration with Wholesale CBDC

- **Wholesale CBDC (w-CBDC):** Digital central bank money for inter-bank settlements.
- **UMI Integration:** Uses w-CBDC for real-time, secure, intermediary-free institutional transactions.
- **Pilot Outcomes:** Since Nov 2022, RBI's pilot proved faster, low-cost, risk-free settlements; under UMI, tokenised assets like T-Bills and bonds can settle instantly via Digital Rupee (Wholesale).

Significance of Unified Markets Interface

6.1 Economic & Structural Impact

- Modernises market infrastructure with blockchain & CBDC integration.
- Enables instant, low-cost, risk-free settlements.
- Ensures transparency through verifiable transactions.
- Promotes retail access via fractional tokenisation.
- Aligns with global digital market standards.

6.2 Strategic & Policy Relevance

- Advances India's Digital Public Infrastructure (DPI) vision.
- Strengthens RBI's Digital Rupee roadmap.
- Fosters inclusion, innovation, and cross-border interoperability.

Challenges and Way Forward

- **Regulation**: Lack of clear laws on tokenised assets and investor protection.
- **Cybersecurity**: Vulnerability to hacking and data breaches.
- **Interoperability**: Need seamless integration across UMI, CBDC, AA, and legacy systems.
- **Awareness**: Limited understanding of tokenisation among institutions and investors.
- **Legal Clarity**: Unclear status of token ownership and smart contract validity.

Way Forward

- Establish **robust regulatory sandbox** for testing UMI-based products.
- Build **public-private collaboration** for scaling blockchain infrastructure.
- Enhance **digital literacy and cybersecurity frameworks**.

26. India's Indigenous 4G Stack: A Step Toward Telecom Self-Reliance and Global Digital Exports

Introduction

India launched its **indigenous 4G stack**, developed by **C-DOT, Tejas Networks, and TCS**, marking a milestone in **Aatmanirbhar Bharat**, digital sovereignty, and strategic telecom autonomy.

Understanding the 4G Stack

2.1 What is 4G?

High-speed mobile broadband using LTE, MIMO, and OFDM for fast, reliable data and HD streaming.

2.2 India's 4G Stack

Indigenous telecom system (core, RAN, software) powering BSNL's 92,000+ towers and 22M users nationwide.

Key Institutions Behind the 4G Stack

- **C-DOT**: Built core network software for data and connectivity.
- **Tejas Networks**: Developed RAN hardware linking devices to towers.
- **TCS**: Integrated software and hardware for seamless operation.

Benefits and Strategic Impact

- Enhances digital sovereignty and security.
- Bridges rural–urban digital divide.
- Boosts local R&D, jobs, and innovation.
- Ensures secure defense communications.
- Positions India as a global telecom exporter.

Challenges and the Road Ahead

Challenge	Explanation
Global Competition	Competing with established players like Huawei and Ericsson requires sustained R&D and financing.
Export Financing & After-Sales Support	Developing nations expect bundled credit and support, which China provides.
Technology Upgradation	Rapid transition to 5G/6G requires continuous innovation.
Cybersecurity Threats	Indigenous systems must meet global encryption and safety standards.

Way Forward

- Boost R&D via public–private partnerships.
- Link 4G/5G exports with foreign aid.
- Form global telecom alliances.
- Upskill engineers for indigenous tech.

Conclusion

India's **indigenous 4G stack** is a strategic milestone, advancing **digital sovereignty, manufacturing, and exports**, and marking India's shift from a telecom consumer to an **innovator in secure, self-reliant networks**.

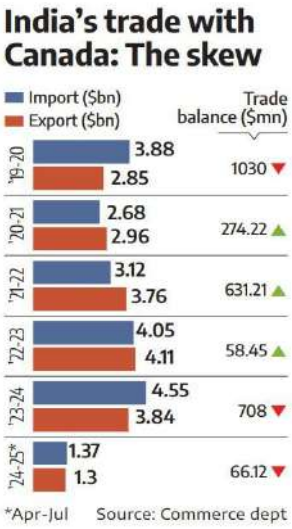
27. India-Canada Relations: Revival and Strategic Cooperation

Introduction

India and Canada's 2025 revival deepens democratic, trade, energy, and tech ties, reaffirming mutual respect and sovereignty.

Historical Context

Early ties rooted in Commonwealth and democracy fostered cooperation in education, agriculture, energy, and trade, while a 1.6 million-strong Indian diaspora deepens cultural and educational links.



Trade and Economic Relations

In 2024, India–Canada trade reached $33.9 billion, with strong exchange in energy, IT, and pharma, while Canadian pension funds boost India's infrastructure; CEPA talks aim to deepen ties.

Recent Diplomatic Strains

- **2023**: Trudeau accused India over Nijjar's killing; India dismissed claims as baseless.
- Resulted in **diplomatic strain** and halted trade talks.
- Under PM Mark Carney, Canada seeks to reset ties with focus on **sovereignty and mutual respect**.

Revival Measures and Strategic Dialogue (2025)

Oct 2025: Jaishankar–Anand meet in New Delhi revived ties, focusing on **trade, energy, tech, and AI**—the first high-level visit in two years.

Key Agreements and Initiatives

- Trade talks relaunched to draft a new **CEPA** aligned with India's recent **FTAs.**
- Energy cooperation expanded through **CIMED** on green hydrogen**, CCUS, biofuels, and critical minerals.**
- **Civil nuclear ties** revived with Canadian uranium supply**; minerals dialogue** set for March 2026.
- **Agriculture partnership** on climate-resilient farming and sustainable tech exchange.
- **Science & Technology** collaboration renewed, focusing on **AI, digital infrastructure, and cybersecurity.**

Diplomatic and Strategic Significance

Post-2023, both sides aim to rebuild trust, respect sensitivities, and renew strategic ties through collaboration in AI and technology.

Broader Global Context

Amid global shifts, India and Canada align on multilateral reform, climate action, and Indo-Pacific stability to boost trade, tech, and resilient growth.

Conclusion

The India–Canada revival marks a strategic reset, strengthening cooperation in trade, tech, clean energy, and AI based on mutual respect and sovereignty.

28. 2025 Nobel Prize in Economics: How Innovation Drives Economic Growth

Introduction

The **2025 Nobel Prize in Economics** honored **Joel Mokyr, Philippe Aghion, and Peter Howitt** for showing how innovation and creative destruction drive long-term economic growth.

Background and Significance

- Shifted growth focus from **capital and labor** to ideas, **innovation, and institutions**.
- Emphasized knowledge and technology as **engines of sustained prosperity**.
- In the **AI and climate innovation era**, their ideas aid **inclusive and sustainable development**.

The Laureates at a Glance

- **Joel Mokyr** (Netherlands/USA, Northwestern): Historical roots of innovation.
- **Philippe Aghion** (France, Collège de France): Innovation-led growth theory.
- **Peter Howitt** (Canada, Brown): Endogenous growth model co-developer.

Joel Mokyr's Contribution: Knowledge as the Engine of Growth

- Mokyr highlighted "**useful knowledge**"—linking **theory ("why") and practice ("how")**—as the driver of continuous innovation.
- The **Scientific Revolution** fused science and engineering, fueling industrial breakthroughs.
- **Policy focus**: invest in **skills, R&D, and open, adaptable institutions** for inclusive innovation.

Aghion & Howitt's Model: The Economics of Creative Destruction

- **Aghion and Howitt** expanded Schumpeter's "**creative destruction**," showing innovation drives cycles of renewal and sustained growth.
- Firms **innovate, enjoy brief monopolies**, then are replaced by better technologies.
- Balanced **R&D** support ensures broad benefits while **curbing monopolies and inequality**.
- Seen today in **AI, digital, and renewable revolutions** transforming economies.

Implications for India

- **India's Innovation Landscape:**
  India ranks **40th (2025)** in the Global Innovation Index, with strengths in **digital payments, space, renewables, and pharma**, but invests only **0.7% of GDP** in R&D — far below global leaders.
- **Policy Priorities:**
  Boost **skills and R&D**, strengthen **industry–academia linkages**, promote **openness and ease of innovation**, and ensure **inclusive benefits** for MSMEs and rural sectors.

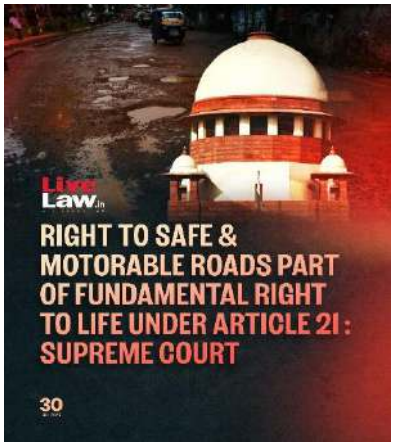
Conclusion

The **2025 Nobel laureates** highlight that true prosperity stems from **ideas, not resources**. Mokyr stressed knowledge and openness, while Aghion and Howitt showed that innovation and creative destruction sustain growth. Their message: invest in **curiosity and innovation** to achieve lasting progress.

29. Supreme Court's Landmark Order on Road Safety and Pedestrian Protection (2025)

Introduction: A Wake-Up Call on India's Road Crisis

With 1.68 lakh road deaths in 2023, India's Supreme Court in 2025 issued key directives to improve safety for vulnerable pedestrians and two-wheeler riders.



Why the Supreme Court Stepped In

The 2025 verdict, stemming from **Dr. S. Rajasekaran's 2012 PIL**, aimed to establish a **uniform, enforceable road safety framework** to tackle rising fatalities and weak enforcement.

The Scale of the Problem — Key Data

In 2023, India saw **1.68 lakh road deaths**—**31%** two-wheeler riders and **20%** pedestrians, whose fatalities doubled since 2016 due to poor helmet use, weak enforcement, and encroached footpaths.

The Supreme Court's Blueprint for Safer Roads

Supreme Court ordered audits of **city footpaths, strict enforcement of helmet and lane** rules via **CCTV/AI, regulation of headlights, and mandatory state rules** for pedestrian-friendly roads within **six months**.

Broader Policy Significance

- Road crashes cost **~3% of GDP,** mainly affecting **working-age men and widening inequality.**
- Only **35%** of urban roads have **usable footpaths, neglecting non-motorised users.**
- **Weak coordination and low convictions** undermine traffic law enforcement.

Government Initiatives on Road Safety

Policies from **2010–2025** aim to cut road deaths by **50% by 2030** through **stricter laws, safer infrastructure, monitoring, and cashless emergency** care under the **Golden Hour Scheme**.

Challenges Ahead

- **Implementation gaps** between policy and ground reality.
- **Coordination issues** among multiple agencies (NHAI, MoRTH, State PWDs, ULBs).
- **Urban encroachment** and weak municipal governance.
- **Behavioural change** remains the toughest — especially regarding helmets, seatbelts, and speeding.

Way Forward

- **Pedestrian-Centric Urban Design:** Adopt "*Complete Streets*" model prioritising walkers and cyclists.
- **Data-Driven Enforcement:** Use AI, sensors, and smart surveillance to detect violations.
- **Institutional Accountability:** Empower local bodies with funds and legal authority.
- **Public Awareness:** Sustained education campaigns like *Sadak Suraksha Abhiyan*.
- **Community Ownership:** Involve RWAs, schools, and civil society in monitoring footpath safety.

Conclusion

The 2025 Supreme Court order affirms **road safety as a constitutional right under Article 21**, emphasizing that roads serve all users. Effective implementation could usher in a new era of **safe, accessible, and dignified urban mobility**.

30. Wild Elephants in India: 2025 DNA-Based Census and Conservation Insights

Introduction: The Elephant in India's Ecology and Culture

Elephants, keystone species and cultural icons in India, number **22,446** per the 2025 DNA-based census, showing an **18% decline since 2017** and highlighting urgent conservation needs.

Distribution and Habitat

India hosts ~**22,400** Asian elephants across four landscapes, mainly in **Karnataka, Assam, Tamil Nadu, and Kerala**, needing vast connected habitats for migration and survival.

Significance of Elephants

- **Ecological:** Key seed dispersers and habitat maintainers.
- **Cultural:** Revered in tradition and tourism as symbols of strength and wisdom.

Threats to Wild Elephants

- Habitat loss from **agriculture, mining, and infrastructure disrupts** key corridors.
- **Human–elephant conflict** causes crop loss and retaliatory killings.
- **Poaching and ivory** trade persist regionally.
- Roads and fences block **migration, reducing genetic flow.**
- **Invasive plants** degrade feeding grounds.

Conservation Status and Legal Protection

Endangered on IUCN Red List; **Schedule I** under Wildlife Protection Act, 1972; **Appendix I** in CITES (trade banned).

India's Conservation Efforts

- **Project Elephant (1992)** focuses on habitat, conflict, and community action.
- **101 corridors** secured for safe migration.
- Campaigns like **Gaj Yatra** promote coexistence.
- **Tech tools (DNA surveys, satellite mapping, M-Stripes)** track populations.

India's First DNA-Based Elephant Census (2025)

Genetic surveys estimate 22,446 elephants, with **Western Ghats** as the main stronghold; **habitat fragmentation** remains a key threat.

Conservation Challenges

Habitat loss, conflict, climate change, and weak enforcement threaten elephant populations and migration corridors.

Way Forward for India

Restore corridors, enhance conflict mitigation, use data-driven policy under Project Elephant 2.0, ensure fair compensation, and boost inter-state coordination.

Conclusion

The **2025 DNA-based census** provides a scientific baseline, enabling India to conserve elephants through habitat protection, corridors, community engagement, and technology.

31. Plastic Waste Management in India: A Growing Environmental Challenge

Introduction

India's **2024 Plastic Waste Management Rules** tighten norms on **microplastics, biodegradability, and producer responsibility** to tackle **3.5 million tonnes** of annual plastic waste.

Understanding Plastic Pollution

- Plastic waste includes discarded single-use and industrial plastics polluting the environment.
- India generates ~3.5 million tonnes yearly, growing 6–8%, with only 60% collected; the rest contaminates land, water, and even Himalayan snow.

Evolution of Plastic Waste Management Rules in India

From 2016–2024, India's plastic rules evolved from basic waste segregation to a strict EPR regime, banning single-use plastics, tightening recycling targets, and regulating microplastics and biodegradables.

Plastic Waste Management (Amendment) Rules, 2024

- **Microplastics** (1–1000 microns) pollute water bodies; testing norms remain unclear.
- **Broadened definitions** of importers, manufacturers, and producers cover all plastic types.
- **Biodegradable plastics** break down biologically but may fail in real conditions; compostable ones need industrial composting to decompose fully.

Extended Producer Responsibility (EPR): A Core Mechanism

EPR makes producers accountable for a product's lifecycle, with targets, **CPCB registration**, and penalties, promoting recycling and a circular economy.

Key Government Initiatives Complementing PWM Rules

Key initiatives include **Swachh Bharat Mission**, **India Plastics Pact** (100% recyclable packaging by 2030), **Un-Plastic Collective**, **KVIC's REPLAN**, **GoLitter Project**, and the **2022 ban on single-use plastics**.

Challenges in Plastic Waste Management

- Poor waste segregation at source
- Low recycling rate (**~60%**)
- Unorganised waste sector with limited protection for informal workers
- Low consumer awareness and reliance on single-use plastics
- Weak monitoring and enforcement by CPCB, SPCBs, and local bodies

Way Forward

- Strengthen **microplastic testing** and introduce **Deposit Refund/Plastic Credit systems**
- Promote **bioplastics and AI-driven** waste management
- Empower **SHGs, recyclers**, and run **"Plastic Free 2047"** campaigns
- Align with global efforts like the **UNEP treaty and EU SUP bans**

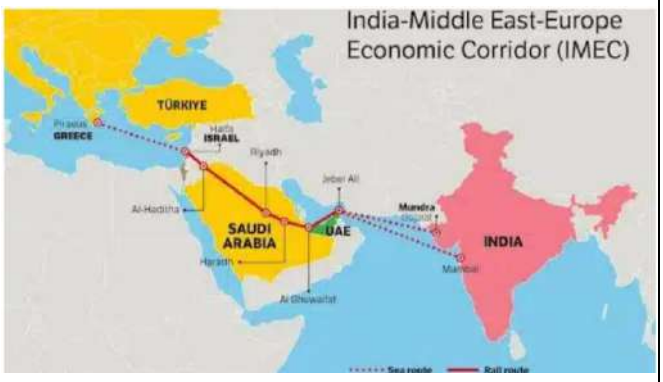
Conclusion

Plastic pollution is a major challenge; the **2024 PWM Amendment** addresses microplastics and accountability, but success needs **enforcement, behaviour change, and circular practices**.

32. India-Middle East-Europe Economic Corridor (IMEC): A Strategic Connectivity Initiative

Introduction

IMEC, launched at G20 2023, links **India, the Middle East, and Europe** through **trade, energy, and digital corridors**, offering an alternative to China's BRI.



Objectives of IMEC

- Boost **trade, investment, and regional integration** across India, the **Middle East, and Europe**.
- Diversify supply chains and build sustainable, tech-driven infrastructure.

Route and Infrastructure

- **Maritime & Rail:** Indian ports → UAE → Arabian Peninsula; high-speed rail UAE → Saudi Arabia → Jordan → Israel → Haifa → Europe, reducing logistics time.
- **Integrated Infrastructure:** Cross-border **electricity grid**, **hydrogen pipeline**, **undersea digital cables**, and upgraded **ports/freight hubs**.

Strategic and Economic Importance for India

- Reduces dependence on the **Suez Canal** and related risks
- Expands access to **Europe, India's** top trading partner **($136 billion in 2024)**
- Aligns with India's **'Act West'** policy for energy and diaspora ties
- Boosts strategic influence in **Gulf geopolitics**
- Opens high-value **European markets** for Indian exports

Economic and Technological Integration

Integrates clean hydrogen, power grids, digital cables, and modern logistics for sustainable trade.

Implementation and Governance

Needs joint governance, PPP investment, security cooperation, and alignment with EU and U.S. infrastructure frameworks.

Challenges and Risks

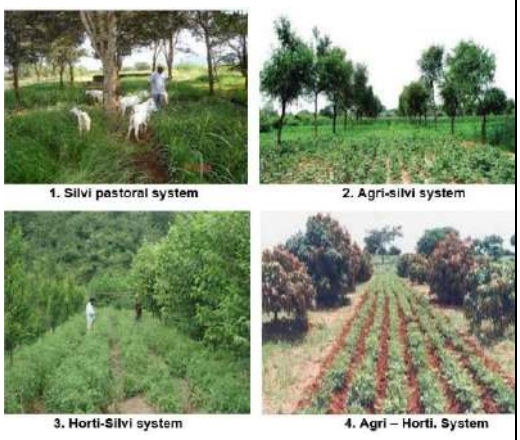
- **Geopolitical**: Regional conflicts, Red Sea instability, Israel–Arab tensions.
- **Economic**: Competition from Arctic routes, funding gaps, cost overruns.
- **Technical**: Challenges in integrating transport, energy, and digital networks.
- **Environmental**: Ensuring sustainability and minimizing ecological impact.

Way Forward

- **Strategic Focus:** Position IMEC as a long-term strategic project.
- **Flexibility:** Include Saudi and Egyptian ports for resilience.
- **Financing:** Use multilateral, PPP, and private investments.
- **Regional Cooperation:** Foster trust and risk-mitigation frameworks.
- **Global Alignment:** Link with EU Global Gateway and PGII.

33. Agroforestry in India: A Sustainable Path for Environment, Livelihoods, and Climate Resilience

Agroforestry integrates trees with farming to boost incomes, restore land, and enhance environmental sustainability.



Understanding Agroforestry

Agroforestry—integrating trees with crops/livestock—enhances productivity, income, and sustainability; rooted in traditional practices, it gained formal backing through India's 2014 National Agroforestry Policy.

Types of Agroforestry in India

Agroforestry types:

- **Agrisilviculture** – trees + crops (Indo-Gangetic plains)
- **Silvopastoral** – trees + livestock (Rajasthan, Gujarat, Karnataka)
- **Agrihorticultural** – crops + fruit trees (South, Northeast)
- **Hortipastoral** – fruit trees + pasture (rainfed areas)
- **Agrosilvopastoral** – trees + crops + livestock (Kerala, Tamil Nadu)

Objectives of Agroforestry

Agroforestry restores land, boosts carbon storage, and supports livelihoods through timber, fruits, and fodder. It promotes simplified tree rules, farmer training, and practices like home gardens, crop-livestock systems, watershed models, and multipurpose tree planting under SMAF.

Government Policies and Initiatives

- **Policies**: National Agroforestry Policy (2014), Forest Policy (1988), Bamboo Mission (2006), Sub-Mission on Agroforestry (2016).
- **Initiatives**: GROW Portal (2024), Green India Mission, PKVY, MGNREGA, and state-level agroforestry programs.

Legal & Regulatory Framework

- **FRA (2006):** Rights over minor forest produce.
- **EPA (1986):** Supports afforestation & carbon management.
- **BDA (2002):** Promotes indigenous species.
- **Land Leasing Act (2016):** Enables tree planting on leased lands.

Challenges:

Fragmented land, insecure tenure, regulatory differences, limited technical support, market risks, and climate vulnerability.

Way Forward:

Harmonize policies, expand GIS/remote sensing, improve credit and markets, promote climate-resilient research, build farmer/women capacity, and align with national targets (33% tree cover, 26 Mha restoration, carbon sinks).

34. Fiscal Federalism and the Crisis of Municipal Finance in Urban India

Understanding Fiscal Federalism

Meaning and Essence

Fiscal federalism governs revenue sharing and spending among Centre, States, and Local Bodies to ensure equity, autonomy, and balanced development.

The Indian Context: Urban Paradox

- Urban areas drive 65–70% of GDP but get <1% of tax revenue.
- Municipalities rely on transfers and loans, limiting fiscal autonomy.

Constitutional Framework and the 74th Amendment

- 74th Amendment (1992) empowered ULBs as the third governance tier with SFCs for fund devolution.
- Yet, ULBs remain fiscally dependent, lacking direct tax shares and timely SFC implementation.

How GST Deepened the Municipal Fiscal Crisis

- **Pre-GST**: Cities had buoyant local taxes like octroi and entry tax.
- **Post-GST**: Lost ~19% revenue; compensation favored states, deepening dependence (e.g., Mumbai lost ₹7,000 cr annually).

The Property Tax Trap

- Property tax yields only **20–25%** of potential due to poor valuation and enforcement, overburdening citizens despite basic service rights.
- Municipal bonds remain **limited to few cities;** need **better credit norms,** inclusion of **grants, and collateral flexibility.**
- **Centralisation persists —** Centre controls most spending, leaving cities resource-poor and dependent.

Dimensions of the Crisis

- **Fiscal**: Shrinking tax base; ULBs' spending <5% of total.
- **Governance**: Weak capacity; mayors lack executive power.
- **Institutional**: Delayed State Finance Commissions.
- **Urbanisation**: Rapid growth outpacing resources (600M by 2036).
- **Social**: Unequal services; slums excluded from tax/service net.

The Way Forward: Towards Fiscal Justice for Cities

- **Democratise fiscal contract:** Give cities **autonomous taxation powers** and link taxes to services.
- **Reimagine fiscal federalism:** Ensure **predictable, untied transfers** and treat grants as a **right**.
- **Strengthen local revenue:** Modernise **property taxes**, diversify income via **land value capture, congestion charges, and service fees**.
- **Reform municipal bonds:** Build **creditworthiness** and use **pooled financing** for smaller cities.
- **Institutional reforms:** Strengthen SFCs and empower urban planning bodies for fiscal autonomy.

Conclusion

Sustainable urbanisation requires **fiscal justice for cities**, making municipal finance a **democratic, moral, and constitutional imperative** to empower cities as drivers of growth.

35. Google's $15 Billion AI Data Centre in Andhra Pradesh: Powering India's Digital Future

Introduction

India's $15 billion Google–Adani–Airtel AI data centre in Visakhapatnam marks the largest private tech investment, boosting AI capacity and digital sovereignty.

What Makes AI Data Centres Different

AI data centres, unlike traditional CPU-based ones, use high-performance GPUs for compute-heavy AI tasks, demanding far more power, cooling, and sustainable energy.

