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MONTHLY MAGAZINE

JULY 2025

THE HINDU | The Indian EXPRESS

1. 10 Years of Digital India Mission
2. Turning Demographics into Development
3. Empowering India's Energy Transition with Artificial Intelligence (AI)
4. Rethinking India's Higher Education Model
5. Balancing Growth and Rivalry with China

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Mains Daily News Analysis

1. Exploring Space, Advancing Life on Earth

Relevance to UPSC

Mains: GS Paper 3: Science and Technology – developments and their applications

Summary of the Article

Captain Shubhanshu Shukla became the **first Indian astronaut to board the International Space Station (ISS) as part of Axiom Mission 4.** This milestone serves as a **precursor to India's Gaganyaan program**, which is scheduled for 2026. During their stay, the crew will conduct scientific experiments, including eight developed by ISRO, with potential direct applications in agriculture, health, material science, and more.

The article explores how space-based experiments and missions **like Axiom-4, Gaganyaan, Chandrayaan, NISAR**, and others are expected to transform lives on Earth by driving innovations in biotechnology, healthcare, renewable energy, navigation, disaster management, and resource sustainability.

Analytical Insights for Mains

1. Space-Based Research Enhancing Everyday Life

- **Sprout Growth in Microgravity**
  Studies on **seed germination in space** can lead to **urban farming solutions, indoor agriculture, and food security.**
- **Cyanobacteria for Life Support**
  Can help in **designing closed-loop systems for oxygen and food in spacecraft**. On Earth, it aids sustainable building designs, water purification, and air quality management.
- **Space Microalgae Growth**
  Supports biofuel development, nutritional supplements, and biowaste recycling, thus promoting green energy solutions.
- **Myogenesis (Muscle Loss in Space)**
  Identifies molecular causes of **muscle atrophy,** potentially leading to better treatment of muscular diseases and conditions like aging-related muscle loss.
- **Display Interaction in Microgravity**
  Can enhance **ergonomics** and user interfaces in smart tech, aiding productivity, healthcare devices, and digital interactions.
- **Tardigrade Survival Study**
  Understanding resilience mechanisms could push frontiers in **biomedical preservation, regenerative medicine, and extreme-environment biotechnology.**

2. Key Technologies Emerged from Space Exploration

- **Healthcare Innovations:**
  - **Telemedicine and remote patient** monitoring adopted by ISRO for rural healthcare.
  - Nutrient-enriched algae used in **infant formula (DHA & ARA).**
  - Portable ultrasound tech now used in emergency medical services.
- **Communication Systems:**
  - Space communication has led to **satellite internet, video conferencing tools, and GPS/NavIC.**
  - India's NavIC to revolutionize **transport, logistics, and agriculture**.

- **Food Preservation:**
  - Innovations like **freeze-drying, vacuum sealing, and space-grown vegetables** are now standard in consumer markets.
- **Consumer Electronics:**
  - Miniaturized electronics led to **smartphones, CMOS sensors, cordless devices like the Dustbuster**.
  - NASA's tech inspired memory foam, cushioned insoles, and Velcro applications in footwear.
- **Water Purification:**
  - NASA's Microbial Check Valve (MCV) used in disaster relief, e.g., **Haiti earthquake.**
- **Energy & Battery Technologies:**
  - High-efficiency solid-state batteries used in **EVs and renewable storage.**
  - Carbon nanotube solar cells and India's leadership in the International Solar Alliance.
- **Disaster Management:**
  - ISRO's Disaster Management Support (DMS) program aids in real-time response to natural calamities.

3. How India Can Further Capitalise Upcoming Space Missions

- **NISAR Mission (with NASA):**
  - Will enhance **disaster monitoring, crop health analysis, and precision agriculture**.
- **Gaganyaan Program:**
  - Will develop **health-monitoring systems, life support tech, and biomedical innovations** that can be used in rural healthcare and geriatric medicine.
- **Venus Orbiter Mission:**
  - Studying extreme greenhouse effects of Venus can improve climate modeling and carbon management on Earth.
- **Mars Orbiter Mission 2:**
  - Boosts interplanetary navigation and communication systems, **aiding GPS, 5G networks, and rural internet connectivity.**
- **Lunar Polar Exploration Mission (with JAXA):**
  - Water ice discovery can lead to advanced purification technologies, mineral resource extraction, and off-grid living innovations.
- **Indian Space Station (Planned):**
  - To serve as a hub for microgravity research, healthcare experiments, and sustainable living solutions.
- **Chandrayaan-4 (Lunar Sample Return):**
  - Analysis of lunar geology could enhance Earth's mineral exploration, space weather prediction, and communication system protection.

Conclusion

"Space exploration is not just about reaching new heights, it's about harnessing the unknown to elevate life on Earth." India's ongoing and upcoming space missions—**from Axiom-4 to Chandrayaan-4**—represent not only milestones in space technology but also key enablers of transformational change in **health, sustainability, and innovation on Earth.** Investing in space is investing in Earth's future.

2. Rooted in Culture, Rising in Strength

Relevance to UPSC:

Mains: GS Paper I: Diversity of India; Salient features of Indian Society; Tribal culture, GS Paper II: Governance issues, PESA, FRA, policy implementation

Summary of the Article:

The Ministry of Tribal Affairs launched a major outreach initiative to deliver welfare schemes to 1 lakh tribal villages, including the **Dharti Aaba Janjatiya Gram Utkarsh Abhiyan**. While numerous policies exist to uplift Scheduled Tribes (STs), especially the **75 Particularly Vulnerable Tribal Groups (PVTGs),** the challenges of land alienation, educational backwardness, and healthcare access continue to impede progress.

Analytical Insights for Mains:

1. Contribution of Tribes to India's Heritage and Progress:

- **Cultural Sentinels:**
  Preserve **oral traditions, folk art, spirituality, and eco-centric worldviews.**
  Example: Gond paintings – nature-spirit symbolism.
- **Natural Custodians:**
  Tribes uphold land-people civilizational bonds and resist resource exploitation.
  Example: Hasdeo Aranya coal mining resistance by Gonds and Oraons.
- **Symbols of Resistance:**
  Key players in anti-colonial revolts and grassroots self-rule.
  Example: Birsa Munda's Ulgulan; over 80 tribal uprisings.
- **Ethical Alternatives to Consumerism:**
  Promote non-accumulative, nature-harmonious lifestyles.
  Example: Galo tribe in Arunachal Pradesh.
- **Borderland Integrators:**
  Secure remote borders and contribute to national unity.
  Example: Konyak Nagas on Indo-Myanmar border.
- **Local Knowledge Systems:**
  Enrich healing, agriculture, folklore, and sustainable practices.
  Example: Bondas use traditional herbs for healing.
- **Egalitarian Communitarianism:**
  Practice decentralized governance, matrilineal succession, collective ownership.
  Example: Khasi tribe and PESA Act (1996).
- **Defenders of Pluralism:**
  Embody inclusive spirituality with animism and polytheism.
  Example: Rabari tribe blending Hinduism and animism.

2. Key Issues Faced by Tribal Communities:

- **Land Alienation & Displacement:**
  Due to mining and conservation, leading to **livelihood and cultural loss**.
  Over **38% of FRA claims rejected**.
- **Weak PESA Implementation:**
  Tokenistic Gram Sabha powers, bureaucratic dominance.
  Only 10 states have notified PESA rules.

- **Educational Barriers:**
  High dropout rates, cultural disconnect, non-functional Eklavya schools.
  1**/3rd of EMRS are incomplete.**
- **Health Deprivation:**
  Poor access, undernutrition, mistrust of state health services.
  E.g., **Sickle cell prevalence among Dhodia, Dubla tribes.**
- **Economic Marginalization:**
  Dependence on minor forest produce, low market access, high migration.
  46% of Jharkhand's tribal households are BPL.
- **Cultural Erosion:**
  Loss of languages, rituals, and identity due to mainstream pressure.
  India has **197 endangered languages**.
- **Conflict-Zone Victimization:**
  Tribals often caught in insurgency, wrongly labelled as Maoists, denied justice.
  E.g., Bastar UAPA charges.
- **Market Isolation of Tribal Products:**
  Lack of branding, fair pricing, and scalable support.
  Only 11.83 lakh reached by **Van Dhan Kendras out of 3958.**

3. Way Forward / Measures for Empowerment:

- **Strengthen Tribal Governance:**
  Empower Gram Sabhas with resource control, budget powers, social audits.
- **Language Inclusion in Education:**
  Mother-tongue instruction, teacher training, digital tribal content.
- **Intellectual Property Protection:**
  Legal framework for tribal knowledge, seeds, healing, art, with benefit-sharing.
- **Tribal Entrepreneurship Models:**
  Promote **forest/craft-based enterprises, value chains, and branding**.
- **Health System Reform:**
  Integrate traditional healers, community health units, diet-sensitive care.
- **Indigenous Education Policy:**
  Culturally **relevant curriculum, oral pedagogy, and tribal scholars' involvement**.
- **Climate-Resilient Livelihoods:**
  Promote regenerative agriculture, carbon credit markets, renewable energy.
- **Digital Inclusion:**
  Contextual **digital literacy, tribal-run digital hubs, tele-services**.
- **Participatory Monitoring:**
  Tribal audit groups, social audits, feedback-based scheme evaluation.
- **Redefine Development Indicators:**
  Use tribal concepts like **food sovereignty, ritual freedom, ecological balance.**

Important Committees & Recommendations:

- **Xaxa Committee (2014):**
  - Protect FRA implementation.
  - Promote mother-tongue education, tribal teachers, health access.

  - Support **agroforestry**, forest-based livelihoods.
  - Create **National Commission on Tribal Development**.
- **Elwin Committee (1959):** Cultural preservation.
- **Dhebar Commission (1960):** Recognized land alienation, defined Scheduled Areas.
- **Lokur Committee (1965):** Defined five ST identification criteria.
- **Bhuria Committee (1991):** Paved way for PESA and tribal self-governance.
- **Mungekar Committee (2005):** Governance in tribal areas.
- **Bandopadhyay Committee (2006):** Tribal development in LWE-affected zones.

Conclusion:

"The test of our progress is not whether we add more to those who have much, but whether we provide enough for those who have too little."

This **quote by Franklin D. Roosevelt aptly highlights that tribal empowerment requires recognition, not assimilation**. They are not backward communities needing saving, but ethical and cultural leaders whose traditions offer India vital alternatives to mainstream development paradigms.

3. India-US Strategic Synergy

Relevance to UPSC:

Mains: GS Paper II: Bilateral relations (India-US), Effect of policies of developed countries (US) on India's interests, India's strategic autonomy and diplomacy

Summary of the Article:

India-US relations have transitioned from **Cold War estrangement to a comprehensive global strategic partnership**. While historical phases were marked by ideological differences and nuclear tensions, post-1991 saw an economic and strategic rapprochement. Major milestones include the **2005 Civil Nuclear Deal, Major Defense Partner status, Quad cooperation, and the Initiative on Critical and Emerging Technologies (iCET).**

In the 2020s, both countries have focused on cooperation in defense, semiconductors, clean energy, space, and digital technology. **Simultaneously, areas of tension persist — notably trade imbalances, India's ties with Russia, digital sovereignty, and visa restrictions.**

Despite challenges, India must pursue pragmatic, visionary diplomacy, balancing strategic autonomy with deeper alignment in technology, defense, and global governance with the US.

Analytical Insights for Mains:

How Have India-US Relations Evolved?

- **1947–60s:** Cold War divergence, US aligned with Pakistan; India followed Non-Alignment
- **1970s:** Nuclear tensions, US imposed sanctions after India's 1974 nuclear test
- **1980s:** Attempts to rebuild ties; cooperation limited by India-USSR proximity
- **1990s:** Post-Cold War realignment, economic liberalization, strategic opening
- **2000s:** Civil Nuclear Deal (2005) — major shift in bilateral trust
- **2010s:** Major Defense Partner status, COMCASA, LEMOA, growing Indo-Pacific cooperation
- **2020s:** Broadened to AI, cybersecurity, clean energy, rare earths, and space collaboration

Key Areas of Cooperation:

- **Defense & Strategic Ties:**

  - India designated Major Defense Partner
  - **Agreements:** COMCASA (2018), MQ-9B drone deal (2024)
  - **Participation in Quad, Malabar exercises**
- **Technology & Innovation:**
  - **iCET (2023):** Focus on AI, semiconductors, space
  - $825 million US investment in Indian semiconductors
- **Economic Relations:**
  - $131.84 billion bilateral trade (2024-25)
  - **US is India's largest trading partner for 4th consecutive year**
  - **US:** 3rd-largest FDI source, with $4.99 billion inflow in 2023-24
- **Climate & Clean Energy:**
  - Climate & Clean Energy Agenda 2030, RETAP
  - $1 billion financing in clean energy supply chains
- **Counterterrorism & Cybersecurity:**
  - Regular Joint Working Group meetings
  - FBI collaboration post-Pulwama (2019)
  - Bilateral cybersecurity framework expanded in 2023
- **Space Cooperation:**
  - **ISRO-NASA missions:** Chandrayaan-1, NISAR satellite (2025)
  - Axiom Mission 4 with ISRO astronaut Shubhanshu Shukla

Key Areas of Friction:

- **Trade & Market Access Issues:**
  - US ended GSP benefits (2019)
  - India imposed retaliatory tariffs on 28 US items
- **Russia Defense Ties:**
  - US concerns over S-400 purchase from Russia under CAATSA
- **Data Sovereignty & Digital Trade:**
  - India's Data Protection Act (2023) mandates data localization
  - US tech giants oppose India's digital rules
- **IPR & Patent Disputes:**
  - India criticized in USTR's Special 301 Report (2023)
  - Conflict over generic drug production vs. pharma patents
- **US-China Rivalry vs. India's Neutrality:**
  - India balances US ties while avoiding full alignment in US-China rivalry
- **H1-B Visa Restrictions:**
  - Stricter US policies affect Indian tech workers
  - Impacts India's IT export industry
- **India-Iran Relations & US Sanctions:**
  - Chabahar Port and energy ties with Iran defy US sanctions
  - Friction post-US withdrawal from Iran Nuclear Deal (2018)

What India Can Do to Enhance the Partnership:

1. Assert Strategic Autonomy while deepening ties in global governance
2. Strengthen Tech Collaboration in **AI, green tech, semiconductors**

3. Engage in **Multilateral Economic Frameworks like IPEF**
4. Expand **Defense Co-development in cybersecurity, autonomous tech**
5. Promote **Cultural & Academic Diplomacy via fellowships & research**
6. Push for Inclusive Global Governance, e.g., **UNSC reforms**
7. Pursue Climate Justice through joint clean energy projects
8. **Boost Digital & Cybersecurity Cooperation, including task forces**
9. Deepen Health Diplomacy via biopharma collaboration & pandemic readiness

4. Factors Behind Monsoon's Early Nationwide Arrival

Relevance to UPSC

Prelims: Climatology (Geography): Monsoon mechanisms, MJO, ENSO, IOD

Mains (GS Paper I & III): Geography: Monsoon dynamics, Environment & Disaster Management: Extreme weather patterns, variability in rainfall

Summary of the Article

- The **southwest monsoon covered the entire country by June 29**, which is nine days earlier than the usual date of July 8.
- This is only the **10th time since 1960 that monsoon has achieved nationwide coverage in June.**

Early Onset in Kerala Set the Pace

- **Monsoon hit Kerala on May 24**, eight days ahead of the normal date.
- The active **Madden-Julian Oscillation (MJO)** in mid-May contributed to this early onset.
- This early arrival laid the foundation for faster advancement across India.

Monsoon Progress Overview

- **South, East, and Northeast India**: Saw early monsoon arrival.
- **Northwest India**: Experienced near-normal timing.
- **Central India**: Witnessed slight delays.

Key Drivers of the Monsoon's Rapid Advance

1. **Low Pressure Systems**
   - Five low-**pressure systems formed in June**.
   - These act as **moisture magnets**, pulling in rain-bearing winds and accelerating monsoon advancement inland.
2. **Active Madden-Julian Oscillation (MJO)**
   - MJO is a **moving system of clouds and wind near the equator.**
   - When active near India, it **enhances monsoon rainfall by increasing cloud cover and moisture.**
   - June witnessed continued MJO activity, pushing rainfall northward.
3. **Favourable Monsoon Trough Position**
   - The monsoon trough, extending from northwest India to the Bay of Bengal, influences rainfall distribution.
   - When the trough shifts south of its normal, it draws in moisture-laden winds from the ocean.
   - This year, it remained south of normal, boosting early and widespread rainfall.
4. **Neutral ENSO Conditions**
   - ENSO affects monsoon through temperature fluctuations in the Pacific Ocean.
   - A **neutral ENSO means no suppression or boost to monsoon.**

- This allowed unhindered monsoon progression.

5. Neutral Indian Ocean Dipole (IOD)

- IOD is defined by **temperature differences in the Indian Ocean.**
- A neutral IOD means minimal influence on the monsoon.
- Hence, other factors like **MJO and monsoon trough** played a greater role.

Analytical Insights for Mains

- The early and rapid spread of the monsoon showcases how multiple climatological drivers—when in sync—can influence rainfall patterns significantly.
- Despite early arrival, **monsoon variability (e.g. sudden pauses) and localized weather disasters highlight the increasing unpredictability linked to climate change.**
- The role of low-pressure systems and MJO points to the need for enhanced climate modelling and forecasting accuracy.
- Neutral phases of **ENSO and IOD** emphasize that Indian monsoon is not always significantly impacted by global indices, allowing regional factors to dominate.

5. 10 Years of Digital India Mission

Relevance to UPSC

Mains: GS Paper II: E-Governance, Welfare Schemes, Government Policies, Role of Civil Services in Governance

Summary of the Article

Launched in 2015, the **Digital India Mission aimed to democratize access to technology**, and in the past decade, it has transformed governance, public service delivery, and digital infrastructure.

Key achievements include:

- Internet penetration rose from 250 million (2014) to 970 million (2023)
- Over 100 billion UPI transactions per year
- ₹3.48 trillion saved via Direct Benefit Transfer (DBT)
- Over **400,000 Common Service Centres (CSCs) enabling last-mile connectivity**
- PMGDISHA certified 4.8 crore rural citizens in digital literacy
- AI-powered governance tools and **Krishi Decision Support System helping agriculture**

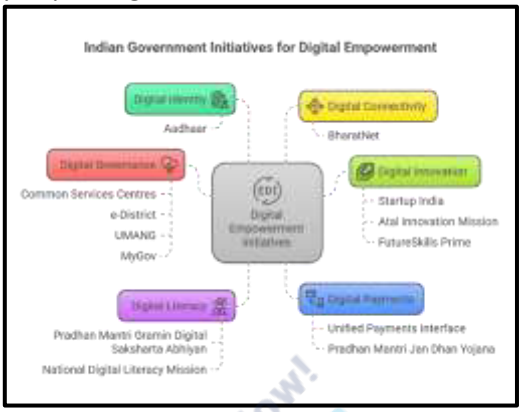
India is now aiming to transition from a **digital governance model to a global digital leadership role.**

Analytical Insights for Mains

Key Strides under Digital India Mission:

1. **Expansion of Digital Infrastructure:**

- Internet connections increased by almost 4x, with rural connectivity improving.
- 400,000+ CSCs established in villages bridging the digital divide.



2. Financial Inclusion via Digital Payments:

- UPI processed ₹139 lakh crore in FY23 (up from ₹1.09 lakh crore in FY18).
- Major driver of financial inclusion, especially for **MSMEs and informal sector.**

3. Aadhaar-Driven Welfare Distribution:

- **138 crore Aadhaar enrollments**, enabling JAM trinity (Jan Dhan-Aadhaar-Mobile).
- ₹44 trillion transferred via DBT, saving ₹3.48 trillion in leakages.

4. Digital Literacy & Empowerment:

- PMGDISHA trained 4.8 crore+ citizens.
- 6 crore rural households targeted for digital awareness and use.

5. Harnessing Emerging Technologies:

- Missions like **IndiaAI, Vishvasya Blockchain Stack, and Krishi DSS** launched.
- **AI-based PM-Kisan chatbot** helped 5 lakh+ farmers.

6. E-Governance & Service Delivery:

- UMANG offers 2,077 services to 7 crore+ users.
- 19 crore e-Signatures issued; SVAMITVA mapped 6.47 lakh villages.

7. Digital Health Infrastructure:

- **eSanjeevani served 38.18 crore patients**.
- 67 million Ayushman Bharat Health Accounts created.

8. Development of Digital Public Infrastructure (DPI):

- **DPI (like Aadhaar, UPI, DigiLocker) enables secure, interoperable, scalable services.**
- Aadhaar now handles 2 billion monthly authentications.

9. Skilling and Employment through Technology:

- 180,000+ startups, 1 lakh+ trained via FutureSkills Prime.
- 60–65 million digital economy jobs expected by 2025.

10. Digital Agriculture and Rural Transformation:

- Tools like **AgriStack, Krishi DSS aid in crop planning, disaster forecasting.**

Key Issues with India's Digital Ecosystem:

1. Digital Divide:

- Only **24% of rural households have internet access, vs 66% in urban areas (NSSO).**
- Hinders inclusive delivery of digital health, education, and finance.

2. Cybersecurity & Data Privacy:

- India ranked **2nd most targeted nation for cyberattacks in 2024.**
- Digital arrest scams tripled between 2022–2024.

3. Fragmented Infrastructure & Interoperability Issues:

- Different states have varying levels of digitization.
- **Poor integration between e-Governance systems and Aadhaar platforms.**

4. Low Digital Literacy & Skill Gaps:

- Only 24.7% computer literacy among people aged 15+ (NSS 78th Round).
- 29 million skilled worker deficit in IT/BFSI sectors.

5. Lack of Policy on Emerging Tech:

- **No law on Generative AI**; copyright regime unclear on AI-generated content.
- AI CoEs are a step forward but need integration into core governance.

6. Vendor Lock-in & Poor Govt-Private Coordination:

- Many platforms run on private vendor tech; risks of dependency and data ownership ambiguity.
- UIDAI doesn't control the tech backend of Aadhaar.

7. Digital Exclusion of Marginalized Communities:

- Only **33% of Indian women have used the Internet (NFHS 2019–21).**
- Tribals, women, and backward classes face systemic access barriers.

Measures to Strengthen Digital Empowerment:

1. Universal Digital Literacy:

- **Embed digital skills in school curriculum** and adult training programs.
- Ensure digital fluency **for banking, governance, health, and education**.

2. Expand Infrastructure in Remote Areas:

- Public-private partnerships to expand 5G and broadband in rural areas.
- Explore satellite internet and low-cost connectivity.

3. Localized & Multilingual Content:

- Promote apps and platforms in regional languages.
- **Bridge language barriers in digital education and governance access.**

4. Public-Private Digital Skilling Ecosystem:

- Government + tech firms + academia to train in AI, cybersecurity, blockchain.
- Use certifications and internships for real-world readiness.

5. Support Digital Startups:

- **Incentivize "Make Tech in India" with tax exemptions**, low-interest loans, incubators.
- Encourage local solutions in health, agri, education sectors.

6. Strengthen Cybersecurity & Privacy Laws:

- Roll out **robust privacy legislation, create independent regulators**.
- Public awareness on digital safety and data protection.

7. Boost Rural Digital Health Services:

- Integrate AI-powered tools, telemedicine, and e-health records in PHCs.
- **Extend eSanjeevani-like services nationwide**.

8. Unified Digital Governance Portal:

- One-stop platform for all citizen services.
- Improve ease of **access, reduce paperwork, corruption, and delays**.

9. Link Digital Literacy with Welfare Schemes:

- Make digital training mandatory for MGNREGA, PDS, etc. beneficiaries.
- Use this to build long-term self-service capacity.

10. Rural Digital Hubs:

- Setup tech-integrated rural centers for training, internet access, and entrepreneurship.
- **Promote community learning and connect to digital markets.**

Conclusion:

Digital India has **reshaped governance, public service delivery, and access to technology for millions.** Yet, to become a global digital leader, India must focus on inclusive, secure, and innovative digital ecosystems. The upcoming Digital India Act could be the key to ensuring equitable digital transformation.

"The power of technology lies not just in its innovation but in its ability to uplift every citizen and bring about inclusive development."

6. Navigating India's Maritime Path

Relevance to UPSC

Mains:

GS Paper II – India and its Neighbourhood, International Relations (India-Sri Lanka maritime cooperation)

Summary of the Article:

India's maritime sector is undergoing a strategic transformation, demonstrated by **Mazagon Dock Shipbuilders Ltd acquiring Colombo Dockyard** for $53 million—countering China's strategic presence in Sri Lanka (Hambantota Port). This reflects a broader vision of maritime diplomacy and economic expansion.

Key Drivers of Growth in India's Maritime Sector:

- **Port Infrastructure Modernization**: Major ports' capacity increased from 871.52 MT (2014) to 1,629.86 MT (2024). Paradip Port became India's largest cargo handler in FY24.
- **Policy and Strategic Support**: Initiatives like **Sagarmala** (₹37,000+ crore investment in 130 projects) and **Maritime India Vision 2030** aim to reduce logistics costs and promote port-led development. 100% FDI allowed in port infrastructure.
- **Sustainability and Green Shipping**: Programs like the **Green Tug Transition Program (GTTP)** and green hydrogen hubs at **Paradip, Kandla, Tuticorin** aim for carbon neutrality by 2030.
- **Technological Advancements**: Digital platforms like **SAGAR SETU** and **National Logistics Portal (Maritime)** reduce turnaround times and enhance transparency.
- **Inland Waterways Expansion**: Cargo on national waterways rose 710% since 2014, reaching 132.89 MMT in 2023–24. IWAI identified 26 new national waterways.
- **Export-Led Maritime Growth**: With a $2 trillion export target by 2030, infrastructure is being ramped up. FY23 merchandise exports stood at $451 billion, mostly via sea.
- **Private Sector Involvement**: PPP models and a shift to an 80% landlord model by 2030 are enhancing efficiency. Adani Ports' expansion is a major contributor.
- **Shipbuilding and Repair**: Initiatives like the Shipbuilding Financial Assistance Policy (SBFAP) led to 313 vessel orders worth ₹10,500 crore.
- **Strategic Port Acquisitions**: Global moves like Chabahar Port (Iran) and Colombo Dockyard (Sri Lanka) boost India's regional and global shipping influence.

Key Issues in the Maritime Sector:

- **Aging Fleet**: Indian ships constitute only 1.2% of global tonnage, with an average vessel age of 26 years (2022–23).
- **High Logistics Costs**: At 14–18% of GDP, India's logistics costs are double the global average (8%), due to infrastructure and regulatory bottlenecks.
- **Environmental Challenges**: Only a few ports (e.g., **Visakhapatnam**) use **100% renewable energy**; green transition is slow.

- **Weak Shipbuilding Industry**: India has <1% global share, lagging behind China and South Korea in tech and infrastructure.
- **Climate Vulnerabilities**: Rising sea levels threaten ports like Mumbai, with 35% of India's population within 100 km of the coast.
- **Security Risks**: **Piracy, Chinese influence in IOR**, and events like the Red Sea crisis expose strategic vulnerabilities.
- **Fragmented Governance**: Regulatory inefficiencies and poor coordination among port authorities increase costs and delay operations.
- **Overdependence on Government Ports**: Low private participation at ports like Chennai and Visakhapatnam limits competition.
- **Poor Global Supply Chain Integration**: India relies heavily on foreign transshipment hubs (e.g., Singapore). Vizhinjam Port is expected to address this.

Measures to Enhance the Sector:

- **Accelerate Port Modernization & Digitization**: Integrate AI, IoT, blockchain and develop smart ports with unified digital platforms.
- **Maritime Security Framework**: Strengthen surveillance, maritime domain awareness, and regional coordination (e.g., Information Fusion Centre).
- **Foster Public-Private Partnerships**: Expand PPP in port operations to improve innovation, efficiency, and accountability.
- **Promote Green Shipping**: Offer subsidies for clean fuels, implement green standards, and fast-track hydrogen adoption.
- **Revive Shipbuilding Industry:** Invest in R&D, modern shipyards, and maritime tech hubs. Encourage electric/hybrid vessels.
- **Develop Skilled Maritime Workforce**: Establish training centers, collaborate with global institutions, and increase female participation.
- **Establish Strategic Transshipment Hubs**: Ports like **Vizhinjam and Kandla** should become regional hubs with competitive tariffs and value-added services.
- **Streamline Maritime Regulations**: Introduce a single-window clearance system, reduce red tape, and simplify compliance.
- **Boost Regional Cooperation:** Deepen ties with IOR, Africa, Southeast Asia, and Middle East through joint ventures and standardization.

Analytical Insights for Mains:

- India's maritime ambitions are both **economic and strategic**, balancing trade needs with geopolitical counterweights to China.
- While significant policy **push exists, capacity gaps, high logistics costs, and environmental lag remain key constraints.**
- Addressing institutional fragmentation and climate resilience is critical for long-term sustainability.
- Enhancing **transshipment capacity and regional cooperation** will help India become a maritime pivot in the Indo-Pacific.
- Reforms must be holistic—balancing private investments, ecological sustainability, and regional security.

7. Gig Workers in India: Data Gaps and the Need for Inclusive Labour Statistics

Relevance to UPSC:

Mains (GS Paper 2 & 3): GS2: Welfare schemes for vulnerable sections, GS3: Inclusive growth, employment, role of digital economy

Summary of the Article:

- India's workforce is witnessing a **structural transformation with the rapid rise of gig and platform-based employment** across sectors like food delivery, ride-hailing, digital freelancing, and home services.
- According to a 2022 NITI Aayog report**, India's gig workforce is expected to reach 23.5 million by 2029-30.**
- While the 2025 Union Budget recognized gig workers by extending social protection, the Periodic Labour Force Survey (PLFS) has failed to classify and quantify this emerging workforce effectively.

Legal Definitions and Policy Framework:

- The **Code on Social Security, 2020 defines gig workers (Section 2(35))** as those engaged in **income-generating activities outside the traditional employer-employee relationship.**
- Platform work specifically involves work accessed through digital platforms.
- **Clause 141 of the Code** mandates a Social Security Fund for gig and unorganised workers.
- **Section 6** envisages a National Social Security Board to monitor welfare schemes.
- However, effective implementation is hindered due to the lack of disaggregated labour statistics.

Limitations of PLFS:

- Gig workers are **not identified as a separate category in PLFS.**
- They are **broadly lumped under 'self-employed', 'own-account workers' or 'casual labourers'**, leading to statistical invisibility.
- Key characteristics of gig work — such as **income volatility, multiple-platform engagement, lack of contracts, and algorithmic dependence —** go unrecorded.
- The PLFS does not distinguish between a traditional shopkeeper and a platform worker like a Zomato delivery agent, leading to misclassification.

Current Government Measures:

- **Government initiatives include:**
  - **e-Shram portal** registration
  - **Ayushman Bharat (PM-JAY) coverage**
  - **Digital identity issuance**
- However, these efforts suffer from recognition without representation, as PLFS still lacks a dedicated category for gig workers.
- The 2025 revision of PLFS improved sample size and coverage but did not resolve the core issue.

Analytical Insights for Mains:

- Lack of **accurate labour data weakens welfare delivery and policy formulation**, especially when targeting non-traditional employment like gig work.
- **Gig work blurs the line between self-employment and wage employment**, creating challenges for traditional classification systems like PLFS.
- **Inclusive labour statistics are essential to:**

  - Measure the effectiveness of welfare schemes
  - Design new interventions
  - Integrate platform workers into India's formal social protection framework
- Policymaking should evolve with the changing nature of work in a digital economy, ensuring representation leads to real benefits.

Way Forward:

- **Revamp PLFS codes to classify gig and platform workers distinctly**.
- Introduce special survey modules or time-use surveys to track task-based work.
- Use digital trace data from platforms (e.g., **Uber, Urban Company) to enrich data.**
- Integrate beneficiary data from welfare schemes with labour databases to track inclusion.

8. Turning Demographics into Development

Relevance to UPSC:

Mains: GS1: Population and associated issues,

GS2: Issues relating to development and management of social sector/services – education, health, GS3: Employment, Growth and Development, Inclusive growth, Skill Development

Summary of the Article:

India is at a demographic inflection point, with a youth bulge and ageing population coexisting. The **demographic dividend, defined by UNFPA as economic growth resulting from changes in population structure (more working-age people**), offers India a potential boost for the next three decades.

- **67.3%** of India's population is currently aged between **15–59 years**.
- By 2030, **India will have 1.04 billion working-age people and a median age of 28.4.**
- India's dependency ratio will be just 31.2%, indicating a favorable economic structure.
- However, this dividend risks becoming a demographic disaster if unaddressed issues like **youth unemployment, poor education, and low female participation persist.**

Analytical Insights for Mains:

Opportunities for India:

- **Services-led growth and a thriving digital economy** have shown how a skilled youth base contributes to GDP (services exports: 4.6% of global total).
- India is the **largest recipient of global remittances ($125+ billion/year).**
- Programs like **PMKVY, Startup India, National Youth Policy**, and YUVA aim to build youth capacity.
- Gig and platform economy workers rose from 2.5 million to 13 million, projected to reach 23 million.
- Education reforms **(Samagra Shiksha, RTE) and efforts to become a global talent hub are in place**.
- Future-ready skilling in AI and other digital sectors is being encouraged through initiatives like the National AI Mission.

Challenges and Risks ("Demographic Disaster"):

- **83% of India's unemployed are youth** (India Employment Report 2024).
- Only **42.6% of graduates are employable** (India Graduate Skills Index 2025).
- **Poor education outcomes**: only 23.4% of Std III students can read Std II-level text (ASER 2024).
- **Skill gap in AI sector**: 51% gap despite having world's 2nd-largest AI talent pool.

- **Malnutrition**: 35.5% of under-5 children stunted; only 11.3% receive minimum adequate diet (NFHS-5).
- FLFPR is only 41.7%, below global average of 47%.
- **Informal sector domination limits income, security, and productivity.**
- **Platform/gig workers face exploitation**: 83% work over 10 hours, 70% can't meet expenses.
- Early workforce exit in gig work leads to a shortened productivity window.
- **Fertility disparities (Bihar TFR: 2.98, Sikkim TFR:** 1.05) create uneven demographic pressures.
- By 2030, 193 million Indians will be elderly, demanding geriatric services.

What More Should India Do?

1. Reform Education & Skilling

- Embed **digital skills, critical thinking**, and employment-linked content in curricula.
- Address skill mismatch by redesigning vocational and higher education.

2. Build Global Talent Hub

- Launch formal "**India for the World" labour strategy** with skill alignment for global demand.
- Develop international certification and placement services.

3. Ensure Decent Work Conditions

- Enforce **ILO-compliant standards in gig and informal sectors:** wage floors, working hours, healthcare rights.

4. Invest in Women's Economic Participation

- Provide **credit, skilling, workplace safety** for higher female labour force participation and GDP contribution.

5. Strengthen AI Skilling

- Tackle the **51% AI skill gap via public-private-academic collaboration.**
- Expand AI skilling platforms for regional reach and customisation.

6. Improve Data Quality

- Create reliable, **real-time demographic and employment data for responsive policymaking**.

7. Ensure Policy Coherence

- Ministries must work in sync (health, education, labour, external affairs) for optimal demographic outcomes.

8. Invest in Early Nutrition

- Prioritise cognitive development through interventions in maternal and child health.

9. Child Labour in India

Relevance to UPSC:

Mains: GS Paper 2: Welfare schemes for vulnerable sections, Issues relating to children, human rights, governance and implementation

Summary of the Article:

Child labour is a global crisis, affecting 160 million children worldwide, nearly 1 in every 10 children. The **Africa, Asia, and Pacific regions account for almost 9 out of every 10 child labourers**. India has the highest absolute number of child labourers globally and is also the biggest employer of child labourers in South Asia.

June 12 is observed annually as World Day Against Child Labour by the International Labour Organisation (ILO) to raise global awareness. The Sustainable Development Goal (SDG) Target 8.7 aims to eradicate child labour in all its forms by 2025.

What is Child Labour?

According to the International Labour Organisation (ILO), **child labour is defined as work that deprives children of their childhood, potential, and dignity, and harms their physical and mental development.**

Acceptable Work: Helping parents at home, working in family business for short hours, or earning pocket money outside school hours is not considered child labour if it does not interfere with education or development.

Extent of Child Labour in India:

- As per Census 2011, **India has 10.1 million child labourers.**
- According to ILO, **India has the highest number of child labourers aged 5–17 in South Asia.**
- **NCRB Report (2022):**
  - 982 cases registered under the Child Labour (Prohibition and Regulation) Act, 1986 in 2021.
  - **Telangana reported the highest number of cases, followed by Assam.**
- **Post-COVID Impact:**
  - A significant rise in child labour has been noted.
  - ILO & UNICEF report observed a reversal in progress, with child labour rising to 160 million globally.
- **Major Employers of Child Labour in India:**
  - Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh, and Maharashtra
  - **Key sectors: Beedi-making, carpet weaving, firework industry**

Causes of Child Labour in India:

1. **Poverty and Indebtedness:**
   - Poor families rely on income from children for survival.
   - Bonded child labour is common in rural and indebted households.
2. **Adult Unemployment and Underemployment:**
   - Adults lacking jobs forces families to make children work for financial support.
3. **Illiteracy and Ignorance of Parents:**
   - Parents may not understand the importance of education, exposing children to exploitation.
4. **Lack of Access to Quality Education:**
   - Poor school infrastructure, absence of vocational education, and inadequate coverage for children aged 15–18 increases dropout rates and child labour.
5. **Cultural and Traditional Practices:**
   - Children join family trades early (e.g., a carpenter's or goldsmith's child).
6. **Social Marginalisation:**
   - A large portion of child labourers belong to SCs, STs, and minority groups with limited access to welfare programs.
7. **Disasters, Conflicts, and Epidemics:**
   - Situations like COVID-19 make children vulnerable to trafficking and exploitation for labour.

Impact of Child Labour in India:

1. **Denial of Education and Skills:**
   - Child labour deprives children of educational opportunities, violating Article 21A (Right to Education).
2. **Health and Safety Risks:**
   - Children suffer physical injuries, long hours of work, and toxic exposure in hazardous industries.
3. **Hampering Human Capital Formation:**
   - Prevents children from becoming productive, skilled adults, reducing national economic capacity.
4. **Perpetuation of Poverty:**
   - Child labour locks families in generational poverty by denying education and decent jobs.

5. **Obstacle to National Development:**
   - High child labour rates hinder economic growth and social progress.
   - Can lead to trade sanctions and loss of international partnerships.
6. **Damage to Global Reputation:**
   - As per an Australian Parliamentary Committee Report, **India's use of child and forced labour undermines international trade deals (e.g., India-Australia ECTA).**

International Provisions to Curb Child Labour:

1. ILO Conventions:
   - **Convention 138**: Minimum age for employment
   - **Convention 182**: Worst forms of child labour
   - **India has ratified both.**
2. Declaration of the Rights of the Child (1959)
3. **United Nations Convention on the Rights of the Child (1989):**
   - **Article 32:** Protection against hazardous work and labour that interferes with education.

National Legal Framework:

1. **Child Labour (Prohibition and Regulation) Act, 1986:**
   - Enacted based on the **Gurupadswamy Committee recommendations.**
   - Prohibits employment of children in certain hazardous occupations.
2. **Amendment Act, 2016:**
   - Prohibits employment of children below 14 years.
   - **Prohibits adolescents (14–18) in hazardous occupations.**
   - Permits children to work in family enterprises, creating a loophole.
3. **National Policy on Child Labour (1987):**
   - Focus on **rehabilitation and education, not just punishment.**
   - Implemented via **National Child Labour Project (NCLP**) in high-incidence districts.
4. **Right to Education Act, 2009:**
   - Free and compulsory education for children aged 6 to 14 years.
5. **Juvenile Justice (Care and Protection of Children) Act, 2000 & 2006 Amendment:**
   - **Section 23**: Cruelty to a juvenile
   - **Section 26:** Prohibits exploitation of children in employment

Government Schemes:

1. **National Child Labour Project (NCLP):**
   - Withdrawal and rehabilitation of children from labour.
   - Bridge education, health care, and vocational training.
2. **PENCIL Portal (Platform for Effective Enforcement for No Child Labour):**
   - Launched by the **Ministry of Labour and Employment**
   - Involves state, district, NGOs, and civil society to rescue and rehabilitate child labourers.

Challenges in Combating Child Labour:

1. **Issues in CLPRA Amendment 2016:**
   - Hazardous occupation list reduced
   - Allows **child labour in family enterprises, reinforcing rural bonded labour**
2. **Inconsistent Definition of "Child":**

- Varying age limits across RTE, JJ Act, and CLPRA, causing legal ambiguity.

3. **Lack of Identity Documents:**
   - Absence of birth certificates and school records allows exploitation.
4. **Weak Law Enforcement:**
   - Poor conviction rates, corruption, and lack of accountability among enforcement agencies.
5. **Socio-Economic Shocks:**
   - Pandemics, inflation, and unemployment aggravate the issue, pushing children into the workforce.

Way Forward:

1. **Legal Uniformity and Clarity:**
   - Harmonise definitions of "child", expand coverage under RTE Act up to 18 years.
2. **FIR Mandate in CLPRA:**
   - Police accountability clause similar to POCSO Act should be included.
3. **Economic Support to Families:**
   - Implement cash transfers and social security programs to eliminate the need for child labour.
4. **Child Tracking and District Funds:**
   - Child Labour Rehabilitation Fund and Tracking Mechanism must be set up as recommended by Parliamentary Committee.
5. **Community and NGO Engagement:**
   - Promote partnerships with **Bachpan Bachao Andolan, CRY, CARE India, ChildFund,** etc.
6. **Parental Literacy and Sensitisation:**
   - Promote adult education and awareness programs to change attitudes toward child work.

Case Study: The Velpur Model (Telangana)

- Velpur Mandal, once infamous for **child labour, underwent a transformation in 2001.**
- **100-day campaign ensured every child between 5–15 years went to school.**
- Initial resistance gave way to community-led advocacy.
- Declared a **"Child Labour Free Mandal",** with 100% school retention even 24 years later.
- Proves that community participation and sustained efforts are key to ending child labour.

Conclusion:

Child labour in India is a **multidimensional problem, driven by poverty, lack of education, and ineffective enforcement of laws.** Despite legal frameworks, implementation gaps persist. **Moreover, child labour affects human rights, socio-economic development, and global trade credibility.**

Therefore, a **holistic approach involving legal reform, economic support, education, community mobilisation, and strict enforcement is essential**. The Velpur Model provides a replicable grassroots template for nationwide change.

10. The Himalayan Tipping Point

Relevance to UPSC:

Mains: GS Paper 1: Geography (Mountains, Water Resources, Urbanization), **GS Paper 2:** Governance and Policy (Institutional framework, Disaster preparedness), **GS Paper 3:** Environment, Disaster Management, Internal Security (Ecology, Climate Resilience, Border Security)

Summary of the Article:

The **Indian Himalayan Region (IHR), often referred to as the "Water Tower of South Asia**," is undergoing an ecological crisis marked by **spring depletion, glacial retreat, deforestation, and unsustainable infrastructure development**. With nearly 50% of springs drying up, regions like Darjeeling are experiencing acute water stress.
The Himalayas play a vital role in **monsoon regulation, river systems, biodiversity, strategic defense, and livelihoods.** Yet, the region faces serious issues such as climate change, tourism overload, and border tensions, especially with China and Pakistan.

Analytical Insights for Mains:

1. Significance of the Himalayas for India:

- **Climate Regulation**: Act as a barrier to monsoon winds, cause **orographic rainfall**, and prevent cold Central Asian winds, protecting Indian plains from turning into cold deserts.
- **Freshwater and River Source**: Source of major rivers (Ganga, Indus, Brahmaputra); critical for hydropower, irrigation, and drinking water.
- **Ecological and Biodiversity Hub**: Home to species like the snow leopard, red panda, Himalayan blue poppy, etc. The **Himalayas are an "ecosystem powerhouse."**
- **Strategic and Border Security**: Act as a natural defense barrier; roads like DSDBO and infrastructure by BRO reinforce India's military readiness.
- **Hydropower Potential**: Installed capacity of 46,850 MW with potential up to 115,550 MW, including key projects like Kishanganga Dam.
- **Livelihood Support**: Supports agriculture, pastoralism, and harvesting of medicinal plants; key to rural economies in the region.
- **Cultural and Tourism Importance**: Sacred to Hindu and Buddhist traditions; contributes over 10% to GSDP in several NE and hill states.

2. Key Issues in the Indian Himalayan Region (IHR):

- **Water Scarcity**: Nearly 50% of springs dried, affecting 200+ million people (NITI Aayog, 2018).
- **Glacial Retreat**: Glaciers retreating at 14-15m/year; risks rise of year-long droughts if global warming hits 3°C.
- **Deforestation**: Shrinking forest cover (e.g., 902 sq. km loss per SFR 2021); illegal logging in areas like Nanda Devi Reserve.
- **Unsustainable Development**: Projects like **Char Dham Highway**, hydropower plants linked to land subsidence (e.g., Joshimath 2023).
- **Strategic Vulnerabilities**: Tensions over Aksai Chin, Galwan clash, Pahalagam attacks, and China's new map claiming Arunachal.
- **Geopolitics over Water:** China's dam on Yarlung Zangbo-Brahmaputra and issues with Indus Water Treaty heighten regional tensions.
- **Tourism Overload**: Pilgrimage hotspots like Kedarnath and Amarnath face ecological stress and pollution.
- **Policy Gaps:** Projects often lack proper Environmental Impact Assessments (EIAs); e.g., Tehri Dam displaced thousands, caused seismic concerns.

3. Measures for Sustainable Development in the Himalayan Region:

- **Integrated Water Resource Management (IWRM):** Community-led spring rejuvenation, watershed conservation, and glacier management.
- **Sustainable Infrastructure:** Eco-sensitive roads and buildings using green technology, solar energy, and rainwater harvesting.

- **Community-Led Conservation**: Empower local people in forest protection, eco-tourism, and sustainable agriculture.
- **Promotion of Green Energy**: Micro-hydro and solar solutions for remote areas; clean energy for tourism and agriculture sectors.
- **Climate-Resilient Agriculture:** Encourage agroforestry, organic farming, drought-resistant crops, and local markets for eco-friendly produce.
- **Eco-Tourism Development**: Limit crowding in pilgrimage zones; promote community-based tourism that respects biodiversity.
- **Disaster Preparedness**: Establish early-warning systems, disaster-resilient infrastructure, and train locals for emergency response.
- **Eco-Corridors for Biodiversity**: Link wildlife habitats to allow safe movement and prevent human-wildlife conflict.
- **Institutional Mechanism**: Establish a dedicated central body to coordinate Himalayan policies across water, energy, and ecology.
- **Awareness and Education**: School and community programs on climate change, biodiversity, and sustainability.

Conclusion:

The Himalayas are India's guardians of heritage, hydrology, and health. As challenges mount—**from climate instability to geopolitical threats—India must adopt sustainable, inclusive, and resilient strategies**. As John Muir said, "In every walk with nature one receives far more than he seeks." Protecting the Himalayas is not just about saving a mountain range, but securing the future of the Indian subcontinent and beyond.

11. Transforming India's Healthcare System

Relevance to UPSC:

Mains GS Paper II: Issues relating to development and management of Health, Government policies and interventions for development in various sectors

Summary of the Article:

India's healthcare system has undergone major transformation over the past decade, driven by schemes like the **National Health Mission and Ayushman Bharat, aimed at achieving universal health coverage (UHC).** More than 1.77 lakh Ayushman Arogya Mandirs have been set up, and digital platforms are being leveraged under Ayushman Bharat Digital Mission (ABDM) to promote accessible healthcare.

The three-tier healthcare structure includes:

- **Primary Healthcare**: Delivered through PHCs, Sub-Centres, and Health & Wellness Centres (HWCs); governed at district and state levels.
- **Secondary Healthcare**: Includes CHCs and district hospitals; offers specialized services.
- **Tertiary Healthcare**: Involves medical colleges, AIIMS, PGIMER offering highly specialized care.

India's regulatory framework involves bodies like:

- **NMC, CDSCO, NABH, PCI, and IRDAI**
- **Key laws include:** Drugs and Cosmetics Act (1940), Clinical Establishments Act (2010), NMC Act (2019), and National Health Policy (2017)

Analytical Insights for Mains:

Key Issues in Indian Healthcare:

- **Rural-Urban Divide**: 68% rural population, but over 80% of doctors in urban areas.
- **High Out-of-Pocket Expenditure (OOPE)**: 47.1% OOPE in FY23, despite Ayushman Bharat.
- **Inconsistent Quality**: Overcrowding, poor infrastructure, and substandard drugs remain concerns.
- **NCD Burden**: 5.8 million deaths/year due to NCDs; growing obesity per NFHS-5 data.
- **Underutilization of Schemes**: CAG found fraudulent registrations in PM-JAY.
- **Infrastructure Gaps**: Despite new centres, many lack equipment and staff.
- **Low Insurance Penetration**: Only 3.7% of GDP in 2023–24 (down from 4%).
- **Private Sector Regulation Weak**: Dominates 70% of care but lacks standard pricing, accountability.

Measures to Improve Healthcare:

- **Strengthening Primary Healthcare:** Upgrade HWCs with trained staff and digital tools.
- **Human Resource Development**: More medical colleges, rural deployment incentives, train CHOs.
- **Digital & Telemedicine Integration:** Boost eSanjeevani, remote consultations.
- **Public-Private Partnerships (PPP):** Mobilize private investment in infrastructure and rural care.
- **Reforming Insurance**: Expand Ayushman Bharat to cover outpatient & diagnostics; enhance affordability.
- **Preventive Healthcare**: National campaigns on lifestyle diseases, screenings.
- **Increased Health Spending**: Raise public health expenditure to 2.5% of GDP; use health bonds and innovation funds.
- **Regulate Private Sector**: Standardize pricing, enforce ethical practices, regulate essential services.
- **Integrate Traditional Medicine**: Combine Ayurveda, Siddha, Homeopathy with allopathic care under clear standards.
- **Adopt One Health Approach**: To address human-animal-environment health linkages.
- **Foster Innovation**: Support health-tech startups, AI-based diagnostics, wearables via incubators and VC funds.