Google's AI Hub in Andhra Pradesh

$15 billion investment with **AdaniConneX** and **Airtel** to expand AI, cloud, and subsea connectivity, creating 1.9 lakh jobs and strengthening India's digital infrastructure.

Collaboration and Infrastructure

- **Clean Energy:** 100% renewable-powered, green, resilient infrastructure.
- **Connectivity:** New Visakhapatnam subsea cable links India to Google's global network via Airtel's backbone.

Strategic Importance

Impact: Strengthens India's role in global AI networks through Google–Adani–Airtel collaboration, driving digital transformation with renewable-powered, secure infrastructure.

India's Data Centre Landscape

India's $10 billion data centre market (FY24 revenue $1.2 billion) is set to reach 1.8 GW by 2027, driven by AI and cloud growth but challenged by high capital and energy costs.

Challenges

- Global data centre power demand may **double by 2026** (IEA).
- **Operational costs:** 40% of capex and 65% of opex spent on electricity.
- **Cost of 1 MW capacity in India:** ₹60–70 crore.
- **Renewable energy limitations:** solar/wind are intermittent; storage is limited.
- **Nuclear energy** explored as a reliable, round-the-clock alternative.
- **Employment impact:** Google's project expected to create **~1.88 lakh jobs** despite high capital intensity.

Policy Implications

- **Digital Sovereignty:** Reduces dependence on foreign infrastructure for AI.
- **AI Ecosystem Growth:** Encourages domestic AI startups and tech innovation.
- **Energy Policy:** Need for **renewable and nuclear integration** to power AI-era data centres.
- **Incentives Debate:** Balancing fiscal incentives against energy demand and environmental impact.

Conclusion

Google's AI centre boosts India's digital sovereignty and global competitiveness.

36. CBDC vs Stablecoins: The Future of Global Payments

Context

RBI urged global CBDC adoption over stablecoins to safeguard monetary stability and sovereignty.

Understanding the Basics

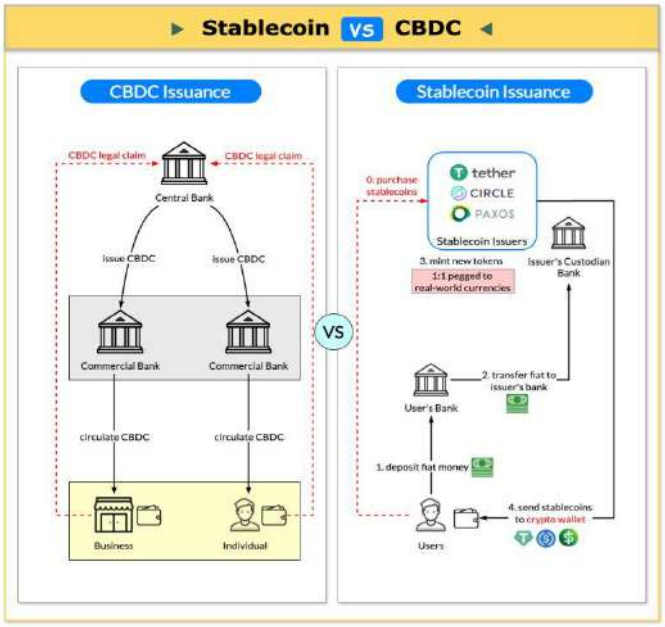
- **CBDC:** Central bank–issued digital currency backed by the government (e.g., Digital Rupee, Digital Yuan).
- **Stablecoin:** Crypto asset pegged to stable assets like USD or gold (e.g., USDT, USDC) for price stability.

Types and Structure

Feature	CBDC	Stablecoin
Issuer	Central Bank (sovereign)	Private Company or Consortium
Backing	Government/Fiat Currency	Fiat, Crypto, or Algorithm
Legal Status	Legal Tender	Not Legal Tender
Objective	Improve payment efficiency & monetary control	Reduce volatility in crypto transactions
Examples	e₹, Digital Yuan, eNaira	USDT, USDC, DAI, UST
Regulation	Centralised & Regulated	Often Unregulated or Lightly Regulated

India's CBDC Journey

CBDC pilots: e₹-W (wholesale, Nov 2022) for interbank use and e₹-R (retail, Dec 2022) for public payments; aim to cut cash use, enhance efficiency, inclusion, and offer a sovereign crypto alternative.



RBI's Position:

RBI favours CBDCs as sovereign and secure, warning that dollar-backed stablecoins risk monetary instability and dollarisation, urging crypto-free cross-border payment reforms.

Comparative Advantages

CBDCs ensure monetary stability and inclusion; stablecoins offer innovation and cross-border liquidity.

Risks and Concerns

CBDCs risk **cyber, privacy, and banking disruptions**; stablecoins risk reserve **opacity, instability, dollarisation, and weak regulation.**

India's Policy Balancing:

RBI balances innovation with sovereignty, promoting regulated fintech while curbing private currency dominance.

Conclusion

CBDCs offer **stability and sovereignty**, while stablecoins bring **speed and innovation**. India's **digital rupee** can balance **financial inclusion** with **monetary security**.

37. Record CO_2 Rise in 2024: A Climate Alarm

Context

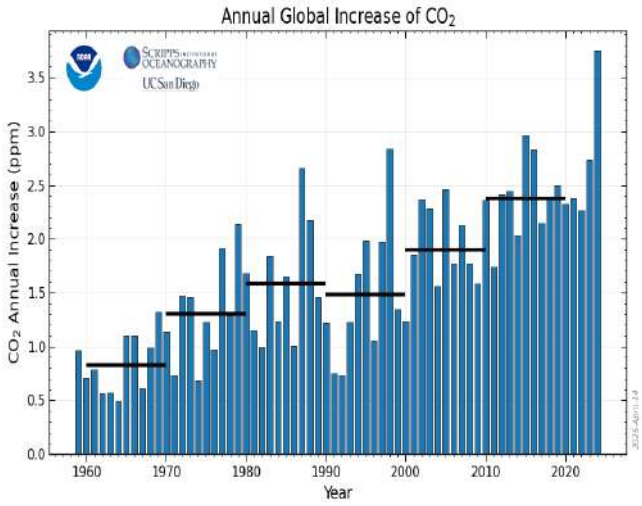
CO_2 hit 423.9 ppm in 2024, with global warming breaching 1.5°C, underscoring Paris Agreement gaps and urgent climate action needs.

Understanding CO_2 and Its Significance

CO_2, a long-lived greenhouse gas from natural and human sources, causes 66% of global warming and 79% in the past decade, making emission cuts crucial for climate stability.

Drivers of the 2024 CO_2 Surge

- **Human causes**: fossil fuels, deforestation, industry.
- **Natural causes**: weaker ocean–forest absorption, wildfires.
- **2024 GHG levels** — CO_2: 423.9 ppm (+3.5), CH_4: 1,942 ppb (+8), N_2O: 338 ppb (+1).



Impacts of Rising CO_2

5.1 Environmental Impacts

- Intensified **global warming and heatwaves**.
- Melting of **glaciers and polar ice caps**.
- Rising **sea levels** and coastal flooding.
- Disruption of **ecosystems** and biodiversity.

5.2 Socio-Economic Impacts

- Threat to **food and water security** due to extreme weather.
- Increased **health risks** from heat, air pollution, and vector-borne diseases.
- Economic losses in **agriculture, fisheries, and infrastructure**.

Example: 2024 wildfires released additional CO_2, creating a **feedback loop** worsening emissions and warming.

Policy Implications

6.1 Global Level

- The 2024 data signals **Paris Agreement shortcomings**.
- Current trajectories suggest **2030 emission reduction targets are unlikely to be met**.
- Need for **enhanced NDCs (Nationally Determined Contributions)** and **global cooperation**.

6.2 Indian Context

- India is highly vulnerable to **climate impacts** like heatwaves, floods, and agricultural stress.
- Requires:
    - Strengthened **renewable energy adoption**.
    - Forest and oceanic **carbon sink conservation**.
    - Aggressive implementation of **Net Zero targets by 2070**.

Conclusion

The 2024 CO_2 surge warns of **accelerating climate change**, driven by human activities and weakened natural sinks, necessitating **urgent emission cuts, renewable energy adoption, and stronger climate governance** globally and in India.

38. FSSAI Bans Misleading 'ORS' Labels on Sugary Beverages

Introduction

FSSAI banned use of 'ORS' label on non-WHO-standard drinks after Dr. Sivaranjani Santosh's decade-long campaign exposing mislabelled sugary beverages.

Why the Ban Was Needed

Many so-called "ORS drinks" had excess sugar, low electrolytes, and misled consumers, violating the Food Safety and Standards Act, 2006.

What is Genuine ORS?

WHO-ORS (245 mOsm/L) with glucose, salts, and electrolytes enables rapid rehydration, serving as the WHO–UNICEF-approved treatment for diarrhoea and dehydration.

FSSAI's Action and Legal Basis

FSSAI's 2025 order bans 'ORS' use in non-compliant drinks, revoking earlier permissions. Under the **Food Safety Act, 2006**, it can set standards, regulate labelling, and penalize misbranding or unsafe products with fines, suspension, or prosecution.

About FSSAI and the Food Safety Act, 2006

FSSAI, a statutory body unifying food laws, sets safety standards, regulates licensing and inspection, enforces penalties, and ensures safe, hygienic, quality food in India.

Significance of the Move

Promotes public health by curbing misuse of sugary drinks and false claims, protects consumers through truthful labelling per the 2019 Act, and reinforces FSSAI's role as a proactive regulator against pseudo-health products.

Challenges Ahead

- **Enforcement** at the state and local level.
- **Consumer awareness gaps**, especially in rural areas.
- **Monitoring of online sales** where misleading descriptions persist.

Public education on differentiating **medical ORS** from **commercial electrolyte drinks** remains vital.

Way Forward

- Stronger **inspection and penalties** for violators.
- Joint campaigns by **FSSAI, Health Ministry, and civil society** to spread awareness.
- **Digital regulation** to flag misleading products on e-commerce platforms.
- Clear policy differentiation between **medical formulations** and **functional beverages**.

Conclusion

The FSSAI's ban on misleading 'ORS' labels is a **landmark in public health regulation**, ensuring that science triumphs over marketing. It safeguards consumers, restores credibility to a **life-saving therapy**, and strengthens India's **food safety ecosystem**.

39. Rare Earths: The New Flashpoint in the US–China Trade War

Introduction

Rare earths, vital for clean tech and defence, make the US–China tussle a key opportunity for India's self-reliance.

What Are Rare Earths?

Comprising **17 metals** (lanthanum–lutetium, plus scandium and yttrium), rare earths have **strong magnetic, conductive, and heat-resistant properties**; heavy REEs are rarer and more valuable.

Importance of Rare Earths

REEs power modern electronics, clean energy, and defence tech, making control over them a key driver of economic and strategic influence.

Why It Matters Globally

China's REE curbs disrupt global supply chains, raise costs, hinder green tech, and highlight Beijing's strategic mineral dominance.

Global Reserves and Production

China holds 37% of REE reserves and leads refining; others like Brazil, Australia, India, and the US lag due to limited output and environmental concerns from polluting, radioactive extraction.

Impact on India

India imports 2,270 t REEs (65% from China); current impact limited, but rising EV and green tech growth heightens long-term dependency risk.

India's Domestic Initiatives

IREL processes ~10,000 tpa REEs; India is exploring **Andaman seabed blocks** and building **Magnet and Titanium** Parks to create a self-reliant REE ecosystem with global partnerships.

Global Realignment Beyond China

US plans to stockpile seabed metals; Japan and EU diversify REE supply chains; Quad explores joint critical mineral security framework.

Challenges for India

India faces tech and capital gaps, ecological risks, regulatory delays, and weak inter-ministerial coordination in REE development.

Way Forward

- **Build Strategic Stockpiles** for defence and energy sectors.
- **Public–Private Partnerships (PPP)** for R&D in separation and magnet technologies.
- **Green Mining Practices** using global best standards.
- **International Collaboration** with like-minded countries under frameworks like **Indo-Pacific Economic Framework (IPEF)**.
- **Value-Added Exports:** Focus on magnet manufacturing, not just raw extraction.

40. India–MERCOSUR Preferential Trade Agreement (PTA)

Why in News?

India and Brazil plan to expand the India–MERCOSUR PTA to boost trade from USD 12.2 billion to 20 billion by 2030 and strengthen ties with the bloc.

About MERCOSUR

MERCOSUR (Southern Common Market), formed in **1991**, is a customs union of **Argentina, Brazil, Paraguay, and Uruguay (HQ: Montevideo)**; it's the world's 4th largest bloc with ~270 million people and the 6th largest economy.

India–MERCOSUR PTA: Background

The 2004 **India–MERCOSUR PTA** (in force since 2009) covers **~450 tariff lines** with limited duty concessions, governed by five annexes on tariffs, origin, safeguards, disputes, and administration.

Trade Profile (FY 2024–25)

- **India–MERCOSUR** trade totals **~USD 17.5 billion,** led by **Brazil (≈70%).**
- **Exports:** pharma, engineering goods, chemicals, textiles.
- **Imports:** edible oils, crude oil, pulses, sugar, minerals.

India–Brazil Joint Declaration (2025): Key Points

PTA expansion to cover **tariff & non-tariff** areas, with **Article 23** dialogue to set terms; aligns with **BRICS, IBSA, G20**, and boosts market access & ease of business.

Significance of India–MERCOSUR PTA

- Boosts **South–South** ties via **BRICS & IBSA.**
- **Diversifies trade** beyond EU, US, China toward Latin America.
- **Expands market access** for Indian pharma, IT, clean energy, autos.
- **Strengthens energy & food security** through MERCOSUR resources.
- Aligns with **India's wider FTA strategy (EU, UK, UAE, Indo-Pacific).**

Challenges in Expanding the PTA

- **Agricultural barriers**: Brazil & Argentina protect farm sectors.
- **Economic mismatch**: Commodity vs. services-led economies.
- **Consensus delays**: All MERCOSUR members must approve deals.
- **Logistics gap**: Distance & poor connectivity hinder trade.
- **NTBs**: Varying standards and customs norms restrict access.

Way Forward

- Expand **PTA to EVs**, **renewables, agri-tech, pharma**.
- Harmonize standards & ease **NTBs via WTO norms**.
- Negotiate gradual **agri-market** access.
- Improve **connectivity** through new sea & air routes.
- Use **BRICS/IBSA** for joint ventures & tech collaboration.

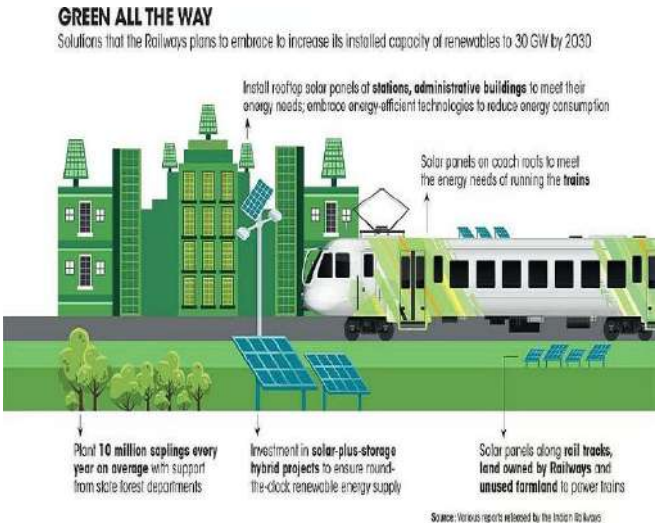
41. Decarbonising Indian Railways: Driving India's Green Transport Revolution

Why in News?

In July 2025, Indian Railways conducted the first trial of a hydrogen-powered coach at ICF, Chennai—marking a key step toward its 2030 net-zero emission goal and India's sustainable growth vision.

Indian Railways: The Lifeline of India

Indian Railways, moving 8 billion passengers and 1.2 billion tonnes of freight yearly, is vital to India's economy—its green transition is a national priority.



Key Initiatives for a Low-Carbon Future

- **98%** of broad gauge electrified (45,000 km in a decade); full target by **2030**.
- **Eastern & Western DFCs** operational; aim 45% freight share by 2030.
- **756 MW** renewables installed; 2,000+ solar stations, BEE "**Shunya**" certified.
- 35 hydrogen trains planned under **National Green Hydrogen Mission** (trial 2025).
- ₹58,000 cr **sovereign green bonds**, **IRFC & World Bank** financing green projects.

Significance of Decarbonisation Efforts

- Cuts **60 Mt CO_2** yearly—equal to 13 million cars off roads.
- Saves ₹1 lakh cr in fuel by **2030**.
- Boosts **energy independence** via green hydrogen & renewables.
- Drives **public awareness** on sustainable transport.
- Enhances **defense logistics & urban decongestion** through electrified freight.

Challenges in the Decarbonisation Journey

- High hydrogen production **costs**.
- Unclear **operating expenses** for hydrogen trains.
- Railways use just 3% of national diesel—**limited emission impact**.
- Infrastructure and storage **gaps** hinder rollout.

The Way Forward

- **Cut hydrogen costs** via R&D, PPPs, and Make in India.
- Use hydrogen trains, regenerative braking, and AI energy systems.
- Link electrification with **renewable** PPAs.
- Mobilize **green bonds, climate finance, and VGF**.
- Promote **green-certified trains** and **public awareness** on sustainable travel.

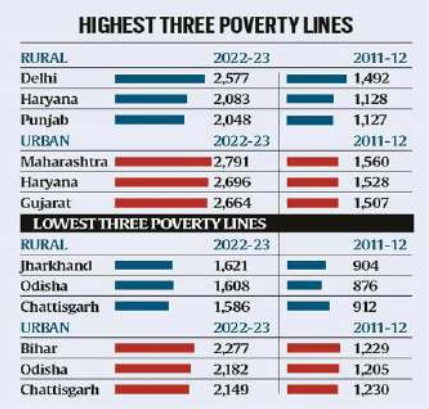
Conclusion

Indian Railways' decarbonisation is a step toward sustainable mobility, energy security, and self-reliance — with innovation and policy support key to making it a global clean transport model.

42. Poverty Measurement in India – From the Rangarajan Line to the Multidimensional Approach

Introduction: Understanding Poverty in the Indian Context

India's multidimensional poverty spans health, education, and living standards; the RBI's revised Rangarajan line renews its measurement debate.



Evolution of Poverty Measurement in India

India's poverty line evolved from calorie-based (Dandekar–Rath) to consumption-linked (Lakdawala), broader essentials (Tendulkar, 2009), and revised thresholds (Rangarajan, 2014) — the last official estimate at 29.5%.

RBI's 2022–23 Update – Revisiting the Rangarajan Line

HCES 2022–23 shows sharp poverty fall in Odisha and Bihar, low levels in southern states, but persistent poverty in Chhattisgarh, Jharkhand, and UP.

Methodological Approach – Beyond Inflation Adjustment

RBI economists built a PLB-based price index (with higher food weights) to set accurate, state-specific poverty lines for 2022–23.

The Shift to Multidimensional Poverty

India now uses the Multidimensional Poverty Index (MPI) with 12 indicators across health, education, and living standards; households deprived in over one-third of them are deemed poor.

India's MPI Progress – NITI Aayog Report (2024)

Between 2013–14 and 2022–23, **24.82 crore people** exited multidimensional poverty as India's **MPI fell from 29.17% to 11.28%**, driven by schemes like **Housing for All, Ujjwala, Swachh Bharat, Jan Dhan, DBT, Ayushman Bharat, and PMGKAY**—with major gains in **UP, Bihar, MP, Odisha, and Rajasthan**.

Analysis – Changing Dynamics of Poverty Measurement

- Shift from **income to capability-based MPI** capturing health, education, and living standards.
- **Progress uneven** — Kerala, HP, TN lead; Chhattisgarh, Jharkhand, UP lag.
- **Data gaps** persist due to irregular surveys and no official poverty line since 2014.
- **Welfare schemes** (PM-KISAN, MGNREGA, NFSA, PMAY, Ujjwala, DBT) have boosted living standards and reduced poverty.

Way Forward

- **Update PLB:** Revise every 5–10 years to reflect changing needs.
- **Integrate Measures:** Combine monetary and MPI indicators for holistic assessment.
- **Improve Data:** Ensure regular, transparent HCES/NSS surveys.
- **Targeted Policies:** Focus on lagging states like Chhattisgarh, Jharkhand, UP, Assam.
- **Use Technology:** Employ Aadhaar-linked registries for efficient, leakage-free delivery.

43. Carbon-Free Shipping: Challenges and Global Efforts

Introduction: Why Shipping Matters

International shipping carries 90% of global goods but emits 1.7–2.3% of CO_2. Operating mainly in international waters, it is hard to regulate, with the IMO leading global efforts to reduce its carbon footprint.

International Maritime Organisation (IMO) and its Climate Strategy

(a) IMO's 2023 GHG Strategy:

- Net-zero shipping by 2050; 40% carbon intensity cut by 2030.
- Promotes zero/low-emission fuels and tech innovation.

(b) Global Carbon-Free Framework:

- Global Fuel Standard + Carbon Pricing to curb fossil fuel use.
- Backed by 63 nations; opposed by 16 led by the U.S.

Recent Developments: Delay in Implementation

- IMO deferred the carbon-free shipping plan to 2026 after a U.S.-led push; vote: 57 for delay, 49 against, 21 abstained.
- Delay proposed by Singapore & Saudi Arabia; opposed by climate-vulnerable states like Vanuatu.
- U.S. termed it a "Global Green Scam Tax," citing consumer cost and political concerns.
- Exposed North–South divide over equitable transition funding and global carbon taxes.

India's Role and Position

- India backs the carbon-free plan but upholds "common but differentiated responsibilities," seeking fair burden-sharing.
- As a growing maritime hub, it supports a phased transition with technology access and financial aid for developing nations.

Environmental Implications

- Heavy fuel oil powers **85%** of large ships, driving most emissions.
- Policy delay may slow **green fuel investment** and hinder **IMO's 2030** emission goals.

Economic and Political Dimensions

- **Global trade–climate tension**: shipping vital but high-emission; carbon pricing debated.
- **North–South divide**: rich nations resist taxes; developing nations seek support.
- **Private players and green corridors** push decarbonisation despite IMO delays.

Way Ahead

- IMO will revisit plan in Oct 2026; delay allows design of **equitable, feasible carbon levy**.
- Experts call for support to **developing nations and island states**.
- **Green tech, electrification, and balanced trade**–climate policies are key.

Conclusion

Decarbonising global shipping demands urgent political will and cooperation, balancing trade, environment, and equity to achieve sustainable growth and climate goals.

44. Attracting Star Faculty: Strengthening India's Research Ecosystem

Introduction

India, despite its strong scientific base, faces persistent brain drain due to low R&D spending and limited autonomy; a new scheme aims to lure top Indian-origin researchers back home.

Background and Need for the Scheme

Challenges in India's Academic Landscape

India's past schemes like VAJRA, Ramanujan, and Ramalingaswami Fellowships saw limited impact due to low pay, weak infrastructure, and bureaucracy—underscoring the need for a larger flagship program.

Key Features of the Proposed Scheme

- Targets top Indian-origin scientists in priority STEM fields.
- Offers generous set-up and research grants with autonomy.
- Ensures simplified bureaucracy and institutional support.
- Fosters long-term global–Indian university collaborations.
- Provides clear IP ownership and flexible governance.

Global Context and Strategic Significance

Global academic shifts create an opportunity for India to attract overseas talent as the U.S. faces policy uncertainty, Europe expands collaborations, and China–Taiwan intensify recruitment.

Expected Benefits for India

- **Reverse Brain Drain:** Bring highly skilled Indian-origin faculty back home.
- **Boost Research & Innovation:** Strengthen R&D in critical sectors and STEM fields.
- **Bridge Academia and Industry:** Facilitate technology transfer and innovation-led growth.
- **Global Collaboration:** Enhance India's participation in international research networks.
- **Strategic Advantage:** Build **national capacity in emerging technologies** and global competitiveness.

Policy Measures to Address Structural Challenges

- **Low pay:** Competitive grants and flexible pay
- **Poor infrastructure:** Funding for advanced labs and teams
- **Bureaucracy:** Streamlined approvals and simplified governance
- **Weak global links:** Partnerships with top universities
- **IP issues:** Clear ownership and researcher autonomy

Outlook and Future Prospects

- **Cabinet nod** awaited for final approval.
- **Impact:** Could transform India's research ecosystem and attract global talent.
- **Goal:** Supports knowledge economy, Startups, Make in India, and tech self-reliance.