What India Can Learn from Global Best Practices:

- **UK:** Universal health coverage via tax-funded NHS
- **Brazil:** Family Health Program with community health workers to boost rural care
- **Estonia:** Digitally integrated e-health records and telemedicine
- **Singapore:** PPP model for modern infrastructure and rural service delivery
- **Japan:** Focus on preventive care, awareness, screenings → leads to high life expectancy

Conclusion:

India's healthcare transition is roo**ted in digital integration, primary healthcare strengthening, and insurance expansion.** However, challenges of access, affordability, quality, and regulation remain. **Realizing SDG-3 (Good Health & Wellbeing)** and aligning with initiatives like the Global Pandemic Treaty will be key to building a resilient, inclusive, and equitable healthcare system for all Indians.

12. India's Strategic Balance Between Global South and West

Relevance to UPSC

Mains : GS-II: International Relations, Foreign Policy, Global Institutions, India and its Neighbourhood

Summary of the Article

The B**RICS Rio Declaration 2025 has amplified calls for greater Global South representation in global institutions**. India, poised to chair BRICS in 2026, is at the heart of this transformation—balancing its advocacy for the Global South with its strategic and economic ties with the West (notably $130 billion trade with the US). India's foreign policy aims to position itself as a bridge, not a divider, in the evolving global order.

Key Factors Driving India's Leadership in the Global South

1. Economic Growth and Trade Influence

- India is the **5th largest economy (potentially 4th) with a strong South-South trade profile.**
- Trade with Africa grew from $5B in 2001 to $90B in 2020.
- India became 7th largest supplier to Latin America ($20.22B in 2024).

2. **Diplomatic and Geopolitical Leadership**
   - Advocates UNSC reform and greater Global South inclusion.
   - Instrumental in making the **African Union a G20 permanent member during its 2023 presidency**.
   - Balances participation in BRICS and Quad, showcasing multipolar diplomacy.
3. **Commitment to Sustainable Development**
   - Leads initiatives like **ISA and National Green Hydrogen Mission.**
   - Aims to install 500 GW of non-fossil energy by 2030.
   - Pushes climate justice for developing countries.
4. **Technological and Digital Innovation**
   - **UPI and Aadhaar models** replicated across 50 countries.
   - Promotes **Digital Public Infrastructure for inclusive governance.**
5. **Humanitarian Leadership and Development Assistance**
   - Vaccine Maitri helped over 100 countries.
   - **Disaster relief missions**: Operation Dost, Karuna, Kaveri.
   - Pledged $12.25 billion for African development projects.
6. **Advocacy in Multilateral Institutions**
   - Calls for IMF and World Bank reforms.
   - **Hosted Voice of Global South Summit 2024**; proposed Global Development Compact.
7. **Historical and Cultural Legacy**
   - Founding member of NAM; supports causes like Palestinian sovereignty.
   - ICCR and cultural diplomacy strengthen Global South ties.
8. **Resilient Foreign Policy and Strategic Autonomy**
   - Avoids formal security alliances, maintains neutrality (e.g., on Russia-Ukraine).
   - Balances ties with **Russia, US, and China, upholding non-alignment**.

Key Hurdles in Balancing Global South Leadership with Western Engagement

1. **Balancing Strategic Autonomy with Western Engagement**
   - Tensions arise when Western alignment (e.g., Quad) conflicts with Global South solidarity.
   - India's abstention on Russia-Ukraine UN votes showcases this tightrope walk.
2. **Economic Dependencies**
   - $130B trade with the US, vs rising Global South trade.
   - **Challenge: Reducing Western dependency while boosting South-South ties.**

3. **Geopolitical Tensions with China and the West**
   - Border disputes with China limit cooperation within BRICS.
   - China's BRI dominates Global South infrastructure—a strategic competition for India.
4. **Conflicting Climate Models**
   - India's coal reliance (70%) conflicts with Western expectations of rapid decarbonization.
   - India's green leadership faces credibility issues over coal use.
5. **Domestic Socio-Political Disparities**
   - **Oxfam (2021):** Top 1% hold 4x the wealth of bottom 70%—undermines India's equity narrative.
   - Communal tensions, poverty, and inequality affect external perception.
6. **Western Climate Finance Gap**
   - Unfulfilled Western commitments to climate finance weaken India's renewable agenda.
   - Green growth targets unmet without adequate global funding.

Measures India Can Adopt for Balanced Engagement

1. **Strategic Multi-Alignment**
   - Continue flexible diplomacy with BRICS, G20, Quad, West.
   - As Shashi Tharoor says, act like a "thali, not a melting pot"—engage all without losing identity.
2. **Deepen South-South Technical and Development Cooperation**
   - Export DPI models, renewable energy solutions, healthcare models.
   - Promote India as a knowledge and development partner, not a donor.
3. **Reform Advocacy in Multilateral Institutions**
   - Push for UNSC and IMF reforms without alienating the West.
   - Combine Global South demands with pragmatic diplomacy.
4. **Inclusive Climate Diplomacy**
   - Lead global climate justice with calls for equitable finance and tech transfer.
   - Align economic growth with sustainability across the South.
5. **Promote Technological Sovereignty**
   - Globalize DPI while retaining control over tech architecture.
   - Create digital coalitions in the Global South, build cyber partnerships with West.
6. **Strengthen Peace and Security Roles**
   - Expand defense cooperation with Africa and Indo-Pacific, alongside ties with US and Europe.
   - Balance regional security provider role with diplomatic neutrality.
7. **Soft Power Expansion**
   - Bollywood, yoga, education, ICCR exchanges to foster goodwill.
   - Promote pluralism and democracy as shared values globally.
8. **Inclusive Global Trade Framework**
   - Advocate for fair, inclusive trade deals balancing Global South development with Western commercial interests.
   - Lead dialogues for restructuring global trade architecture.

Analytical Insights for Mains

- **India's ability to lead without alienating—through strategic multi-alignment**—is key to its diplomatic maturity.
- India's technological innovation, economic growth, and civilizational ethos offer an alternative model of leadership to China's authoritarian developmentalism.
- **India's dual identity—as a rising power with deep roots in postcolonial solidarity—gives it unique leverage in reshaping global governance.**

- However, unless India resolves its domestic contradictions and bridges its development-sustainability trade-offs, its global leadership could be undermined.

13. Rising Seas, Shifting Lives and a Test of Democratic Values

Relevance to UPSC:

Mains: GS Paper II: Welfare of vulnerable sections, constitutional safeguards, role of NGOs, GS Paper III: Environmental degradation, climate change adaptation, sustainable development, disaster management

Summary of the Article:

- India's coastal regions are increasingly affected by **rising sea levels, saltwater intrusion, and unregulated development, leading to the displacement of communities** dependent on coastal ecosystems, such as agriculturalists and fishers.
- Villages like **Satabhaya (Odisha**) have already vanished, with resettled populations struggling to rebuild livelihoods in ill-equipped colonies.
- **Large infrastructure projects (e.g., Sagarmala) are causing ecological degradation**—including loss of mangroves, dunes, and wetlands—which in turn increases vulnerability to climate impacts.
- Displaced communities are pushed into informal urban labour markets in cities like Chennai, Hyderabad, and Mumbai, facing labour exploitation—such as debt bondage, lack of social protection, and gendered abuse.
- India lacks a specific legal framework to protect those displaced by slow-onset climate change. **Existing laws (e.g., Disaster Management Act, CRZ Rules) are either environmental or emergency-oriented,** with no long-term rehabilitation measures.
- Judicial precedents (e.g., **M.C. Mehta v. Union of India**) affirm environmental rights under Article 21, but there is a gap between court judgments and enforceable legal safeguards.
- **India's NAPCC and State Action Plans acknowledge climate vulnerability but do not adequately address rehabilitation or urban labour integration.**
- The CRZ 2019 Notification has been criticised for prioritising tourism and industry over the rights of coastal communities, leading to further displacement.
- "Managed retreat" due to climate change is increasingly being used without ensuring participatory planning or rights-based rehabilitation, threatening democratic values.

Analytical Insights for Mains:

- **Constitutional Dimensions:**
  Climate displacement tests the right to life and dignity under Article 21, calling for legally enforceable entitlements for displaced populations.
- **Human Rights Approach:**
  The state must recognise climate migrants as rights-holders, ensuring access to housing, healthcare, education, and decent work, particularly in informal urban settings.
- **Policy Reform Imperatives:**
  - Revise Labour Codes to include climate migrants, especially in informal sectors.
  - Strengthen coastal regulation to prioritise community resilience over industrial expansion.
  - Mainstream climate displacement into urban planning, migration policies, and disaster risk reduction frameworks.

- **Democratic Accountability:**
  India's response to climate displacement is a litmus test of its democratic and constitutional values, especially in safeguarding the most vulnerable.
- **Global Commitments:**
  Fulfilling SDG 8.7 (end forced labour, promote decent work) requires addressing exploitation of displaced communities and their formal inclusion into labour and welfare regimes.

14. Revitalizing Forests for a Sustainable India

Relevance to UPSC:

Mains: GS Paper 2: Governance, Role of judiciary in environmental protection, Decentralization, **GS Paper 3:** Environment and Conservation, Biodiversity, Climate Change, Inclusive Growth, Sustainable Development Goals (SDGs)

Summary of the Article:

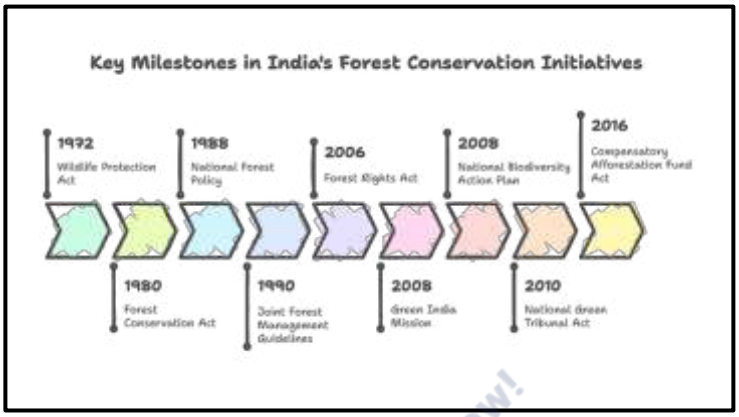
- The Supreme Court's intervention in forest governance since the 1995 **Godavarman case expanded the definition of "forest" to include all areas recorded as forest in official records, regardless of vegetation**.
- This has led to centralized governance, often sidelining community-based forest conservation approaches.
- Forests play a **multi-dimensional role in ensuring ecological, economic, and social sustainability.**

Analytical Insights for Mains:

How forests are a cornerstone of India's ecological and developmental vision:

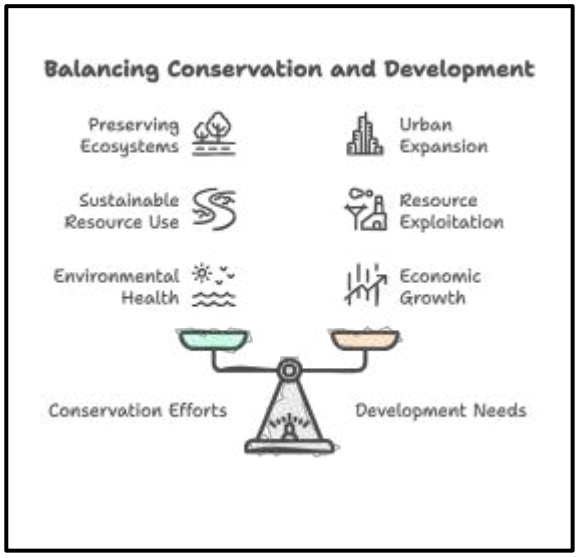
- **Ecological Balance & Biodiversity:**
  - **Forests support ~80% of India's terrestrial biodiversity.**
  - Critical for habitat preservation—species like the Bengal tiger and Asiatic lion.
  - 25.17% of India's geographical area is under forest/tree cover (ISFR 2023).
- **Carbon Sequestration & Climate Change Mitigation:**
  - Forests store 30.43 billion tonnes of CO_2 equivalent.
  - India's NDC target includes an additional sink of 2.5–3 billion tonnes CO_2 eq. by 2030.
- **Livelihoods Support:**
  - Over 250 million people depend on forests.
  - Forests provide timber, fuelwood, NTFPs, and medicinal plants.
  - Forest Rights Act (2006) aims to empower local communities.
- **Water Cycle & Soil Conservation:**
  - Forests regulate watersheds and prevent erosion, especially in Western Ghats and Aravallis.
  - Critical in **drought-prone and desertification-risk zones (e.g., Rajasthan).**
- **Economic & Green Growth:**
  - Forests contribute to timber, pharmaceuticals, eco-tourism.
  - Initiatives like **Telangana's Haritha Haram** have increased green jobs and forest cover.
- **Disaster Resilience:**
  - Forests buffer against floods, landslides, droughts—crucial for vulnerable areas like Uttarakhand.
- **Tourism & Cultural Identity:**
  - Wildlife tourism (e.g., Sundarbans, Kanha) growing at ~15% annually.
  - Promotes **local economies, conservation, and cultural preservation.**

Key Issues in Forest Management:



- **Deforestation & Land Diversion:**
  - Despite FCA (1980), 28,880 ha of forest land diverted in 2023–24.
  - 2023 FCA amendments exclude certain forests and activities from legal protection.
- **Weak FRA Implementation:**
  - **Community Forest Rights (CFRs) poorly recognized—zero recognition in major states like MP and Rajasthan**.
  - Over 250 million people still denied rightful access to forests.
- **Development vs Conservation Conflicts:**
  - Projects like Narmada Basin and Bullet Train cause massive deforestation.
- **Monoculture Plantations:**
  - Afforestation focusing on non-native species (e.g., eucalyptus, teak) harms biodiversity and soil.
- **Centralized Governance:**
  - Forest departments dominate decisions, excluding Gram Sabhas.
  - Joint Forest Management (JFM) remains largely ineffective.
- **Loss of Forest-Based Livelihoods:**
  - Privatization and overregulation marginalize forest communities.
  - **Example: Lindur village in Himachal Pradesh facing collapse due to ecological mismanagement.**
- **Climate Change Impact:**
  - Over 92,000 sq km forest degraded (2013–2023).
  - 34,562 sq km burnt in the last wildfire season.
- **Illegal Logging & Encroachment:**
  - 146% rise in encroachments in a year.
  - Rampant illegal timber trade in states like MP and Chhattisgarh.

Way Forward: Measures for Sustainable Forest Management:



- **Decentralized, Community-Based Governance:**
  - Empower Gram Sabhas under FRA with scientific and ecological support.
  - Strengthen traditional knowledge systems and local stewardship.
- **Ecological Restoration over Monoculture:**
  - Restore native biodiversity, habitat connectivity, and soil-water integrity.
- **Strengthen Wildlife Corridors & Protected Areas:**
  - Ensure genetic exchange and ecosystem connectivity across fragmented zones.
- **Agroforestry Integration:**
  - Provide subsidies, training, and incentives to promote tree-based farming.
- **Capacity Building & Forest Education:**

  - Train forest officers in modern ecological science, community engagement.
  - **Gadchiroli (Maharashtra) is a model of empowered local forest governance.**
- **Sustainable Forest Certification:**
  - **Promote Forest Stewardship Council (FSC)-type standards.**
  - Encourage ethical timber production and responsible trade.
- **Technology for Monitoring & Enforcement:**
  - Use **satellites, drones, AI for real-time tracking of deforestation, fires, and illegal activity.**
  - Forest Survey of India uses MODIS sensor for monitoring.
- **Public Awareness & Eco-Branding:**
  - National campaigns and eco-labels to promote forest-friendly products.
- **Dedicated Financial Mechanisms:**
  - Tap CSR funds, green taxes, international climate finance for forest protection.
  - Reward states for achieving conservation milestones.
- **Strengthen Legal Framework:**
  - Harsher penalties for illegal activities, better land-use planning, regular compliance audits.

Conclusion:

India's forests are integral to SDG 13 (Climate Action), SDG 15 (Life on Land), and SDG 8 (Decent Work and Economic Growth). A rights-based, ecologically sound, and inclusive governance model is essential for revitalizing forests.
"Forests are the foundation of a sustainable future—protecting them is key to achieving the world we want."

15. India's Shift to Electric Vehicles (EVs)

Relevance to UPSC

Mains: GS Paper 3: Infrastructure (Transport), Environment, Science & Technology, Industrial policy, **GS Paper 2:** Government policies and interventions

Summary of the Article

- **India's EV market reached 7.5% penetration in 2024**, with electric two-wheelers comprising 60% of the market due to affordability and suitability for urban mobility.
- The **FAME II scheme and PLI scheme for battery and vehicle production** have provided crucial policy and financial incentives.
- Public transport electrification is advancing, with 14,000 e-buses planned by 2026, supported by schemes like PM e-Drive and PM e-Bus Sewa.
- Domestic battery manufacturing is being scaled up, especially **Lithium Iron Phosphate (LFP) batteries, to reduce import dependence.**
- **India's EV adoption targets by 2030:**
  - 80% in two- and three-wheelers
  - 40% in buses
  - 30% in private vehicles

Analytical Insights for Mains

Opportunities:

- **Green transition**: Helps meet climate goals and reduce oil import dependency.
- **Job creation**: EV ecosystem (battery, vehicle, infrastructure) can generate green employment.

- **Energy security**: Reducing dependency on crude oil and imported batteries.
- **Urban air quality**: EVs can significantly lower vehicular emissions.

Challenges:

1. High Initial Cost:
- **EVs cost 20–30% more than ICE vehicles**.
- Low availability of affordable EV variants.

2. Insufficient Charging Infrastructure:
- Only 1 station per 135 EVs vs. global average of 1 per 6–20 EVs.
- **High capital cost, lack of standardisation**, and grid unreliability are key issues.

3. Dependence on Imports:
- **90% of lithium-ion batteries are still imported.**
- Domestic battery cell production still in infancy.

4. **Regulatory Uncertainty:**
- Shift from FAME II to PM e-Drive raised concerns.
- Need for long-term stable policy framework.

5. **Consumer Concerns:**
- Range anxiety, low awareness, poor resale value, and limited financing options are deterrents.

Steps Taken to Promote EV Adoption

- **PM e-Drive Scheme (2024–2026):**

₹10,900 crore outlay, including ₹2,000 crore for 72,000 charging stations.
BHEL as nodal agency, with a unified EV Super App proposed.

- **New E-Vehicle Policy (2024):**

Minimum ₹4,150 crore investment, 3-year deadline for manufacturing, 50% DVA in 5 years.

- **PLI Scheme:**

₹18,100 crore for Advanced Chemistry Cells (ACC) to boost local battery manufacturing.

- **Electric Mobility Promotion Scheme:**

Focus on incentives, carbon reduction, and air quality.

- **GST Reduction:**

5% GST on EVs and charging equipment to improve affordability.

- **PM e-Bus Sewa Scheme:**

10,000 e-buses via PPP model with central assistance to states and cities.

- **EV Mitra Scheme:**

Simplifies subsidy claims and improves consumer engagement.

Way Forward

1. Accelerate Battery Production:
- Focus on solid-state and sodium-ion batteries.
- Leverage National Critical Mineral Mission for lithium sourcing.

2. **Expand Charging Infrastructure:**
- Promote **Battery-as-a-Service (BaaS) and battery swapping.**
- Push interoperable standards and rural accessibility.

3. **Global Best Practices:**
- Adopt models like Germany's ELISA (electrified highways) and California's PPP model.

4. **Hybrid Financing Models:**
   - Use green bonds, concessional loans, and global collaborations.
5. **Harmonize Policies:**
   - Align Centre and State efforts.
   - Resolve GST disparities between components and final products.
6. **Boost R&D:**
   - Prioritise range enhancement, charging speed, and cost reduction.
7. **Global Collaboration:**
   - Partner with Argentina and other lithium-rich nations.
   - Attract global OEMs through liberalised import regimes tied to local manufacturing.
8. **Hydrogen Fuel Cell EVs:**
   - Align with National Green Hydrogen Mission for long-term zero-emission transport.
9. **Focus on Key Market Segments:**
   - Prioritise fleets, buses, taxis, and last-mile delivery.
   - Sustain incentives for 2- and 3-wheelers, the largest market share holders.

16. Empowering India's Energy Transition with Artificial Intelligence (AI)

Relevance to UPSC:

GS Paper 3: Energy: Renewable Energy, Energy Security, Science & Technology: Developments and applications of AI, Environment: Climate Change and Mitigation, Infrastructure: Energy infrastructure and reforms

Summary of the Article:

India is projected to double its energy demand by 2030. To meet this sustainably, India targets 500 GW non-fossil capacity by 2030 and net-zero emissions by 2070. **Artificial Intelligence (AI) is emerging as a key enabler in this transition by enhancing:**

- **Grid operations and renewable integration** through forecasting of demand and production
- Energy efficiency via real-time demand-side management
- **Renewable energy performance through predictive analytics**
- Carbon emissions monitoring for achieving climate goals
- **Decentralized energy management** especially in rural India
- Electric Vehicle integration by optimizing charging infrastructure and load

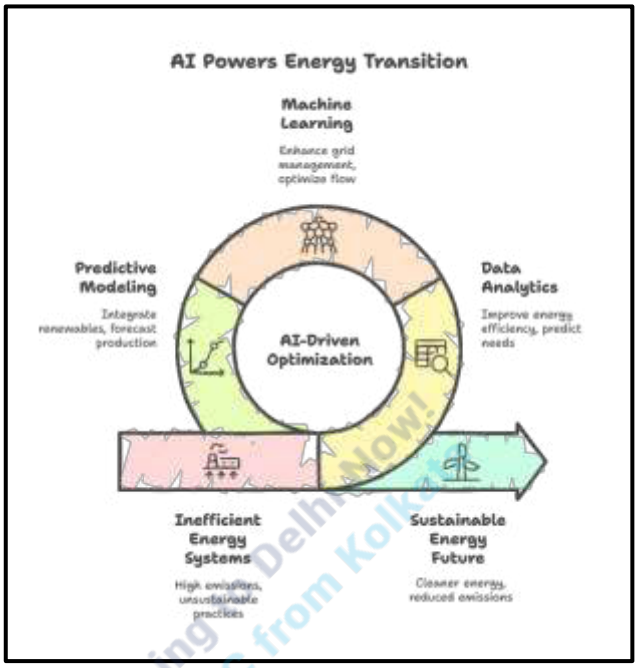
However, the transition faces challenges such as **poor data quality, AI skill shortages, cybersecurity risks, regulatory gaps, environmental footprint of AI systems, and legacy infrastructure compatibility.**

To overcome these, a National AI-Energy Framework, smart metering rollout, AI-enabled rural microgrids, incentives for private AI solutions, and robust regulatory oversight are proposed.

Analytical Insights for Mains:

Role of AI in India's Energy Transition:

- **Enhancing Grid Stability**: AI can predict fluctuations in solar and wind energy, enabling better grid balancing.
- **Reducing Transmission Losses**: AI can help identify and mitigate India's 20–30% T&D losses.
- **Demand-side Efficiency**: Tools like ABB Ability Forecasting allow real-time adjustments in industrial and residential consumption.
- **Climate Mitigation**: AI aids in identifying emission hotspots and enabling 10–20% energy cost reduction, per McKinsey.
- **EV Ecosystem Support**: AI allows smart EV charging schedules, reducing stress on power grids.



Challenges in AI Integration:

- **Data Deficiency:** Only 3% of Distribution Transformers have functioning smart meters.
- **Skill Gap:** Just 1 GenAI engineer per 10 jobs, hindering AI system deployment.
- **Cyber Threats**: Notable incidents like RedEcho cyberattacks show AI-enabled systems' vulnerability.
- **High Energy Use of AI:** AI model training itself can consume electricity equal to small cities.
- **Outdated Infrastructure**: Requires ₹2,442 billion investment for AI-readiness in power grids.

Proposed Measures:

- **National AI-Energy Strategy**: Create a dedicated policy for AI in energy production, storage, and use.
- **Predictive Grid Management**: Use ML to balance renewable variability and prevent outages.
- **Smart Meter Rollout**: Equip all DTs with AI-integrated meters for real-time monitoring and theft detection.
- **AI-Driven Microgrids**: Enable rural energy autonomy using AI-powered renewable microgrids.
- **Public-Private Partnerships**: Offer tax benefits and R&D support for AI energy startups.
- **Cybersecurity Frameworks**: AI-based detection and response systems to safeguard grid infrastructure.
- **R&D Hubs**: Establish AI labs at NISE and IITs to innovate low-carbon energy tech.

17. Strengthening India's Innovation Landscape

Relevance to UPSC:

Mains GS Paper III: Indian Economy: Mobilization of resources, Investment models, Science and Technology – developments and their applications

Summary of the Article:

India's innovation journey is no longer a binary choice between the state and the market but a collaborative ecosystem where both play essential roles. The **state provides regulatory frameworks, long-term capital, and infrastructure, while private players bring agility, capital, and market insights**. India is gradually implementing this symbiotic model in sectors like semiconductors, space tech, and renewable energy.