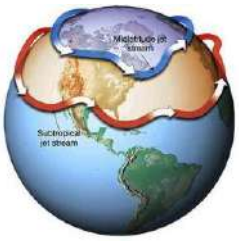
Conclusion

India's new scheme to attract Indian-origin star faculty can reverse brain drain and boost innovation—its success hinges on competitive incentives, autonomy, infrastructure, and efficient governance.

45. Jet Streams: The Fast Lanes of the Atmosphere

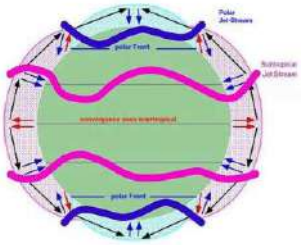
Introduction

Jet Streams are fast-moving air currents high in the atmosphere that shape global weather, influence monsoons, and affect air travel—key to understanding Earth's changing climate patterns.



What Are Jet Streams?

Jet Streams are high-speed (up to 400 km/h) west-to-east winds in the upper atmosphere (6–15 km), formed by strong temperature and pressure contrasts between tropical and polar air masses; they occur between 20° latitudes and the poles, absent at the equator.

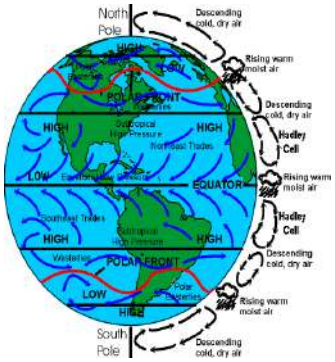


Characteristics of Jet Streams

Jet Streams: High-speed (120–400 km/h) west-to-east winds in the upper troposphere (6–15 km), a few km thick and hundreds of km wide, formed by thermal contrasts between Hadley and Ferrel cells, showing meandering Rossby waves.

Major Types of Jet Streams

- **STJ:** 25°–35° N/S, ~12 km; winter jet influencing India's winter weather and monsoon onset.
- **PFJ:** 50°–60°; drives western disturbances and mid-latitude cyclones.
- **TEJ:** 8°–35° N in summer; east-to-west jet from Tibetan heating, crucial for SW monsoon.
- **Polar-Night Jet:** Stratospheric winter jet over poles; impacts ozone circulation.



Seasonal Migration of Jet Streams

- **Winter:** STJ flows south of Himalayas, bringing western disturbances and rainfall; PFJ strengthens and moves equatorward.
- **Summer:** STJ shifts north to Tibet, TEJ forms; this triggers Southwest Monsoon as low pressure over northwest India draws moist winds from the seas.

Jet Streams and the Indian Monsoon Mechanism

- **Pre-Monsoon:** STJ south of Himalayas causes hot, dry loo winds.
- **Onset:** STJ shifts north, TEJ forms, bringing monsoon rains.
- **Withdrawal:** STJ moves south; Southwest Monsoon retreats, Northeast Monsoon begins.

Rossby Waves: The Meandering Jet Streams

Jet Streams meander as Rossby Waves, forming alternating ridges and troughs that intensify cyclones/anticyclones; when stationary, they cause prolonged heat or cold spells.

Recent Developments & Climate Change Linkages

Climate change, driven by Arctic amplification, is weakening and wavering the Polar Jet Stream, causing extreme weather events; missions like NASA's Global Jet Stream Study and India's INSAT satellites monitor these shifts.

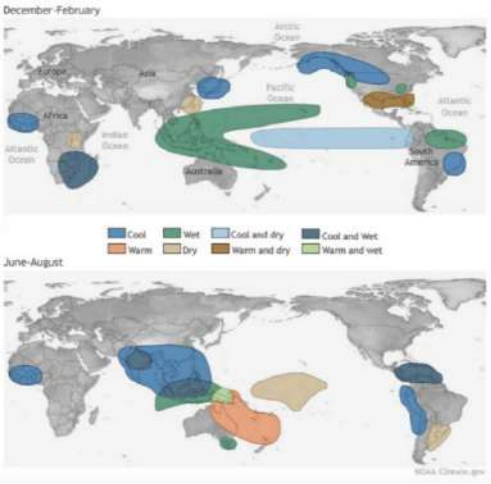
Conclusion

Jet Streams drive Earth's climate, shaping rainfall, monsoons, agriculture, and extreme weather; understanding them is vital for India's planning in agriculture, water, and disaster management.

46. La Niña: Impacts, Mechanism & Predictions

Why in News

La Niña has re-emerged in the Pacific, but is mild and delayed due to unusually warm global oceans, with limited global weather impact expected.



Understanding La Niña

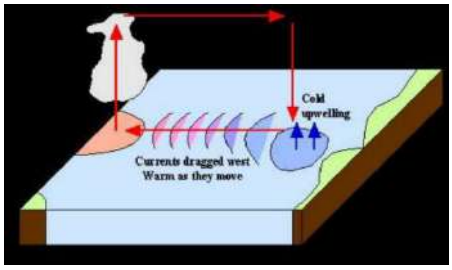
- **La Niña:** Cool ENSO phase with below-average Pacific SSTs.
- **ENSO Phases:** El Niño (warm), La Niña (cool), Neutral (average).

Mechanism: How La Niña Works

- **Normal:** East-to-west trade winds push warm water to the western Pacific; upwelling cools eastern Pacific.
- **La Niña:** Stronger winds intensify western warming and eastern cooling, altering Walker Circulation and global weather.

Frequency and Duration

Occurs every 2–7 years, lasting 9–24 months; the 2020–23 triple-dip La Niña was among the longest in recent decades.



Measurement & Monitoring Tools

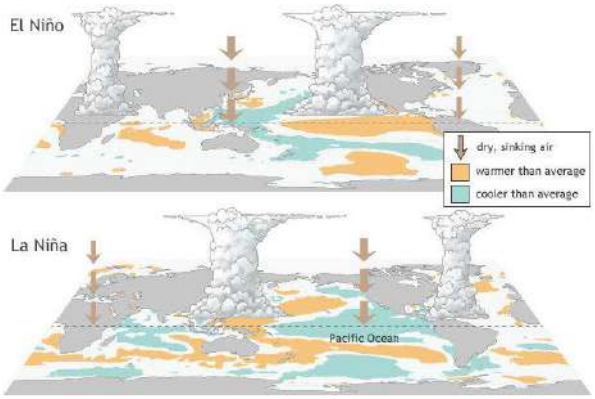
ONI (Niño 3.4 SST): El Niño ≥ +0.5°C, La Niña ≤ –0.5°C; strength ±1–1.5°C; tracked via buoys, satellites, and models, with La Niña predictable up to 2 years post strong El Niño.

Global Climatic Impacts of La Niña

La Niña boosts monsoon rains in India and SE Asia, brings floods to Australia, drought to southern U.S. and South America, and contrasting wet–dry patterns across Africa.

Linkage with Indian Monsoon

La Niña strengthens the southwest monsoon via enhanced Walker circulation (e.g., 2010, 2022), while El Niño weakens it, causing droughts (e.g., 2015).



La Niña and Climate Change

Climate change amplifies La Niña impacts, causing extreme rains, droughts, and record heat even with cooler Pacific waters (2020–23).

Challenges Ahead

Warming oceans and ENSO–IOD overlap hinder rainfall prediction, demanding ENSO-based planning for agriculture, disaster management, and climate adaptation.

Conclusion

La Niña alters global weather—strengthening India's monsoon but disrupting food supply—making precise forecasting and global climate coordination essential.

47. Reimagining the Role of the National Commission for Minorities (NCM)

Context

India's Minority Commission lacks autonomy and capacity, needing reforms for effective inclusion.

Genesis and Evolution of the NCM

Background

The Minorities Commission was created in 1978 and gained statutory status in 1992 under the NCM Act, providing it a permanent legal foundation.

Composition and Structure

The NCM comprises a Chairperson, Vice-Chairperson, and 5 members (all government-nominated) serving 3-year terms, representing six notified minorities; prolonged vacancies have at times rendered it non-functional.

Who Are the Minorities in India?

India recognizes **religious and linguistic minorities** (≈19.3% population) under the **NCM Act, 1992**. Key safeguards include **Articles 29–30** (cultural, educational rights), **347, 350A–B** (language protection), and laws like the **NCMEI Act, 2004** ensuring minority inclusion and autonomy.

Functions and Powers of the NCM

- **Mandate:** Protect and promote minority welfare; monitor schemes, rights, and grievances.
- **Powers: Civil court authority but only advisory—recommendations aren't binding.**

Key Challenges Facing the NCM

- **Vacancies:** Chairperson and members posts often empty, making it non-functional.
- **Non-constitutional:** Statutory body dependent on executive, unlike SC/ST Commissions.
- **Limited powers:** Advisory only; NCMEI further limits education role.
- **Low autonomy:** Under Ministry control; reports often ignored.
- **Weak impact:** High budget but limited outcomes; lacks data-driven monitoring.

Why Strengthening the NCM Matters

India's minorities (20% population) face education, economic, and social challenges; a strong NCM can act as a bridge, watchdog, and policy advisor for inclusive development.

The Way Forward – Reimagining the NCM

- Grant constitutional status for autonomy and binding powers.
- Ensure transparent appointments, funding, and parliamentary oversight.
- Establish Centre–State coordination council for welfare schemes.
- Implement Sachar & Misra reforms for education, skills, and economic upliftment.
- Create data-driven Minority Welfare Dashboard for monitoring outcomes.

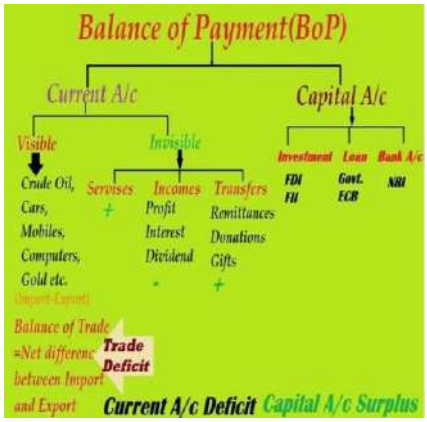
Conclusion

The NCM, meant to safeguard India's pluralism, remains symbolic due to vacancies, weak powers, and executive control; it needs constitutional empowerment, autonomy, and data-driven functioning to be effective.

48. Balance of Payments (BoP) in India: Understanding Economic Transactions with the World

Introduction: Meaning and Significance

BoP tracks a nation's trade, income, and capital flows with the world, indicating economic health and currency stability (e.g., India's $150B software exports vs. $100B oil imports → surplus).



Components of Balance of Payments

- **Current Account**: Trade (exports–imports), services, income, and transfers (remittances, aid). Surplus = net lender; deficit = net borrower.
- **Capital Account**: FDI, portfolio flows, and loans. Surplus shows investor confidence.
- **Errors & Omissions**: Adjust data gaps.
- **Forex Reserves (RBI)**: Used to manage BoP stability.

BoP vs Balance of Trade

- **BoT:** Goods only, excludes capital flows — partial view.
- **BoP:** Includes goods, services, income, and capital — full view with reserve adjustments.
- **Example:** Trade deficit from oil imports offset by FDI inflows.

Disequilibrium in BoP

- **BoP Disequilibrium:** Occurs when credits ≠ debits.
- **Causes:** High imports, inflation, instability, rising import demand.
- **Types:** Temporary (short-term), Cyclical (business cycles), Structural (long-term shifts), Fundamental (persistent imbalances).

Measures to Correct BoP Imbalances

- **Automatic:** Market adjusts via prices, interest rates, and income.
- **Deliberate:**
    - **Monetary:** Tight money, devaluation, exchange control.
    - **Trade:** Boost exports, restrict imports.
    - **Others:** Foreign aid, FDI inflows, tourism, remittances, import substitution.

Balance of Payments Crisis

BoP Crisis: When a country can't fund imports or debt due to capital outflows — marked by falling reserves, currency depreciation, and high interest rates.
Response: IMF aid, swaps, fiscal reforms. *Example:* India 1991 → IMF bailout, liberalization.

Global Institutions Supporting BoP Stability

- **IMF:** Offers financial aid, policy advice, and stabilization programs.
- **BRICS CRA:** Provides short-term liquidity through currency swaps for members.

Conclusion

BoP reflects India's global economic health, guiding policies to maintain currency stability, competitiveness, and sustainable growth.

49. Election Commission Mandates AI Labels to Curb Deepfakes and Protect Fair Elections

Context

In October 2025, the Election Commission of India directed political parties to label all AI-generated or altered content to curb deepfakes and misinformation, ensuring transparency and fairness in elections.

Background: The Rise of AI and Deepfakes in Politics

Deepfakes are AI-altered media that mimic real people, posing election risks as seen in Slovakia (2023) and the U.S. (2024) where fake clips misled voters.

ECI's New Directive: A Step Towards Digital Accountability

Key Features of the Advisory

- Mandatory clear AI labels ("AI-Generated," etc.) covering 10% of screen/time.
- Metadata with creator info and party logs for ECI checks.
- Deepfakes must be removed within 3 hours.
- Repeat violations face action under MCC and IT Act.

Alignment with Draft IT Rules, 2021 (Amendments)

ECI's move aligns with MeitY's draft IT Rules, 2021, mandating AI content disclosure and platform verification to safeguard digital integrity and democratic trust.

Broader Threat: AI and Democracy

- **Information Disorder**: AI spreads fake news, images, and videos at scale (e.g., bots flooding social media with misinformation).
- **Voter Manipulation**: Algorithms micro-target voters with propaganda (e.g., Cambridge Analytica).
- **Algorithmic Bias**: Biased AI models reinforce polarization and echo chambers.
- **Erosion of Trust**: Deepfakes blur truth, undermining confidence in leaders and institutions.

Legal and Ethical Dimensions

- **Constitutional:** Upholds Articles 324 & 19(2) for fair, orderly polls.
- **Legal:** Backed by IT Act, MCC, and RPA to curb misinformation.
- **Ethical:** Ensures transparent, accountable, and responsible AI use in elections.

Challenges in Implementation

- **Technological Limits:** Deepfake detection remains imperfect despite advanced tools.
- **Enforcement Gaps:** Ensuring compliance across numerous party units and volunteers is challenging.
- **Free Speech Balance:** Excess regulation may curb legitimate satire or commentary.
- **Platform Variations:** Different social media policies hinder uniform implementation.

Way Forward

- **Institutional Collaboration:** Strengthen coordination between ECI, MeitY, and digital platforms.
- **AI Literacy:** Educate voters to identify and report deepfakes.
- **Indigenous Tools:** Invest in homegrown AI-detection systems under the *IndiaAI Mission*.
- **Ethical Communication:** Political parties should follow digital ethics charters for responsible tech use.

50. Google's Willow Processor: A Verifiable Quantum Breakthrough

Context

In October 2025, Google and top U.S. universities achieved verified quantum advantage with the Willow processor, marking a milestone toward practical quantum computing.

What is Quantum Advantage?

Quantum Advantage is when a quantum computer outperforms the best classical supercomputers in specific tasks — e.g., Google's Willow processor completed a simulation in 2 hours that would take classical systems over 3 years.

How Do Quantum Computers Work?

Qubits exist in superposition, can be entangled, and use interference to amplify correct outcomes—giving quantum computers massive parallelism for complex tasks like molecular modelling, cryptography, and optimization.

Key Studies and Findings

- **Decoded Quantum Interferometry (DQI):** Quantum algorithm using Fourier transforms; solved optimal polynomial intersection far faster than classical methods.
- **Quantum Information Scrambling:** Tracked information spread across qubits via OTOC; Willow finished in 2 hours what classical systems need 3 years—proving verified quantum advantage.

Applications of Quantum Advantage

- **Healthcare & Drug Discovery:** Simulating molecular interactions for faster drug development.
- **Finance:** Optimizing portfolios and predicting market risks.
- **Logistics:** Real-time route optimization and scheduling.
- **Climate Modeling:** Simulating atmospheric systems with unprecedented precision.
- **Cybersecurity:** Developing quantum-resistant encryption methods.

Challenges Ahead

- **Error Correction:** Qubits are fragile — even small disturbances can collapse quantum states.
- **Scalability:** Building large, stable quantum systems remains technologically demanding.
- **Verification Frameworks:** Standard benchmarks are still evolving for confirming quantum results.
- **High Costs:** Quantum hardware requires cryogenic environments and specialized infrastructure.

Way Forward

- **Error-Resilient Architectures:** Improve qubit coherence time and reduce noise.
- **Standardized Verification Protocols:** Ensure reproducibility across labs.
- **Public–Private Collaboration:** Bridge research and industrial deployment.
- **Human Resource Development:** Build expertise under India's *National Quantum Mission*.
- **Ethical and Security Frameworks:** Prevent misuse of quantum computing in cybersecurity.

Conclusion

The Willow Quantum Processor marks a shift from experiment to utility, proving quantum computing's real-world potential and underscoring the need for ethical, collaborative, and indigenous innovation.

51. India's Makhana Revolution: Transforming the Foxnut Industry

Introduction

The launch of the National Makhana Board (₹100 crore) marks a major push to promote makhana from Bihar's Mithilanchal as a national superfood, blending cultural heritage with economic potential.

Understanding Makhana (Foxnut)

Makhana (Euryale ferox): Aquatic plant whose popped seeds are rich in protein, calcium, and antioxidants; used in snacks, sweets, and Ayurveda—dubbed the "Black Diamond of Mithila."

Bihar – The Heartland of Makhana

Bihar produces about **90%** of India's makhana (~10,000 tonnes across 15,000 ha), mainly in **Mithilanchal** districts, but gains less due to weak value addition and export infrastructure.

Global and Domestic Market Outlook

- Global makhana market size (2023): **US$43.5 million**
- Projected market (2033): **US$100 million** (Spherical Insights).
- In India, demand is rising due to its popularity as a **vegan, gluten-free, and healthy snack**.
- However, states like **Punjab and Assam** dominate exports by processing raw makhana sourced from Bihar — capturing the higher value segment.

Key Challenges Facing the Makhana Sector

- Farmers lose profits to middlemen due to weak cooperatives.
- Lack of processing, cold chains, and packaging limits value addition.
- Labour-intensive, risky cultivation lowers efficiency.
- Low-yield varieties and poor HYV adoption curb output.
- NRCM Darbhanga's weak capacity hampers research and innovation.

Government Initiatives and Policy Push

- **National Makhana Board (2025):** ₹100 crore outlay to strengthen the value chain, train farmers (PM-FME), boost branding/exports, and align central–state schemes.
- **GI Tag (2022):** Mithila Makhana secured GI status, enhancing global branding.
- **MSP Demand:** Bihar seeks MSP to ensure fair returns and income stability.
- **Infrastructure Push:** Food processing clusters, cargo airports (Patna, Purnea, Darbhanga), and cold chains planned to aid exports.

Way Forward

- Strengthen FPOs for direct market access.
- Boost R&D, mechanisation, and NRC-Makhana support.
- Promote high-yield varieties.
- Foster PPPs for value chains and processing.
- Brand "Mithila Makhana" and expand exports via APEDA/IBEF.

52. PM–SHRI Schools Scheme: Modernizing India's Education Landscape

Introduction

Launched in **2022**, **PM–SHRI** aims to make select government schools **NEP 2020 models**; Kerala's entry has rekindled debates on federal autonomy and funding.

Genesis and Context

Launched in 2022 by the Education Ministry, PM–SHRI targets 14,500 govt schools as NEP 2020 model institutions promoting quality, inclusivity, and innovation.

Objectives and Key Features

Core Objectives

Implement NEP 2020 through holistic, skill-based, inclusive learning and make schools mentors for others.

Major Features

Covers **14,500** govt schools (2022–27); funded **60:40** (**90:10** for NE/UTs); aligned with NEP via NCF/SCF and SQAF assessment.

Implementation Mechanism

- **Selection**: 13,070 schools chosen for infrastructure, outcomes, and digital readiness.
- **Structure**: Centre funds, states implement, SMCs oversee.
- **Monitoring**: Via UDISE+ with performance-linked funding.

Funding and Fiscal Architecture

PM–SHRI's 60:40 funding is milestone-based and tied to Samagra Shiksha, with non-compliance risking fund cuts—sparking state-level disputes.

Link with NEP 2020

PM–SHRI translates **NEP 2020** into action by promoting **holistic learning**, **foundational literacy**, **vocational training**, **digital classrooms**, **teacher upskilling (NISHTHA)**, and **regional language instruction** up to Grade 5.

Challenges and Concerns

- **Centralization:** May dilute state autonomy in a Concurrent List subject.
- **Funding Gaps:** Poorer states may struggle to meet their share.
- **Capacity Issues:** Large-scale teacher training and infrastructure upgrades are challenging.
- **Uniformity vs. Diversity:** Difficult to balance national and regional needs.
- **Political Polarization:** Seen by some states as NEP imposition "through the backdoor."

Way Forward

- **Promote Cooperative Federalism** through Centre–State dialogue.
- **Preserve State Autonomy** in curriculum and instruction.
- **Build Capacity** via teacher training and digital readiness.
- **Enhance Transparency** with public performance dashboards.
- **Ensure Inclusion** by prioritizing Aspirational Districts, tribal, and urban slum areas.

53. Foreign Universities in India: Global Campuses, Local Classrooms

Context

NEP 2020 enables global universities to open campuses in India, shifting it from student exporter to education hub—underscored by UK PM Keir Starmer's 2025 visit with 14 VCs.

Policy Background and Evolution

NEP 2020 allows top 100 global universities to open campuses in India under UGC (2023) and IFSCA (2022) regulations.

Current Status and Numbers

17 foreign universities approved; 3 campuses running in major cities. Deakin and Wollongong lead in GIFT City; UK universities like Bristol and Liverpool to follow. QS Top 500 eligible under UGC 2023.

Why Are Foreign Universities Coming to India?

- **Rising Demand:** India's large youth base and expanding education market attract global institutions.
- **Policy Push:** NEP 2020 promotes global collaboration and liberalization.
- **Financial Strain Abroad:** UK universities face funding crises and seek new revenue sources.
- **Strategic Partnerships:** India offers opportunities for research, innovation, and long-term collaboration.

Economic and Strategic Significance

Dimension	Impact
Economic	Reduces forex outflow from students studying abroad (~$13 billion annually).
Academic	Enhances competition, innovation, and quality in Indian universities.
Diplomatic	Deepens educational ties, especially with UK and Australia.
Skill Development	Helps create a globally competitive workforce aligned with Industry 4.0.

Challenges and Concerns

- Oversight needed to prevent profit focus and ensure parity.
- May serve urban elites, widening inequality.
- Balancing foreign autonomy with UGC norms is challenging.
- Could cause faculty drain but also drive quality upgrades in Indian universities.

Way Forward

- Build synergic partnerships, not one-way investments.
- Maintain academic sovereignty while embracing global best practices.
- Align expansion with Skill India, Digital India, and Atmanirbhar Bharat goals.
- Ensure that foreign campuses complement, not compete with, Indian universities.

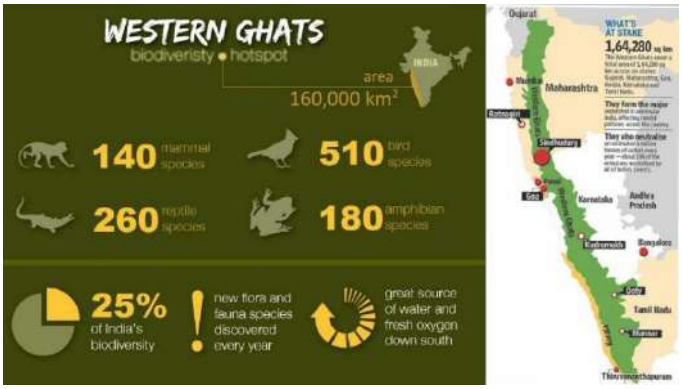
Conclusion

Foreign universities can transform India into a global education hub if implemented transparently and inclusively — turning "brain drain" into "brain gain."

54. Western Ghats Under Threat: IUCN Flags Biodiversity Risks in India's Natural Heritage

Introduction

IUCN's *World Heritage Outlook 4 (2025)* lists India's Western Ghats as of **"Significant Concern"**, citing **climate change, hydropower, and unregulated tourism** — highlighting gaps in India's conservation efforts.



About IUCN and World Heritage Outlook

IUCN (est. 1948, Switzerland) manages the Red List and World Heritage Outlook; its 2025 report (228 sites) rates only 57% positive, citing climate change as the top threat.

India's Conservation Status: Mixed Results

India's 8 natural heritage sites show uneven health—Himalayan sites fare well, while the Western Ghats and Sundarbans face growing fragility.

Why Western Ghats Matter

Western Ghats (UNESCO site, 2012) span **6 states**, covering **1.6 lakh sq km (6% of India)**; host **7,400+ species**, including **325 threatened ones**, source of major rivers, and act as a **climatic regulator** for peninsular India.

Why the Western Ghats Are Under Threat

- **Hydropower & Infrastructure**: Dams and roads (e.g., Sillahalla, Hubballi–Ankola) fragment forests.
- **Tourism**: Overcrowding in Wayanad, Coorg, Munnar; waste, resorts disrupt wildlife corridors.
- **Plantations**: Coffee, tea, rubber replace native forests, harming biodiversity.
- **Invasive Species**: Eucalyptus, acacia outcompete native flora.
- **Climate Change**: Rising heat, erratic rains affect species and ecosystems.
- **Urbanization & Quarrying**: City expansion, sand mining strain fragile slopes.

The Broader Picture: Other Threatened Indian Sites

Rising seas, salinity, encroachment, and poaching threaten Sundarbans and Manas, showing how climate and development pressures erode India's ecological heritage.

India's Policy and Institutional Framework

Efforts: Biodiversity Act 2002, National Biodiversity Mission 2023, ESZ norms, and Western Ghats panels.
Challenges: Fragmented governance, weak ESZ enforcement, and conservation–development conflicts.

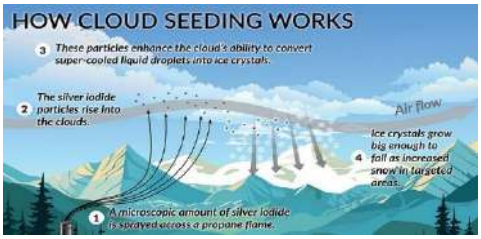
Way Forward

- **Strengthen Eco-Sensitive Zones (ESZs) –** Strict monitoring of construction, tourism, and deforestation.
- **Promote Community-Based Conservation –** Involve tribal and local panchayats in forest management.
- **Sustainable Tourism Policy –** Carrying-capacity studies and regulation of resorts.
- **Restore Native Vegetation –** Replace invasive species with indigenous flora.
- **Climate Adaptation Strategies –** Early warning systems and species migration corridors.
- **Integrate Conservation with Development –** Implement green infrastructure and ecological impact audits.

55. Cloud Seeding: Can Artificial Rain Clean Delhi's Air?

Introduction

Delhi's winter smog spurred cloud-seeding trials with IIT-Kanpur, but minimal rainfall (0.1–0.2 mm) reignited debate on the limits of artificial rain for pollution control.



What is Cloud Seeding?

Cloud seeding boosts rainfall by dispersing silver iodide or salt into clouds to trigger condensation and precipitation.

How Does Cloud Seeding Work?

Choose moisture-rich clouds (>50% humidity); seed cold clouds with silver iodide and warm clouds with salt/KI; disperse particles by aircraft, rockets, drones or ground generators to create nuclei so droplets grow and fall as rain.

Conditions Required for Successful Cloud Seeding

Cloud seeding **cannot create clouds**; it only works **if clouds already exist**.

Effective seeding needs moist cumulus clouds (≥50% humidity, -10°C to +20°C, <5,000 ft base); Delhi's low 10–15% humidity caused minimal rain.

Environmental and Health Concerns

AgI buildup may harm aquatic life; seeding can reduce downwind rain, alter weather patterns, and is costly with uncertain long-term benefits.

Benefits of Cloud Seeding

Boosts water security, crop yields, pollution control, reservoir inflow, and snowpack—used in drought areas, Delhi, and Himalayan states.

Limitations and Challenges

- **Weather Dependent:** Ineffective without suitable clouds.
- **Uncertain Results:** Hard to distinguish seeding impact from natural rain (WMO).
- **Costly, Low Yield:** Expensive with limited success.
- **Short-Term Fix:** Doesn't tackle pollution sources.
- **Coordination Challenge:** Clouds move, affecting nearby regions' rainfall.

Way Forward

- **Scientific Validation:** Conduct long-term trials to test effectiveness in Indian conditions.
- **Environmental Assessment:** Study AgI toxicity and ecological impact.
- **Supplementary Use:** Apply only during severe pollution episodes.
- **Indigenous Tech:** Promote IIT, ISRO, and DRDO research on drone-based seeding.
- **Policy Framework:** Form a national weather modification policy for regulation and safety.

Conclusion

Delhi's cloud-seeding trials show both the potential and limits of artificial rain. It can offer temporary relief during pollution crises but cannot replace long-term solutions like emission control, greener cities, and clean energy — true rain begins with policy, not planes.

56. WHO Adopts First-Ever Pandemic Agreement: Building a Fairer, Safer World

Context:
In 2024, the World Health Assembly adopted the first-ever **legally binding WHO Pandemic Agreement** under Article 19, aiming to prevent a repeat of the global unpreparedness and inequity seen during COVID-19.

The World Health Assembly (WHA): Quick Overview
WHO's 194-member World Health Assembly (Geneva) meets annually to set health policy, adopt budgets, and treaties—key milestones: Smallpox (1979), FCTC (2003), PIP (2011), Pandemic Pact (2025).

Background: Why a Pandemic Treaty Was Needed
COVID-19 exposed global inequities; the WHO Pandemic Agreement aims to boost preparedness, equitable access, and global solidarity.

Legal and Historical Significance
Adopted at WHA-78 (2024), the legally binding Pandemic Treaty under Article 19 takes effect after 60 ratifications—WHO's second global treaty, advancing collective health governance post-COVID.

Core Objectives
The WHO Pandemic Agreement aims to strengthen global preparedness with equity, transparency, and cooperation while upholding national sovereignty.

Key Provisions of the WHO Pandemic Agreement

- **Prevention:** Strengthen surveillance, zoonotic control, and lab safety.
- **PABS:** Share pathogen data; 20% of products reserved for equitable access.
- **Technology & Production:** Promote tech transfer, local manufacturing, and mRNA hubs.
- **Supply Chains:** WHO to ensure fair, transparent distribution.
- **Equity & Finance:** High-income nations to fund LMIC capacity.
- **Sovereignty:** Implementation voluntary; no WHO-imposed laws.

India's Role and Opportunities
India can leverage the treaty to expand Vaccine Maitri, pharma diplomacy, health surveillance, and its "One Earth, One Health" global leadership.

Challenges Ahead
Delays in ratification, funding gaps, weak infrastructure, and sovereignty concerns may hinder implementation, while vaccine nationalism could still reappear.

Way Forward

- **Strengthen National Health Systems —** primary care, labs, supply chains.
- **Enhance Global Data Sharing —** transparent and real-time mechanisms.
- **Foster R&D Collaboration —** particularly in diagnostics and genomics.
- **Institutionalize Equity —** through binding funding commitments.
- **Public Awareness —** combat misinformation and promote vaccine confidence.

57. Foreign Capital & Indian Banks: A New Wave of Confidence and Caution

Introduction

India's banking sector is witnessing rising foreign investments, reflecting global confidence but also raising concerns over control, regulation, and financial sovereignty.

Background: From Protection to Liberalization

India's tightly regulated banking sector began liberalizing post-1991; RBI now permits higher foreign stakes (e.g., Fairfax–CSB), signaling strategic openness for growth and competitiveness.

Why Foreign Capital is Flowing In

India's 6.5–7% growth, $46 bn bank profits, cleaner balance sheets, rising credit demand, and RBI stability boost global investor confidence.

Regulatory Context and RBI's Role

RBI's cautious easing of foreign stakes (e.g., Fairfax–CSB, 5-year cap) reflects trust in governance while safeguarding stability and domestic control.

Opportunities: What India Gains

- **Benefits:** Strengthens capital, innovation, global ties, and skilled jobs.
- **Risks:** Potential loss of control, capital volatility, regulatory strain, and PSB disadvantage.

RBI's Balancing Act

RBI will set clear foreign ownership norms, ensuring fair competition, strong governance, and adequate capital and liquidity safeguards.

Broader Economic Implications

- **Financial Sector:** Boosts competition, innovation, and consolidation among banks and NBFCs.
- **Economy:** Aids India's $7 trillion GDP goal and strengthens its role as a global financial hub through initiatives like GIFT City.

Way Forward

Challenge	Suggested Measure
Regulatory clarity	RBI should update FDI & ownership caps for modern realities.
Offshore control risk	Mandate that key decision-making remains India-based.
Level playing field	Strengthen PSBs and domestic NBFCs via recapitalization & tech adoption.
Financial inclusion	Use foreign capital to fund inclusive credit (MSME, rural finance).
Shock resilience	Maintain strong capital buffers & early-warning risk systems.

Conclusion

The surge of foreign capital reflects global trust in India's financial strength. Yet, India must balance openness with caution to safeguard sovereignty and stability, ensuring foreign investment drives sustainable, inclusive growth.

58. National Household Income Survey (NHIS): A Landmark Step in Measuring India's Real Economy

Introduction: A First in India's Statistical History

India will launch its first **National Household Income Survey (NHIS)** in **February 2026**, led by **MoSPI**, to provide the first credible data on **household income distribution**, addressing a key gap in India's statistical system.

Why the Survey is Needed: The Missing Link in India's Data Ecosystem

India's reliance on consumption data skews income estimates; absence of reliable income data hinders policy accuracy, and past surveys failed due to poor self-reporting.

Key Details of the NHIS

NHIS, led by MoSPI and TEG chaired by Dr. Surjit Bhalla, launches Feb 2026 to survey all households and deliver India's first reliable income distribution data by mid-2027.

Challenges in Conducting Income Surveys

(a) Sensitivity: Most respondents hesitate to disclose income due to privacy concerns, tax fears, and social taboos.
(b) Informal Economy: With 80% in informal work, incomes are irregular and hard to capture.
(c) Data Reliability: Multiple income sources and misreporting risk undermine accuracy.

MoSPI's Strategy for Implementation

(a) Trust Building: Awareness drives to assure data confidentiality and non-tax use.
(b) Trained Enumerators: Skilled staff to handle sensitive queries and ensure accuracy.
(c) SOP Framework: Uniform methods and privacy standards for consistent data quality.

Significance and Policy Implications

- **Policymakers:** Enables evidence-based welfare, employment, and tax reforms; aids subsidy and cash transfer redesign.
- **Fiscal Planning:** Assesses tax–spending impact and income group incidence.
- **Inclusive Growth:** Integrates informal workers and bolsters social protection systems.
- **Global Credibility:** Aligns with UN-SNA and OECD norms, enhancing global comparability.

Way Forward

Challenge	Way Forward
Low disclosure due to fear	Ensure strong confidentiality and awareness drives.
Informal sector complexity	Use mixed methods — surveys + administrative data.
Data reliability	Independent audit and expert review.
Comparability with existing surveys	Integrate NHIS data with PLFS and CES.
Time lags in release	Develop faster digital data processing systems.

Conclusion

The NHIS marks a paradigm shift by measuring income alongside consumption, revealing true inequality and informal earnings. If implemented transparently, it can anchor a data-driven welfare state based on real household incomes.

59. Human Development Index (HDI): A True Measure of India's Real Progress

Context:
Economic growth alone doesn't define development; true progress lies in people's health, education, and living standards. The HDI, introduced by UNDP in 1990, shifts focus from national output to human well-being.

Concept and Meaning
HDI measures human development across three dimensions—**health (life expectancy)**, **education (mean & expected schooling years)**, and **living standards (GNI per capita, PPP)**—each scored 0–1, with the final index as their geometric mean.

Historical Background
Introduced by UNDP in 1990 HDR by Mahbub ul Haq and Amartya Sen, the HDI aims to go beyond GDP by assessing people's capabilities for a long, healthy, and creative life.

India's HDI Performance (UNDP HDR 2025)

- **India's HDI (2025):** 0.685 (Rank 130/193) — Medium Human Development.
- Since 1990, HDI rose 57% (0.434 → 0.685) with life expectancy 58.6→72 yrs, schooling 3.0→6.2 yrs, and GNI per capita $2,000→$9,000.
- **Top states:** Kerala, Goa, Himachal Pradesh; Low HDI: Bihar, Jharkhand, Uttar Pradesh.

Components Explained

- **Health:** Life expectancy shows healthcare and nutrition access (e.g., Ayushman Bharat, Poshan Abhiyaan).
- **Education:** Schooling years reflect literacy and learning quality (e.g., NEP 2020, Samagra Shiksha).
- **Living Standard:** GNI per capita gauges resource access (e.g., Skill India, PM-KISAN, PMAY).

Inequality-Adjusted HDI (IHDI)
IHDI adjusts HDI for inequality across health, education, and income — India loses ~31%.
GII 2024: **Rank 108**, with **women's labour <30%** and persistent gaps in education and representation.

Limitations of HDI

- Oversimplifies diverse realities into one index.
- Omits environmental and intra-national inequalities.
- Relies on outdated data and ignores quality of outcomes.

Way Forward for India

- **Quality Education:** Prioritise learning outcomes.
- **Health Access:** Expand universal care and nutrition.
- **Inclusive Growth:** Create jobs and ensure fair incomes.
- **Equity:** Empower women and marginalised groups.
- **Regional Balance:** Develop lagging states.
- **Sustainability:** Integrate environmental and digital metrics.

60. Cyclones: Understanding Their Nature, Impact, and India's Disaster Management Response

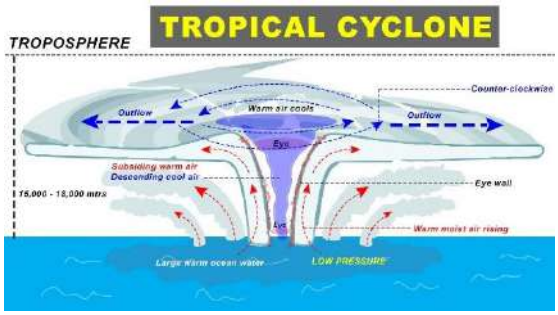
Introduction

Cyclones are intense tropical storms that frequently form over the Bay of Bengal and the Arabian Sea. With a coastline exceeding 7,500 km, India remains highly vulnerable to their destructive impacts.

What is a Cyclone?

Definition

A cyclone is a rotating storm around a low-pressure center formed over warm ocean waters. The term, coined by Henry Piddington in 1840, comes from the Greek *kyklos*, meaning "circle."



Conditions Favourable for Cyclone Formation

Cyclone Formation Conditions:

- **Warm ocean (≥26.5°C):** Energy source via evaporation.
- **Coriolis force:** Enables rotation (absent near equator).
- **Low-pressure core:** Initial trigger.
- **High humidity:** Supports cloud buildup.
- **Low wind shear:** Maintains vertical structure.
- **Upper divergence:** Allows outflow, sustaining uplift.

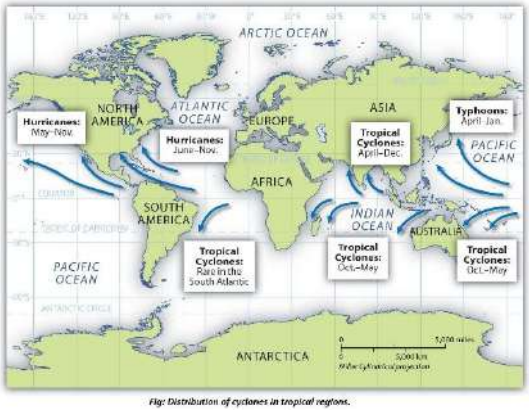


Fig: Distribution of cyclones in tropical regions.

Cyclone Movement: Why Do They Move Toward Land?

Cyclones follow trade winds westward in the Bay of Bengal, exposing India's east coast; they weaken after landfall due to loss of ocean heat, as seen in Cyclone Montha (2025).

Impacts of Cyclones

- **Environmental:** Coastal erosion, saltwater intrusion, damage to mangroves/corals, biodiversity loss.
- **Economic:** Infrastructure destruction, crop losses, disruption of fisheries and trade.
- **Social:** Loss of lives, displacement, disease outbreaks, mental trauma.
  Example: Cyclone Amphan (2020) caused ₹1 lakh crore loss in West Bengal.

Climate Change and Cyclones

- **Trends:** Arabian Sea cyclones up 52%, intensifying with warmer seas (e.g., Montha 2025).
- **Findings:** 1.5°C warming may raise extreme rain; sea level rising ~1.7 mm/yr.

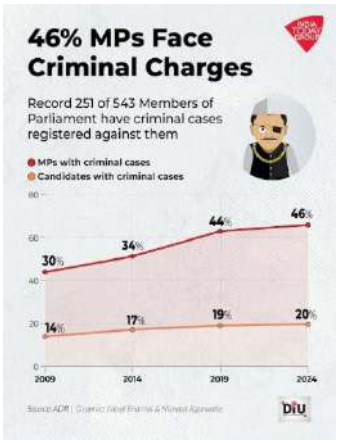
Way Forward

- **Mainstream Disaster Risk Reduction (DRR)** into all development projects.
- **Promote Coastal Literacy –** integrate disaster education in school curricula.
- **Leverage AI & Big Data –** for predictive modeling and risk communication.
- **Insurance Mechanisms –** introduce climate risk insurance for small farmers and fishermen.
- **Strengthen Regional Cooperation –** through BIMSTEC and SAARC Disaster Management Centres.

61. Safeguarding Political Accountability in India

Introduction

Political accountability sustains democracy, but criminalised politics persists. The 130th Amendment Bill (2025) seeks to remove ministers detained over 30 days for serious offences, testing the balance between accountability and due process.



Context and Background

- **Criminalisation:** ADR (2024) reports 47% ministers face cases, 174 with serious charges, eroding trust.
- **Past Efforts:** Vohra Committee, Law Commission, and SC rulings (ADR 2002; Lily Thomas 2013) urged strict disqualification.
- **130th Bill (2025):** Seeks automatic removal of ministers detained 30+ days for serious offences, amending Articles 75, 164, and 239AA.

Key Provisions of the 130th Constitutional Amendment Bill

- **Union:** President removes ministers on PM's advice after 30+ days' detention — automatic cessation.
- **State:** Governor acts on CM's advice; CM/minister loses office after 30 days.
- **PM/CM:** Must resign by 31st day or face automatic removal (applies to Delhi CM).
- **Reappointment:** Permitted post-release/acquittal to balance fairness.

Judicial Stand on Political Accountability

- **Manoj Narula (2014):** PM advised against appointing tainted ministers.
- **Public Interest Foundation (2018):** Disqualification laws rest with Parliament.
- **Lily Thomas (2013):** Conviction ≥2 years leads to instant disqualification.
- **Arvind Kejriwal (2024):** Barred official duties on bail, exposing accountability gap.
- **V. Senthil Balaji (2025):** SC forced resignation, reinforcing ethical governance.

Key Concerns and Criticisms of the Bill

- **Presumption of Innocence:** Detention-based removal breaches Article 21 and due process.
- **Political Misuse:** Risk of agency-driven vendetta.
- **30-Day Rule:** Arbitrary, violating Article 14's fairness.
- **Democratic Impact:** Undermines legislative accountability.
- **Selective Scope:** Applies only to ministers, not legislators.

Way Forward: Balancing Accountability with Constitutional Rights

- **Judicial Vetting:** Independent tribunals (retired judges) to review cases before removal.
- **Transparency:** Mandate disclosure of criminal & financial records; promote voter awareness.
- **Clean Funding:** Enable state-funded elections and donor transparency.
- **Party Reforms:** Ensure internal democracy and fair candidate selection.
- **Judicial Oversight:** Review arrests to prevent political misuse, per Vineet Narain (1998).

Conclusion

India's 130th Amendment Bill (2025) reflects a bold push for clean politics, but true accountability must balance ethics with fairness and due process.

Educrat IAS ACADEMY | No Need of going to Delhi Now! Prepare for UPSC from Kolkata

EDU-SAMIKSHA

CA MONTHLY MAGAZINE

OCT PRELIMS 2025

THE HINDU | The Indian EXPRESS | pib FACT CHECK

PARK STREET: 9163228921 & SALT LAKE: 9147388921

Table of Contents

43	Atacama Desert
44	SPARK–4.0 Initiative
45	Tele-MANAS
46	Somnath Temple (Gujarat)
47	Maitri II Station (Antarctica)
48	Blue Flag Certification (Eco-Label)
49	Exercise AUSTRAHIND (India–Australia Joint Military Exercise)
50	Kiru Hydroelectric Project
51	Indian Wolf (Canis lupus pallipes)
52	Armenia
53	Steadfast Noon
54	Virtual Museum of Stolen Cultural Objects
55	LEAPS 2025
56	Impatiens rajibiana
57	Naying Hydroelectric Project
58	Crew Escape System (CES)
59	SAIME Initiative
60	Mission Drishti
61	Silent Valley National Park
62	Chiron
63	Uruguay
64	Exercise Samudra Shakti
65	Public Trust Doctrine
66	Blackbuck (Antilope cervicapra)
67	Chikungunya
68	Taftan Volcano
69	IN–RoKN Exercise
70	Henley Passport Index
71	Tuvalu
72	Rakchham Chitkul Wildlife Sanctuary
73	Zombie Deer Disease (Chronic Wasting Disease)
74	Nafithromycin
75	New Development Bank (NDB)
76	Gulf of Kutch & Dugong
77	Markanda River
78	Kurinji Bloom
79	International Maritime Organisation (IMO)
80	UN Global Geospatial Information Management (UN-GGIM)
81	MAM01 Monoclonal Antibody
82	Carabid Beetle
83	Malabar Gliding Frog
84	Konark-Balukhand Sanctuary
85	Sinapic Acid
86	Chrysanthemum
87	Anagyrus lopezi

88	Indian Scops-Owl
89	JAIMEX 2025
90	Sabarimala Temple
91	Pseudorhombus bahudaensis
92	Barnawapara Wildlife Sanctuary
93	Leachate
94	Hyunmoo-5 Missile
95	International Convention against Doping in Sport
96	Pilot Whales
97	Timor Leste
98	Kamlang Tiger Reserve
99	ICGS Ajit & ICGS Aparajit
100	MAHA MedTech Mission
101	Bondla Wildlife Sanctuary
102	Loktak Lake
103	Taal Volcano
104	Dilmun Civilization
105	Dogri Language
106	Satkosia Tiger Reserve
107	Karakoram Wildlife Sanctuary
108	Koyla Shakti Dashboard
109	SJ-100 Aircraft
110	Rehabilitation Council of India (RCI)
111	Coelacanth
112	Sunni Dam Hydro Electric Project
113	Benzene
114	INS Ikshak
115	Indian Council of Agricultural Research (ICAR)
116	Hemiphyllodactylus venkatadri
117	CLAMP Portal
118	Koyla Shakti Dashboard
119	AmazonFACE Project
120	Transit Oriented Development (TOD)
121	Model Youth Gram Sabha (MYGS)

PRELIMS POINTERS

Ichamati River

- **Type:** Trans-boundary river (India–Bangladesh), forms part of the international border.
- **Origin:** Mahjdia village, Nadia district, West Bengal.
- **Course:** Flows through Nadia & North 24 Parganas → enters Bangladesh (Satkhira, Khulna) → joins Kalindi River at Hasnabad → Bay of Bengal near Moore Island.
- **Length:** ~216 km.
- **Features:** Forms oxbow lakes near Bangaon; bifurcation of Mathabhanga (Padma distributary).
- **Issues:** Siltation → low flow in dry season, floods in rainy season.

Trichloroethylene (TCE)

- **Nature:** Volatile, colorless liquid organic solvent; man-made, not naturally occurring.
- **Uses:** Metal degreasing, refrigerant production, dry cleaning, household products (cleaning wipes, paint removers, adhesives, carpet cleaners).
- **Exposure:** Air, water, soil near production/use sites; accumulates in groundwater; general population exposed via inhalation, drinking water, or contaminated food.
- **Health Effects:** Liver and kidney toxicity, cancer risk, genotoxicity, immunotoxicity, reproductive toxicity, teratogenicity; linked to Parkinson's disease.
- **Environmental Persistence:** Breaks down slowly, long-lasting in environment.