Key Strides in India's Innovation Ecosystem:

1. Government-Led Efforts:

- **Strategic Government Policies and Schemes:**
  - **Startup India, Make in India, and PLI schemes** actively support innovation.
  - Startup India Hub connects over 1,140 incubators and accelerators.
  - ₹945 crore allocated in 2023 under the Startup India Seed Fund Scheme (SISFS).
- **Push to R&D and Academia-Industry Linkages:**
  - Programs like **Atal Innovation Mission (AIM)** foster collaboration.
  - Fund of Funds for Startups (₹10,000 crore) and recently approved ₹1-lakh crore RDI scheme aim to boost basic research.
- **Support to DeepTech:**
  - Initiatives under PLI for semiconductors and Quantum Tech.
  - ₹76,000 crore allocated to National Semiconductor Mission.
  - IndiaAI Mission aims to enhance AI and data science capabilities.
- **Inclusion of Tier-2 and Tier-3 Cities:**
  - Atal Tinkering Labs (ATLs) and PM Mudra Yojana promote grassroots innovation.
  - 45% of DPIIT-recognized startups come from non-metro cities (Economic Survey 2023-24).

2. Private Sector-Led Efforts:

- **Venture Capital and Angel Investment Growth:**
  - 480 new DeepTech startups in 2023; India has the third-largest DeepTech pool globally.
  - Platforms like **LetsVenture and Indian Angel Network** are fueling early-stage capital.
- **CleanTech Innovations:**
  - Companies like Ather Energy, ReNew Power, Ola Electric are pioneering EVs and renewable energy.
  - **Over 63 CleanTech startups are supporting India's SDG goals**.
- **Growth of Unicorns and Emerging Sectors:**
  - 100 unicorns as of 2022 – India is 3rd globally in startup ecosystem size.
  - **Notable firms:** Swiggy, Zomato, Razorpay.
- **Technology in Healthcare and Education:**
  - Firms like Practo, 1mg, Dozee using AI and telemedicine.
  - India's EdTech market projected at USD 10.4 billion by 2025.

Key Issues in India's Innovation Ecosystem:

- **Regulatory Bottlenecks:**
  - Complex compliance, slow approvals—India ranked 63rd in Ease of Doing Business (2020).
  - Startup India has helped, but reforms are slow.
- **Low R&D Investment:**
  - India's R&D spend is 0.7% of GDP, versus 3.5% (USA) and 2.4% (China).
  - Private sector contributes only 35% to R&D in India.
- **Talent Drain and Skill Mismatch:**
  - Brain drain due to poor infrastructure.
  - Only 8.25% of graduates in suitable jobs; 51.25% of youth employable.
- **Weak IP Commercialization:**
  - Over 100,000 patents granted in FY24, but many remain unutilized.
  - Patent processing delays up to 5 years.
- **Funding Gaps in Early-Stage Startups:**
  - VC funding declined by 67% YoY in 2023.

- High-risk sectors like DeepTech struggle for funds.

- **Infrastructure Gaps for Prototyping:**
  - Lack of physical testing facilities, especially in Tier-2/3 cities.
- **Limited Grassroots Innovation Commercialization:**
  - Innovations remain local due to lack of visibility and support.
- **Unbalanced Sectoral Growth:**
  - Focus on digital sectors (e.g., foodtech, fintech); manufacturing, semiconductors lag.

Measures to Enhance Public-Private Synergy:

- **Establish Public-Private Innovation Hubs:**
  - Shared labs, testing facilities, and venture funds in AI, CleanTech, Semiconductors.
- **Incentivize Corporate R&D:**
  - Tax incentives tied to measurable outputs—patents, prototypes, etc.
- **Strengthen Industry-Academia Ties:**
  - Co-designed curriculums, joint research, and internship programs.
- **Foster Open Innovation Models:**
  - Open-access platforms for shared IP and research data.
- **Revamp Public Procurement Policies:**
  - Outcome-based tenders for government tech adoption from startups.
- **Create Sectoral Innovation Councils:**
  - Like a CleanTech Council for cross-sectoral policy and funding synergy.
- **Promote Government-Backed Angel Funds:**
  - Public-private angel partnerships to de-risk early DeepTech investment.
- **Launch Talent Development Programs:**
  - Public-private skilling initiatives in blockchain, data science, and AI.
- **Develop Regional Innovation Clusters:**
  - Decentralized innovation ecosystems in rural/agri-tech and social enterprises.

Analytical Insights for Mains:

- A **robust innovation ecosystem requires institutional convergence, capital support, and inclusive policies.**
- Public-private complementarity, not competition, is key—evident from success in semiconductors and **CleanTec**h.
- India needs to **move beyond digital consumption** (e.g., food delivery) towards deep tech creation.
- **Bridging the gap between research and commercialization** (especially grassroots and academic innovations) is crucial for equitable growth.
- True innovation leadership will emerge from holistic reforms in regulation, funding, talent, and infrastructure.

18. India's Diplomatic Shift to Latin America

Mains – GS Paper II: India's Foreign Policy, Effect of Policies of Developed and Developing Countries on India's Interests, India and its Neighborhood-Relations and Global Groupings

Summary of the Article:

India's recent diplomatic push towards Latin America, reflected in the Prime Minister's multi-nation visit, marks a **strategic realignment aimed at strengthening partnerships** with this resource-rich yet under-engaged region. Historically marked by limited engagement, the ties have evolved over time—**from shared colonial experiences to**

post-Cold War economic collaboration and now strategic cooperation in renewable energy, defense, technology, and trade.

India's current outreach reflects a desire to diversify trade and geopolitical alignments, counter China's increasing influence, and pursue South-South cooperation. Despite reaching $35.73 billion in trade in 2023–24, challenges such as geographic distance, limited connectivity, and low multilateral engagement persist.

India can enhance this relationship through infrastructure development, FTAs, cultural diplomacy, technological collaboration, and security cooperation. The focus must shift from symbolic visits to consistent policy frameworks for long-term partnership.

Analytical Insights for Mains:

1. Evolution of India–Latin America Relations:

- **Pre-1947:**
  - Shared colonial past but minimal interaction due to internal political priorities.
- **1947–1970s (Post-Independence):**
  - Non-Aligned Movement as common ground.
  - Indira Gandhi's 1968 visit was a landmark in asserting solidarity with the Global South.
- **1990s (Economic Liberalization):**
  - Post-liberalization era saw increased trade and investment.
  - FOCUS LAC Program (1997) initiated to expand exports.
- **2000s–Present:**
  - Preferential Trade Agreement with MERCOSUR (2009).
  - High-level visits such as **Modi's participation in BRICS (2014).**
  - Renewed focus on strategic partnerships in energy, tech, and multilateral forums.

2. Significance of Latin America for India:

- **Strategic Economic Diversification:**
  - Trade reached $35.73 billion in 2023–24; target of $100 billion by 2025.
  - Helps reduce dependence on China and the US.
- **Energy Security:**
  - Imports 15–20% of crude oil from Latin America.
  - New copper supply deal with Chile's Codelco boosts resource security.
- **Technological & Industrial Cooperation:**
  - Indian IT firms employ 40,000+ locals.
  - MSMEs (99.5%) in Latin America are ripe for partnerships.
- **Geopolitical Alliances:**
  - India strengthens presence via BRICS, G20, countering China's influence.
  - Shared vision of "Active Non-Alignment" on global issues.
- **Cultural Diplomacy:**
  - Popularity of Bollywood, Yoga, and sports connects people.
  - Latin American actors in Indian films and vice versa.
- **Food Security:**
  - Latin America emerged as a key edible oil supplier post-Ukraine war.

- Imports from the region hit $5.6 billion in 2022.

- **Green Energy Collaboration:**
  - Partnerships in lithium, solar energy, and ISA highlight mutual climate ambitions.

3. Challenges in India–Latin America Relations:

- **Geographical & Connectivity Barriers:**
  - No direct flights (e.g., Delhi–Buenos Aires) or efficient shipping routes.
- **Cultural Misperceptions & Lack of Awareness:**
  - Limited understanding of each other's capabilities and markets.
- **Economic Infrastructure Gaps:**
  - Trade concentrated in few nations like Brazil; others lack enabling infrastructure.
- **Inconsistent Political Engagement:**
  - Few high-level visits post-2014; only 5 Latin American leaders have visited India.
- **Protectionism & Trade Barriers:**
  - High tariffs on agricultural products hinder deeper trade.
- **China's Growing Influence:**
  - China's $427.4 billion trade with the region dwarfs India's.
  - China dominates with infrastructure and rail corridor investments.
- **Weak Multilateral Engagement:**
  - Passive participation in CELAC, Pacific Alliance slows regional ties.
- **Language and Cultural Barriers:**
  - Lack of Spanish/Portuguese fluency among Indian professionals impedes expansion.

4. What Can India Do?

- **Improve Direct Connectivity:**
  - Establish air and sea links, logistics corridors, and trade hubs.
- **Intensify Political & Diplomatic Efforts:**
  - Regular high-level visits, more regional summits, and a MEA Latin America Desk.
- **Push for FTAs & Economic Agreements:**
  - Upgrade PTAs to FTAs with MERCOSUR, Mexico, and others.
- **Expand Cultural & Educational Diplomacy:**
  - Scholarships, diaspora engagement, and language/cultural exchange programs.
- **Collaborative Research & Innovation:**
  - Joint ventures in sustainable agriculture, coastal management, biofuels.
- **Enhance Technological Cooperation:**
  - Set up digital hubs, tech parks, and AI training centers.
- **Lead South-South Development Initiatives:**
  - Focus on health, education, and poverty alleviation, using BRICS and G20 platforms.
- **Strengthen Security Ties:**
  - Joint defense training, counter-terrorism, and cybersecurity partnerships.

Conclusion:

Though distance and disconnect have historically hindered the India–Latin America relationship, the geopolitical and economic realities of the 21st century present an opportunity to recalibrate this partnership. As EAM S. Jaishankar

aptly noted, "Modern logistics offer us collaborative possibilities and so do modern communications." Strategic vision, coupled with sustained engagement, can transform this distant relationship into a vital pillar of India's global strategy.

19. The U.S. Established and Extinguished Multilateralism

Relevance to UPSC

Mains:

GS Paper II: International Relations – Multilateralism vs. Unilateralism, India and its neighbourhood; Groupings like BRICS, G-77, India's strategic autonomy and diplomacy

Summary of the Article

- The U.S., under Donald Trump, symbolized a **shift from multilateralism to unilateralism**, sidelining the United Nations and emphasizing bilateral trade deals.
- **Unilateral tariffs have become tools to extract concessions**, weakening global consensus and South-South solidarity.
- The 2025 BRICS Summit (despite 126 outcomes) did not challenge the U.S. stance or emphasize South-South cooperation, showing a weakened collective front.
- The U.S. no longer aims to define global frameworks, instead pursuing self-sufficiency and containment of China.
- Power is now exercised through **interconnected trade, financial sanctions, and influence zones, rather than global institutions.**

Analytical Insights for Mains

India's Strategic Repositioning:

- India must acknowledge the **decline of multilateralism and focus on national prosperity** and strategic autonomy to assert global influence.
- Losing the UNESCO post to Pakistan is a warning that global platforms may no longer reflect India's strategic weight.

Economic Realignment:

- India should pivot from the West to the East, prioritizing ASEAN trade and infrastructure investment to offset trade losses with the U.S.
- **Atmanirbhar Bharat can benefit from a China-like infrastructure** boom, e.g., high-speed rails, data centres, and global universities.

Technology and the Fourth Industrial Revolution:

- India's leadership in generative AI patents signals its potential in the Fourth Industrial Revolution, offering economic self-reliance.
- This innovation can drive both civilian and defence technologies, enhancing economic and strategic autonomy.

Military and Strategic Capabilities:

- The global military focus is shifting to **satellites, air defence, drones, and cyber warfare.**
- India can reduce military imports, and develop indigenous defence tech, increasing foreign policy flexibility.

Diplomatic Recalibration:

- India is reassessing historical border disputes — especially with China and Pakistan — focusing on diplomatic solutions over military standoffs.
- Such engagement may help de-escalate tensions in Eastern Ladakh and Jammu & Kashmir and foster regional peace.

Reviving South-South Cooperation through BRICS 2026:

- India should redefine BRICS to prioritize intra-South cooperation, rather than depend on G-77-style bargaining with the G-7.
- By redesigning tariffs and value chains, **the Global South can target its own rising consumer base, promoting affordable and locally-driven growth.**

20. Rethinking India's Higher Education Model

Relevance to UPSC

Mains

GS Paper II: Issues relating to development and management of social sector/services relating to education and human resources

Summary of the Article

India's higher education sector is undergoing significant transformation, **marked by both expansion and new policy directions**, but also challenged by issues of academic quality, equity, and global relevance.

Key Developments:

- **Expansion of State Public Universities (SPUs):**
  - SPUs account for 81% of enrollments, reaching over 3.25 crore students, and are crucial for inclusive access aligned with NEP 2020's vision to double enrollments by 2035.
- **Rise in Research Output:**
  - India's share in global research grew from 3.5% (2017) to 5.2% (2024), with IITs alone contributing 24% of publications.
- **Internationalization Initiatives:**
  - Through Institutes of Eminence, global collaborations, and examples like IIT Madras Zanzibar, India aims to become a global education hub.
- **Digitalization and Hybrid Learning:**
  - Platforms like **DIKSHA and National Digital Library** have expanded access to quality resources; hybrid learning models are improving reach and flexibility.
- **Progress in Gender Parity:**
  - Gender Parity Index (GPI) improved from 0.87 (2011-12) to 1.01 (2021-22); 43% of STEM graduates are women.
- **Surge in Private Institutions:**
  - 497% increase in private university enrollments (2011-12 to 2021-22), though concerns remain on quality and affordability.
- **Financial and Infrastructure Investments:**
  - Through HEFA and allocation of 1.57% of GDP to tertiary education (2021), infrastructure is being upgraded, but sustained investment is essential.

Key Challenges:

- **Quality vs. Quantity:**
  - Rapid expansion led to overcrowding, unaccredited institutions (600 universities, 25,000 colleges), and shortage of faculty.
- **Faculty Deficit:**
  - Vacancies in IITs (40%), IIMs (31%); bureaucratic delays and over-reliance on contract staff reduce academic quality.

- **Regional and Socio-economic Disparities:**
  - High enrollments are concentrated in states like **Uttar Pradesh, Maharashtra, Tamil Nadu, while Bihar, Odisha lag behind.**
- **Outdated Curriculum:**
  - Only 51.25% of youth are employable (Economic Survey 2023–24); lack of alignment with AI, ML, data science, etc.
- **Weak Research Ecosystem:**
  - India spends only 0.7% of GDP on R&D, well below global benchmarks; quantity often prioritized over quality.
- **Governance and Bureaucratic Interference:**
  - Excessive government control, politicized appointments, and lack of autonomy hinder innovation.
- **Lack of International Appeal:**
  - Only 46,000 foreign students in India vs 1.8 million Indian students abroad – contributing to brain drain.
- **Mental Health Concerns:**
  - Over 35% of suicides occur in the 15-24 age group, due to exam pressure and rote-learning-based system.

Analytical Insights for Mains

- India must **balance massification with quality in higher education** through a strategic, inclusive, and research-driven approach.
- The NEP 2020, while progressive, needs **uniform implementation and political insulation for effective results**.
- Skill-oriented curriculum reform, industry linkages, and ethical governance are key to making India a knowledge economy.
- **Addressing gender equity, regional imbalances, and mental well-being must be prioritized to ensure holistic development.**
- Public-private synergy and global collaborations can position India as both a regional education leader and a global innovation hub.

21. India Achieves Clean Energy Target Ahead of Schedule

Relevance to UPSC:

Mains (GS Paper 3): Environment: Conservation, environmental pollution and degradation, Infrastructure: Energy, storage capacity, and grid stability, Climate Change: Commitments under international agreements (Paris Agreement)

Summary of the Article:

- India has achieved 50.1% of its installed electricity capacity from non-fossil fuel sources as of June 30, 2025, meeting its Paris Agreement target five years ahead of the 2030 deadline.
- **Non-fossil capacity includes:**
  - 185 GW from renewables (solar, wind, small hydro, biogas)
  - 49 GW from large hydro projects
  - 9 GW from nuclear energy
- **Thermal power's share has dropped to 49.9% of installed capacity (from 70% in 2015**), though it still accounts for over 70% of actual electricity generation, due to the intermittent nature of renewables.
- Despite this progress, India faces serious challenges in power storage and grid management, especially during peak demand and low renewable output.

Analytical Insights for Mains:

1. Fast-Tracking Energy Transition:

- India's early achievement reflects policy effectiveness, especially in **promoting solar and wind capacity.**
- Shows leadership among developing nations in meeting climate goals.

2. **Storage as a Bottleneck:**

- Less than 5 GW of storage capacity (as of end-2024)—a major obstacle.
- Events in May 2024 and May 2025 highlight the mismatch between renewable generation and real-time demand.
- **Storage is vital for grid balancing, investment confidence, and reliability of supply.**

3. **Policy Push and Limitations:**

- **Recent measures:**
  - Viability Gap Funding (₹5,400 crore for 43 GWh) battery storage
  - CEA's advisory on co-locating storage with solar
  - Waiver of ISTS charges till June 2028
- **Progress is hindered by:**
  - High upfront costs
  - Import duties and domestic content requirements
  - Dependence on Chinese supply chains

4. **Transmission Constraints:**

- Grid infrastructure remains underdeveloped.
- Shortage of HVDC transformers is stalling power evacuation from renewable-rich regions.
- 30 GW of projects without PPAs leads to revenue uncertainty.

5. **Hybrid Tenders:**

- India is increasingly focusing on solar-wind-storage hybrid models to tackle intermittency.

22. Shaping India's Nutrition Revolution

Relevance to UPSC

Mains: GS Paper 2: Welfare schemes for vulnerable sections (nutrition, health), **GS Paper 3:** Issues of food security, agriculture, soil health, biotechnology in nutrition, climate-resilient agriculture

Summary of the Article

India has made a remarkable transition from **food scarcity in the 1960s to food surplus, becoming the world's largest rice exporter and running the world's largest public food distribution programme**. However, despite caloric sufficiency, malnutrition persists, reflecting a deeper crisis of hidden hunger, driven largely by poor soil health and a cereal-centric food policy. India's nutrition revolution needs a **shift from quantity-based food distribution to quality-focused, nutrient-dense food systems.**

Analytical Insights for Mains

Key Strides of India in Ensuring Nutritional Security:

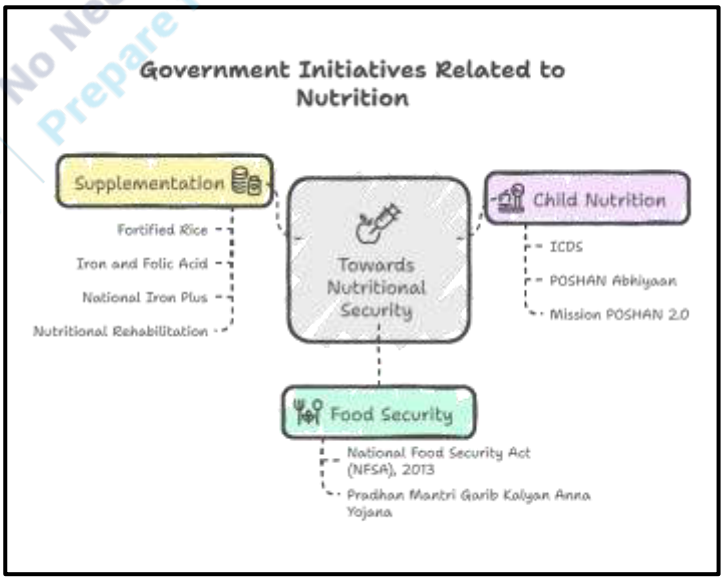
- **PMGKAY and NFSA:** Universal access to food for 81.35 crore people; 608.75 LMT foodgrains stocked; protects against inflation.
- **ICDS and POSHAN Abhiyaan**: 13.9 lakh digitised Anganwadi Centres; 100+ crore awareness activities in 2024; real-time service delivery through POSHAN Tracker.
- **Millets and Diversification**: Millets integrated into NFSA and school meals; "Shree Anna" campaign launched in Budget 2023.
- **Price Stabilisation:** Subsidised nutrition via Bharat Dal, Bharat Atta, Bharat Rice through NAFED/NCCF.

- **Global Leadership**: From PL-480 aid dependency to rice export leadership; shaping South-South cooperation in nutrition policy.

Key Issues Hindering Nutritional Security:

- **Persistent Child Malnutrition**: 35.5% stunted, 19.3% wasted, 32.1% underweight (NFHS-5); India has 6.7 million zero-food children.
- **Soil Health Crisis**: Only <5% soils with sufficient nitrogen; zinc-deficient soils linked to stunting.
- **Cereal-Centric Policies**: PMGKAY focuses on rice/wheat, ignoring dietary diversity; protein intake gaps persist despite fortified rice.
- **Gendered Nutrition Gaps**: 57% of women anaemic; women eat last/least, perpetuating intergenerational malnutrition.
- **Urban-Rural Inequities**: Rural stunting (37%) > Urban (30%); rising obesity/NCDs in urban areas.
- **Infrastructure Gaps:** Only 66% of POSHAN Abhiyaan funds spent; Ayushman Arogya Mandirs underutilised.
- **Poor WASH Linkages**: 50% malnutrition linked to diarrhoea; ~620 million practice open defecation.
- **Affordability Crisis**: 74.1% Indians can't afford healthy diet (FAO 2023); pulses, fruits, proteins remain inaccessible for poor.

Way Forward / Measures Needed:



- **Shift to Nutrient-Dense Systems**: Redesign PDS, MSP, procurement to promote millets, pulses, vegetables, animal proteins.
- **District Nutrition Action Plans (DNAPs):** Decentralised, data-driven plans led by Zila Parishads with Nutrition Dashboards.
- **Soil-Nutrition Link:** Promote biofortification, integrate nutrition indicators into Soil Health Cards; make "Soil to Stomach" a core strategy.
- **Strengthen Ayushman Arogya Mandirs:** Add nutrition counsellors, promote preventive nutrition services, and launch mobile units.
- **Universal Fortification**: Expand to milk, oil, pulses; use SHGs and cooperatives; cover schools, anganwadis, workplaces.
- **Customised Take-Home Ration (THR):** Tailored nutrition kits with age-specific diets, local sourcing, Ayurvedic options, and user instructions.
- **Nutrition Education in Schools**: Embed nutrition literacy, train teachers, involve local mothers and cooks for planning.
- **National Nutrition Grid**: Real-time unified dashboard, integrate NFHS, PM-POSHAN, POSHAN Tracker, HWC data; ensure quarterly audits.
- **Climate-Smart Nutrition**: Encourage resilient crops, low-emission nutrition chains, indigenous food systems aligned with SDG 13.
- **CSR Nutrition Missions:** Private sector to support mobile nutrition clinics, fortified food chains, workplace outreach.

- **Gender-Responsive Nutrition Budgeting**: Apply gender lens across ministries; cash transfers, empower women farmers, ensure local representation.

23. Balancing Growth and Rivalry with China: Strategic Dimensions of India-China Cooperation

Relevance to UPSC:

Mains: GS Paper 2: India and its neighbourhood relations, Effect of policies and politics of developed and developing countries

Summary of the Article:

- India-China cooperation is a **strategic necessity despite deep-seated border disputes and political rivalry.**
- EAM Jaishankar's visit to China, the first since the Galwan clash in 2020, signals an attempt to revive diplomatic ties and manage differences.
- While economic engagement continues robustly, unresolved border issues, **geostrategic competition, and mistrust hamper deeper collaboration.**
- The evolving framework between the two Asian powers aims to ensure that "differences do not become disputes, and competition does not become conflict."

Analytical Insights for Mains:

Strategic Importance of India-China Cooperation:

1. **Economic Growth and Trade Linkages:**
   - **China is India's largest trading partner, with trade reaching $118.4 billion in 2023–24.**
   - Imports from China are vital for telecom, pharma ingredients, and electronics, supporting India's manufacturing and digital transformation.
2. **Technology Transfer and Manufacturing:**
   - Chinese investments (~$4 billion) in Indian start-ups (2015–2020) and supply chain expertise are critical for boosting 'Make in India' and sectors like semiconductors and electronics.
3. **Infrastructure and Connectivity:**
   - **India is the largest borrower and second-largest shareholder in AIIB** (7.5% vote share), with 39 out of 202 approved projects.
   - Cooperation is visible in projects like the **Kailash Mansarovar Yatra** and urban transport development.
4. **Environmental and Climate Cooperation:**
   - India and China are pivotal to global climate action; collaboration in solar, EVs, and green technology can support India's target of 500 GW renewable energy by 2030.
5. **Strategic Economic Decoupling and Resilience:**
   - As global supply chains shift, China's advanced manufacturing can help India diversify, reduce Western dependency, and ensure semiconductor and rare earth access.
6. **Energy Security and Resource Management:**
   - Potential collaboration in cross-border energy grids, Indian Ocean exploration, and alternative energy can boost regional energy resilience.
7. **Geostrategic and Multilateral Engagement:**
   - India-China relations will shape the Indo-Pacific.
   - Joint efforts in G20, BRICS, and SCO enhance their global negotiating power and multipolarity in world order.