Bathukamma Festival

- **Type:** Floral festival celebrated by women in Telangana.
- **Meaning:** "Bathukamma" = "Mother Goddess Come Alive," symbolizing feminine energy and protection.
- **Historical Roots:** Linked to Goddess Gauri legends; promoted by Kakatiya dynasty for feminine strength and agricultural prosperity.
- **Timing:** September–October, during Durga Navratri; 9-day festival ending with **Saddula/Pedda Bathukamma**, followed by **Boddemma** (7-day festival).
- **Recognition:** Declared as Telangana State Festival; recently set **two Guinness World Records**.

False Smut Disease

- **Nature:** Fungal disease of rice (paddy) caused by *Ustilaginoidea virens*; also called Haldi Rog, Lakshmi disease, or Oothupathi disease.
- **Symptoms:** Black mycelium on grains, yellow/orange spores, chalky grains, reduced weight and germination; affects panicles, not other plant parts.
- **Favourable Conditions:** Warm (25–30°C), humid (>80%), infected crop debris, high soil nitrogen.
- **Impact:** Reduces yield and seed viability; only some grains in a panicle are infected.
- **Control:** Fungicides effective, but overuse can cause resistance and environmental harm.

Philippines

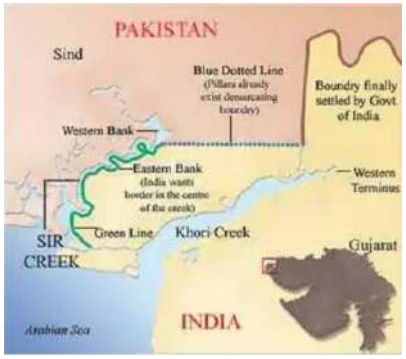
- **Location:** Island country in Southeast Asia, western Pacific Ocean; maritime borders – Vietnam (W), Taiwan (N), Palau (E), Malaysia & Indonesia (S).
- **Surrounding Seas:** South China Sea (N, W), Philippine Sea (E), Celebes Sea (S), Sulu Sea (SW).
- **Capital:** Manila.
- **Highest Point:** Mount Apo.
- **Major Rivers:** Cagayan (longest), Mindanao, Agusan.
- **Major Volcano:** Mayon Volcano (highly active).
- **Major Lake:** Laguna de Bay.
- **Climate:** Tropical, monsoonal.
- **Natural Resources:** Timber, petroleum, nickel, cobalt, silver, gold, salt, copper.
- **Energy:** 3rd-largest geothermal energy producer globally (after USA and Indonesia).
- **World Heritage Site:** Puerto-Princesa Subterranean River National Park (1999).
- **Recent Event:** Offshore earthquake, magnitude 6.9, struck Cebu province.

Thumri Music:

- **Type:** Semi-classical Hindustani vocal music, called the “lyric of Indian classical music”
- **Origin:** 18th century, Eastern UP (Lucknow & Benares); developed by Sadiq Ali Shah
- **Themes:** Love, separation, devotion (often Radha-Krishna)
- **Language:** Braj Bhasha, Awadhi, Hindi, with Urdu/Sanskrit touches

- **Distinctive Feature:** Emphasis on **bhava**; improvisational freedom
- **Associated Dance:** Kathak
- **Types:**
    - **Purbi Thumri:** Slow, emotional, Banaras Gharana
    - **Punjabi Thumri:** Fast, lively, Patiala Gharana
- **Major Gharanas & Exponents:**
    - **Banaras:** Girija Devi, Rasoolan Bai, Siddheshwari Devi, Chhannulal Mishra
    - **Lucknow:** Begum Akhtar
    - **Patiala:** Rhythmic, vibrant style
- **In News:** Recently, the passing of **Pandit Chhannulal Mishra (1936–2025)**, Padma Vibhushan awardee and one of the last great exponents of Banaras Gharana's Purab Ang of Thumri.

Sir Creek Dispute:



- **Location:** 96 km tidal estuary between **Gujarat (India)** and **Sindh (Pakistan)** in **Rann of Kutch**, opens into **Arabian Sea**
- **Significance:**
    - **Strategic & security:** Sensitive border area
    - **Economic:** Fishing rights, potential oil & gas, EEZ delimitation
- **Dispute Basis:** Differing interpretations of **1914 Bombay Government Resolution**
    - **Pakistan:** Boundary on **eastern bank**, Sir Creek belongs to Sindh
    - **India:** Boundary along **thalweg (mid-channel) principle**; navigable at high tide
- **Recent News:** Defence Minister **Rajnath Singh** warned Pakistan against aggression, promising **decisive response** that could alter "history and geography"

Exercise Drone Kavach:

- **Conducted by:** Indian Army's **Spear Corps**, Eastern Command
- **Location & Duration:** Forward areas of **Eastern Arunachal Pradesh**, four-day exercise
- **Objective:** Test **combat readiness for drone warfare** and validate **state-of-the-art drone technologies**
- **Participants:** Army units and **Indo-Tibetan Border Police (ITBP)** personnel
- **Focus Areas:**
    - **Target acquisition**
    - **Active & passive counter-drone measures**

  - **Target neutralisation**
  - **Tactics, techniques, and procedures (TTPs)** for multi-domain operations
- **Significance:** Enhances preparedness for **technology-infused, next-generation battlefield scenarios**

Banni Festival:

- **Type:** Traditional **stick-fight festival**
- **State: Andhra Pradesh**
- **Timing:** Celebrated on **Vijaya Dasami (Dussehra night)** annually
- **Origin:** Dates back to the **Vijayanagara Empire**
- **Legend:** Marks victory of **Lord Mala Malleswara Swamy and Goddess Parvati** over demons **Mani and Mallasura** in Devaragattu region

- **Rituals:**
  - Midnight procession of **deity idols** (Malamma/Parvati and Malleshwara Swamy/Shiva) down the hill temple at **Neraneki**
  - Devotees use **long sticks/lathis** to hit each other aiming to **capture the procession idol**
- **Significance:** Combines **devotion, community participation, and martial tradition**

Tadoba-Andhari Tiger Reserve (TATR):

- **Location:** Chandrapur district, **Maharashtra**
- **Significance:** Largest and oldest tiger reserve in Maharashtra; part of **Central India Tiger Landscape**
- **Components: Tadoba National Park** + **Andhari Wildlife Sanctuary**; corridor linkages with **Nagzira-Navegaon** and **Pench Tiger Reserves**
- **Habitat:** Southern Tropical **Dry Deciduous Forests**, undulating topography
- **Water Bodies: Tadoba Lake, Kolsa Lake, Tadoba River**
- **Flora:** Teak, crocodile bark, salai, tendu, karaya gum, mahua
- **Fauna:** Bengal tiger, leopard, sloth bear, wild dog (dhole), gaur, chital, sambar

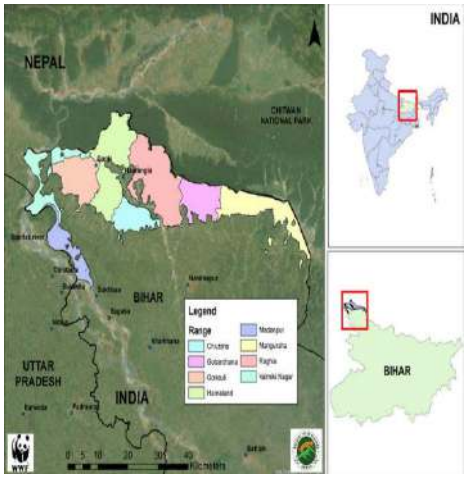
Pulicat Lake

- **Location:** Coastal brackish lagoon along Bay of Bengal; spans **Andhra Pradesh & Tamil Nadu**.
- **Size:** Second largest brackish water lagoon in India after Chilika Lake.

- **Separation:** From Bay of Bengal by **Sriharikota Island**.
- **Inflow:** Fed by **Aarani River (south)** and **Kalangi River (northwest)**; **Buckingham Canal** passes through.
- **Ramsar Site:** Designated in **2002**.
- **Biodiversity:** Ecotone supporting rich aquatic life (mudskippers, seagrass, oyster reefs) and **>200 bird species**.
- **Flora:** ~132 species, e.g., *Walsura piscida, Manilkara elengi, Excoecaria agallocaha*.
- **Fauna:** Migratory birds including **Eurasian curlew, oystercatcher, bar-tailed godwit, sand plover, greater flamingo**.
- **Current Issue: Siltation** threatening fishermen livelihoods; demand for long-term

Valmiki Tiger Reserve

- **Location:** India-Nepal border, **West Champaran, Bihar**.
- **Area:** ~880 sq. km; only tiger reserve in Bihar.
- **Components: Valmiki National Park** + **Valmiki Wildlife Sanctuary**.
- **Bio-geographic Zone: Gangetic Plains**, with Bhabar & Terai tracts.
- **Surroundings: Royal Chitwan National Park (Nepal)** north; **Gandak River** west; Himalayas in backdrop.
- **Drainage:** Rivers **Gandak, Pandai, Manor, Harha, Masan, Bhapsa**.



- **Vegetation:** Tropical wet deciduous forests, grasslands, savannas, riverine forests.
- **Flora:** Dominated by **Sal**, also **Teak, Bamboo, Semal, Khair**.
- **Fauna: Tiger, Leopard, Fishing Cat, Leopard Cat, Sambar, Hog Deer, Spotted Deer, Blackbuck, Gaur, Sloth Bear, Langur, Rhesus Monkey**.
- **Recent News:** Tiger attack claimed a human life.

Mono Ethylene Glycol (MEG)

- **Chemical Formula:** $C_2H_6O_2$
- **Other Names:** Ethylene glycol, glycol
- **Appearance:** Clear, colourless, slightly viscous liquid with sweet taste, almost no odour
- **Properties:**
    - **Miscible** with water, alcohols, and many organic compounds

  - **Hygroscopic:** absorbs water, useful as a dehydrating agent
  - **Low toxicity**; safe for many industrial uses
- **Production:** From **ethylene oxide + water** reaction
- **Major Uses:**
  - **Textile & polyester industry:** Polyester fibre, fabrics, PET resin (plastic bottles)
  - **Other industrial uses:** Coolant, antifreeze, heat transfer agent, hydrate inhibitor in gas pipelines
- **Recent News:** Textile industry requests **no anti-dumping duty** on MEG.

Dark Stars

- **Definition:** Hypothetical early-universe stars powered by **dark matter annihilation** instead of nuclear fusion.
- **Significance:** May be the **oldest stars**, representing the first phase of stellar evolution.
- **Size & Mass:**
  - **Width:** 400–200,000 times the Sun
  - **Mass:** 500–1,000 times the Sun
- **Appearance:** Not truly dark, but **do not emit visible light**; appear as giant, puffy clouds.
- **Energy Source: Dark matter heating** powers the star instead of hydrogen fusion.

- **Temperature:** Cooler than normal stars due to absence of fusion.
- **Brightness:** Can outshine early galaxies despite being faint in visible light.
- **Other Features:** Potentially emit **gamma rays, neutrinos, and antimatter**, but hard to detect.
- **Recent Discovery:** Astronomers found **evidence supporting existence** of dark stars in the early universe.

Dhvani Missile

- **Type:** Hypersonic Missile, **Hypersonic Glide Vehicle (HGV)**
- **Developer: DRDO, India**
- **Speed: Mach 5–6** (~7,400 km/h)
- **Range: 6,000–10,000 km**
- **Targets: Land and maritime**, precision strike
- **Flight:** Launched to extreme altitudes, then **glides at hypersonic speeds**; hard to detect/intercept
- **Design:** Blended wing-body, **~9 m long, 2.5 m wide**
- **Features:**
  - **Stealth-optimized geometry** for low radar visibility

  - **Ultra-high-temp ceramic composites** for 2,000–3,000°C reentry protection
- **Significance:** Enhances India's **strategic and defense capabilities**; next-gen missile technology.

Manjeera River

- **Type:** Tributary of **Godavari River**
- **States Covered:** Maharashtra, Karnataka, Telangana
- **Origin:** Balaghat Hills, Ahmednagar, Maharashtra (Altitude: 823 m)
- **Length:** 724 km | **Catchment Area:** 30,844 sq.km
- **Mouth:** Joins Godavari at Basara, Nizamabad, Telangana
- **Notable Tributaries:** Haldi (Haridra), Lendi, Nalla, Manyad, Terna, Tawarja, Gharni
- **Key Projects:** Singur Dam/Reservoir, Nizam Sagar Project

Ortolan Bunting

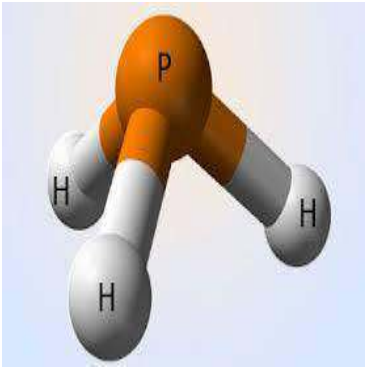
- **Scientific Name:** *Emberiza hortulana*
- **Type:** Small Palearctic migrant songbird
- **Recent Sighting in India:** Baruipur, Bengal (rare, single recorded sighting)
- **Distribution:** Most of Europe; extends east to Mongolia, north to Arctic Circle
- **Habitat:** Open cultivated/uncultivated areas with sparse woody vegetation; up to 2,500 m altitude; avoids forests and oceanic climates
- **Physical Features:**
  - Length: 6.3–6.7 inches | Wingspan: ~10 inches
  - Male: Greenish-gray head, yellow throat, eye ring, brown streaked back
  - Female/Juvenile: Duller, spotted belly
  - Conical beak for cracking seeds
- **Conservation Status:** Least Concern (IUCN Red List)

Coral Triangle

- **Location & Countries:** Marine area of ~10 million sq. km; includes **Indonesia, Malaysia, Papua New Guinea, Singapore, Philippines, Timor-Leste, Solomon Islands**
- **Nickname:** "Amazon of the Seas"

- **Biodiversity Significance:**
  - 75% of world's coral species
  - 1/3 of global reef fish
  - Vast mangrove forests
  - 6 of 7 marine turtle species
- **Human Significance:** Supports **food security and livelihoods of 120+ million people**
- **Threats:** Coral bleaching, habitat loss, species decline due to **climate change, pollution, destructive fishing, carbon emissions**
- **Recent News:** Philippines to host **Southeast Asia's first coral larvae cryobank**, linking regional research institutions
- **Corals:** Sessile animals; live in colonies of polyps; have **symbiotic relationship with zooxanthellae algae** for nutrition; use tentacles to feed

Phosphine (PH_3)



- **Chemical:** One phosphorus + three hydrogen atoms; also called **hydrogen phosphide**
- **Recent News:** Detected in **brown dwarf Wolf 1130C** by **James Webb Space Telescope**
- **Natural Formation:** Produced by **Earth bacteria** in low-oxygen environments; also present in **Jupiter and Saturn** atmospheres
- **Properties:** Colourless, flammable, highly toxic, garlic-like odour, slightly soluble in water; structurally similar to ammonia
- **Uses:** Semiconductors, plastics, flame retardants, pesticide for stored grain

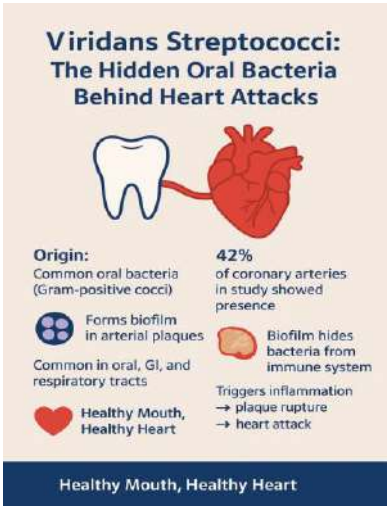
Baratang Island & Mud Volcano

- **Location:** North and Middle Andaman district, ~150 km from Port Blair, Andaman & Nicobar Islands
- **Significance:** India's **only mud volcano**; popular tourist spot
- **Recent News:** Erupted recently due to **oceanic seismic shifts**
- **Inhabitants:** Home to **Jarawa tribe**, indigenous people of Andaman
- **Mud Volcano:**
  - Also called **Mud Domes**; eruption of **mud, water, and gases** (mainly methane, sometimes CO_2 or N_2)
  - **No lava**; unlike igneous volcanoes

- **Size:** 1–2 m to 700 m high; 1–2 m to 10 km wide
- Found on **land and seabed**; can form islands and alter coastline topography

Viridans Streptococci

Why in News:



- A **Finnish study (Tampere University)** found **Viridans streptococci** in **~42% of coronary arteries** from sudden-death autopsies and surgical cases, linking oral bacteria to heart attacks.

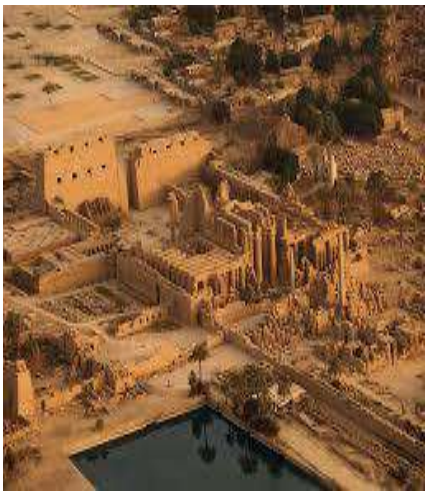
Key Points:

- **Type:** Group of **gram-positive cocci**, common oral commensals.
- **Habitats:** Oral cavity, gastrointestinal, respiratory, and female genital tracts.
- **Pathogenic Role:**
  - Forms **biofilms** inside **atherosclerotic plaques**.
  - Evades immune detection.
  - Biofilm fragments trigger **inflammation**, weakening plaque caps.
  - Plaque rupture → **blood clots → heart attack**.
- **Clinical Link:** Associated with **infective endocarditis** and cardiovascular events.

Karnak Temple

Why in News:

- A **recent geoarchaeological study** revealed how **Karnak Temple complex** developed from an island amid Nile floods into one of the **ancient world's major sacred centers**.



Key Points:

- **Location:** Karnak, **Luxor Governorate, Egypt**, east bank of the Nile.
- **Timeline:** Built **2055 BC – 100 AD**; construction continued through **New Kingdom, Greco-Roman, and early Christian periods**.
- **Dedication:** Cult temple for **Amun, Mut, and Khonsu**.
- **Significance:**
  - Largest religious building in ancient Egypt.
  - Called **"most select of places"** by Egyptians.
- **Notable Pharaohs:** Hatshepsut, Tuthmose III, Seti I, Ramesses II.
- **UNESCO Status:** Part of **World Heritage Site** along with Luxor Temple and Valley of the Kings.

PM-SETU Scheme

Why in News:

- Launched by **Prime Minister** during **Kaushal Deekshant Samaroh** at Vigyan Bhawan, Delhi, to **upgrade ITIs and enhance employability**.

Key Points:

- **Full Form:** Pradhan Mantri Skilling and Employability Transformation through Upgraded ITIs
- **Objective:** Upgrade **1,000 ITIs** with industry-aligned courses, modern infrastructure, and placement support
- **Model: Hub-and-Spoke** (200 hubs linked to 800 spokes)
- **Investment & Support:** Rs **60,000 crore**, backed by **World Bank & ADB**
- **Centres of Excellence:** 5 National Skill Training Institutes (**Bhubaneswar, Chennai, Hyderabad, Kanpur, Ludhiana**)
- **First Phase:** Patna & Darbhanga ITIs

Exercise KONKAN-25

Why in News:

- **Exercise KONKAN-25** commenced on **5 Oct 2025** off India's western coast, strengthening **India-UK naval cooperation**.

Key Points:

- **Type:** Bilateral naval exercise (**Indian Navy & Royal Navy, UK**)
- **Phases:**
    1. **Harbour Phase:** Professional interactions, cross-deck visits, sports, cultural engagements
    2. **Sea Phase:** Maritime drills – **anti-air, anti-surface, anti-submarine**, flying operations, seamanship evolutions

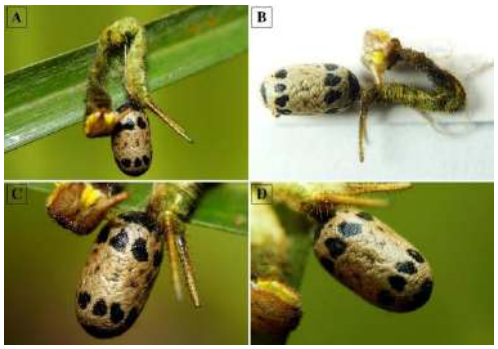
- **Assets Deployed:** Aircraft carriers, destroyers, frigates, submarines, air assets
- **India Representation: Carrier battle group of INS Vikrant** + other surface, sub-surface, and air units
- **Significance:**
    - Enhances **strategic ties and interoperability**
    - Contributes to **regional maritime stability**
    - Reflects **India-UK Vision 2035 Comprehensive Strategic Partnership**

UNESCO

- **Why in News:** Khaled el-Anani nominated as **next UNESCO Director**

- **Full Form:** United Nations Educational, Scientific and Cultural Organization
- **Founded:** 1945, HQ in **Paris**, 194 members + 12 associates
- **Objective:** Promote **education, science, culture, communication**
- **Focus Areas:** Education, Natural & Social Sciences, Culture, Communication
- **Functions:** Eliminate illiteracy, share knowledge, work with NGOs/private sector, maintain **World Heritage Sites**

Nesolynx banabitanae:



- **Species:** *Nesolynx banabitanae* – newly discovered wasp.
- **Location:** Central Park, Salt Lake, West Bengal.
- **Naming:** Named after "Banabitan," the local name of Central Park.
- **Significance:** 7th wasp species identified in India.
- **Family:** Eulophidae – known for parasitic behaviour.
- **Ecology:** Hyperparasitoid – parasitises other parasitoid wasps.
- **Specific Interaction:** Targets *Charops aditya*, which parasitises caterpillars of **common palmfly** and **common castor butterflies**.

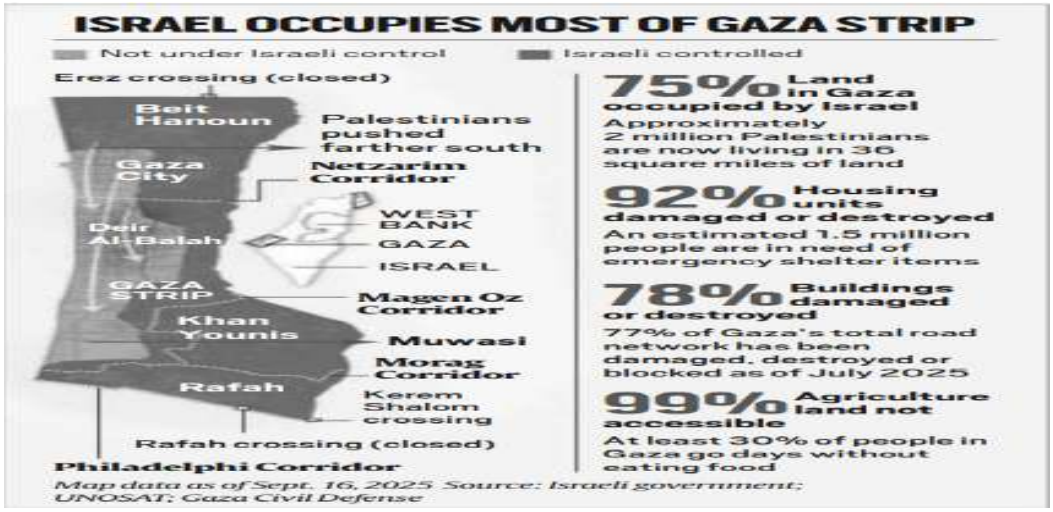
Easter Island and Moai statues:

- **Location:** Easter Island (Rapa Nui), Polynesian island, southeastern Pacific Ocean.
- **Territory:** Special Chilean territory; 3,540 km west of Chile; area 163.6 sq.km.
- **Geography:** Triangular volcanic island with three extinct volcanoes – Terevaka, Poike, Rano Kau; tropical rainforest climate.
- **UNESCO Status:** World Heritage Site (1996); protected under Rapa Nui National Park.
- **Moai Statues:**
  - Large megalithic statues, often 40 ft tall, ~75 tonnes.
  - Carved from volcanic stone; feature heads and "Pukao" (red stone hat).

- Built between 13th–16th centuries by Rapa Nui people.
- Represent ancestors or chieftains; placed on **ahu** (stone platforms/tombs).
- Over 900 moai found.

- **Recent Finding:** Moai statues were “walked” upright to their locations using ingenious engineering, not dragged or rolled.

Gaza Strip



ONDLS Portal:

- **Full Form:** Online National Drugs Licensing System (ONDLS).
- **Purpose:** Single-window digital platform for processing drug-related licences in India.

- **Developed by:** CDAC in coordination with CDSCO, DGHS, MoHFW, and State/UT Drug Authorities.
- **Functions:**
    - Issuance of manufacturing & sales licences, Blood Banks approvals.
    - Certificates: COPP, GMP, WHO-GMP, Market Standing, post-approval changes.
- **Objectives:** Uniform, transparent, accountable licensing process across States/UTs.
- **Current Status:** 18 State drug authorities adopted ONDLS; full compliance with CAPA guidelines yet to be achieved.

IRSA:

- **Full Form:** Indian Radio Software Architecture (IRSA) Standard 1.0.
- **Released by:** DRDO, Integrated Defence Staff, Tri-Services.
- **Purpose:** Standardised software architecture for **Software Defined Radios (SDR)**; ensures secure, efficient communication.
- **Significance:**
    - India's first national SDR specification.
    - Defines interfaces, APIs, execution environments, waveform portability, interoperability, certification.
    - Positions India alongside global SDR frameworks: US SCA, Europe ESSOR, NATO STANAG.
- **Vision:** Make IRSA a global benchmark; enable exports of IRSA-compliant solutions.
- **About SDR:** Reconfigurable software-based radios; flexible, versatile, used in modern wireless communication.

Nobel Prize in Literature 2025

László Krasznahorkai, who won the Nobel Prize in Literature; and some of his books on display in Stockholm. FILE PHOTOS

- **Laureate:** *László Krasznahorkai* (Hungary)
- **Awarded For:** *"Compelling and visionary oeuvre that, amid apocalyptic terror, reaffirms the power of art."*
- **Notable Work:** *Satantango*
- **Announced By:** *Swedish Academy* on **9 October 2025**
- **Established:** *1895* (Alfred Nobel's will); **First awarded in 1901**
- **Significance:** Honors *outstanding literary achievements* that enrich humanity and reflect cultural, philosophical, and human values.
- **Ceremony Date:** *10 December 2025*, Stockholm.

Coco Islands

- **Location:** Bay of Bengal, **part of Myanmar's Yangon Region**.
- **Proximity to India:** *Great Coco Island* is just **55 km from Andaman & Nicobar Islands**.
- **Geography:** Part of the **Arakan/Rakhine mountain range**, geologically continuous with Andaman & Nicobar Islands.
- **Historical Facts:**
  - Early 19th century: Supplied food to **Andaman penal colony**.
  - Leased to **Jadwet family of Burma** during British period.
  - **1882:** Officially became part of **British Burma**.
  - **1937:** Became a **self-governing crown colony** after Burma separated from British India.
- **Recent News:** Myanmar assures India there is **no Chinese presence** at Coco Islands.

IUCN World Conservation Congress

- **Full Form:** *International Union for Conservation of Nature (IUCN) World Conservation Congress*
- **Frequency:** Held **once every four years**
- **Purpose:** Largest gathering of **nature conservation experts, leaders, and decision-makers**; shapes global priorities for **nature conservation and climate change**
- **Theme 2025:** *"Powering transformative conservation"*
- **Recent Highlight:** India unveiled its **National Red List Roadmap and Vision 2025–2030**
- **Components:**
  - **Forum:** Knowledge marketplace for conservation & sustainable development
  - **Exhibition:** Pavilions by IUCN Members, businesses, academia
  - **Members' Assembly:** Highest decision-making body; votes on conservation policies, approves programmes, elects council
- **IUCN Facts:**
  - Founded in **1948**

  - **Membership Union** of governments and civil society organizations
  - Largest global environmental network
- **Governance:**
  - **IUCN Council & President** manage governance between Congresses
  - **Members' Assembly** at Congress is IUCN's supreme decision-making body
  - **IUCN Statutes** define governance framework and procedures

Mera Hou Chongba Festival

- **State:** *Manipur*
- **Timing:** Celebrated on **15th lunar day of Mera month** of the Meitei calendar (usually September–October)
- **Significance:** Symbolises **Hill-Valley unity** and communal harmony among all indigenous communities of Manipur
- **Historical Roots:** Dates back to **Nongda Lairen Pakhangba**, legendary early ruler of Manipur
- **Rituals:**
  - **Procession:** Led by the titular King from **Manipur Royal Palace** to **Kangla**
  - **Mera Thaomei Thanba:** Lighting of ceremonial fire
  - **Mera Yenkhong Tamba:** Exchange of gifts
  - **Culmination:** Cultural dances and grand feast
- **Unique Feature: All indigenous communities** participate, fostering unity and brotherhood
- **Recent News:** Celebrated recently with emphasis on **Hill-Valley unity**

PM-KUSUM Scheme

- **Full Form:** *Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhiyan*
- **Launch Year:** 2019
- **Nodal Ministry:** *Ministry of New and Renewable Energy (MNRE)*
- **Objectives:**
  - Provide **energy & water security** to farmers
  - **Enhance farmer income**
  - **De-dieselize** farm sector
  - **Reduce environmental pollution**
- **Target:** Add **34,800 MW** solar capacity by **March 2026**

- **Eligible Beneficiaries:** Individual farmers, farmer groups, FPOs, Panchayats, Cooperatives, Water User Associations
- **Components:**
    - **Component A:** 10,000 MW **grid-connected renewable energy plants** on barren/fallow land; capacity 500 kW–2 MW; power sold to DISCOMs at pre-fixed tariff
    - **Component B: 20 lakh standalone solar agriculture pumps** (up to 7.5 HP) for off-grid areas; replaces diesel pumps
    - **Component C: Solarisation of 15 lakh grid-connected agriculture pumps**; excess power sold to DISCOMs
- **Recent News:** India to showcase PM-KUSUM via **International Solar Alliance** to African countries and island nations

Surrogacy (Regulation) Act, 2021

- **Purpose:** Regulates surrogacy; prohibits commercial surrogacy; allows **altruistic surrogacy** only.
- **Surrogate Eligibility:** Married woman, 25–35 years, at least one child, can act as surrogate **once**; must not use own gametes.
- **Intended Couple Eligibility:** Married Indian couple, woman 23–50 yrs, man 26–55 yrs, married ≥5 yrs, **no surviving children**.
- **Clinic Regulation:** Only **registered clinics** can conduct surrogacy; commercial practices banned.
- **Procedures:** Certificate of essentiality required; abortion only with written consent of surrogate & medical team.
- **Child Rights:** Child born via surrogacy deemed **biological child** of intended couple, entitled to full rights.
- **SC Ruling 2025:** Age limits **not applicable** to couples who froze embryos and started surrogacy **before Jan 25, 2022**.

International Solar Alliance (ISA)

- **Type:** Treaty-based international intergovernmental organization.
- **Launch:** 2015 by **India and France** at COP21, Paris.
- **Headquarters: National Institute of Solar Energy (NISE), Gurugram, India** – first intl organization in India.
- **Objective:** Scale up solar energy, reduce costs, enhance energy security, promote clean energy globally.
- **'Towards 1000' Strategy:**
    - Mobilize **USD 1000 bn** investment in solar by 2030.

  - Provide **energy access to 1 billion people**.
  - Install **1000 GW solar capacity**.
  - Reduce **1000 million tonnes CO2** annually.
- **Membership:** States between **Tropic of Cancer & Capricorn**; 100+ signatories, 90+ ratified. Partner status for others.
- **Assembly:** Apex decision-making body; approves budget, selects Director General. First held in **Oct 2018, Greater Noida**.
- **Latest News:** India presiding; assembly to review global solar progress and challenges.

AIM-120 AMRAAM Missile

- **Type:** Advanced Medium-Range Air-to-Air Missile (BVR, radar-guided, active).
- **Origin:** Developed in the **US** (1970s–80s), operational since 1991.
- **Users:** 35+ countries, including **US, UK, Japan, Australia, NATO members**; deployable on F-15, F-16, F-35, Typhoon, Gripen.
- **Features:**
  - **Speed:** >Mach 4 (~3,000 mph)
  - **Range:** >160 km
  - **Capability:** Fire-and-forget, all-weather, day/night operations
  - **Guidance:** Onboard radar + two-way data link for real-time updates.
- **Latest News:** Pakistan may receive AIM-120 missiles under a US deal.

AgriEnIcs Programme

- **Type:** National programme by **MeitY** for agriculture & environment technology.
- **Objective:** R&D, deployment, demonstration, and commercialization of AI, IoT, machine vision, and sensor-based solutions for precision agriculture and environmental management.
- **Implementation: C-DAC Kolkata** as nodal agency; involves academia, R&D labs, and industry partners.

- **C-DAC:** Established 1988 under MeitY; built **India's first supercomputer, Param 8000 (1991)**; focuses on electronics & IT research.
- **Latest News:** Technology transferred under AgriEnIcs programme.

DRAVYA Portal

- **Full Form:** Digitized Retrieval Application for Versatile Yardstick of AYUSH Substances.
- **Objective:** Largest AI-ready database on Ayurvedic ingredients & products; integrates classical texts, modern research, and field studies.
- **Implementing Agency: Central Council for Research in Ayurvedic Sciences (CCRAS)**.
- **Features:**
    - QR code integration for standardized info in plant gardens & drug repositories
    - Searchable profiles on pharmacology, botany, chemistry, safety, and therapeutics
    - Planned integration with **Ayush Grid** and other Ministry initiatives.

Latest News: First phase catalogs **100 key medicinal substances**.

Green Sea Turtle (Chelonia mydas)

- **Size & Shell:** Largest hard-shelled sea turtle; carapace olive to black; “green” refers to fat under shell.
- **Diet:** Juveniles carnivorous; adults omnivorous.
- **Role:** Keystone species in tropical marine ecosystems.
- **Distribution:** Tropical & subtropical waters worldwide.
- **Anatomy:** Small head; beak-like jaws; no visible ears, excellent low-frequency hearing & smell.
- **Behavior:** Almost entirely aquatic; surfaces only for nesting.
- **Lifespan:** 60–70 years.
- **Conservation Status:** IUCN – Least Concern.

Palamau Tiger Reserve

- **Location:** Latehar district, Jharkhand; part of **Betla National Park**.
- **Area:** ~1026 sq. km.
- **Significance:** One of the first 9 **Project Tiger** reserves; first tiger census via pugmark in 1932.
- **Terrain & Rivers:** Undulating hills, valleys, plains; rivers – **North Koyal, Auranga, Burha** (only perennial).
- **Geology & Minerals:** Gneiss, granite, limestone; rich in **Bauxite and Coal**.
- **Flora:** Moist & dry deciduous forests; major species **Sal and bamboo**.

- **Fauna:** Tigers, Asiatic elephants, leopards, grey wolves, wild dogs, gaurs, sloth bears, four-horned antelope.

Atacama Desert

- **Location:** Northern Chile, between **Andes Mountains** (east) and **Pacific Ocean** (west); ~1,000 km long.
- **Borders:** Argentina, Peru, Bolivia.
- **Climate:** Driest desert; avg. rainfall ~1 mm/year; some places never recorded rain; mild temperature ~18°C.
- **Geography:** Hosts 12 volcanoes in western Andes.
- **Resources:** Largest natural **Sodium Nitrate** deposits.
- **Historical Significance: Chinchorro mummies** – oldest artificial human mummies.
- **Flora: Cistanthe longiscapa** ("pata de guanaco") blooms after rare rains; switches between **C3 and Crassulacean Acid Metabolism (CAM) photosynthesis** to survive extreme conditions.

SPARK–4.0 Initiative

- **Full Form: Studentship Program for Ayurveda Research Ken**.
- **Launched by: CCRAS**, Ministry of **AYUSH**.
- **Objective:** Foster **research aptitude** among undergraduate **BAMS** students.
- **Scope:** 300 students; **₹50,000 stipend** (₹25,000/month for 2 months).
- **Features:** Short-term independent projects under **faculty mentorship**; hands-on experience in research methodology, experimental design, and data analysis.
- **Support:** Colleges provide research facilities and guidance; certificate awarded on completion.
- **Significance:** Strengthens **research in traditional medicine** and integrates **innovation with heritage**.

Tele-MANAS

- **Full Form: Tele Mental Health Assistance and Networking Across States**.
- **Launched by:** Ministry of **Health & Family Welfare**, 2022.
- **Objective:** Provide **24×7 equitable, affordable, quality mental health care** nationwide.
- **Structure:** Two-tier system:
    - **Tier 1:** State-level counsellors & specialists – **tele-counseling/consultation**.

    - **Tier 2:** DMHP & medical college specialists – **audiovisual/physical consultations** via **e-Sanjeevani**.
- **Digital Platform:** Mobile app with **multi-lingual interface, chatbot (Asmi), self-care tools, stress management tips, emergency module**.
- **Languages:** English, Hindi + 10 regional languages (Assamese, Bengali, Gujarati, Kannada, Malayalam, Marathi, Tamil, Telugu, Odia, Punjabi).

Somnath Temple (Gujarat)

- **Deity:** Lord Shiva
- **Location:** Prabhas Patan, near Veraval, Saurashtra, Gujarat
- **Significance:** First of 12 Jyotirlingas; ancient pilgrimage site at the **Triveni Sangam** (Kapila, Hiran, Saraswati rivers)
- **History:** Destroyed multiple times by invaders (notably Mahmud Ghazni, 11th century)
- **Reconstruction:** Present temple in **Chalukya style**, completed **May 1951** under **Sardar Vallabhbhai Patel**

Maitri II Station (Antarctica)

- **Type:** India's newest proposed Antarctic research station
- **Location:** Eastern Antarctica
- **Nodal Agency:** National Centre for Polar and Ocean Research (NCPOR), Ministry of Earth Sciences
- **Design & Features:**
    - Larger than Maitri I
    - Green research base using **solar (summer)** and **wind energy**
    - Automated instruments for data collection, can operate unmanned
- **Construction Timeline:** Expected completion **January 2029**
- **Existing Indian Bases:**
    - **Maitri I:** Schirmacher Oasis, operational since 1989, accommodates 25–40 scientists
    - **Bharati:** Operational since 2012
    - **Dakshin Gangotri:** First Indian base, now non-operational

Blue Flag Certification (Eco-Label)

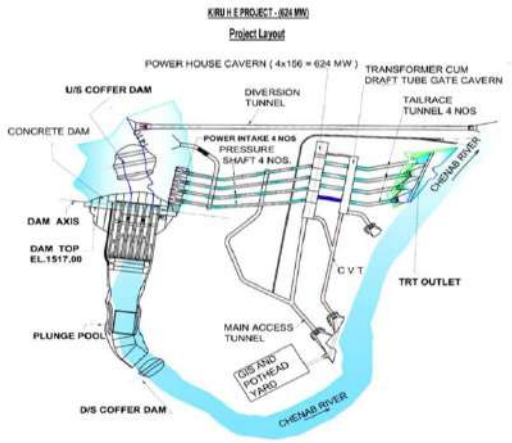
- **Awarded By:** Foundation for Environmental Education (FEE), Denmark
- **Purpose:** Recognizes beaches, marinas, and sustainable tourism initiatives meeting high environmental and safety standards
- **Criteria:** 33 parameters under four pillars:
    1. **Water Quality**
    2. **Environmental Management**
    3. **Environmental Education**
    4. **Safety & Services**
- **History:** Started in **France, 1985**; expanded outside Europe in 2001
- **Mission:** Promote sustainable tourism, environmental protection, and education
- **Indian Blue Flag Beaches (selected):**
    - **Maharashtra:** 5 recently certified beaches
- **Other states:** Shivrajpur (Gujarat), Ghoghla (Diu), Kasarkod & Padubidri (Karnataka), Kappad (Kerala), Rushikonda (Andhra Pradesh), Golden (Odisha), Radhanagar (Andaman & Nicobar), Kovalam (Tamil Nadu), Eden (Puducherry), Minicoy & Kadmat (Lakshadweep)

Exercise AUSTRAHIND (India–Australia Joint Military Exercise)

- **Type:** Annual bilateral military exercise
- **Participants:** Indian Army & Australian Army
- **Latest Edition:** 4th edition in 2025 at **Irwin Barracks, Perth, Australia**
- **Indian Contingent:** Led by **Battalion of Gorkha Rifles** with troops from other arms/services (120 personnel)
- **Aim:**
    - Enhance **military cooperation**
    - Improve **interoperability**
    - Exchange **tactics, techniques, and procedures** in sub-conventional warfare
- **Focus Areas:**
    - Joint company-level operations in **urban/semi-urban and semi-desert terrain**
    - **Tactical drills, special arms skills, joint planning**
    - Integration of **emerging technologies**
- **Other India–Australia Exercises: AUSINDEX, PITCHBLACK**

Kiru Hydroelectric Project

- **Type:** 624 MW run-of-river hydro project
- **Location:** Chenab River, Patharnakki & Kiru, Kishtwar, J&K
- **Dam:** Concrete gravity, 135 m height
- **Powerhouse:** Underground, 4 × 156 MW vertical Francis turbines
- **Developer:** Chenab Valley Power Projects (NHPC 49%, JKSPDC 49%, PTC 2%)
- **Status:** 10 lakh m³ of 12 lakh m³ dam concreting completed



- **Significance:** Supports northern India power grid, located between Kirthai II (upstream) & Kwar (downstream) projects

Indian Wolf (Canis lupus pallipes):

- **Subspecies of Grey Wolf** found in Indian subcontinent & Southwest Asia.
- **Habitat:** Scrublands, semi-arid grasslands, agro-ecosystems.
- **Behavior:** Small packs (6–8), nocturnal, territorial, less vocal.
- **Appearance:** Medium size; thinner coat adapted to warmer climates.
- **Distribution:** India, Pakistan, Afghanistan, Nepal, Bhutan, Israel, Turkey, Iran, Syria.
- **Threats:** Habitat loss, declining prey, human persecution.
- **Conservation Status:** IUCN – Vulnerable; CITES – Appendix I; Wildlife Protection Act 1972 – Schedule I.

Armenia:

- **Location:** Landlocked, south of Caucasus Mountains.
- **Borders:** Georgia (N), Azerbaijan (E), Iran (SE), Turkey (W).
- **Terrain:** Lesser Caucasus Mountains; volcanic soils rich in nitrogen, potash, phosphates.
- **Highest Peak:** Mount Aragats (4,090 m, extinct volcano).
- **Climate:** Highland continental – hot summers, cold winters.
- **Rivers:** Aras, Hrazdan, Arpa, Vorotan – hydropower & irrigation.
- **Natural Resources:** Gold, copper, molybdenum, zinc, bauxite.

- **Lake:** Lake Sevan – largest lake.
- **Capital & Language:** Yerevan; Armenian.
- **Recent News:** Newest State Member of IUCN.

Steadfast Noon:

- **Nature:** Annual NATO nuclear deterrence exercise.
- **2025 Host:** Netherlands (Volkel Air Base); also involves bases in Belgium, UK, Denmark.
- **Participants:** 14 NATO and partner nations, including US, Germany, Poland, Finland; France opts out.
- **Aircraft:** Around 70 conventional and dual-capable jets (nuclear-certified, unarmed).
- **Objective:** Assess NATO's nuclear readiness and deterrence capabilities.

Virtual Museum of Stolen Cultural Objects:

- **Overview:** UNESCO digital platform showcasing stolen cultural heritage to reconnect communities.
- **Launch:** MONDIACULT 2025; supported by Saudi Arabia; developed with INTERPOL.
- **Objective:** Create global virtual museum, raise awareness on illicit trafficking, assist recovery.
- **Highlights:** Displays ~240 missing objects from 46 countries, including two 9th-century Indian sculptures (Nataraja and Brahma, Mahadev Temple, Chhattisgarh).

LEAPS 2025:

- **Full Form:** Logistics Excellence, Advancement, and Performance Shield 2025.
- **Ministry:** DPIIT, Ministry of Commerce & Industry.
- **Aim:** Benchmark logistics excellence, boost India's competitiveness, align with National Logistics Policy & PM GatiShakti.
- **Scope:** Covers air, road, rail, sea freight; warehousing; multimodal transport; MSMEs; startups; academia.
- **Focus:** Innovation, sustainability, ESG, green logistics, and government-industry-academia collaboration.

- **PM GatiShakti:** Integrates multimodal transport to reduce logistics costs; project cost ~₹100 trillion.

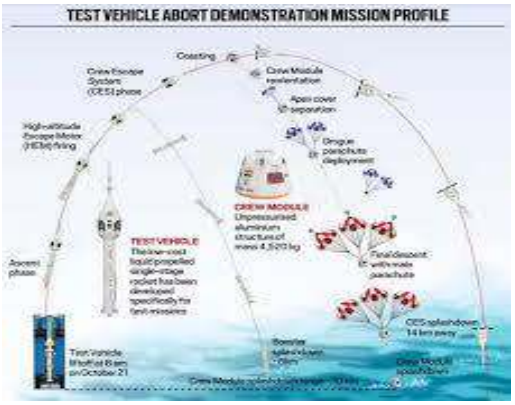
Impatiens rajibiana

- **Discovery:** Newly identified balsam species by Botanical Survey of India.
- **Location:** Shergaon, West Kameng district, Arunachal Pradesh.
- **Habitat:** Moist, shaded forests at >2,000 meters elevation.
- **Family:** Balsaminaceae (balsams).
- **Endemism:** Many balsams are endemic with limited distribution.
- **India's Balsams:** ~230 species, including *Impatiens balsamina*.
- **Recent Discoveries:** Arunachal Pradesh saw 16+ new balsam species (2013–2017), e.g., *Impatiens godfreyi*, *I. sashinborthakurii*.
-

Naying Hydroelectric Project

- **Capacity:** Proposed 1,000 MW hydropower project.
- **Location:** Siyom (Yomgo) River, Arunachal Pradesh.
- **Implementing Agency:** North Eastern Electric Power Corporation (NEEPCO).
- **Key Features:** Concrete dam, underground powerhouse, tunnels.
- **Timeline:** Construction ~2028; commissioning ~2032.
- **Annual Generation:** ~4,967 GWh.
- **Siyom River Facts:** Right-bank tributary of Brahmaputra; ~170 km long; Mouling National Park on east bank.

Crew Escape System (CES)



- **Purpose:** Emergency system to pull crew module with astronauts to a safe distance during launch abort.
- **Types:**
  - *Puller Type:* Pulls module away (used in ISRO's Gaganyaan, Saturn V, Soyuz, Long March).

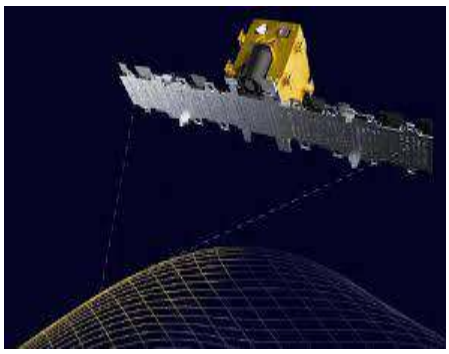
    - *Pusher Type:* Pushes module away with high-thrust engines (used in SpaceX Falcon 9).
- **Working:** Moves module away → releases → multistage parachutes slow descent → safe splashdown.
- **Safety Feature:** Crew remains inside module; physiological limits protected.
- **IVHM Role:** Sensors and software monitor vehicle & crew health, detect anomalies, and trigger CES automatically.
- **Latest Development:** ISRO tested a cost-effective single-stage CES vehicle powered by Vikas engine.