Key Issues Hindering India-China Dialogue:

1. **Border Disputes and Militarization:**
   - Eastern Ladakh, Arunachal Pradesh, and LAC tensions persist despite multiple disengagement talks.
   - **China's "Xiaokang villages**" and India's infrastructure build-up fuel continued suspicion.
2. **China's Strategic Ties with Pakistan:**
   - Deepening ties via CPEC, military aid, and support on terrorism (e.g., Pahalgam attack, May 2025) challenge Indian security.
   - China's vetoes at the UN shield Pakistan-backed terrorists, obstructing India's global counterterrorism agenda.
3. **Trade Imbalance and Economic Dependence:**
   - India's trade deficit with China is $99.2 billion in FY2023-24.
   - Heavy dependence on electronic goods and APIs limits India's strategic autonomy.
4. **China's Expansionist Policies:**
   - BRI-related projects and control of ports (Gwadar, Hambantota, Kyaukpyu) create strategic encirclement concerns.
   - China's hydropower projects on Yarlung Tsangpo (Brahmaputra) threaten India's water security.
5. **Multilateral Aggression:**
   - China opposes India's UNSC bid and blocks terror designations against Pakistan-based actors.
   - This hampers India's aspirations for a larger global role.
6. **Diplomatic Inconsistencies and Mistrust:**
   - Mismatch in priorities—India focuses on border resolution, China on trade—leads to diplomatic impasse.
   - China's disputes with multiple neighbours create a trust deficit in India.

Measures India Can Adopt to Strengthen Cooperation:

1. **Focused Dialogue on Border Management:**
   - Enhance Corps Commander-level talks and WMCC, establish real-time communication, no-patrol zones, and de-escalation protocols.
2. **Balanced Economic Engagement:**
   - Negotiate for export diversification and joint ventures in high-tech sectors with national security safeguards.
   - Leverage Chinese tech to build domestic capability in 5G, AI, and electronics.
3. **Cultural and Academic Diplomacy:**
   - Promote people-to-people ties through student exchanges, joint research, cultural programs, and tourism.
4. **Joint Regional Infrastructure Projects:**
   - Explore cooperation on energy grids, transport corridors, and smart cities, while ensuring strategic control and autonomy.
5. **Technology Partnerships with Safeguards:**
   - Create R&D frameworks in emerging sectors (e.g., quantum, biotech) with IPR protections and transparency clauses.
6. **Environmental Collaboration:**
   - Co-develop green technologies, focus on solar energy, EVs, and carbon reduction projects to meet global climate targets.
7. **Cybersecurity Cooperation:**
   - Initiate bilateral platforms on cybercrime, data protection, and digital infrastructure security, while preserving sovereignty.

Conclusion:

India and China must manage their complex ties through a balanced approach combining conflict avoidance, strategic competition, calibrated cooperation, and necessary containment. As Jaishankar aptly noted, "Stable and constructive ties between India and China are not only to our benefit, but that of the world as well." Strategic engagement, grounded in mutual respect, realism, and layered diplomacy, can ensure that their coexistence fuels development, preserves peace, and supports a multipolar global order.

24. Soil Health Crisis and India's Path to Recovery

Relevance to UPSC

Mains Syllabus: GS Paper 3: Environment and Ecology: Land degradation, desertification, soil health, Agriculture: e-technology in the aid of farmers, irrigation, fertilizer policy

Summary of the Article

- **Less than 5% of Indian soils have sufficient nitrogen**, highlighting a severe nutrient imbalance.
- Fertilizer efficiency has fallen from 1:10 in the 1970s to 1:2.7 today, reflecting declining returns from inputs.
- **Overuse of nitrogen-based fertilizers is causing groundwater pollution and emission** of N_2O, a GHG 273 times more potent than CO_2.
- **NPK usage imbalance**: Current ratio is 7.7:3.1:1, against the ideal 4:2:1, leading to soil fatigue and declining yields.
- **Water erosion, poor irrigation, and deforestation** are major contributors to soil erosion and salinity.
- Climate change, monocropping, industrial contamination, and overgrazing worsen degradation.
- Soil vulnerability differs regionally, e.g., alluvial soils in the Indo-Gangetic plain face nutrient loss, while black soils suffer from poor drainage and salinization.
- **Impacts include:**
  - Reduced productivity, rising fertilizer costs
  - Food insecurity, farmer distress
  - Loss of traditional knowledge, biodiversity, and carbon sequestration capacity
- Recommendations include: **precision fertilization, conservation agriculture, organic farming, agroforestry, and soil carbon sequestration.**
- Calls for capacity-building, real-time soil monitoring, and policy support to achieve Land Degradation Neutrality by 2030.

Analytical Insights for Mains

1. Causes of Soil Degradation:

- **Imbalanced fertilization**, especially nitrogen excess, has degraded soil nutrient profiles.
- Water erosion due to **over-irrigation and poor drainage systems, especially in Punjab, TN.**
- **Monocropping in Punjab** (wheat-rice) and sugarcane areas reduces organic carbon (<0.3% in some zones).
- **Deforestation** (95% loss within natural forests between 2013–2023) removes soil cover and increases erosion.
- Climate change-induced events (droughts, floods) disturb soil structure and fertility.

2. Region-wise Soil Vulnerability:

- **Alluvial soils**: erosion and waterlogging risks.
- **Black soils**: cracking and salinization.
- **Red and laterite soils**: nutrient-poor, erosion-prone.
- **Desert soils**: high salinity and wind erosion.
- **Mountain soils**: prone to landslides and runoff.

3. Implications:

- **Economic**: declining productivity, rising input costs.
- **Social**: food insecurity, farmer distress, depopulation of rural areas.
- **Ecological**: biodiversity loss, water pollution, and climate change amplification.

4. Recommendations for Soil Recovery:

- Precision fertilization using **remote sensing; restore ideal NPK ratios.**
- Organic farming and IPM to reduce harmful chemical dependency.
- **Conservation agriculture**: minimum tillage, crop rotation, cover crops.
- Agroforestry and afforestation to stabilize soils and diversify income.
- Soil **carbon sequestration via biochar, mulching, reduced tillage**.
- Water-efficient irrigation (drip/sprinkler) to prevent salinity.
- **Robust monitoring systems**: integrate SHC data with satellite tools.
- Farmer training in climate-resilient and conservation practices.

25. AI for India's Economic Transformation

Relevance to UPSC:

Mains: GS Paper 2: Governance, e-Governance applications, Inclusive development, Welfare schemes, **GS Paper 3:** Science and Technology (AI, Robotics), Economic Development, Employment, Infrastructure (Digital), Environment (AI's energy footprint)

Summary of the Article:

- India's AI market is projected to grow to $17 billion by 2027, creating 1.25 million jobs.
- **India holds 16% of global AI talent, second only to the US.**
- AI is already transforming sectors like **agriculture (ITC MAARS), logistics (PandoAI), biosciences, healthcare, and energy (smart grids).**
- Digital infrastructure like **Aadhaar, UPI, ONDC** lays the foundation for scalable AI deployment.
- AI enables predictive agriculture, efficient logistics, personalised healthcare, and financial fraud detection (RBI MuleHunter).
- Government initiatives like **IndiaAI Mission, National Semiconductor Mission, FutureSkills PRIME, and AI Opportunity Fund are accelerating inclusive AI growth.**
- Startups like **Sarvam AI and Krutrim** are working on India-centric LLMs for linguistic inclusion.
- **Challenges include:**
  - Threat to low-skilled jobs, especially for women and rural populations
  - Digital divide in rural areas and low compute/data infrastructure
  - Lack of a national AI strategy, low academia-industry collaboration, and environmental footprint of AI models

Analytical Insights for Mains:

1. **Inclusive Economic Potential:**
   - AI can boost productivity by up to 66%, especially through Generative AI.
   - It can modernize traditional sectors like agriculture and MSMEs, employing a large share of India's workforce.
2. **Governance and Public Services:**
   - AI-powered education and healthcare can bridge access gaps.
   - Use of AI in **fraud detection, public planning, and climate resilience strengthens governance.**
3. **Skilling and Labour Transition:**
   - India must **reskill vulnerable segments** (women, informal workers, rural youth) to prevent AI-led exclusion.
   - Embed AI curriculum in non-elite institutions for broad-based employability.

4. **Strategic Gaps and Infrastructure Needs:**
   - Despite generating 20% of global data, India holds only 2% of compute capacity.
   - Chip dependency, fragmented governance, and limited rural connectivity hinder AI democratization.
5. **Policy Recommendations:**
   - Create cross-sectoral stewarding institutions and an Inter-Ministerial AI Coordination Committee.
   - Expand compute and data infrastructure to Tier-2/3 cities and rural areas.
   - Enact a responsible AI framework focusing on ethics, fairness, and transparency.
   - Encourage **academia-industry synergy through IP sharing, fellowships, and AI R&D hubs.**
   - Promote localised solutions via startups, especially in agriculture, healthcare, and education.

26. Unlocking India's Nuclear Potential

Relevance to UPSC

Mains: GS Paper 3: Infrastructure (Energy), Environment (Clean Energy), Science and Technology, **GS Paper 2:** Government Policies and Interventions, Role of NGOs and Private Sector

Summary of the Article

- **Union Budget 2025–26 sets an ambitious target of 100 GW nuclear power capacity by 2047,** up from 8.18 GW currently, aligning with Viksit Bharat 2047 and net-zero emissions by 2070.
- A new ₹20,000 crore **Nuclear Energy Mission aims to develop at least five indigenous SMRs by 2033.**
- India's nuclear journey began with the Apsara reactor (1956) and faced global isolation post-1974 Peaceful Nuclear Explosion.
- Despite the NSG waiver post-2008, CLNDA, 2010 discouraged foreign investment. **Russia remains the sole major partner at Kudankulam.**
- **Nuclear power is vital for India's green development due to:**
  - Base-load reliability, unlike intermittent renewables
  - India's climate goals: net zero by 2070, 500 GW non-fossil fuel capacity by 2030, 50% energy from renewables

Three-pronged strategy to scale up:

1. **Standardisation of SMRs (220 MW PHWR**) to replace 100+ GW thermal plants
2. **Scaling up 700 MW PHWRs** via NPCIL with fast-tracked clearances and supply chain strengthening
3. Global partnerships with France and USA to resume after long delays
   - Legal and regulatory reforms needed:
     - **Amend Atomic Energy Act, 1962** to allow private participation
     - Amend CLNDA, 2010 to ease liability norms for suppliers
     - Clarify tariff-setting mechanisms for nuclear energy under the Electricity Act
     - Establish an independent nuclear regulator (revive 2011 AERB Bill)
   - **Incentives for private and foreign investment:**
     - Reclassify nuclear as renewable for green finance
     - Enable Viability Gap Funding and Power Purchase Agreements
     - Open up FDI (up to 49%) with safeguards
   - Public sector JVs like NPCIL-NTPC and potential REC partnerships are in progress, but reforms must go further.

Analytical Insights for Mains

- **Energy security vs Climate action**: India must balance base-load power demands with its green commitments.

- **Reform imperative**: Current laws limit private innovation and foreign investment; bold structural changes are necessary.
- **Strategic autonomy**: Indigenous SMRs enhance India's technological independence and enable global leadership in clean energy.
- **Public-private synergy**: A shift from a state-dominated to a collaborative nuclear ecosystem is key for scaling.

27. Advancing India-UK Cooperation

Relevance to UPSC:

Mains (GS Paper II): Bilateral Relations: India-UK Strategic and Economic Relations, Diaspora and Soft Power in India's foreign policy

Summary of the Article:

The formal signing of the India-UK Free Trade Agreement (FTA) during the Indian PM's London visit marks a watershed moment in bilateral ties, **reflecting a shift from colonial-era mistrust to strategic convergence**. The partnership is now multi-**dimensional, encompassing trade, technology, defence, education, climate change, and people-to-people ties**. As middle powers in a multipolar world, India and the UK are recalibrating their partnership to act as force multipliers for each other's global ambitions, particularly in the face of China's assertiveness and the US's unpredictability.

Key Areas of Convergence:

- **Trade and Economic Cooperation**
  - India-UK FTA aims to **eliminate tariffs on 99% of Indian exports**.
  - Bilateral trade stood at USD 21.34 billion in 2023–24.
  - The UK views India's large market as critical post-Brexit.
  - India's exports to UK rose by 12.6% to $14.5 billion in 2024–25.
- **Technology and Innovation**
  - Launch of **India-UK Technology Security Initiative (TSI) in 2024.**
  - SRAM & MRAM committed INR 30,000 crore to India's semiconductor sector.
  - **Collaboration in AI, semiconductors, cybersecurity with a focus on "responsible and human-centric" AI.**
- **Defence and Security**
  - Deployment of HMS Queen Elizabeth in Indian Ocean highlights alignment.
  - **2+2 Defence Dialogue Mechanism initiated in 2023.**
  - Rising Indo-Pacific cooperation to counter China's influence.
- **Climate Change and Green Energy**
  - **India's aim:** 65% renewable electricity by 2030; UK targets net-zero by 2050.
  - Collaboration on **green hydrogen, climate finance, and UK-India Hydrogen Partnerships**.
- **People-to-People and Diaspora Ties**
  - Over 1.6 million Indian-origin population in the UK.
  - **26 Indian-origin MPs in UK Parliament (as of 2024).**
  - Diaspora contributes to healthcare, tech, business.
- **Education and Research**
  - Indian students form a large portion of the UK's international student base.
  - **Southampton University set up a campus in India.**
  - India Young Professionals Scheme boosts academic exchange.

Key Areas of Friction:

- **Migration and Visa Issues**
  - UK's restrictive immigration clashes with India's demand for skilled mobility (IT, healthcare, education).
  - Visa liberalisation delays have slowed FTA progress.
- **Legal and Extradition Disputes**
  - Cases like **Vijay Mallya highlight UK's reluctance to extradite fugitives.**
  - Erodes trust and hinders cooperation in trade and security.
- **Russia-Ukraine War Divergence**
  - India's neutral stance clashes with UK's pro-Ukraine position.
  - Strategic autonomy causes occasional diplomatic friction.
- **Environmental Standards and CBAM**
  - UK's Carbon Border Adjustment Mechanism (CBAM) may hit India's steel and iron exports.
  - India views CBAM as environmental protectionism.
- **Extremist Activities in the UK**
  - Presence of **Khalistani separatists causes tensions**.
  - Incidents like protests at Indian High Commission create diplomatic strain.
- **Trade Barriers and Tariff Disputes**
  - India maintains high tariffs (150% on whisky, 100% on cars).
  - UK demands greater market access in automobiles, alcohol, agriculture.
  - **Under negotiation:** tariffs on Scotch whisky to be reduced gradually to 40%.
- **Intellectual Property Rights**
  - UK demands stronger IP protection, especially in pharma and innovation.
  - India defends generic drug production and affordable medicine policies.

Measures India Can Adopt to Enhance Ties:

- **Streamline Visa and Migration Policies**
  - Negotiate skilled migration agreements, especially for IT, healthcare, and students.
  - As per C **Raja Mohan, the diaspora will remain crucial to India's global outreach**.
- **Prioritize Technological Collaboration**
  - Create joint research hubs for AI, quantum, and green tech.
  - Enhance infrastructure for **tech startups and innovation ecosystems.**
- **Leverage Cultural Diplomacy and Soft Power**
  - Promote **Indian culture, cinema, and arts in the UK.**
  - Establish cultural exchange programs to strengthen emotional ties.
- **Collaborate on Indo-Pacific and Global Security**
  - Joint ventures in **maritime security, cyber defence, and counterterrorism**.
  - Work through Quad, AUKUS, and other multilateral forums.
- **Joint Platforms for Climate Innovation**
  - Establish research centres on renewable energy, carbon capture, and green hydrogen.
  - **Align India's green growth with UK's net-zero vision.**
- **Enhance Trade and Investment Diplomacy**
  - Negotiate tariff reductions while protecting sensitive sectors.
  - Position India as a hub for Global Capability Centres (GCCs) to attract UK investments.

Role of Global Capability Centres (GCCs) in Strengthening India-UK Relations:

- **Drivers of Economic and Trade Growth**
  - Enable cost-efficient operations for UK firms in India.
  - Promote **reciprocal investments and trade expansion.**
- **Enablers of Technological Transfer**
  - Facilitate innovation in AI, IT, and cybersecurity.
  - Act as technology bridges between both nations.
- **Boost Employment and Skill Development**
  - Generate thousands of jobs; collaborate with educational institutions.
  - **Upskill Indian talent to global standards.**
- **Promote Strategic R&D Collaboration**
  - Focus on pharma, clean energy, engineering.
  - Serve as joint innovation hubs for India-UK excellence.

Analytical Insights for Mains:

- India-UK ties exemplify the challenge of balancing economic pragmatism with strategic autonomy.
- The **diaspora acts as both a bridge and a pressure point in bilateral ties.**
- India can use post-Brexit UK's need for partnerships as leverage to extract long-term trade and tech gains.
- GCCs offer a model for North-South collaboration grounded in innovation and inclusivity.
- Managing divergences in climate standards, IP regimes, and security perceptions is crucial to unlock the full potential of this strategic partnership.

28. Influence of Plastic Industry on Environmental Policies – A Growing Global Concern

Relevance to UPSC

Mains: GS Paper 3: Environmental Pollution & Degradation, Conservation, Waste Management, Role of informal sector, Greenwashing

Summary of the Article

The plastic industry is facing renewed global scrutiny for its influence over environmental policy-making, especially during negotiations for a UN treaty on plastic pollution. Investigations reveal the industry has **adopted manipulative tactics similar to those historically used by the tobacco industry, including shifting blame to consumers, funding misleading studies, and greenwashing.**

Key Highlights

1. Imitating Tobacco Industry Tactics

- **Blame-shifting**: The industry emphasizes consumer responsibility for recycling, deflecting from its own unsustainable practices.
- **Funding Misleading Science**: Just like tobacco companies, plastic producers promoted recycling despite privately acknowledging its technical limitations.
- **Greenwashing & Mislabelling**: Products labelled "biodegradable" or "compostable" often do not degrade effectively, especially in developing nations like India.
- **Example**: Coca-Cola dropped its 2030 goal of 25% reusable packaging, showcasing a contradiction between claims and action.

2. Expansion into the Global South

- **With stricter regulations in the West, the industry is shifting its focus to low- and middle-income countries, where:**
  - Plastic consumption may triple in Asia and double in Sub-Saharan Africa by 2060 (OECD 2022)
  - Weak environmental laws and poor waste infrastructure make these regions vulnerable to pollution and corporate influence.

3. **India's Plastic Policy Landscape**
   - **Informal Sector's Role:**
     - 70% of India's plastic recycling is handled by informal workers, often under unsafe and unregulated conditions.
     - **NAMASTE Scheme (2024) aims to formalise this sector:**
       - 80,000+ workers profiled
       - 45,700+ given safety gear
       - 26,400+ received Ayushman Bharat cards
   - **Extended Producer Responsibility (EPR):**
     - Mandated under Plastic Waste Management Rules (2016, amended 2022)
     - Only 11% of banned single-use plastic is actually covered by the ban
     - Less than 50% compliance among producers, indicating weak enforcement
4. **Global Lobbying and Treaty Obstruction**
   - During **UN INC-3 negotiations, industry lobbyist participation increased by 36%**
   - Civil society flagged undue industry influence in stalling meaningful binding agreements
   - CIEL and Centre for Climate Integrity reported that industry knew recycling was ineffective but still promoted it to avoid accountability

Analytical Insights for Mains

- **Environmental Governance Crisis**: The plastic industry's influence reveals gaps in global environmental governance. Weak regulations, poor enforcement, and underrepresentation of vulnerable stakeholders worsen the crisis.
- **Need for Transparency**: Global negotiations must limit corporate lobbying to prevent conflict of interest and ensure scientific objectivity in environmental policymaking.
- **India's Dual Challenge**: Balancing growth and regulation is a key issue. While India's steps like EPR and NAMASTE are commendable, weak enforcement and lack of systemic integration risk undermining progress.
- **Informal Sector Integration**: Formalising waste workers is crucial for sustainable waste management. Their contributions must be institutionalised through legal, social, and financial protection.

29. India's Investment Climate and Reforms

Relevance to UPSC:

Mains (GS Paper 3): Indian Economy – growth, development, and employment, Investment models and industrial policy, Infrastructure development and ease of doing business, Role of regulatory reforms, digital transformation, and trade integration

Summary of the Article:

The article highlights the **paradoxical investment climate in India, where gross FDI inflows have increased but net FDI has sharply declined due to high repatriation**. Despite macroeconomic strength, India's investment potential remains

underutilized due to regulatory bottlenecks, logistics inefficiencies, and skills mismatch. However, with strategic reforms and better alignment with global trade architecture, India has the opportunity to transform into a global investment magnet.

Analytical Insights for Mains:

Key Factors Driving India as a Global Investment Hotspot:

1. **Robust Economic Growth:**
   - India's real GDP expected to grow by 6.5% in FY 2024–25.
   - **Projected to become 4th largest economy globally by 2025 (IMF estimate: $4.187 trillion).**
2. **Demographic Dividend:**
   - **Working-age population (15–59 yrs):** 64.9% by 2036.
   - **Median age:** 28.4 years, making India an attractive labor hub.
3. **Infrastructure Push:**
   - **Key initiatives:** National Infrastructure Pipeline, PM Gati Shakti, Sagarmala, Bharatmala.
   - 280+ operational SEZs, 3rd-largest domestic aviation market.
4. **Liberalized FDI Policies & Reforms:**
   - 100% FDI allowed under the automatic route in key sectors.
   - **Flagship initiatives**: Make in India, PLI scheme.
5. **Green & Renewable Investment Opportunities:**
   - $6 billion in FDI (2020–23) in renewable energy.
   - Major investments in electric mobility by Hyundai, Foxconn, etc.
6. **Healthcare & Pharma Growth:**
   - $1.5 billion FDI in FY24 in hospitals (50% of total healthcare FDI).
   - **Reforms:** 100% FDI in greenfield pharma and R&D incentives.
7. **Digital Transformation:**
   - Over 900 million internet users by 2025.
   - Digital economy contributes 11.74% to GDP (FY23).
   - Investments by **Amazon, Microsoft, and others.**
8. **Geopolitical & Strategic Advantage:**
   - Access to 3.2+ billion consumers via proximity to Asia, ME, Africa.
   - FTAs like India-UAE CEPA positioning India as a trade hub.

Major Hurdles Limiting India's FDI Potential:

1. **Regulatory Uncertainty:**
   - Delays in rules (e.g., DPDPA 2023).
   - Increased tax and ROC compliance burden in Union Budget 2025.
2. **Infrastructure Gaps:**
   - Logistics cost = 14% of GDP (vs 7–8% in developed nations).
   - Ranked 38th in World Bank's Logistics Performance Index (2023).
3. **Skilled Labor Shortage:**
   - 14–19 lakh tech professionals shortfall expected by 2026 (Nasscom-Zinnov).
   - Inadequate workforce for AI, robotics, high-end manufacturing.
4. **Geopolitical Risks:**
   - Rising tensions with neighbours (e.g., Pahalgam Attack).
   - 30% of firms cite trade/tariff policies as top concern.

5. **Land & Environmental Approvals:**
   - 700 delayed highway projects, 35% due to land acquisition issues.
6. **Competition from Other Nations:**
   - Vietnam's FDI surged 32% in H1 of 2025.
   - **Vietnam, Mexico, Bangladesh offer simpler regulations, cheaper labor.**
7. **Digital Divide:**
   - Only 67% of MSMEs are digitally equipped.
   - Limited AI, IoT, analytics adoption outside urban India.

Reform Agenda for Transforming Investment Ecosystem:

1. **Streamline Regulatory Framework:**
   - Time-bound approvals for **land, environment, and construction.**
   - Dedicated taskforces for fast-tracking projects.
2. **Strengthen Legal & Contract Enforcement:**
   - Establish special commercial courts.
   - Fast-**track dispute resolution.**
3. **Accelerate Infrastructure Development:**
   - Modernize logistics (ports, roads, rail).
   - Boost rural connectivity and create industrial corridors.
4. **Address Skill Gaps:**
   - **Sector-specific skilling in AI, biotech, robotics.**
   - PPP-based vocational education and R&D institutes.
5. **Simplify and Stabilize Tax Regime**:
   - Tax holidays, clear GST structure, and predictable policies.
   - **Robust tax dispute resolution framework.**
6. **Boost Green Investments:**
   - Green bonds, FDI liberalization, tax incentives for EVs, waste management, clean tech.
7. **Foster Innovation and Startups:**
   - Innovation hubs, angel investor-friendly policies, and VC incentives.
   - Startup zones with tax breaks and global linkage.
8. **State-Level Reforms:**
   - Investment Friendliness Index for states.
   - Decentralized reforms tailored to local challenges.
9. **Digitally Empower All Sectors:**
   - Promote cloud, blockchain, and AI beyond urban hubs.
   - Incentivize MSME digital transformation.
10. **Deepen Trade Agreements:**
    - Fast-track FTAs with EU, Canada, emerging markets.
    - Eliminate tariffs, enable supply chain diversification.

Conclusion:

India stands at a crucial juncture. While **macroeconomic and demographic fundamentals are strong, to truly emerge as a global investment destination, India must focus on structural reforms, policy stability, infrastructure modernization, and digital inclusivity.** Strategic execution of these priorities can unlock sustained FDI inflows, boost employment, and solidify India's role in the global economic order.

30. The Reality of the Changing Dimensions of Warfare

Relevance to UPSC

Mains: GS Paper 2: International Relations (changing global order, strategic alliances), **GS Paper 3:** Security (modern warfare, cyber threats, defence preparedness)

Summary of the Article

- The international order shaped by the **Peace of Westphalia and Congress of Vienna is eroding**, giving rise to new tools of dominance powered by technological innovation.
- The illusion of post-WWII peace was maintained through American military hegemony, but conflicts continued across regions—from Korea and Vietnam to North Africa.
- **Operation Desert Storm (1991**) marked a strategic shift towards high-tech warfare, featuring satellite intelligence, precision-guided missiles, and fast-strike doctrines.
- **9/11 introduced an era of "pretextual warfare",** where ideological justification and perception replaced legality. This laid the groundwork for algorithmic and digital warfare.
- **The Russia-Ukraine war (2022 onwards) and the India-Pakistan conflict (May 2025)** exemplify digitised and autonomous warfare, with:
  - Drones, loitering munitions, and AI-based surveillance playing dominant roles.
  - Integration of fighter jets, missiles (e.g., BrahMos, PL-15s), and networked AI systems shaping outcomes.
- Modern warfare is now multi-domain—spanning air, land, cyber, and space. Cyberattacks, AI targeting, and hypersonic weapons are key elements.
- **Traditional metrics of military power—troop numbers and physical control—are becoming obsolete.**

Analytical Insights for Mains

- **Machiavellian realism is re-emerging**—power today is defined by control over digital and informational realms, not just physical territory.
- India must recognise that legacy systems and external dependency are liabilities in the emerging security environment.
- **There is a pressing need for:**
  - **Indigenous development in AI, cyber, and drone technology**
  - **Modernisation of surveillance through long-endurance UAVs**
  - **Diversification of strategic platforms to prepare for potential two-front conflicts (Pakistan and China)**
- The shift to digital warfare is not just technological but strategic and civilisational, demanding a rethink of defence doctrine, procurement policy, and R&D strategy.

31. Unraveling the Roots of Left Wing Extremism (LWE) in India

Relevance to UPSC

Mains: GS Paper III: Internal Security Challenges, Linkages between Development and Extremism, Role of External State and Non-state Actors

Summary of the Article

The recent Maharashtra bill on LWE has reignited debates on the balance between security and freedom of expression. The root causes of Left Wing Extremism (LWE) lie in **socio-economic inequalities, tribal marginalization, and state neglect, rather than purely ideological factors.** While India has made significant strategic and developmental breakthroughs, the persistence of Maoist violence in some regions highlights enduring governance and welfare deficits.

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Key Breakthroughs in Combating LWE

1. Enhanced Intelligence & Counter-Terrorism Capacity

- Formation of **NIA, strengthened Special Intelligence Branches**, and 290 Maoists neutralized in 2024.
- Fortified police stations have improved operational efficiency.

2. **Strategic Military Operations**

- Operations like **Black Forest (Karreguttalu Hill, 2025)** neutralized 31 Maoists with zero casualties on the government side.
- 8,000+ Maoist surrenders in a decade.

3**. Inter-State Cooperation**

- Joint efforts by **Chhattisgarh, Jharkhand, Odisha** reduced affected districts from 126 (2013) to 38 (2024).
- Effective resource sharing and coordination.

4. **Community Peacebuilding & Civic Action Programs**

- Civic Action Programme (₹196 crore) and Tribal Youth Exchange Programs (TYEP) promoted trust and social integration.

5. **Rehabilitation of Former Maoists**

- Chhattisgarh's surrender policy offers land, jobs, vocational training, leading to successful reintegration.

6. **Targeted Development Schemes**

- **Dharti Aaba Janjatiya Gram Utkarsh Abhiyan (2024)** aims to empower 1.5 crore tribals.
- 17,000 km of roads, 7,768 telecom towers, and ₹3,563 crore under Special Central Assistance Scheme.

7. **Empowered Local Law Enforcement**

- Rise in fortified police stations from 66 (2014) to 612 (2024).
- ₹3,260 crore under Security Related Expenditure (SRE) scheme.

Key Factors Behind Persistence of LWE

1. **Socio-Economic Inequality and Tribal Marginalization**

- Only 10.7% tribal households have tap water, despite welfare schemes.

2. **Governance Deficits**

- Administrative absence in remote areas exploited by Maoists (e.g., parts of Jharkhand and Madhya Pradesh).

3. **Ideological Entrenchment and Political Alienation**

- Maoists still resonate with "**Jal, Jungle, Zameen" ideology.**
- Extortion and violence hinder development (e.g., Malkangiri cannabis extortion).

4. **Resource Exploitation and Displacement**

- Hasdeo Arand coal mining has triggered tribal backlash, aiding Maoist narratives.

5. **Poor Scheme Implementation**

- Infrastructure gaps persist despite construction targets (e.g., Madhya Pradesh and Odisha road inaccessibility).

6. **External Support Networks**

- NGO fronts and alleged links with China and Myanmar aid Maoist operations.

7. **Youth Recruitment and Guerrilla Warfare**
    - Armed wing PLGA still recruits effectively through guerrilla tactics and tribal dissatisfaction.

Recommended Measures to Dismantle LWE Roots

1. **Decentralized and Inclusive Governance**
    - Empower Panchayati Raj, local tribal leaders, and grievance redressal systems.
2. **Land Reforms and Tribal Rights**
    - Ensure Forest Rights Act implementation and secure land tenure for tribals.
3. **Rural Livelihood Generation**
    - Focus on sustainable agriculture, vocational training, and entrepreneurship for tribal youth.
4. **SMART and Community Policing**
    - **Align policing with SMART goals:** Strict and Sensitive, Modern and Mobile, Alert and Accountable, Reliable and Responsive, Tech-savvy and Trained.

5. **Ideological Counter-offensives**
    - Promote peace narratives, local influencers, and democratic participation to combat Maoist ideology.
6. **Infrastructure Acceleration**
    - Prioritize road, telecom, electricity projects in LWE zones through PPP models.
7. **Inclusive and Tribal-Sensitive Education**
    - Scale up Eklavya Model Schools, vocational institutes, and culturally rooted curriculums.
8. **Technology for Development and Security**
    - Use drones, GIS, big data, and digital platforms for scheme delivery and security.
9. **Cultural Revitalization Programs**
    - Promote tribal art, language, and heritage to counter cultural alienation by Maoists.
10. **Rural Cooperative Models**
    - Encourage tribal cooperatives for forest produce, agriculture, and handicrafts.
11. **Enhanced Border and Resource Control**
    - Cross-border security cells to monitor Maoist logistics and funding.

Conclusion

The SAMADHAN doctrine encapsulates India's approach to LWE—**Smart policing, Aggressive operations, Motivating surrender, Actionable intelligence, Developing infrastructure, Harnessing technology, Adopting government schemes, and Noteworthy coordination.**

A dual strategy of development plus security—not punitive laws alone—remains the key to eliminating the LWE threat and ensuring inclusive, sustainable peace in India's heartland.

32. India's Path to Sustainable Air Quality

Relevance to UPSC

Mains Syllabus:

GS Paper 3: Environmental pollution and degradation, Conservation, environmental impact assessment, Science and Technology – developments and their applications, Indian Economy – sustainable development

Summary of the Article

- Industrial emissions contribute significantly to air pollution, with 37% of polluted cities flanked by large industries, but only 0.6% of NCAP funds are spent on controlling industrial pollution.
- **Vehicular emissions remain one of the largest contributors**, especially in metros like Delhi where PM2.5 levels reached 108.3 µg/m³.
- Thermal power plants and industries lack pollution-control tech like Flue Gas Desulfurization (FDG), worsening emissions.
- **Crop residue burning, especially in Punjab, Haryana, and Uttar Pradesh**, causes seasonal pollution spikes.
- Residential biomass burning causes over 30% of PM2.5 emissions in cities like Kanpur and Varanasi, with 70% of air pollution deaths in rural areas.
- **Weather and geography, including temperature inversions in winter**, trap pollutants close to the ground.
- Urban waste burning adds significant PM2.5, dioxins, and furans to the air.
- Climate change intensifies pollution, with India's GHG share at 7.8% globally, causing ground-level ozone formation and heatwaves.

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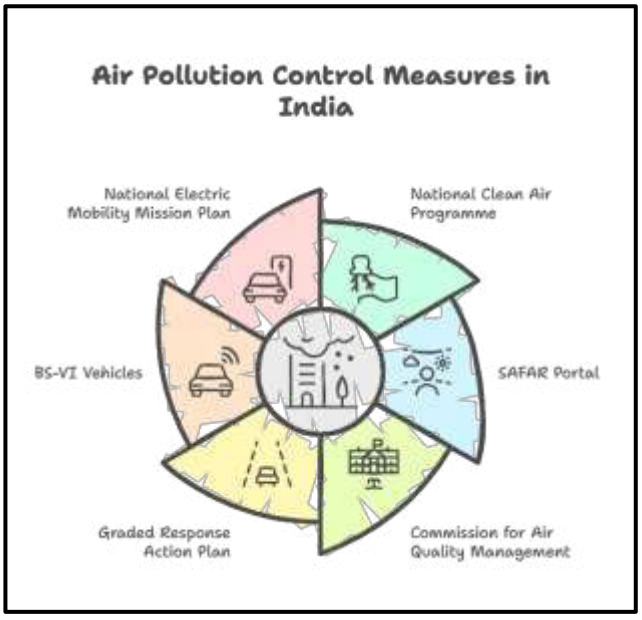
Key Issues and Gaps:

- **Weak enforcement of environmental regulations, especially for MSMEs**, stone crushers, and brick kilns.
- 28 NCAP cities lack continuous air quality monitoring, reducing effective intervention.
- **Focus remains on PM10 over PM2.**5, despite the latter being more harmful.
- Underutilization of tech like low-cost sensors, satellite data, and real-time monitoring tools.
- Reliance on short-term fixes (e.g., street sweepers) over structural reforms.



Implications:

- **Public health crisis with 2.1 million deaths in 2021,** disproportionately affecting children and rural populations.
- Economic losses are steep: $95 billion in 2019, about 1.36% of GDP.
- **Urban liveability and ecosystem health deteriorate, with implications for Article 21 (Right to Life) as interpreted by the Supreme Court.**

Tech-based Solutions:

- **WAYU air purifiers**, smog towers, photonic systems for monitoring.
- EV retrofitting, autonomous navigation tech, and ionisation-based pollution reduction.
- DST's low-cost sensors and real-time analytics for better monitoring.

Policy Recommendations:

1. Widen monitoring infrastructure using **low-cost sensors and satellite data.**

2. Waste management **should follow the circular economy model**, inspired by the Indore model.
3. **Airshed-level planning** rather than city-wise; adopt performance-based funding incentives.
4. Accelerate **EV and public transport adoption**, develop non-motorised infrastructure.
5. Retrofitting MSMEs and large industries with electrostatic precipitators and scrubbers.
6. **Phase out fossil fuel subsidies**, invest in renewables and carbon pricing mechanisms.
7. **Expand green urban spaces**, including green roofs and vertical gardens.
8. Support alternatives to crop burning, e.g., **Happy Seeder, biomass gasifiers, and biochar.**
9. Public engagement campaigns to raise awareness and encourage clean practices.

Conclusion:

India's air pollution crisis demands a **multi-pronged approach that integrates technological innovation, regulatory enforcement, and community participation**. Achieving clean air is essential for meeting SDG 3 (Good Health), SDG 11 (Sustainable Cities), and SDG 13 (Climate Action). India must strike a balance between People, Planet, and Profit, ensuring that economic growth aligns with environmental sustainability and public health.

33. Unleashing India's Entrepreneurial Spirit

Relevance to UPSC

Mains GS Paper 3: Indian Economy – Mobilization of Resources, Growth and Development

Summary of the Article

India's vast demographic dividend—**with over 65% of its population under 35—presents an opportunity for transformative economic growth**. However, to capitalise on this, India must foster a culture of mass entrepreneurship rather than relying solely on job creation. While the Draft National Skill Policy 2025 lays a strong groundwork for skilling, complementary support systems are essential to enable local enterprise development.

Present State of India's Entrepreneurship Ecosystem

- India has the **3rd largest startup base** globally with 1.57 lakh DPIIT-recognised startups (up from 502 in 2016).
- Over **51% startups now come from Tier II and III cities, not just metros.**
- **Fintech is booming**, with India ranking 2nd globally in adoption (~87%), and projected to hit $420 billion valuation by 2029.
- **AI-driven innovation is rising — 70% of startups use AI, particularly in healthcare, edtech, and retail**.
- States like **UP, Assam, Gujarat, and Delhi** are launching targeted startup policies and VC funds (e.g., ₹400 crore fund in Delhi's Draft Industrial Policy 2025–35).
- Non-tech entrepreneurship is rising – agripreneurs and artisans using digital platforms (e.g., DeHaat, KisanKonnect).
- **Rise of solopreneurs and creator economy** – over 2 to 2.5 million active digital creators monetising content and expertise without formal teams or VC backing.

Key Impediments to Entrepreneurship

- **Inadequate job creation**: India needs 90 million non-farm jobs by 2030.
- **Capital access remains skewed**, particularly for women, SC/ST, and PwDs (e.g., 79% of Mudra loans for women are in the smallest Shishu category).
- **Digital divide**: Only 24% rural households have internet, vs 66% urban.

- **Weak support in rural areas**: Despite 3rd largest startup base, many districts lack access to incubators, mentors, or capital.
- **Female LFPR is low**: Though improved to 31.7% (2023–24), only 15.9% have salaried jobs.
- **Innovation-commercialisation gap:** Only 560 patents were reported as "working" in 2022–23, down from over 16,000 in 2019–20.
- **Weak implementation of entrepreneurship schemes**: E.g., only 18% of 13.7 million PMKVY trainees placed in jobs.
- Societal mindset favors secure jobs, especially in rural India, discouraging entrepreneurial risk-taking.

Key Government Initiatives: Startup India Initiative, Startup India Seed Fund Scheme (SISFS), Fund of Funds for Startups (FFS), Atal Innovation Mission (AIM), BHASKAR Registry, MAARG Portal, SAMRIDH Scheme

Reforms Needed

1. **National Entrepreneurship Mission**
   - Umbrella framework connecting **Skill India, AIM, and district-level initiatives, aligned with Aspirational Districts Programme (ADP).**
   - **Example: GAME-NITI Aayog pilot in Nagpur, Visakhapatnam, and districts in UP.**
2. '**Entrepreneurship for Bharat' Strategy**
   - Focus on rural, Tier II/III areas with better digital infrastructure, financial inclusion, and platform access (UPI, ONDC).
   - Initiatives like "**Shark Roots"** can showcase grassroots innovations.
   - Learn from global models like **Desa Brilian (Indonesia), Start-up Chile.**
3. **Support for Underserved Groups**
   - Tailored skilling for PwDs, women, NEETs, focusing on finance, marketing, digital access.
   - AI-driven multilingual content via BHASHINI and remote mentorship networks.
4. **Gender-Targeted Entrepreneurship Support**
   - Expand PMKVY, WEP, and savings schemes with women-specific modules.
   - **Promote women role models (e.g., Kiran Mazumdar-Shaw, Falguni Nayar).**
5. **Entrepreneurship Curriculum in Higher Education**
   - Integrate idea validation, financial literacy, and business planning in colleges.
   - Promote entrepreneurship as a respectable alternative to salaried jobs.
   - Expand programs like **Jagriti Yatra for inclusion and awareness.**
6. **Simplify Exit and Re-entry**
   - Reform insolvency laws, remove stigmas around failure, allow re-entry for failed startups.
7. **Startup Procurement Reform**
   - Mandate government procurement from startups in sectors like health, education, and rural development.
   - Prioritise women, youth, SC/ST entrepreneurs to enhance confidence and market linkage.

Analytical Insights for Mains

- **Linking entrepreneurship to demographic dividend** is key for sustainable development.
- **Inclusive entrepreneurship needs infrastructure, capital, mentoring, and mindset shifts**.
- Addressing regional disparities and gender gaps in entrepreneurship will lead to more equitable growth.
- **Reformative, bottom-up entrepreneurship policies** can help India evolve from a startup hub to a mass enterprise nation.
- India's approach must move from event-based to ecosystem-based entrepreneurship development.

34. India-China Water Tensions – The Brahmaputra Factor

Relevance to UPSC

Mains: GS Paper 2: International Relations, Bilateral Issues with Neighbours, India-China Relations, **GS Paper 3:** Disaster Management, Environmental Conservation, Water Resources, **GS Paper 1 (Geography):** River systems, water resource management

Summary of the Article

China's plan to construct a massive hydropower project on **the Yarlung Tsangpo (Brahmaputra) just 30 km from the Indian border in Medog County poses strategic, ecological, and humanitarian challenges for India**. As the Brahmaputra holds immense value for India's water security, hydropower, agriculture, biodiversity, and strategic interests, such unilateral moves by China could disrupt regional stability, transboundary governance, and ecosystem sustainability.

Despite having mechanisms like the Expert Level Mechanism (2006) and data-sharing arrangements (which expired in June 2023), there is no formal treaty between the two countries on Brahmaputra water-sharing. **India's lack of a legally binding water-sharing framework with China complicates its ability to respond effectively.**

Analytical Insights for Mains

1. Significance of the Brahmaputra for India

- **Water Security & Agriculture:**
  - Lifeline for northeastern states like Assam and Arunachal Pradesh
  - Supports **irrigation, drinking water, and industrial use**
  - Assam's tea industry, one of the world's largest, depends on its ecology
  - Seasonal flooding is crucial for agricultural productivity
- **Hydropower Potential:**
  - **Major projects:** Lower Subansiri, Dibang, Kameng, Ranganadi
  - The Subansiri project alone is expected to generate 2,000 MW
  - **Upper Siang Project (planned):** 11,000 MW
- **Ecological & Biodiversity Significance:**
  - Home to Kaziranga, Manas, and Majuli Island
  - Supports Gangetic dolphins, migratory birds, wetlands
  - Dynamic flow sustains unique floodplain ecosystems
- **Strategic and Geopolitical Value:**
  - A transboundary river linking India and China
  - Enhances the river's role in India-China military-diplomatic rivalry
  - Climate change on the Tibetan Plateau intensifies disputes
- **Transport & Connectivity:**
  - **National Waterway 2 (Dhubri to Sadiya)** boosts inland transport
  - Riverine routes reduce dependence on overland connectivity

2. Potential Impacts of China's Dam Project

- **Environmental & Ecological Risks:**
  - Alters natural flow; Tibet contributes 25–35% to Siang waters
  - Cascade reservoirs threaten fisheries and aquatic life
  - **Past precedent**: 2000 Siang flood due to upstream landslide
  - Mekong River example shows risks of Chinese dam cascades

- **Geological & Seismic Concerns:**
  - Medog County lies in Seismic Zone V (very high risk)
  - Presence of **Medog Fault and Himalayan Frontal Thrust**
  - Risk of earthquake-induced floods from poor engineering
  - **Reference:** Structural flaws in China's Neelum-Jhelum project
- **Impact on India's Hydro-Energy Strategy:**
  - Reduces downstream hydro potential for India
  - May trigger a hydrological arms race in the region
  - Local resistance to Indian dam projects also rising
- **Socio-Economic and Security Risks:**
  - Risk of **large-scale displacement in Assam and Arunachal Pradesh**
  - **Majuli Island already lost 40% of its landmass**
  - May trigger migration from Bangladesh during floods
  - Could worsen internal security in NE states due to unrest
- **Setback to Diplomatic Engagement:**
  - Undermines revival of India-China people-to-people ties
  - Could jeopardize initiatives like Kailash Mansarovar Yatra revival

3. Measures India Can Take to Safeguard Its Interests

- **Strengthen Joint Rivers Commission (JRC):**
  - Expand to include China
  - Use **India-Bangladesh Ganges Treaty as a model**
  - Push for a treaty-based mechanism like the Indus Waters Treaty
- **Enhance Domestic Preparedness:**
  - Invest in hydrological monitoring, remote sensing
  - Use models like the **Tehri Dam for flood control**
  - Support inter-basin water transfer (e.g., Brahmaputra-Ganga link)
- **Strategic Infrastructure as Deterrence:**
  - Accelerate Upper Siang, Dibang Valley projects
  - Use non-provocative projects as signalling mechanisms
  - Assert first-use riparian rights through downstream infrastructure
- **Foster Downstream Regional Cooperation:**
  - Partner with Bangladesh, Bhutan, Nepal
  - Focus on **joint flood modelling and disaster coordination**
  - Build a lower riparian coalition for diplomatic leverage
- **Leverage Environmental NGOs and Global Forums:**
  - Collaborate with groups like International Rivers, Wetlands International
  - Advocate for rules-based ecological governance
  - Promote alignment with SDG 6, UN Watercourses Convention
- **Build Long-Term Water Resilience:**
  - Reduce dependency on transboundary rivers
  - Invest in **rainwater harvesting, desalination, efficient irrigation**
  - Explore models like Israel's water conservation techniques

Conclusion

India must adopt a **multi-pronged approach blending strategic signalling, environmental prudence, and cooperative diplomacy to counter China's assertive moves on the Brahmaputra**. Investing in infrastructure, technology, and regional alliances can help India uphold its sovereign interests, secure livelihoods, **and promote a rules-based river governance regime**. Upholding principles like equitable use, no significant harm, and intergenerational equity can transform this challenge into a driver for regional peace and sustainable growth.

35. New GDP, IIP, and CPI Base Year Series to Boost Accuracy of Country's Economic Data

Relevance to UPSC:

Prelims:

Mains: GS Paper III: Indian Economy – Growth & Development, Government Budgeting, Inclusive Growth, Changes in Industrial Policy

Summary of the Article:

The **Ministry of Statistics and Programme Implementation (MoSPI) will release a new GDP series with 2022–23 as the base year in February 2026,** followed by revised IIP (from April 2026) and CPI (FY 2026–27) series. These updates aim to enhance accuracy, timeliness, and representativeness of India's core economic indicators in light of post-pandemic economic shifts and digital transformation.

Analytical Insights for Mains:

1. **New GDP Series (Base Year 2022–23):**
   - **Key Enhancements:**
     - Use of GST data for indirect tax estimates
     - UPI transaction data from NPCI
     - **E-Vahan portal for vehicle registrations**
     - Administrative records from MCA-21, RBI, and CGA
   - **Impact:** Better coverage of informal sector, increased use of real-time administrative data
2. **Revised IIP Series (Base Year 2022–23):**
   - Reflects changes in manufacturing structure, technology, and industrial output.
   - The 2011–12 base is outdated due to structural and technological shifts.
3. **Updated CPI Series (Base Year 2024):**
   - Captures post-COVID household consumption patterns.
   - **Innovative data sources:**
     - Online airfare and rail fare data
     - OTT subscription prices
     - E-commerce scanner data and web scraping
     - Fuel prices from administrative sources
4. **Enhancing Statistical Accuracy:**
   - Shift towards technology-enabled, high-frequency, and diversified datasets
   - **Key innovations:**
     - Web scraping and online surveillance for price data
     - GSTN-aligned survey frames for better coverage of services sector
     - NPCI collaboration for real-time digital transaction tracking
5. **Launch of New Statistical Surveys:**

- **National Household Travel Survey (NHTS) –** Tracks travel behavior, price elasticity, supports transport policy.

- **Domestic Tourism Expenditure Survey (DTES)** – Captures household spending and travel patterns.
- **Annual Survey of Service Sector Enterprises (ASSSE**) – Analogous to ASI; covers formal services sector, employment, and regional diversity. Uses GSTN database for robust sample design.

Implications:

- Evidence-based policymaking through high-quality real-time data
- Enhanced global credibility of Indian statistics
- Informed private investment decisions
- Improved **understanding of informal and digital economy**
- Alignment with international best practices (e.g., 3-year cycle for Household Consumption Expenditure Survey)

36. Flash Floods in India: Rising Threats, Deepening Impact

Relevance to UPSC

Mains (GS Paper 1, 3): GS1: Geographical features and their effects; changes in critical geographical features (water-bodies, etc.), **GS3: Disaster** Management; Environment and Climate Change

Summary of the Article

- Flash floods are **increasingly frequent and destructive in India, with** recent events in Himachal Pradesh (2025), Wayanad (2024), Ladakh (2024), and Sikkim (2023) highlighting their deadly impact.
- As per the **Union Jal Shakti Ministry, such events rose from 132 in 2020 to 184 in 2022**, mainly driven by extreme rainfall due to global warming.
- A study by IIT Gandhinagar, published in Nature Hazards, **maps flash flood hotspots across Indian river basins using hydrological and geomorphological indicators.**
- The study emphasizes that flash floods are not caused by rainfall alone—75% occur due to extreme rainfall over already saturated soil.
- The **Himalayas, West Coast, and Central India emerge as the most vulnerable regions:**
  - In the Himalayas, steep slopes and elevation are the main drivers.
  - In the West Coast and Central India, the high "flashiness" or quick runoff response is key.
- **Climate change is intensifying the threat by increasing the frequency and intensity of extreme rainfall events,** especially during monsoon and pre-monsoon seasons.
- Alarmingly, previously low-risk sub-basins are witnessing rising flash flood events, while some traditional hotspots are experiencing reduced wet hours.
- The **study stresses the need for region-specific mitigation, early warning systems, climate-resilient infrastructure, and integrated flood management.**

Analytical Insights for Mains

- **Interlinking Flash Floods with Climate Change**: The rise in flash floods demonstrates the clear linkage between global warming and hydrological disasters, demanding integration of climate adaptation into national disaster policies.
- **Shift in Vulnerability Zones**: New areas becoming flood-prone calls for dynamic flood mapping and flexible planning, rather than relying on traditional hazard zones.
- **Regional Specificity in Response**: A "one-size-fits-all" flood management approach is ineffective. Local topography, soil conditions, and rainfall patterns must guide planning.