SAIME Initiative

- **Full Form:** Sustainable Aquaculture in Mangrove Ecosystems (SAIME).
- **Purpose:** Climate-adaptive shrimp aquaculture linked with mangrove restoration; protects mangrove ecosystems and supports livelihoods.
- **Implementation:** Multi-stakeholder partnership (MSP) with GNF, NEWS, Naturland, BEDS.
- **Recognition:** Received Global Technical Recognition from FAO.
- **Mangroves:** Salt-tolerant coastal trees/shrubs with aerial roots, prop roots, vivipary; high carbon sequestration; buffer against storms; support biodiversity.
- **Location Example:** Sundarbans, West Bengal.

Mission Drishti

- **Type:** World's first multi-sensor Earth Observation (EO) satellite.
- **Developer:** Bengaluru-based startup GalaxEye; India's largest privately built, highest-resolution satellite.
- **Launch Timeline:** Planned in early next year; 8–12 satellites by 2029.
- **Key Features:** Synthetic Aperture Radar (SAR) + high-resolution optical payloads; 1.5 m resolution; all-weather, day/night imaging; 160 kg.
- **Applications:** Border surveillance, disaster management, defence, infrastructure monitoring, agriculture assessment.
- **Testing:** Cleared ISRO UR Rao Centre structural tests for space resilience.



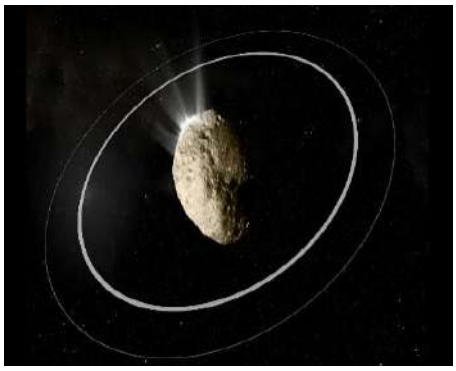
Silent Valley National Park

- **Location:** Southwest Nilgiris, Kerala; part of **Nilgiri Biosphere Reserve**.
- **Area & Altitude:** ~237.52 sq.km; 658–2383 m.
- **River:** Kunthipuzha River flows through the park.

- **Significance:** Last undisturbed tropical rainforest in India; **UNESCO World Heritage Site (2012)**.
- **Name Origin:** "Silent" due to absence of cicadas.
- **Vegetation Types:**
  - West Coast tropical evergreen forest
  - Southern sub-tropical broad-leaved hill forest
  - Montane wet temperate forest
  - Grasslands

- **Flora:** ~1000 flowering plants, 107 orchids, 100 ferns, 200 liverworts, 75 lichens, 200 algae; medicinal plants; Culinea trees.
- **Fauna:**
  - **Endangered:** Lion-tailed macaque (Western Ghats endemic)
  - Other mammals: Nilgiri langur, Malabar giant squirrel, elephant, tiger, leopard, gaur
  - Birds: 200+ species including great Indian hornbill, Nilgiri wood pigeon
- **Recent News:** Six new dragonfly and damselfly species discovered.

Chiron



- **Type:** Centaur – object between **Jupiter and Neptune**, with characteristics of **asteroids and comets**.
- **Discovery:** 1977 by **Charles Kowal**.
- **Orbit & Size:** Diameter ~200 km; orbital period ~50 years.
- **Recent Discovery: First observed ring system** around Chiron – 4 rings, 3 inner rings within dust disk.
- **Composition:** Rock, water ice, and complex organic compounds.
- **Activity:** Occasional comet-like gas and dust ejection.
- **Observation Method: Stellar occultation** by international team (Brazil, France, Spain).

Uruguay

- **Location:** Southeastern South America; entirely **south of the Tropic of Capricorn**.
- **Borders:** Argentina (west & southwest), Brazil (north & east), South Atlantic Ocean (southeast).
- **Capital:** Montevideo.
- **Geography:**

  - **Climate:** Humid subtropical
  - **Terrain:** Pampas grasslands, rolling plains, low plateaus, hills
  - **Ridges:** Haedo Ridge (north), Grande Ridge (southeast)
- **Rivers:** Rio de la Plata/Paraná, Uruguay River (border with Argentina)
- **Coastal Currents:** Brazil Current (warm, northward), Malvinas/Falkland Current (cold, southward)
- **Highest Point:** Mount Catedral
- **Recent News:** Senate passed law **decriminalising euthanasia**.

Exercise Samudra Shakti

- **Type:** Bilateral **maritime exercise** between **India and Indonesia**.
- **Latest Edition:** 5th edition, **2025**, hosted at **Visakhapatnam**.
- **Objective:** Enhance **interoperability, tactical coordination**, and **mutual understanding**; promote **Indo-Pacific stability**.
- **Indian Participation:** Includes **INS Kavaratti** (Anti-Submarine Warfare Corvette, Eastern Fleet).
- **Phases:**
  - **Harbour Phase:** Cross-deck visits, yoga, sports, professional exchanges (SMEE)
  - **Sea Phase:** Helicopter ops, air defence, weapon firing, VBSS exercises
- **Other India–Indonesia Exercises:**
  - **Garuda Shakti** (Military)
- **IND-INDO CORPAT** (Maritime)

Public Trust Doctrine

- **Meaning:** Legal principle that certain **natural and cultural resources** are preserved for **public use**.
- **Origins: Roman law**, developed through **English common law**.
- **Scope:** Includes **rivers, lakes, wetlands, tidal waters, ecosystems**; recently extended to **man-made waterbodies** serving ecological purposes.
- **Principle:** Resources are owned by the **public**, and government acts as **trustee** to protect and maintain them.
- **Restrictions on Government:**

- Use only for **public purposes**; accessible to general public
- Cannot **sell** the property, even for cash
- Must **maintain** for intended uses

- **Recent News:** Supreme Court clarified doctrine applies to **artificial/ecological waterbodies**.

Blackbuck (Antilope cervicapra)

- **Native Range:** India & Nepal
- **Habitat:** Open grasslands, dry scrub, lightly forested areas
- **Distribution:** Rajasthan, Gujarat, MP, Tamil Nadu, Odisha; reintroduced in Chhattisgarh
- **State Animal:** Punjab, Haryana, Andhra Pradesh
- **Features:**
  - Males: dark brown/black with long spiral horns (up to 20 inches)
  - Females: yellowish-brown, hornless
  - Speed: up to 80 km/h (50 mph)
- **Social Structure:** Herds of 5–50
- **IUCN Status:** Least Concern

Chikungunya

- **Cause:** Chikungunya virus (CHIKV), mosquito-borne
- **Transmission:** By **Aedes aegypti** & **Aedes albopictus**; not person-to-person
- **Symptoms:** Sudden fever, severe joint pain, muscle pain, headache, rash; joint pain may persist for months
- **History:** First outbreak in Tanzania, 1952; name means “that which bends up”
- **Treatment:** Symptomatic relief; **no vaccine or antiviral**
- **Global Presence:** Reported in 110+ countries; recently first local case in 6 years in the USA

Taftan Volcano

- **Location:** Southeastern Iran, 56 km from Pakistan; part of **Makran volcanic arc**
- **Type:** Semi-active **stratovolcano (composite volcano)**
- **Elevation:** 12,927 ft (3,940 m); two summits – Narkuh & Matherkuh

- **Geology:** Formed by **Arabian plate subduction under Eurasian plate**; hosts **hydrothermal system and fumaroles**
- **Activity:** No known historic eruptions; recent research suggests reawakening after ~700,000 years
- **Stratovolcano Features:** Tall, steep, cone-shaped; **andesite/dacite lava**, prone to **explosive eruptions**

IN–RoKN Exercise

- **What:** Bilateral naval exercise between **Indian Navy (IN)** and **Republic of Korea Navy (RoKN)**
- **Inaugural Exercise:** October 2025, **Busan, South Korea**
- **Phases:**
  - **Harbour:** Cross-deck visits, best practices, training, sports, diplomatic outreach
  - **Sea:** Joint naval exercises between **INS Sahyadri** and **ROKS Gyeongnam**

- **INS Sahyadri:** Shivalik-class stealth frigate, commissioned 2012, **indigenously built**, Eastern Fleet, capable of multi-dimensional warfare
- **Objective:** Enhance **interoperability, coordination, and professional exchange**

Henley Passport Index

- **What:** Ranks passports by **visa-free access** to countries (based on IATA data)
- **India 2025: 85th**, down 5 places
- **Top Rank:** Singapore – 193 destinations
- **Other Highlights:**
  - South Korea – 190, Japan – 189
  - US – 12th (180 countries)
  - Afghanistan – 106th (24–26 countries)
- **Significance:** Reflects **diplomatic ties, economic influence, and international trust**

Tuvalu

- **Location:** Pacific Ocean, between Australia and Hawaii.
- **Former Name:** Ellice Islands.
- **Area:** ~26 sq. km (4th smallest country).
- **Capital:** Funafuti.

- **Highest Point:** 4.5 m above sea level (highly vulnerable to sea-level rise).
- **Neighbours:** Kiribati (N), Fiji (S).
- **Language:** Tuvaluan & English.
- **Currency:** Tuvalu dollar (par with Australian dollar).
- **Political System:** Parliamentary democracy under a constitutional monarchy; part of the Commonwealth Realm; King Charles III is the monarch (represented by Governor-General).
- **Independence:** 1978 (from the UK).
- **Economy:** Subsistence farming, remittances, copra, postage stamps, and fishing license fees.
- **Recent News:** Became the **90th State Member of IUCN** (2025).

Rakchham Chitkul Wildlife Sanctuary

- **Location:** Kinnaur district, Himachal Pradesh; Western Himalayas.
- **Area:** 30.98 sq. km.
- **Elevation:** 3,200 – 5,486 m.
- **Climate:** Dry zone; no monsoons.
- **Terrain:** Snow-capped peaks, green valleys, gushing rivers.
- **Key Trek:** Lamkhanga Pass (connects Kinnaur to Gangotri, Uttarakhand).
- **Flora:** Rhododendrons, oak, pine, medicinal herbs.
- **Fauna:** Snow leopard, Himalayan black bear, musk deer, diverse bird species.
- **Recent News:** Hosted an international bird-watching programme.

Zombie Deer Disease (Chronic Wasting Disease)

- **Scientific Name:** Chronic Wasting Disease (CWD).
- **Affected Species:** Deer, elk, moose, reindeer.
- **Nature:** Progressive, fatal neurological disease affecting brain and spinal cord.
- **Cause:** Infectious prions (misfolded proteins; no DNA/RNA).
- **Transmission:** Through body fluids (saliva, urine, feces, blood) and contaminated environment; prions persist in soil and plants for years.
- **Incubation Period:** 18–24 months; animals appear normal initially.
- **Symptoms:** Progressive weight loss, behavioral changes, loss of fear, excessive drinking/urination, salivation; leads to death.
- **Treatment:** No cure or vaccine; always fatal.
- **Human Risk:** No confirmed transmission to humans, but caution advised.

- **Recent News:** Confirmed cases reported in Florida (2025).

Nafithromycin

- **Type:** First indigenously developed antibiotic in India.
- **Developer:** Supported by **Biotechnology Industry Research Assistance Council (BIRAC)**.
- **Trade Name:** Miqnaf.
- **Significance:** Targets **Antimicrobial Resistance (AMR)**; first new antibiotic in its class globally in over 30 years.
- **Use:** Treats **Community-Acquired Bacterial Pneumonia (CABP)**, effective against resistant respiratory infections; useful for cancer patients and uncontrolled diabetics.
- **AMR Context:** Occurs when microbes resist medicines, making infections harder to treat and increasing disease severity and spread.

- **Recent News:** Announced by India's Science & Technology Minister (2025) as a breakthrough in homegrown drug innovation.

New Development Bank (NDB)

- **Former Name:** BRICS Development Bank.
- **Founding Members:** Brazil, Russia, India, China, South Africa (BRICS).
- **Established:** Agreement signed in 2014 (Fortaleza BRICS Summit); operations started **21 July 2015**.
- **Headquarters:** Shanghai, China; regional offices in South Africa and Brazil.
- **Objective:** Fund infrastructure and sustainable development projects in BRICS and other emerging economies.
- **Key Sectors:** Clean energy, transport, water & sanitation, environmental protection, social & digital infrastructure.

- **Capital:** Authorized USD 100 billion; initial subscribed USD 50 billion (equally among five members).
- **Governance:** Equal voting power; Board of Governors (finance ministers) and Board of Directors; presidency rotates among founding members.
- **Membership:** Open to all UN member states.
- **Recent News:** Pakistan seeks BRICS/NDB membership with China's support (2025).

Gulf of Kutch & Dugong

- **Location:** West coast of India, Jamnagar district, Gujarat; inlet of Arabian Sea.

- **Area & Geography:** 7,300 sq.km; divides Kutch & Kathiawar; tidal range with currents ~2.5 m/s.
- **Biodiversity:** Mangroves, coral reefs, islands; highly productive marine ecosystem.
- **Energy:** High **tidal energy potential**.
- **Marine National Park:** India's first **Marine National Park** located on southern shore.
- **Dugong:** Only herbivorous marine mammal in India ("sea cow"); feeds on seagrass (Cymodocea, Halophila, Thalassia, Halodule).
- **Distribution:** Gulf of Kutch, Gulf of Mannar, Palk Bay, Andaman & Nicobar Islands.

- **Conservation Status: Vulnerable** (IUCN); long-term survival in Gulf of Kutch uncertain.

Markanda River

- **Type:** Tributary of the **Ghaggar River**; historically called **Aruna**, linked to **mythical Saraswati River**.
- **Origin:** Lower Shiwalik Hills, Nahan area, **Sirmaur district, Himachal Pradesh**.
- **Course:** Flows through Kala Amb → Bikram Bag → Sadhora Bridge → Haryana (130 km) → joins **Ghaggar at Ismailabad**.

- **Hydrology:** Rain-fed; low flow in winter/summer; rises in monsoon.
- **Tributaries:** Begna, Nakati, Ran, Salani Nallah, Roon Nallah, Sukdoh Nallah.
- **Cultural Significance: Markandeshwar Temple** on its banks, dedicated to Maharshi Markandeya.
- **Environmental Concern:** NGT monitoring pollution from industries in Sirmaur, Himachal Pradesh.

Kurinji Bloom

- **Location:** Gudalur Reserve Forest, **Nilgiris, Tamil Nadu**, Western Ghats.
- **Species:** Over 60 species endemic to Western Ghats; **Strobilanthes sessilis** bloomed recently (flowers once every 8 years).
- **Neelakurinji:** *Strobilanthes kunthiana*, blooms once every 12 years; IUCN Status – **Vulnerable**; abundant in Kodaikanal; Nilgiris named "Blue Mountains" after it.
- **Flowering Cycle:** Plants flower once in a lifetime, then die; regeneration via seeds.

- **Colors:** Purple, blue, white, pink, multiple shades.
- **Ecological Importance:** Supports pollinators (butterflies, bees); indicates healthy grasslands; attracts wildlife like elephants, tigers, hornbills.
- **Cultural Significance:** Linked to Lord Muruga; symbolizes love & passion for Toda and Muthuva tribes.

International Maritime Organisation (IMO)

- **Type:** UN specialised agency for **shipping safety, security, and marine pollution prevention**.
- **Headquarters:** London, UK
- **Membership:** 176 Member States + 3 Associate Members
- **Role:** Sets **global standards** for shipping safety, security, and environmental performance; regulations become domestic law once adopted by member states.
- **Contribution to SDGs:** Supports **SDG 14** – Life Below Water.
- **Functions:** Safety & security regulations, marine environmental protection, legal matters (liability, compensation), facilitation of maritime traffic.
- **Structure:**
    - **Assembly:** Supreme body; meets every 2 years.
    - **Council:** Executive organ overseeing work between Assemblies.
    - **Committees:** 5 major committees, e.g., **Marine Environment Protection Committee (MEPC)**.
- **Funding:** Mandatory contributions, voluntary donations, commercial revenue.

UN Global Geospatial Information Management (UN-GGIM)

- **India's Role:** Elected **Co-Chair of UN-GGIM Asia-Pacific (UN-GGIM-AP)** for 2025–2028.
- **Geospatial Data:** Location-based, time-referenced data; helps analyze patterns, trends, and relationships.
- **UN-GGIM Purpose:** Global policymaking on geospatial info; addresses development challenges; supports data-driven governance.
- **UN-GGIM-AP:** Represents 56 Asia-Pacific nations; promotes **regional cooperation, capacity building, and shared geospatial solutions**.

India's Focus: Secure digital transformation, good governance, and data-driven decision-making.

MAM01 Monoclonal Antibody

- **Purpose:** Prevents **malaria infection** by targeting **Plasmodium falciparum circumsporozoite protein**.

- **Trial Results:** Dose-dependent **full protection** with minimal side effects.
- **Administration: Single long-acting injection**; offers **months-long protection**.
- **Target Beneficiaries: Young children and pregnant women** in malaria-endemic regions.
- **Monoclonal Antibodies (mAbs):**
  - Lab-made **clones of a single antibody**.
  - Produced by **cloning B cells**; highly specific to a target antigen.

- Used for **infectious diseases, cancer, autoimmune disorders**.

Carabid Beetle

- **Common Name:** Ground beetle; family **Carabidae**.
- **Habitat:** Forests, grasslands, agricultural fields, wetlands, urban areas; temperate to tropical regions.
- **Diet:** Predators of **snails, caterpillars, slugs**, and other small invertebrates.
- **Features:** Long legs, powerful mandibles, emits **pungent smell** when threatened.
- **Life Cycle:** Egg → Larva → Pupa → Adult; **sexual reproduction** with internal fertilization.
- **Ecological Role: Biological pest control**; potential **bioindicator for soil microplastics**.

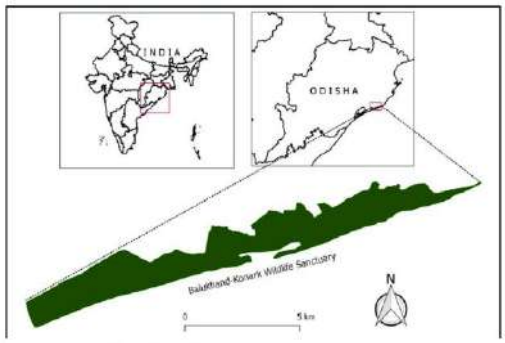
Malabar Gliding Frog

- **Scientific Name:** *Rhacophorus malabaricus*
- **Type:** Tree frog; endemic to **Western Ghats, India**
- **Habitat:** Rainforests, tree leaves near streams; breeds above water bodies
- **Unique Feature:** Can **glide 9–12 meters** using webbed toes
- **Appearance:** ~10 cm long; vivid green back, pale yellow belly, orange-red webbing
- **Conservation Status: IUCN – Least Concern**

Konark-Balukhand Sanctuary

- **Location:** Puri district, Odisha; declared a sanctuary in **1984**
- **Geography:** Sandy tract between Puri and Konark; rivers – Nuanai, Kusabhadra, Kadua, Prachi

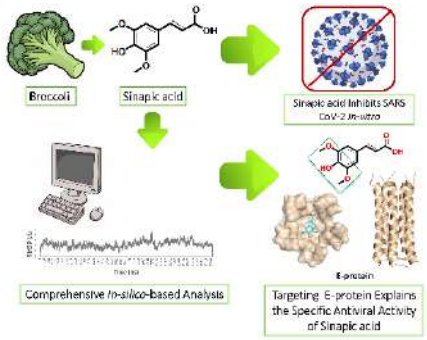
- **Flora:** Casuarina, cashew, jamun, neem, karanj, polang
- **Fauna:** Spotted deer, monkeys, jungle cat, hyena, monitor lizard, snakes; **Olive Ridley turtles** nest on beaches
- **Spotted Deer:** Common Indian deer; **IUCN – Least Concern**; distributed across India, Sri Lanka, Bangladesh, Bhutan, Pakistan



Location map of Balukhanda -Konark Wildlife Sanctuary, Puri, Odisha, India

Sinapic Acid

- **Type:** Natural **phenolic acid**, derivative of **cinnamic acid**
- **Sources:** Spices, citrus & berry fruits, vegetables, cereals, oilseeds
- **Properties: Antioxidant, antitumor, anti-inflammatory, antibacterial, neuroprotective**
- **Medical Significance:** Accelerates **wound healing in diabetic conditions** via **SIRT1 pathway**
- **Diabetes Context:** Helps manage **slow-healing diabetic wounds**, reducing risk of infection, neuropathy, and amputation



Chrysanthemum

- **Genus & Family:** *Chrysanthemum*, ~30 species; family **Asteraceae**.
- **Origin:** Asia & northeastern Europe.
- **Type:** Perennial, herbaceous, blooms in **autumn**.
- **Appearance:** 50–150 cm tall; deeply lobed leaves; flowerheads **white, yellow, or pink**.
- **Climate:** Subtropical & temperate; ideal **day 20–28°C, night 15–20°C**.
- **Soil:** Well-drained red loamy, pH 6–7.
- **Uses:** Herbal remedies—hypertension, fever, headache, inflammation.
- **Recent News:** Kashmir opened its **first Chrysanthemum garden** for tourism.

Anagyrus lopezi

- **Type:** Tiny parasitic wasp.
- **Purpose:** Biological control of **cassava mealybug**.
- **Working:** Lays eggs inside mealybug → larvae consume pest → reduces population naturally.
- **Spread:** Can move **30–40 km** from release points.

- **Origin:** Imported from **IITA, Benin, West Africa**.
- **Impact:** Protects cassava crops; improves agricultural productivity in South India.

Tapioca (Cassava)

- Major cultivation: **Tamil Nadu, Kerala, Puducherry**.
- Uses: Flour, breads, tapioca, starch, alcoholic beverages.
- Soil: Well-drained, preferably **red lateritic loamy**.
- Climate: Tropical, warm, humid; rainfall >100 cm/year; elevation ≤1000 m.
- Caution: All parts contain **cyanogenic glucosides (CNGs)**.

Indian Scops-Owl

- **Scientific Name:** *Otus bakkamoena*
- **Type:** Small woodland owl; nocturnal insectivore.
- **Size:** 17–20 cm height; wingspan ~45 cm; stocky body, round head, short tail.
- **Appearance:** Brown-grey feathers with stripes/spots; large yellow eyes.
- **Habitat:** Forests, scrublands, agricultural areas; non-migratory.
- **Distribution:** India, Nepal, Pakistan, Sri Lanka, Iran.
- **Conservation Status: Least Concern (IUCN)**.
- **Recent Sighting:** Daroji Sloth Bear Sanctuary, Karnataka.

JAIMEX 2025

- **Full Form:** Japan-India Maritime Exercise 2025.
- **Participants:** INS Sahyadri (India) & Japan Maritime Self-Defense Force (JMSDF).
- **Objective:** Strengthen naval ties, interoperability, and ensure peace & stability in the Indo-Pacific.
- **Phases:**
    - **Sea Phase:** Anti-Submarine Warfare, missile defence drills, flying operations, underway replenishment.
    - **Harbour Phase:** Professional & cultural exchanges, cross-deck visits, operational planning.
- **Significance:** Supports India-Japan 'Special Strategic & Global Partnership' (2014); shared vision of free, open Indo-Pacific.
- **Other India-Japan Exercises:** Malabar (Navy), Veer Guardian (Air Force), Dharma Guardian (Army).

- **INS Sahyadri:** Shivalik-class stealth frigate, commissioned 2012, equipped with Barak-1, Shtil-1, BrahMos missiles, anti-submarine rockets; multi-role and indigenously built.

Sabarimala Temple

- **Location:** Pathanamthitta District, Kerala, Western Ghats; altitude 4,134 ft.
- **Deity:** Lord Ayyappa (Dharma Shasta), son of Shiva and Mohini.
- **Significance:** One of the largest annual pilgrimage sites; 40–50 million devotees visit, especially during Mandalam-Makaravilakku season.
- **Access & Rituals:** Pilgrims observe a 41-day vratham (austerity) before visiting; open to all faiths.
- **Religious Harmony:** Vavaru Nada near temple dedicated to Vavar, a Sufi friend of Ayyappa.