- **Governance and Institutional Response**: Strengthening the State Disaster Response Forces (SDRFs), investing in community-based disaster risk reduction, and mainstreaming flood resilience in infrastructure planning are critical.
- **Urban Planning Reform**: Many flash floods have urban dimensions (poor drainage, land-use violations), necessitating urban flood management frameworks in **Smart City and AMRUT policies.**

37. India Rethinks China Blockade to Boost Tech Manufacturing

Relevance to UPSC

Mains GS Paper 2: International Relations (India–China Bilateral Issues), **GS Paper 3:** Indian Economy (FDI, Industrial Growth, Manufacturing Sector), Science and Technology (Electronics, Supply Chains), Internal Security (Critical Technology Dependencies)

Summary of the Article

Introduction

- India is reconsidering its **post-Galwan blockade on Chinese investments to boost domestic electronics manufacturing and deepen integration into global supply chains.**
- This shift is driven by the critical role of Chinese firms in supplying upstream components essential for India's electronics sector.

Background of the Blockade

- In April 2020, through Press Note 3, India mandated government approval for FDI from countries sharing land borders (especially targeting China).
- It **aimed to prevent opportunistic takeovers during the pandemic and retaliate against Chinese aggression.**
- The policy excluded Chinese firms from sectors like telecom, electronics, and infrastructure, even as PLI schemes accelerated domestic electronics assembly.

Emerging Signs of Policy Recalibration

- India is now **adopting a pragmatic stance due to limited domestic capacity for advanced components.**
- **Key developments include:**
  - **Dixon Technologies–Longcheer** JV approved by Ministry of Electronics & IT to produce smartphones, wearables, auto electronics, etc.
  - NITI Aayog's recommendation to ease FDI norms for Chinese firms to improve export competitiveness.
  - Economic Survey 2023–24 signaled need to revisit restrictions due to Chinese firms' integral supply chain roles.

Structural Dependency on Chinese Components

- In FY **2023–24, India imported $12 billion worth of electronic components from China and $6 billion from Hong Kong — over 50% of total component imports.**
- Despite excluding finished Chinese products, India is highly dependent on upstream components for its booming electronics sector.

Policy Drivers Behind the Rethink

1. **Manufacturing Ambitions:**
   - India's Rs. 23,000 crore scheme for components manufacturing requires foreign collaboration, where Chinese technical capabilities are still unmatched.
2. **Global Supply Chain Realignment:**

- The China+1 strategy, U.S.–China trade war, and post-COVID shifts offer India an opening — but it must integrate deeper into global value chains, many of which still involve China.

3. **Geopolitical Pragmatism:**
   - India has resumed Chinese visas, and diplomatic visits (like EAM Jaishankar's) emphasize that competition must not escalate to conflict.

Challenges and Repercussions

- **China has retaliated by:**
  - Withdrawing technical personnel
  - Restricting export of rare earths and magnets, vital for electronics
- Indian firms face import hurdles for capital goods from China.
- Chinese firms face delays and scrutiny under Indian security norms.
- The core challenge: **balancing strategic autonomy vs manufacturing dependency.**

Analytical Insights for Mains

- **India's geo-economic realism reflects a shift from security maximalism to economic pragmatism**, crucial for achieving its 5-trillion-dollar economy goal.
- The **China+1 opportunity** can only be seized if India ensures supply chain stability, even if it involves calibrated engagement with China.
- **India's PLI schemes and semiconductor mission depend on robust access to global inputs**, making selective de-risking more practical than decoupling.
- There is a need for clear and consistent FDI policy, which distinguishes strategic security sectors from commercial manufacturing.

PRELIMS BOOSTER & PIB (THE HINDU & INDIAN EXPRESS)

1ST JULY

1. Football for Schools (F4S) Programme

Launched by **FIFA in collaboration with UNESCO** to promote education, development, and empowerment of youth through football. **Targets 700 million children globally**, promoting inclusivity for both boys and girls. **Integrates football into school curricula to teach life skills and support UN SDGs**. Aligned with **UNESCO's Kazan Action Plan, Incheon Declaration, and WHO's GAPPA**. Started in 2019 with pilot projects in Puerto Rico and Lebanon. **Implemented in India by DoSEL**, supported by AIFF and SAI.

2. GoIStats App

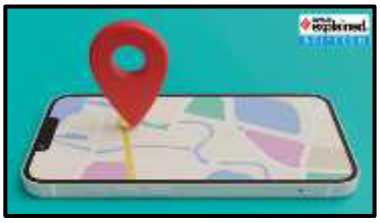
GoIStats App is a **mobile application developed by NSO** to provide seamless access to official data. "**Key Trends**" dashboard displays socio-economic indicators with dynamic visualizations. "**Products" section offers one-click CSV downloads from NSO's database**. Advanced filtering, search, and mobile-optimized data tables are included. Visual data storytelling with **infographics, interactive charts, and social sharing features enhance data literacy**. Access to NSO reports with instant downloads and regular updates via app notifications.

3. Trachoma

Trachoma is a **bacterial eye infection caused by Chlamydia trachomatis** and can lead to irreversible blindness if untreated. It spreads through contact with infected eye, nose, or throat secretions, especially in poor environmental conditions. **WHO classifies it as a Neglected Tropical Disease affecting 150 million globally.**

India launched the National Trachoma Control Program in 1963, later integrated into NPCB. **India was declared free from infectious trachoma in 2017**; surveillance continued till 2024. The **SAFE strategy (Surgery, Antibiotics, Facial cleanliness, Environmental improvement)** is WHO's approach to eliminate trachoma.

4. GPS interference



GPS interference includes **jamming and spoofing, both disrupting navigation systems.** Jamming uses strong signals to block GPS reception, preventing location/time detection. **Spoofing deceives receivers with false GPS signals, misguiding navigation.** Spoofing misleads, while jamming disrupts entirely. **Both civilian and military systems are vulnerable, even without direct targeting**. Not all interference is malicious; causes include solar flares, atmospheric disturbances, and nearby electronics. Nations with electronic warfare capabilities are often behind intentional interference.

5. Similipal Tiger Reserve (STR)

Similipal Tiger Reserve (STR) is **located in Mayurbhanj District, Odisha, within the Deccan Peninsular Biogeographic Zo**ne. It covers 2750 sq.km with waterfalls like Joranda and Barehipani. **Part of the Mayurbhanj Elephant Reserve, it includes Hadgarh and Kuldiha Sanctuaries**. Declared a **Tiger Reserve in 1956, it was included under Project Tiger in 1973 and became a UNESCO Biosphere Reserve in 2009**. Drained by 12 rivers; major ones include Burhabalanga and Deo. Dominated by Sal forests, it hosts tigers, elephants, leopards, and tribes like Santhala and Mankadia.

2ND JULY

1. Mud Volcano

Mud volcanoes are **cone-shaped formations made of mud, clay, and hot water, often just a few meters tall**. Formed by gas and hot water eruptions, similar to lava fountains in magmatic volcanoes. Craters erupt intermittently, rebuilding cones that erode easily. **Gases released include methane, CO_2, and nitrogen; liquids are often acidic or salty**. Found on land and sea floors, they can alter coastlines. ~1,000 exist worldwide, **notably in Azerbaijan, Pakistan, Indonesia, and Trinidad.**

2. Financial Stability Report

Released biannually by RBI, reflecting FSDC Sub-Committee's risk assessment. Indian economy is resilient, driving global growth with sound fundamentals.

Downside risks: Geopolitical tensions, trade disruptions, climate-related uncertainty. GNPA at 2.3% (March 2025), may rise to 2.6% by March 2027. Banks' capital adequacy remains strong, even under stress tests. NBFCs show robust health with capital buffers and improved asset quality. Food inflation outlook is favorable, supported by record crop output.

3. Space-Based Surveillance-III (SBS-III) Programme

Total of 52 satellites: 21 by ISRO, 31 by private firms. ₹26,968 crore project, to be completed by 2029. **First launch expected by April 2026.** Enhances surveillance over China, Pakistan & IOR with AI-enabled, interlinked satellites. **Operates in LEO & GEO to counter China's anti-satellite threats**. DSA under IDS leads the project, coordinating with ISRO, DRDO & armed forces. Involves SSLV tech transfer to private players for rapid launches.

4. India Energy Stack (IES)

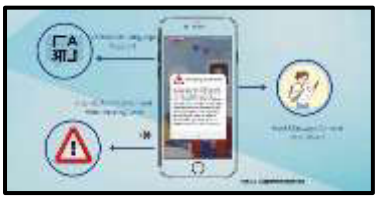
India Energy Stack (IES) is a **Digital Public Infrastructure for the energy sector, initiated by the Ministry of Power.** It aims to build a secure, standardised, and interoperable digital platform for managing the electricity value chain.

Key features include:

- Unique IDs for consumers, assets, and transactions
- **Real-time, consent-based data sharing**
- **Open APIs for integration**
- Consumer tools for empowerment and innovation

- A 12-month Proof of Concept (PoC) and Utility Intelligence Platform (UIP) will be piloted.
- A Task Force will guide development and scale-up.

5. Cell Broadcasting System



Cell Broadcasting (CB) is a mobile technology used to send text alerts to all users in a specific area, especially during emergencies. **Developed indigenously by C-DOT and currently under testing in India**. It enables instant alerts even on congested networks, unlike SMS. **CB complements the existing Integrated Alert System (SACHET), which uses the Common Alerting Protocol (CAP)** and has delivered billions of messages. **CB messages will be multilingual, ensuring inclusive, rapid disaster communication across India.**

3 JULY

1. Central Adoption Resource Authority (CARA)

Central Adoption Resource Authority (CARA) is a **statutory body under the Ministry of Women & Child Development, established under Section 68 of the Juvenile Justice (Care and Protection of Children) Act, 2015**. It is the nodal body for in-country and inter-country adoptions of Indian children. **Designated as the Central Authority under the Hague Convention on Protection of Children and Co-operation in Respect of Intercountry Adoption (1993), ratified by India in 2003**. Handles adoption of orphaned, abandoned, and surrendered children. Maintains centralised adoption databases and issues No Objection Certificates (NOC) and Conformity Certificates. **Monitors and supports State Adoption Resource Agencies (SARAs), Specialised Adoption Agencies (SAAs), Child Welfare Committees (CWCs), District Child Protection Units (DCPUs),** and Authorised Foreign Adoption Agencies (AFAAs). Engages in awareness, training, counselling, and research to promote adoption.

2. Bond yield

A bond is a **loan from an investor to a borrower, with regular interest payments and a fixed maturity period.** Bond yield is the expected annual return for the investor and is influenced by coupon payments and market price.

Bond Yield = Coupon Amount / Market Price

Bond prices and yields move in opposite directions—if bond prices rise, yields fall, and vice versa. Interest rate fluctuations affect bond prices; falling rates increase old bond prices (higher coupons), and rising rates lower them. Bond yield may differ from the coupon rate depending on the market price.

3. Darknet

Darknet is a **hidden segment of the internet accessible only through specialized protocols like Tor.** Tor (The Onion Router) enables anonymous communication using onion routing, which masks users' IPs. **The dark web refers to content hosted on darknet networks.**

Darknet ≠ Deep Web: The deep web includes unindexed content still accessible via regular browsers. Darknet hosts intentionally hidden content, often for privacy or censorship resistance. It also **enables F2F (friend-to-friend) secure communications. Darknet is linked to both privacy tools and illegal activities.**

4. Microcrystalline Cellulose (MCC)

Microcrystalline Cellulose (MCC) is a free-flowing, purified cellulose powder derived from refined wood pulp. It is **chemically inert, non-digestible, and non-toxic.** Crystalline structure arises from its tightly packed cellulose microfibres and strong hydrogen bonds. High plasticity during compression gives it excellent binding properties. **Used as a binder, texturizer, emulsifier, and bulking agent in pharmaceuticals and food.**

Key application: Tablet and vitamin supplement production for uniformity and active ingredient delivery.

5. RailOne App

Developed by CRIS, a Railways' PSU, as a unified super app for all railway services. **Integrates features of IRCTC, UTSonMobile, Rail Madad, NTES, and Food on Track.** Offers ticket booking (reserved/unreserved), live train tracking, PNR status, food ordering, and refund tracking. Single sign-on using IRCTC/UTS credentials; multilingual support. **Secure payments via Indian Railways' R-Wallet. Coach position finder and Rail Madad complaint integration included.** IRCTC-authorised app, easing access to railway services in one platform.

4 JULY

1. Santhal Rebellion

The **Santhal Rebellion (Hul) began in 1855, two years before the 1857 revolt,** as an organized tribal uprising against British colonial oppression. **Led by Sidhu and Kanhu, along with Chand, Bairab, and sisters Phulo and Jhano Murmu**, the rebellion mobilized 10,000 people using the Dharwak sal leaf messaging system. **It erupted in Damin-i-Koh (Rajmahal Hills) where Santhals faced land alienation and bonded labour despite settlement promises**. Crushed by 1856, the British used modern arms and elephants. **Santhals were agrarian, followed animism, and had a clan-based society.**

2. Volume Weighted Average Price (VWAP)

VWAP is the **average stock price weighted by volume, calculated intraday**.

Formula: VWAP = (Typical Price × Volume) / Cumulative Volume; Typical Price = (High + Low + Close) / 3

Used to assess market trend and decide entry/exit points.

Above VWAP = uptrend, below = downtrend.

Pros: Aids algorithmic trading, improves liquidity, lowers costs, avoids price inflation in bulk trades.

Cons: Lagging indicator due to large data volume; mostly used with 1- or 5-minute charts.

3. Namdapha National Park & Tiger Reserve

Namdapha National Park & Tiger Reserve is located in Changlang District, Arunachal Pradesh, along the India-Myanmar border. Covers 1985.23 sq.km and lies at the Indo-China and Indian subcontinent biogeographic junction. **Bounded by Dapha Bum ridge and Patkai Ranges; adjacent to Kamlang Wildlife Sanctuary. Namdapha River, a tributary of Noa-Dihing, flows through it**. Vegetation includes tropical evergreen to alpine scrub forests.

Home to four big cats: Tiger, Leopard, Snow Leopard, Clouded Leopard.

Notable flora: Blue Vanda, Mishimi Teeta, Pinus Merkusi. White-Eared Night Heron (Oroanassa magnifica): Endangered, found in China & Vietnam, nocturnal and secretive.

4. Genome

A genome is the **complete set of genetic instructions in an organism**. In humans, it includes nuclear and mitochondrial DNA (3.2 billion base pairs). **Genes are segments of DNA located within chromosomes, influencing traits.** DNA is composed of four bases: **adenine, thymine, cytosine, and guanine**, arranged in a double helix. **Humans have 23 chromosome pairs; sequenced in the Human Genome Project (1990–2003).** Eukaryotic genomes are in the nucleus; prokaryotic in the nucleoid. Red blood cells lack a genome; gametes have half the DNA. Genome size varies; **Paris japonica has the largest known genome.**

5. Kariyachalli Island

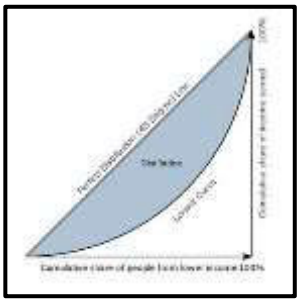
Kariyachalli Island is **part of the Gulf of Mannar Marine National Park, located between Rameshwaram and Thoothukudi**. It is one of India's ecologically sensitive marine zones, featuring coral reefs, beaches, sand dunes, and seagrass meadows**. The island's landmass has shrunk by over 70% since 1969, primarily due to erosion, sea-level rise, and coral degradation**. It may submerge by 2036. **TNSHORE project (starting August 2025) aims to restore coral reefs and seagrass beds to protect the island.**

7 JULY

1. Alluri Sitaram Raju

Born on 4th July 1897 in Bhimavaram, Andhra Pradesh. **Led the Rampa Rebellion (1922) against British oppression of Adivasis** under the Madras Forest Act, 1882. Used **guerrilla tactics** in the forested regions of East Godavari and Visakhapatnam. Known as **"Manyam Veerudu" (Hero of the Jungle).** Adopted Non-cooperation movement elements to mobilize tribal support. Captured and executed on 7 May 1924 at Koyyuru. **Acknowledged by the British as a skilled guerrilla strategist.**

2. Gini Index



The Gini Index **measures income or wealth inequality within a population, ranging from 0 (perfect equality) to 1 (perfect inequality)**. Developed by **Corrado Gini in 1912, it's derived from the Lorenz curve**, which compares cumulative income against population percentiles**. It doesn't measure absolute income, only income distribution**. According to the World Bank, **India's Gini Index is 25.5, making it the fourth most**

equal country globally, ahead of China (35.7) and all G7/G20 nations. India improved from 8 in 2011 to 25.5 in 2022.

3. Tokara Islands

Tokara Islands, also known as T**oshima Islands, are a small archipelago in southern Japan**, located south of Kyushu and north of the Amami Islands. Over 1,000 earthquakes have struck the region in two weeks, highlighting its high seismic activity. Toshima-mura includes 7 inhabited and 5 uninhabited islands; **Nakanoshima is the largest and most populated. Mount Otake on Nakanoshima is the highest peak at 979 meters.** The islands lie in a subtropical-temperate zone, with 20°C average temperature and 2,700 mm annual rainfall.

4. Green Climate Fund (GCF)

Green Climate Fund (GCF) is the **world's largest dedicated climate fund, established at COP 16 in Cancun (2010**). It is an operating entity under the UNFCCC financial mechanism. Supports developing countries in achieving NDCs and climate-resilient pathways. **Follows a country-driven, partnership-based approach**. Mandated to allocate 50% funds each to mitigation and adaptation, with half of adaptation funds for SIDS, LDCs, and African States. **Legally independent, with a secretariat in Songdo, South Korea, operational since 2013.**

5. "3 by 35" initiative

WHO launched the "3 by 35" initiative to promote higher health taxes. It urges countries to raise real prices of tobacco, alcohol, and sugary drinks by at least 50% by 2035.

Goal: Mobilize US $1 trillion over the next 10 years. Aims to reduce harmful consumption, improve public health, and generate revenue.

Key actions:

- Mobilize countries through **political engagement and recognition.**
- Support **country-led policies with evidence-based guidance.**
- Build partnerships to shift public perception and strengthen civil society roles.

8 JULY

1. National Commission for Minorities (NCM)

Statutory body under the Ministry of Minority Affairs, established by the NCM Act, 1992. Formed originally in 1978 as Minorities Commission; became statutory in 1992.

Six religious communities recognized as minorities: **Muslims, Christians, Sikhs, Buddhists, Parsis, and Jains.**

Constitutes Chairperson, Vice Chairperson, and 5 members, all from minority communities, appointed for 3 years. Advises government, monitors safeguards, investigates complaints, and recommends measures for minority welfare and development.

2. Atomic Energy Regulatory Board

Atomic Energy Regulatory Board (AERB) was **constituted on 15 November 1983 under the Atomic Energy Act, 1962.** It regulates nuclear and radiation safety in India. Regulatory powers stem from the Atomic Energy Act and the Environment (Protection) Act, 1986.

Mission: Ensure safe use of ionizing radiation and nuclear energy.

Administers industrial safety under the Factories Act for DAE units. **Headquartered in Mumbai with RRCs in Kolkata, Chennai, and New Delhi**. Safety Research Institute (SRI) located in Kalpakkam, Tamil Nadu. **AERB license is mandatory for radiation and nuclear activities.**

3. Satkosia Tiger Reserve

Satkosia Tiger Reserve is **located in Odisha, spanning Angul, Cuttack, Boudh, and Nayagarh districts**. Formed by Satkosia Gorge and Baisipalli Sanctuaries, covering 1136.7 sq.km including 440.26 sq.km buffer. **Lies within the Mahanadi Elephant Reserve and at the confluence of Deccan Peninsula and Eastern Ghats biogeographic regions**. Terrain is hilly, with the Mahanadi river flowing through it.

Vegetation: Tropical moist deciduous and sal forests.

Fauna: Includes tiger, elephant, leopard, sloth bear, and endangered gharial and freshwater crocodile.

4. International Treaty on Plant Genetic Resources for Food and Agriculture

Adopted in **2001 by the FAO Conference**. Recognizes farmers' contribution to crop diversity. **Establishes a global system for access to plant genetic resources.** Ensures benefit-sharing from use of genetic materials. **Facilitates cross-border sharing through a Multilateral System (MLS).** Supports developing countries via the Benefit-sharing Fund (BSF). **Aims to conserve, manage and use plant genetic resources to improve food security and climate resilience.**

5. National Biobank

The National Biobank is **part of the Phenome India Project, aiming to build a nationwide health database.** It will track 10,000 individuals across India over several years, capturing genomic, lifestyle, and clinical data. **The project is designed to reflect India's geographic, ethnic, and socio-economic diversity.** Launched under the CSIR's Phenome India-CSIR Health Cohort Knowledgebase (PI-CheCK) on December 7, 2023.

Focus: Cardio-metabolic diseases like diabetes, liver, and heart ailments.

Participants include **CSIR employees, pensioners, and their spouses across 17 states and 24 cities.**

Expected outcomes: early diagnosis, precision therapies, and understanding gene-environment interactions.

9 JULY

1. Tiruchendur Subramanya Swamy Temple

Tiruchendur Subramanya Swamy Temple is **dedicated to Lord Murugan and located in Thoothukudi district, Tamil Nadu**. It is one of the six sacred abodes of Lord Murugan, and the only one situated along the seashore. Faces the Bay of Bengal, built with red sandstone, showcasing Tamil architecture over 2000 years. **Unique west-facing RajaGopuram (138 feet, 9 tiers, 9 Kalasams),** due to the sea on the eastern side. **Features mandapams, carved pillars, long streets, and small shrines.**

2. National Overseas Scholarship (NOS) Scheme

Central Sector Scheme under **the Ministry of Social Justice & Empowerment**. Aims to support low-income students from marginalized communities (SCs, Denotified Nomadic & Semi-Nomadic Tribes, Landless Agricultural Labourers, Traditional Artisans). **Provides financial assistance for Master's and Ph.D. courses abroad**. 125 fresh candidates selected per year (subject to funds), including: **115 for SCs, 6 for Denotified Tribes, and 4 for Labourers/Artisans. 30% of slots reserved for female candidates.**

Eligibility Criteria:

- Age below 35 years as of 1st April of the selection year.
- Unconditional offer from a government-accredited foreign university.
- **Minimum 60% marks in the qualifying examination.**
- **Family income** ≤ ₹8 lakh per annum.

Exclusions:

- Bachelor's-level courses not covered.
- No more than two children from the same family eligible.
- Candidates already studying/have studied abroad on any scholarship or self-funding are not eligible.
- No **scholarship for pursuing the same level of course already completed.**

3. Ancient City of Penico

Peñico is a **newly discovered 3,500-year-old ancient city in Peru**, dating back to 1800–1500 BC. Located 200 km north of Lima in Barranca province, it sits 600m above sea level. **Peñico is a cultural continuation of the Caral civilization (3000 BC),** the oldest in the Americas. Archaeologists uncovered 18 structures, including temples and plazas with reliefs of pututu (conch shell trumpet). **Artifacts include clay sculptures, ceremonial items, and seashell necklaces. It likely served as a key trade hub between the coast, Andes, and Amazon.**

4. North Eastern Region District SDG Index

The second edition (2023–24) of the NER District SDG Index was **released by NITI Aayog and MoDoNER, with UNDP's support.** It covers 121 districts across 8 North Eastern states, based on NITI Aayog's SDG India Index methodology. **Districts are ranked as Achiever (100), Front Runner (65–99), Performer (50–64), Aspirant (<50).**

Hnahthial (Mizoram) scored highest (81.43); Longding (Arunachal Pradesh) scored lowest (58.71).

All districts in **Mizoram, Sikkim, and Tripura are Front Runners.**

Sikkim shows the most consistent performance (narrowest score range of 5.5 points). The Index guides policy and action for achieving SDGs by 2030 in the NER.

5. Japonica rice

Japonica rice is one of the two major eco-geographical races of Oryza sativa, the other being Indica. Scientists at NIPGR used CRISPR-Cas9 to improve phosphate uptake in Japonica varieties. **It is an Asian rice variety, grown mainly in northern/eastern China, Japan, Korea, Vietnam, and Indonesia**. Grown in cooler subtropical and temperate zones. Grains are short, thick, sticky, and have 0–20% amylose content. **Includes types like sushi rice and glutinous rice (gluten-free).** Cultivars are developed for specific culinary and climatic conditions.

15 JULY

1. Tungabhadra River

Tungabhadra is a **major river in Karnataka and Andhra Pradesh, formed by the confluence of the Tunga and Bhadra rivers at Koodli**. It is the principal tributary of the Krishna River and flows for 531 km, eventually joining the Krishna at Sangamaleshwaram. Originates from the Eastern slopes of the Western Ghats and has a catchment area of 69,552 sq.km. **Hampi, capital of Vijayanagara Empire, lies on its banks.**

Major tributaries: Varada and Hagari Rivers.