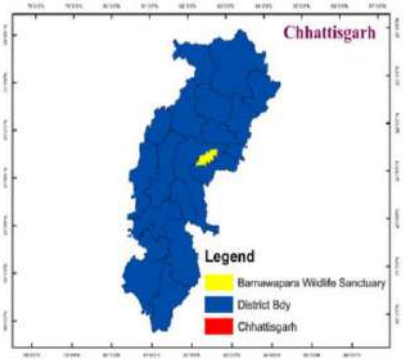
- **Architecture:** Blend of Kerala & Dravidian styles; 40-ft high plateau, copper-plated sanctum, 4 golden finials, 18 sacred steps.
- **Sabarimala Case:** Customary ban on women aged 10–50; 2018 Supreme Court ruled ban unconstitutional; larger bench review pending.

Pseudorhombus bahudaensis

- **Type:** New flounder species (flatfish, order *Pleuronectiformes*)
- **Discovery:** Bahuda estuary, Odisha by Zoological Survey of India researchers
- **Resemblance:** Similar to *Pseudorhombus arsius* (Gangetic largetooth flounder)
- **Habitat:** Bottom-dwelling, migratory; inshore waters up to 50 m, can tolerate salt and freshwater
- **Significance:** Potentially widespread in Indo-Pacific region

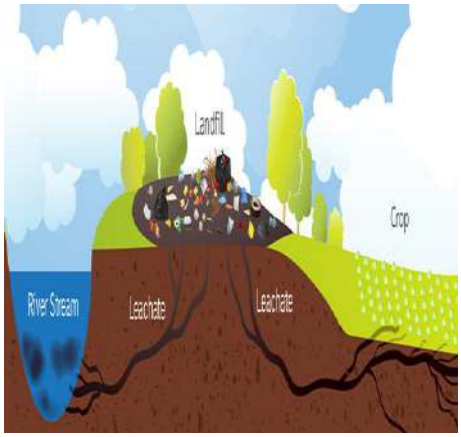
Barnawapara Wildlife Sanctuary

- **Location:** Northern Mahasamund district, Chhattisgarh
- **Area:** 245 sq.km
- **Rivers:** Balamdehi (west), Jonk (northeast), tributaries of Mahanadi
- **Flora:** Tropical dry deciduous forest – Teak, Sal, Bamboo, Terminalia; also Semal, Mahua, Ber, Tendu



- **Fauna:** Tigers, leopards, Indian bison, neelgai, wild boar, porcupine, pythons, antelopes (blackbuck revival), cheetal, sambhar
- **Birds:** 150+ species – parrots, herons, egrets, peafowl
- **Special:** Blackbuck reintroduced after 50 years of local extinction via 5-year revival plan

Leachate



- **Definition:** Highly toxic liquid generated from municipal landfills
- **Formation:** Waste decomposition + water infiltration + chemical reactions
- **Composition:** Organic pollutants, inorganic compounds, heavy metals, microbial contaminants
- **Risks:** Environmental pollution, groundwater contamination, health hazards
- **Management:** Critical for landfill operations; requires collection, treatment, and safe disposal as per environmental regulations
- **Example/News:** Illegal discharge into Aravalis raised environmental concerns

Hyunmoo-5 Missile

- **Type:** South Korean ballistic missile
- **Purpose:** Deep penetration strikes; destroy heavily fortified underground targets
- **Framework:** Part of KMPR (Korean Massive Punishment and Retaliation) to deter North Korea conventionally
- **Unveiled:** October 2024
- **Specifications:**
    - Weight: ~36 tonnes
    - Warhead: Up to 8 tonnes
    - Range: 600–5000+ km (payload-dependent)
    - Penetration: Targets >100 m underground
    - Speed: Up to Mach 10 in descent
    - Launch: Mobile platform
- **Nickname:** “Monster missile”

International Convention against Doping in Sport

- **Type:** Multilateral treaty under UNESCO
- **Adopted:** 19 Oct 2005; **Entered into force:** 1 Feb 2007
- **Members:** 192 States Parties (2nd most ratified UNESCO treaty)

- **Aim:** Harmonize anti-doping laws, regulations, and rules globally; ensure fair and safe sport
- **Governance:** Conference of Parties (COP) – biennial sessions; oversees implementation
- **Features:**
    - Recognizes WADA and its Code
    - Provides guidance, training, financial support to States
    - Serves as forum for public-private sport integrity stakeholders
- **Funding:** Anti-Doping Fund for awareness and capacity-building

    India: Re-elected Vice-Chairperson of Asia-Pacific Bureau at COP10

Pilot Whales

- **Family:** Delphinidae (largest members).
- **Species:**
    - **Short-finned (G. macrorhynchus) –** tropical & warm-temperate waters.
    - **Long-finned (G. melas) –** cold-temperate & sub-polar oceans.
- **Distribution:** Pacific, Atlantic, around Australia, New Zealand, Japan, India.
- **Features:** Rounded forehead, short snout, pointed flippers; 4–6 m long; males larger.
- **Behaviour:** Highly social; matrilineal pods; feed mainly on squid.
- **IUCN Status:** Least Concern.

Timor Leste

- **Location:** Eastern Lesser Sunda Islands, Southeast Asia; shares island with West Timor (Indonesia).
- **Seas:** Bounded by **Wetar Strait (N), Ombai Strait (NW), Timor Sea (SE).**
- **Capital:** Dili.
- **Highest Point:** Mount Tatamailau.
- **Major Rivers:** Lakla, Lies, Seical.
- **Resources:** Gold, petroleum, natural gas, manganese, marble.
- **People:** Papuan, Malayan & Polynesian origin.
- **Climate:** Dry tropical; sandalwood-covered hills, coconut & eucalyptus in lowlands.
- **Recent News:** Admitted to ASEAN (2025) – first expansion since 1990s.

Kamlang Tiger Reserve

- **Location:** Lohit district, Arunachal Pradesh, near Myanmar border.
- **Part of:** Eastern Himalayan Biodiversity Hotspot.
- **River:** Named after Kamlang River (joins Brahmaputra).
- **Boundaries:** South–Namdapha NP; North–Lang River; West–Lati River; East–Tawe River.
- Climate: Subtropical.
- **Vegetation:** Moist evergreen, subtropical & temperate forests.
- **Flora:** Amari, Gamari, Hillika, Dhuna, etc.
- **Fauna:** All 4 big cats (Tiger, Leopard, Clouded Leopard, Snow Leopard); Hoolock Gibbon, Slow Loris, Himalayan Palm Civet, Capped Langur, Hornbills.
- **Communities:** Hishmi, Digaru, Mizo.
- **Recent News:** Nature trail & angling spot to promote eco-tourism.

ICGS Ajit & ICGS Aparajit

- **Launched by:** Indian Coast Guard at Goa Shipyard Ltd (GSL).
- **Type:** Fast Patrol Vessels (FPVs) – 7th & 8th in series of 8 indigenously built FPVs.
- **Length/Displacement:** 52 m; 320 tonnes.
- **Propulsion:** Controllable Pitch Propellers (CPP) – better manoeuvrability & efficiency.
- **Roles:** Coastal patrol, anti-smuggling, anti-piracy, fisheries protection, search & rescue.
- **Area of Operation:** Island territories & Exclusive Economic Zone (EEZ).
- Indian Coast Guard:
- **Established:** 1978 (Coast Guard Act).
- **HQ:** New Delhi**; Under:** Ministry of Defence.
- **Head:** Director General, ICG.
- **Functions:** Maritime security, pollution control, protection of fishermen & offshore assets.

MAHA MedTech Mission

- **Launched by:** ANRF, ICMR & Gates Foundation.
- **Full Form:** Mission for Advancement in High-Impact Areas – Medical Technology.
- **Aim:** Boost indigenous MedTech innovation, cut import dependence, ensure affordable access.

- **Objectives:**
  - Support R&D & commercialization of affordable medical technologies.
  - Promote self-reliance & industry–academia collaboration.
  - Focus on public health impact & cost reduction.
- **Funding:** ₹5–25 crore/project (up to ₹50 crore exceptionally); milestone-linked.
- **Support Mechanisms:**
  - **Patent Mitra –** IP & tech transfer.
  - **MedTech Mitra –** regulatory guidance.
  - **Clinical Trial Network –** validation & evidence.
  - **Mentorship –** from industry experts.
- **Duration:** 5 years.

Bondla Wildlife Sanctuary

- **Location:** Northeastern Goa, Western Ghats foothills (~3000 ft).
- **Area:** ~8 sq. km – Goa's smallest WLS; also a wildlife resort.
- **Rivers:** Rangado (east), Madhel (north).
- **Vegetation:** Moist deciduous forest with semi-evergreen patches; cane along streams.
- **Flora:** Terminalia crenulata (Matti – Goa's state tree), Rosewood.
- **Fauna:** Panther, Leopard Cat, Gaur, Wild Boar, Malabar Giant Squirrel.
- **Birds:** Grey Hornbill, Golden-backed Woodpecker, Ruby-throated Yellow Bulbul.
- **Special:** Goa's only zoo, set to get new animals (barking deer, sloth bears) after 12 years.

Loktak Lake

- **Location: Manipur –** largest freshwater lake in Northeast India.
- **Feature:** Famous for phumdis (floating biomass).
- **National Park:** Keibul Lamjao NP – home to brow-antlered deer (Sangai).
- **Inflowing Rivers:** Khuga, Nambul, Imphal, Thoubal, etc.
- **Ramsar Site:** Since 1990; in Montreux Record (1993).
- **Biodiversity:** 132 plant & 428 animal species.
- **Uses:** Hydropower, fisheries, transport, tourism.
- **Threats:** Land-use change, agriculture, settlements, jhum cultivation → water pollution & biodiversity loss.

Taal Volcano

- **Location:** Batangas province, ~70 km south of Manila, Philippines.
- **Type:** Complex (compound) volcano – multiple vents & domes.
- **Feature:** Stratovolcano with a crater lake on a volcanic island within a large caldera.
- **Eruptions:** ~38 eruptions in last 450 years; caldera formed ~140,000–5,380 BCE.
- **Recent Event:** Reported three eruptions recently.
- Example of Complex Volcanoes: Taal and Vesuvius.

Dilmun Civilization

- **Location:** Eastern Arabian Peninsula — mainly Bahrain & Failaka Island (Kuwait); also parts of Saudi Arabia, Qatar, Oman, & Iranian coast.
- **Period:** c. 3200–1600 BCE (Bronze Age).
- **Significance:** Acted as a trade hub between Mesopotamia and Indus Valley Civilization.
- **Trade Goods:** Copper, pearls, dates, and other materials.
- **Nickname:** "Land of Copper" — key supplier to Mesopotamia.
- **Decline:** After 1600 BCE, absorbed by Mesopotamia and later Persia.
- **Archaeological Finds:** Burial mounds, settlements, stamp seals in Bahrain & Kuwait.
- **Latest Discovery:** 4,000-year-old temple found on Failaka Island, Kuwait.

Dogri Language

- **Family:** Indo-Aryan branch of the Indo-European language family.
- **Region:** Mainly spoken in Jammu region (J&K); also in Himachal Pradesh and northern Punjab.
- **Origin:** Traces back to Old Indo-Aryan (Vedic Sanskrit) → Middle Indo-Aryan (Pali, Prakrit, Apabhramsha) → Modern Indo-Aryan (from ~10th century CE).
- **Earliest Reference:** By Amir Khusrow in Nuh Sipihr (1317 CE) as "Duggar."
- **Script:** Originally Takri, now Devanagari.
- **Linguistic Affinity:** Related to Shauraseni Prakrit.

- **Current Issue:** Facing decline in usage in Jammu region.

Satkosia Tiger Reserve

- **Location: Odisha –** spans Angul, Cuttack, Boudh & Nayagarh districts.
- **Area: 1,136.7 sq. km –** includes Satkosia Gorge & Baisipalli WLS.
- **River:** Mahanadi River divides the reserve.
- **Part of:** Mahanadi Elephant Reserve.
- **Biogeographic Zone:** Junction of Deccan Peninsula & Eastern Ghats.
- **Terrain:** Hilly; elevation 37–932 m.
- **Vegetation:** Moist deciduous & Sal forests.
- **Flora:** Sal, Asan, Dhaura, Bamboo, Simal.
- **Fauna:** Tiger, Elephant, Leopard, Wild Dog, Sloth Bear, Gharial, Mugger Crocodile.
- **News (2025):** OHRC sought report on village relocation irregularities.

Karakoram Wildlife Sanctuary

- **Location:** Ladakh, along border with Jammu & Kashmir.
- **Nearby Parks:** North of Hemis NP, east of Deosai NP.
- **Terrain: Snow peaks, alpine meadows, deep ravines.**
- **Climate:** Cold desert; temp often below 0–10°C even in warmest months.
- **Major Peaks:** Saltoro Kangri, Saser Kangri I, K12.
- **Rivers:** Shyok and Nubra.
- **Vegetation:** Alpine & cold desert flora; medicinal & endemic species.
- Flora: Rosa webbiana, Ephedra, Caragana shrubs.
- **Fauna:** Snow leopard, Tibetan antelope (Chiru), Argali, Bharal, Ibex, Ural, Tibetan gazelle, Bactrian camel.
- **News (2025):** Proposal to redraw sanctuary boundaries under review.

Koyla Shakti Dashboard

- **Launched by:** Ministry of Coal
- **Type:** Smart coal analytics dashboard for real-time monitoring of coal operations.
- **Purpose:** Enhance efficiency, transparency, and coordination across the coal supply chain.

- **Integrates Data From:** Coal PSUs, private miners, Ministries (Coal, Power, Railways, Finance, Ports, Roads), state e-khanij portals, power plants, and ports.
- **Key Features:**
    - Unified platform for all coal sector data.
    - Real-time tracking of production, dispatch, logistics.
    - Analytical tools for policy and forecasting.
    - Alerts for incident response.
    - Standardized reporting and performance metrics.
    - Scalable & transparent digital monitoring system.

SJ-100 Aircraft

- **Origin**: Russia (developed by Sukhoi Civil Aircraft, now under UAC).
- **Type**: Twin-engine, narrow-body short-haul jet.
- **Seats**: ~103 passengers.
- **Range**: ~3,530 km.
- **Operators**: 200+ aircraft in service with 16 airlines (mainly Russian).
- **MoU**: HAL & UAC to jointly produce SJ-100 in India.
- **Features**: Low operating cost, suitable for extreme temperatures (–55°C to +45°C).
- **Use**: Commercial civil aviation.

Rehabilitation Council of India (RCI)

- **Type:** Statutory body (under RCI Act, 1992; effective 22 June 1993).
- **Background:** Set up as a society in 1986; became statutory in 1993.
- **Nodal Ministry:** Ministry of Social Justice & Empowerment.
- **Mandate:** Regulate and monitor training, services, and professionals in rehabilitation and special education.
- **Functions:**
    - Standardize training courses and syllabi.
    - Maintain Central Rehabilitation Register of qualified professionals.
    - Prescribe minimum education standards for 16 professional categories.
    - Recognize national/apex institutes as manpower development centres.

Coelacanth

- **Latest News (2025):** New Whiteia species of Coelacanth described from China fossils.
- **Type:** Prehistoric lobe-finned fish (Order: Coelacanthiformes), termed a “living fossil.”
- **Age:** Origin — Devonian Period (~420 mya).

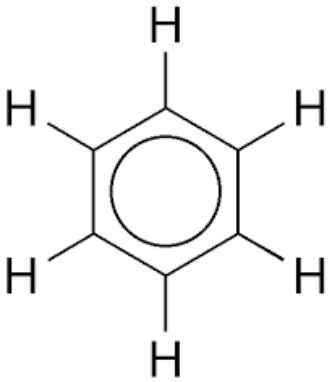
- **Rediscovery:** Found alive in 1938 off South Africa after being thought extinct for ~66 million years.
- **Living Species:**
  - West Indian Ocean Coelacanth
  - Indonesian Coelacanth
- **Habitat:** Deep marine waters (~200–1000 m).
- **Features:**
  - Fleshy, limb-like paired fins supported by bones (link to evolution of tetrapods).
  - Rostral organ (electrosensory) to detect low-frequency signals.
  - Hinged skull for wide mouth opening.

Sunni Dam Hydro Electric Project

- **Type:** Run-of-the-river hydroelectric project.
- **Location:** Satluj River, Shimla & Mandi districts, Himachal Pradesh.
- **Capacity:** 382 MW; expected generation — 1,382 million units/year.
- **Developer:** Satluj Jal Vidyut Nigam (SJVN) — joint venture of GoI & GoHP.
- **Structure:** Concrete gravity dam with underground powerhouse (right bank).
- **Part of: Luhri HEP series —**
  - Luhri Stage-I: 210 MW
  - Luhri Stage-II: 172 MW
  - Sunni HEP: 382 MW
- **Latest News (2025):** NGT took cognisance of illegal muck dumping into the Sutlej during construction.

Benzene

- **Discovered by:** Michael Faraday (1825); structure proposed by August Kekulé.
- **Nature:** Colorless, sweet-smelling, highly flammable liquid.
- **Sources:** Volcanoes, forest fires, and industrial emissions.
- **Family:** BTEX group (Benzene, Toluene, Ethylbenzene, Xylene).
- **Uses:** Base for plastics, resins, nylon, synthetic fibers, dyes, detergents, pesticides, drugs.



- **Health Impact:** Carcinogenic — causes acute myeloid leukemia, aplastic anemia.
- **Significance:** Fundamental aromatic hydrocarbon in organic chemistry.

INS Ikshak

- **Type:** Indigenously built Survey Vessel (Large) for underwater hydrography
- **Built by:** Garden Reach Shipbuilders & Engineers (GRSE), Kolkata
- **Meaning of name:** "Ikshak" means "The Guide" – symbolizes charting unexplored waters
- **Specifications:** 110 m long, 16 m wide, 3400-ton displacement
- **Speed:** Cruise – 14 knots; Maximum – 18 knots
- **Indigenization:** Over 80% indigenous content
- **Roles:** Hydrographic surveys, Humanitarian Assistance and Disaster Relief (HADR), hospital ship during emergencies
- **Special feature:** First SVL with dedicated accommodation for women officers and sailors
- **Base:** To be commissioned at Naval Base Kochi

Indian Council of Agricultural Research (ICAR)

- **Type:** Autonomous organisation under the Department of Agricultural Research & Education (DARE), Ministry of Agriculture & Farmers Welfare
- **Established:** 16 July 1929 (as Imperial Council of Agricultural Research)
- **HQ:** New Delhi
- **Legal Status:** Registered under Societies Registration Act, 1860
- **Network:** 101 ICAR institutes and 71 agricultural universities – among the largest agri research systems globally
- **Mandate:** Coordinate, guide, and manage research & education in agriculture, horticulture, animal sciences, and fisheries
- **Major Contributions:** Green Revolution, agricultural technology development, higher education in agriculture
- **Current Issue:** Directed to fill large number of vacant posts in agricultural institutions

Hemiphyllodactylus venkatadri

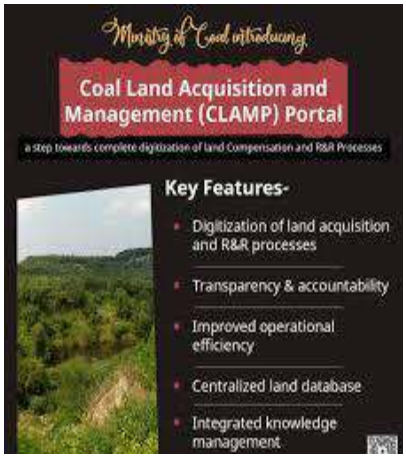
- **Discovered by:** Zoological Survey of India (ZSI)
- **Type:** New species of slender gecko (genus Hemiphyllodactylus)
- **Location:** Tirumala hill ranges, Seshachalam Biosphere Reserve, Andhra Pradesh

- **Named after:** Sacred Venkatadri Hills
- **Size: Small—**just over 2 inches; short limbs, spurs at tail base
- **Significance:** 2nd slender gecko species from Andhra Pradesh (after H. arakuensis)

Seshachalam Biosphere Reserve

- **Location:** Tirupati–Kadapa hills, Eastern Ghats, Andhra Pradesh
- **Declared:** 2010
- **Features:** Faulted, eroded ranges with gorges and gaps; highest peak – Tellaralla Penta
- **Religious significance:** Includes Tirumala Hills, abode of Lord Venkateswara (Balaji)

CLAMP Portal



- **Full Form:** Coal Land Acquisition, Management & Payment Portal
- **Launched by:** Ministry of Coal
- **Purpose:** Streamline land acquisition, compensation, and R&R in the coal sector
- **Features:** Centralized digital repository of land records; improves transparency, accountability & inter-agency coordination
- **Benefit:** Reduces delays and enhances efficiency in land management across coal PSUs

Koyla Shakti Dashboard

- **Aim:** Integrates entire coal value chain – mine to market
- **Function:** Real-time coordination among coal companies, railways, ports & end users
- **Benefits:** Transparency, data-driven monitoring, and faster decision-making through live analytics

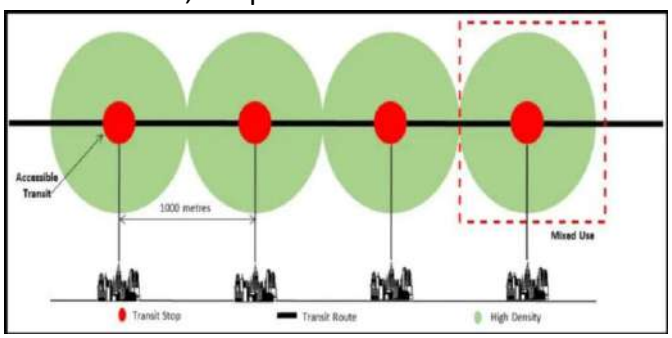
AmazonFACE Project

- **Location**: Near Manaus, Brazil
- **Aim**: Study how mature tropical trees respond to future CO_2 levels
- **Technology**: Free-Air CO_2 Enrichment (FACE) – releases CO_2 around forest canopy without enclosures
- **Setup**: 6 steel rings; 3 exposed to elevated CO_2, 3 as control

- **Supported by**: Brazil's Federal Government & the UK
- **Significance**: First large-scale CO_2 experiment in a natural tropical forest; aids climate change impact assessment on Amazon carbon absorption

Transit Oriented Development (TOD)

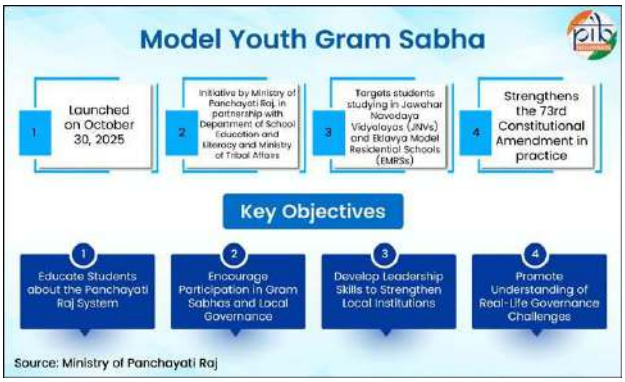
- **Definition:** Urban strategy promoting dense, mixed-use development around public transport hubs.
- **Objective:** Reduce private vehicle use, shorten commutes, cut pollution.
- **Core Principles:**
  - Transit Hub: Development around metro/rail/bus nodes.
  - Multi-modal Integration: Seamless transfer between transport modes.
  - Pedestrian & Cyclist Friendly: Safe, walkable neighbourhoods.



- **Mixed Use:** Homes, offices, shops, recreation within close radius.
- **Advantages:**
  - Cuts congestion & emissions.
  - Boosts non-ticket revenue for transport agencies.
  - Enables value-capture financing via rise in land values.
- **Latest:** DDA's East Delhi Hub – India's first TOD project.

Model Youth Gram Sabha (MYGS)

- **Purpose:** Simulated Gram Sabha sessions for school students (Classes 9–12) to promote participatory governance.
- **Inspired by:** Model United Nations (MUN) concept.
- **Initiative of:** Ministry of Panchayati Raj, with Ministry of Education & Ministry of Tribal Affairs.



- **Implementation:** 1,000+ schools — including JNVs, EMRSs, and state govt schools.
- **Activities:** Students act as Sarpanch, Ward Members, etc.; hold mock meetings, draft budgets & development plans.
- **Support:** ₹20,000 per school for conducting sessions.
- **Aim:** Strengthen Janbhagidari (people's participation) and civic awareness.