Raichur Doab lies between the Tungabhadra and Krishna rivers.

Major dams: Tungabhadra, Bhadra, Tunga Anicut, and Hemavathy.

2. Exercise Talisman Sabre 2025

Largest bilateral military exercise between Australia and the U.S., held biennially since 2005. Conducted across Australia and offshore, using Defence and non-Defence areas. **Aims to promote a free and open Indo-Pacific by enhancing interoperability among allies.**

11th edition; largest and most sophisticated warfighting exercise in Australia. Over 35,000 personnel from 19 countries participating; **Malaysia and Vietnam as observers.** Involves live-fire drills, amphibious landings, ground manoeuvres, air and maritime operations.

3. 'Ordinarily Resident' under Representation of the People Act

Section 19 of the Representation of the People Act (RPA), 1950 mandates that only ordinarily resident individuals can be enrolled in a constituency's electoral roll.

Section 20 defines the term; mere ownership or possession of property is insufficient for ordinary residence status.

Temporary absence (due to work, travel, etc.) does not negate residency. Covered categories include **armed forces personnel, State armed police posted outside the state, central government employees abroad, constitutional office holders, and their spouses**. Section 20A permits Non-Resident Indians (NRIs) to register and vote from their passport address.

Electoral roll processes are governed by the Registration of Electors Rules (RER), 1960, framed by the Central Government in consultation with the Election Commission of India (ECI).

Gauhati High Court (1999, Manmohan Singh case) stressed habitual residence and intent to dwell as essential criteria.

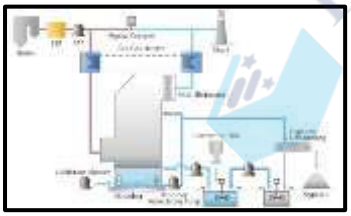
4. Carbon Credit Trading Scheme (CCTS)

CCTS is a market-based framework under the Indian Carbon Market to trade carbon credits and decarbonise industrial sectors. It **shifts focus from energy efficiency (PAT Scheme) to GHG emissions intensity, issuing Carbon Credit Certificates (CCCs).** Overseen by BEE and NSCICM for transparent governance.

Mandatory for 8 sectors: aluminium, cement, paper & pulp, chlor-alkali, iron & steel, textiles, petrochemicals, and refineries.

Power sector excluded for now. Has both compliance and offset mechanisms to meet India's NDC target of 45% emission intensity reduction by 2030.

5. Flue Gas Desulphurisation (FGD)



FGD removes **Sulphur Dioxide (SO_2) from flue gases of coal-fired plants to curb acid rain and particulate pollution**.

Common reagents: limestone, lime, ammonia.

Major technologies: Dry Sorbent Injection, Wet Limestone Scrubbing, and Seawater FGD.

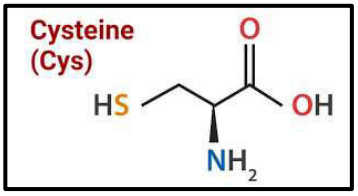
India mandated FGD for all coal plants in 2015, deadline by 2017. Only ~8% of units have FGDs installed (mostly by NTPC) due to high costs, delays, vendor shortages, and policy exemptions citing low sulphur coal.

16 JULY

1. Noctilucent Clouds

Noctilucent clouds are **high-altitude clouds in the mesosphere that glow at night with a blue or silvery hue**. Found at latitudes 45°–80° during summer months (June–July in Northern Hemisphere, December–January in Southern Hemisphere). Formed **when ice crystals develop on dust particles (from micrometeorites, volcanoes, or rocket exhausts) in the cold summer mesosphere**. They reflect sunlight from below the horizon, making them visible in darkness. **Also known as polar mesospheric clouds.**

2. Cysteine



Cysteine is a **sulfur-containing, non-essential amino acid involved in protein function and oxidative metabolism.** Though less abundant, it is often highly conserved in key protein sites (regulatory, catalytic, or binding). **Rich in beta-keratin, it supports structure in hair, skin, and nail**s. Crucial for collagen synthesis, impacting skin elasticity and texture. Helps make glutathione (antioxidant) and taurine for digestion and heart health. **Supports detoxification and strengthens the immune system.** Low cysteine levels may cause fatigue, slow growth, and weak immunity.

Amino acids are protein-building blocks; 9 are essential, and 11 are non-essential, including cysteine.

3. Sigandur Bridge

Sigandur (Ambaragodlu-Kalasavalli) Bridge is **India's second-longest cable-stayed bridge, spanning 44 km and 16 m wide, built across the Sharavati River backwaters in Shivamogga, Karnataka.** Constructed at a cost of Rs 473 crore, it connects Sagara to Sigandur, improving access to the Chowdeshwari temple. Restores connectivity lost due to the Linganamakki Dam (1970s). **Sharavati River is a west-flowing river forming the Jog Falls (253 m); it spans 128 km with tributaries like Nandihole and Haridravathi.**

4. Wular Lake

Wular Lake is **India's largest freshwater lake and Asia's second-largest**. Located in Bandipore district, Jammu & Kashmir. **Fed by the Jhelum River; lies at an altitude of 1,580 m. Formed due to tectonic activity; may be a remnant of ancient Satisar Lake.** Spread over 200 sq.km with Zaina Lank island built by Zainul-Abi-Din. **Declared a Ramsar site in 1990.** Vital for bird biodiversity and contributes 60% of the state's fish production.

5. RhoDIS India Programme

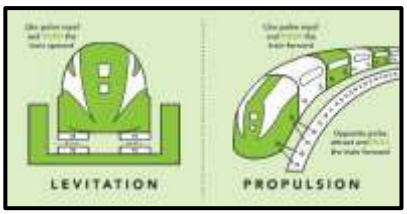
RhoDIS India is a **DNA-based wildlife forensics tool developed to combat rhino poaching and aid legal proceedings**. Launched in 2016 by MoEFCC with WII, WWF India, and state forest departments. **It uses unique genetic signatures to identify individual rhinos for crime investigations**. Standardised DNA profiling protocols are used as per MoEFCC guidelines. Rhino horns are made of keratin and rich in sulphur-containing amino acids like cysteine. **Greater one-horned and Javan rhinos have a single horn; others have two.**

17 JULY

1. Klyuchevskoy Volcano

Klyuchevskoy is an **active stratovolcano on the Kamchatka Peninsula, eastern Russia**. It is the tallest active volcano in Eurasia, rising 4,750 m (15,584 ft). The cone has a central crater and ~70 lateral craters. Over 50 eruptions since 1700; smoke often seen at the summit. **Kamchatka Volcanological Station is at its base**. Kamchatka is bordered by Sea of Okhotsk, Pacific Ocean, and Bering Sea. It **is part of the Ring of Fire, with 68 active volcanoes, forming the Kuril-Kamchatka arc.**

2. Maglev Technology



Maglev (magnetic levitation) technology uses electromagnetism to lift and propel trains without physical contact, minimizing friction. Conceptualized in the early 1900s, commercial use began in 1984. Works via levitation, guidance, and propulsion using magnets and linear motors. **Speeds exceed 600 km/h, offering faster travel than conventional trains**. Lower maintenance and higher energy efficiency due to reduced friction. **Eco-friendly with zero direct**

emissions, can use renewable energy. Smooth, quiet ride with minimal vibrations enhances passenger comfort.

3. Quantum Noise

Quantum noise **refers to unavoidable disturbances in quantum systems causing computation errors.** It arises due to energy quantization and the Heisenberg uncertainty principle, making precise measurement inherently limited. Even ideal conditions cannot eliminate quantum noise. **It stems from thermal fluctuations, environmental interactions, and imperfect gates.** Phase and amplitude noise affect qubits differently. **Decoherence results from noise, leading to loss of superposition and entanglement, undermining quantum computations.** Understanding it is vital for error mitigation in quantum computing.

4. Prime Minister Professorships

Prestigious initiative to boost research and innovation in less-endowed state universities. Eminent scientists, faculty, industry professionals (Indian & overseas) eligible. **Applicants must be superannuated, actively involved in research, and willing to relocate full-time to PAIR Category A state universities.**

Tenure: Up to 5 years, based on performance.

Funding: ₹30 lakh fellowship + ₹24 lakh research grant + ₹1 lakh overhead per annum.

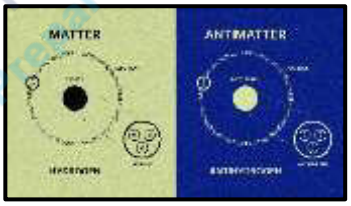
No upper age limit for superannuated applicants.

5. Swachh Survekshan 2024-25

Annual urban cleanliness survey under Swachh Bharat Mission-Urban (SBM-U) by MoHUA, implemented by QCI. Assesses cities on 10 parameters and 54 indicators for sanitation and waste management. **Introduced 'Super Swachh League (SSL)' for consistently top-performing cities**. Awards across 4 categories, including state-level recognitions and special categories like Ganga towns and Cantonment Boards**. Cities classified into 5 population-based categories for fair comparison and tailored evaluation.**

18 JULY

1. Antimatter



Antimatter is similar to ordinary matter but has opposite electric charge. **Its particles include positrons (e^+), antiprotons ($\bar{p}$), and antineutrons ($\bar{n}$).** Positrons are positively charged, antiprotons negatively charged, and antineutrons have opposite magnetic moments to neutrons. **Matter and antimatter annihilate on contact, releasing energy as gamma rays or particles.** Both were created after the Big Bang, but antimatter is now rare in the universe. **Antimatter is produced artificially in particle accelerators like CERN's Large Hadron Collider.**

2. Pavana River

Pavana River is **located in Pune District, western Maharashtra, originating from the Western Ghats**

near Lonavala. It flows for about 60 km before merging with the Mula River in Pune. **The Mula River later joins the Mutha River, forming the Mula-Mutha, which drains into the Bhima River, a tributary of the Krishna River**. Pavana Nagar Dam, an earth-fill gravity dam, is built on the river to supply drinking water to Pune and Pimpri-Chinchwad.

3. YD One

YD One is **India's lightest active wheelchair and the first indigenously developed mono-tube rigid-frame wheelchair.** Developed by **IIT Madras' R2D2 and Thryv Mobility.** Fully customised for user's body, posture, and mobility needs. Made with aerospace-grade materials, it weighs just 9 kg but can support up to 120 kg. Compact and portable, it fits easily in cars and public transport. **Offers high performance at low cost, reducing dependence on imports.**

4. Tadoba-Andhari Tiger Reserve

Tadoba-Andhari Tiger Reserve is the largest and oldest tiger reserve in Maharashtra, located in Chandrapur district. It comprises Tadoba National Park and Andhari Wildlife Sanctuary. **Named after the Taru deity and Andhari river.** It has corridor linkages with Nagzira-Navegaon and Pench Tiger Reserves. Falls in the Central Plateau of Deccan Peninsula, with Southern Tropical Dry Deciduous forests.

Major water bodies: Tadoba Lake, Kolsa Lake, and Tadoba River.

Rich in flora like teak, salai, tendu, mahua, and fauna such as tiger, leopard, sloth bear, wild dog, and gaur.

5. Coronal Mass Ejections (CMEs)

Coronal Mass Ejections (CMEs) **are massive bursts of magnetized plasma from the Sun's corona.** They form via magnetic reconnection—realignment of tangled magnetic field lines near sunspots. **Often associated with solar flares, but not always simultaneous**. Travel speeds range from <250 km/s to 3000 km/s; fastest ones reach Earth in 15–18 hours. **Expand in size, potentially covering ¼ of the Sun-Earth distance**. Common during the solar maximum. **Can cause geomagnetic storms, affecting satellites, communications, and power grids.**

22 JULY

1. Rajendra Chola I (1014–1044 CE)

Rajendra Chola I (1014–1044 CE) succeeded his father Rajaraja I. Known as **Gangaikonda Cholan (Bringer of the Ganges) and Kadaram Kondan (Conqueror of Kedah).** Led overseas military campaigns, reaching the Ganges, Southeast Asia, and defeating Mahipala of Bengal. **Built Gangaikondacholeshwaram temple and founded Gangaikondacholapuram (new capital).** Commanded India's largest navy and promoted trade with Song China and Arabs. **Promoted self-governance and supported Shaivism and Buddhism**. Succeeded by Rajadhiraja I.

2. Pale-capped Pigeon

The **Pale-capped Pigeon (Columba punicea) is a large, purplish-maroon frugivorous bird found in parts of India and Southeast Asia**. It inhabits evergreen forests and nearby fields up to 1,600 m elevation. Males have a whitish-grey cap, while females have a duller appearance.

IUCN Red List Status: Vulnerable.

Dehing Patkai National Park, Assam, covers 231.65 sq.km, located in Dibrugarh and Tinsukia districts. **Known as 'Amazon of the East', it has India's longest tropical lowland rainforest stretch.** Home to diverse flora and fauna, including elephants, leopards, clouded leopards, and ethnic communities like Tai Phake and Singpho.

3. Tuvalu

Tuvalu, **formerly the Ellice Islands, is a low-lying island nation in the west-central Pacific, between Hawaii and Australia**. It consists of nine islands (four reef islands and five coral atolls), stretching 676 km. No point rises above 4.5 m, making it highly vulnerable to sea level rise.

Capital: Funafuti; Languages: Tuvaluan, English.

Population: Second smallest globally after Vatican City.

Economy: Subsistence farming, remittances, copra, stamps, and fishing fees.

Governance: Parliamentary democracy, constitutional monarchy, under King Charles III.

4. Bedouins

Bedouins are **traditionally nomadic, Arabic-speaking tribes of the Middle East and North Africa**. The term "Bedouin" comes from Arabic badawi, meaning "desert dweller". Livelihood is based on herding camels, sheep, and goats with seasonal migrations. **Tribes are often classified by the animals central to their economy**. In Syria, **they mainly inhabit the Al-Badia desert in provinces like Sweida and Deir ez-Zor. Society is tribal, patriarchal, patrilineal, endogamous, and often polygynous**. Leadership is by a sheikh, aided by a male elders' council.

5. INVICTUS

INVICTUS is a European Space Agency (ESA) funded research programme focused on developing hypersonic technologies for reusable vehicles with horizontal launch capability. **The vehicle is fully reusable, capable of flying at Mach 5, and features an upgradable design.** It will demonstrate sustained hypersonic flight using a hydrogen-fuelled, precooled air-breathing propulsion system. **Funded under the General Support Technology Programme (GSTP) and the Technology Development Element (TDE),** it offers industry, academia, and agencies a platform to test technologies in real flight conditions.

23 JULY

1. International Seabed Authority

The International Seabed Authority (ISA) is **an autonomous international body established under UNCLOS (1982) and the 1994 Agreement. Headquartered in Kingston, Jamaica**, it came into existence on 16 November 1994. It regulates mining and related activities in the international seabed beyond national jurisdiction, covering 54% of the ocean floor. **ISA has 169 members (168 States + EU).**

Its Assembly and 36-member Council oversee policy and mining contracts. It **ensures marine environmental protection from deep-seabed activities.**

2. Dharmasthala Manjunatheshwara Temple

Dharmasthala Manjunatheshwara Temple is a Hindu temple in Karnataka, dedicated to Lord Shiva as Lord Manjunatha. The temple is 800 years old. It is administered by a Jain Heggade family, while **Madhwa Vaishnava priests perform rituals**. Built **in Kerala temple architecture style**, it stands out from typical South Indian temples.

Materials used: granite, laterite, wood, clay, stone, metals. It has a square plan with a pyramidal sloping roof covered with gold-plated copper plates. Wooden pillars support the front pavilion.

3. Codex Alimentarius Commission

Codex Alimentarius Commission (CAC) is **the international food standards body, established in 1963 by FAO and WHO.**

Objective: To protect consumer health and ensure fair food trade practices.

Headquarters: Rome; meets annually, alternating between Rome and Geneva.

Members: 189 (188 countries + EU); India joined in 1964.

CAC comprises the Commission, Executive Committee, Secretariat, and subsidiary bodies. **Codex Alimentarius is a collection of international food standards, recognized by the WTO SPS Agreement**. India's NCCP, under FSSAI, coordinates Codex activities and inputs in India.

4. Meri Panchayat App

Unified digital platform for rural governance under Ministry of Panchayati Raj and NIC (MeitY). Integrates multiple Panchayat services into a single web-based interface. Real-time access to budgets, payments, GPDPs, infrastructure data, and weather. **Offers social audit tools, grievance redressal, and geo-tagged project tracking.** Citizens can propose, review, and rate projects, and view Gram Sabha decisions. **Multilingual support (12+ languages) ensures inclusivity. Aims to strengthen participatory democracy in rural India.**

WSIS Prize: Recognizes ICT-based initiatives that advance sustainable development, based on global stakeholder evaluation.

5. Cy-TB Test

Cy-TB is **a third-generation intradermal test to detect TB infection, approved by the Central TB Division under NTEP for individuals aged 18 years and above**. It involves injecting 0.1 ml of TB-specific antigens (ESAT-6 and CFP-10) into the forearm. An induration ≥5 mm within 48–72 hours indicates TB infection. TB is caused by Mycobacterium tuberculosis and mainly affects the lungs. **India accounts for 26% of global TB cases and is a hub for DR-TB and TB deaths.**

24 JULY

1. Tayfun Block-4

Tayfun Block-4 is **Turkey's first hypersonic ballistic missile, developed by Roketsan**. It is a hypersonic version of the Tayfun missile, Turkey's longest-range indigenous missile. Hypersonic denotes speeds of Mach-5 or more.

Length: 6.5 meters; Weight: 2,300 kg.

Range: Up to 800 km, planned to extend to 1000 km.

Guidance: GPS, GLONASS, and INS with 5-meter accuracy.

Warhead: Fragmentation; **Fuel**: Solid composite.

Targets strategic assets like air defenses and command centers.

2. Stablecoins

Stablecoins are **cryptocurrencies pegged to assets like fiat currency or gold to maintain a stable value.** They reduce volatility, making them suitable for transactions and blockchain-based financial services.

Types include: Fiat-collateralized (backed by reserves), Crypto-collateralized, Non-collateralized (algorithmic) (use supply-demand algorithms).

Stability isn't guaranteed; market fluctuations and inadequate reserves can affect value. **Cryptocurrencies are decentralized, digital currencies using encryption and blockchain technology** for secure, peer-to-peer transactions.

3. Etruscans

The Etruscans were a **Mediterranean civilization that thrived from the 8th to 3rd centuries BCE in central Italy, known as Etruria (Tuscia**). They dominated the Tyrrhenian Sea with a strong navy and held the largest iron reserves in the western Mediterranean. **They influenced Roman culture, including grid-based city planning.** Etruscan society had three social classes, and women held equal status and were educated. **Their religion involved nature-based gods, distinct yet later merged with Greek-Roman deities.** Their decline began in the 6th century BCE, ending with Roman absorption by the 1st century BCE.

4. UNESCO

UNESCO is a **specialized agency of the UN, founded in 1945 post-WWII**. Aims to promote global peace and security through education, culture, sciences, and communication.

Headquarters: Paris; **Parent body**: UN Economic and Social Council.

Has 194 member states and 12 associate members.

Key focus areas: Education, Natural & Social Sciences, Culture, Communication.

Publishes major reports like **Global Education Monitoring Report and World Water Development Report. Maintains World Heritage Sites list and supports the UN Sustainable Development Goals.**

5. IUCN World Conservation Congress

IUCN World Conservation Congress is the **world's largest gathering for nature conservation and climate change action, held once every four years.**

It has three components: **Forum (knowledge sharing), Exhibition (interactive displays), Members' Assembly (highest decision-making body).**

Theme for 2025: "Powering transformative conservation".

IUCN is a global union of government and civil society, founded in 1948. Governance includes the President, Council, and World Conservation Congress.

25 JULY

1. Central Board of Direct Taxes

The Central Board of Direct Taxes (CBDT) is a statutory authority under the Central Board of Revenue Act, 1963. It **functions under the Department of Revenue, Ministry of Finance.** It is **responsible for formulating direct tax policies, supervising income tax administration, and proposing tax law changes**. It originated from the 1924 Board of Revenue and was split into CBDT and CBEC in 1964. It is headed by a **Chairman and six Members from the Indian Revenue Service (IRS), each handling a specific function.**

2. Financial Inclusion Index

The **Financial Inclusion Index (FI-Index) measures the extent of financial inclusion in India on a scale from 0 (exclusion) to 100 (inclusion).** It improved to 67% in FY 2025 from 64.2% in FY 2024. Developed by RBI, it covers banking, investments, insurance, postal, and pension sectors.

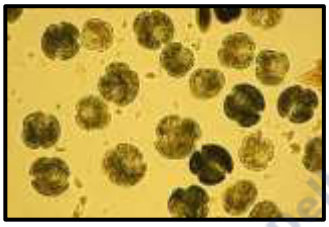
It includes three parameters: **Access (35%), Usage (45%), and Quality (20%).**

Quality reflects **financial literacy, consumer protection, and service equity**. Published annually in July, it has no base year.

3. Cholagangam Lake

Cholagangam Lake, also known as **Ponneri Lake, is located near Gangaikonda Cholapuram in Ariyalur District, Tamil Nadu**. It was constructed by Rajendra Chola I to commemorate his northern campaign (as per Tiruvalangadu Copper Plates). A canal from the Kollidam River was built to ensure regular water supply to the lake. The lake is rain-fed and historically irrigated 1,564 acres. It was **primarily designed to supply drinking water to Gangaikonda Cholapuram.**

4. Karenia mikimotoi



Karenia mikimotoi is a red-tide dinoflagellate commonly found in the eastern North Atlantic and around Japan. It **produces hemolytic and ichthyotoxins, severely impacting marine life, especially fish, shellfish, and crustaceans**. While it poses no confirmed direct threat to human health, it causes anoxic conditions due to oxygen depletion after bloom decay**. Less toxic but globally widespread, with blooms in India, Japan, U.S., and more**. It is photosynthetic, with chloroplasts, a pyrenoid, and an ellipsoidal nucleus, and adapts to diverse conditions.

5. Lantana camara

Lantana camara is an **invasive alien pantropical weed, native to Central and South America. Introduced in India in the 18th century**, it has now spread across most tropical regions. It forms dense bushy thickets, invading higher altitudes and displacing native flora. **Releases allelochemicals, reducing biodiversity by inhibiting other plant growt**h. Can be managed by utilizing its biomass for furniture, fuelwood, and organic compost, offering a sustainable alternative to inorganic fertilizers.

29 JULY

1. SPARSH (System for Pension Administration – RAKSHA)

SPARSH (System for Pension Administration – RAKSHA) is an **initiative of the Ministry of Defence, Government of India.**

Aims to digitally manage pension sanction and disbursement for Armed Forces and Defence Civilians. Administered by Defence Accounts Department through PCDA (Pensions), Prayagraj. **Directly deposits pensions without third-party intermediaries. Enables self-verification, grievance redressal, and data correction**. **Provides a transparent pension account view to pensioners.** Covers entire pension cycle: initiation, sanction, disbursement, revision, and service management.

2. CERT-In

CERT-In (Indian Computer Emergency Response Team) is the national nodal agency for cyber security under the Ministry of Electronics & IT. Established under Section 70B of the IT Act, 2000, it secures Indian cyberspace and responds to cyber incidents.

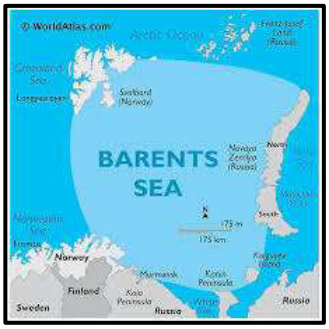
Key functions include: cyber threat analysis, alerts, emergency response, issuing advisories, and coordination.

Empowered to issue directions to service providers and organizations.

Projects: **Cyber Swachhta Kendra, NCCC, Cyber Threat Intel Platform, Cyber Abhyas Suvidha**.

Collaborates internationally on cyber threats.

3. Barents Sea



Barents Sea is a **marginal sea of the Arctic Ocean, located along northern Norway and Russia**. It spans 1.4 million sq.km, with a length of 1,300 km and average depth of 230 m. **Named after Willem Barents, it was historically known as the Murmean** Sea. Bounded by **Svalbard, Franz Josef Land, Novaya Zemlya, Norwegian Sea, Greenland Sea, and Kola Peninsula. White Sea and Pechora Sea** are part of it. Gulf Stream moderates its subarctic climate. It supports rich biodiversity, including seabirds, coral reefs, and polar mammals.

4. World Food India (WFI)

World Food India (WFI) is **organized by the Ministry of Food Processing Industries, Government of India**. The first edition was held in 2017, followed by 2023 and 2024 editions.

WFI 2025 theme: "Processing for Prosperity".

It is the largest global gathering in the food processing sector. **Aims to boost investment and trade in India's food economy.** Part of Make in India, with infrastructure support like Mega Food Parks offering plug-and-play facilities for entrepreneurs.

5. TRACERS Mission

TRACERS (Tandem Reconnection and Cusp Electrodynamics Reconnaissance Satellites) aims to

study magnetic reconnection in Earth's polar cusp regions. It consists of twin satellites flying in low Earth orbit to investigate how solar wind interacts with Earth's magnetosphere. **The mission will observe over 3,000 magnetic reconnection events in its first year**. Findings will enhance space weather forecasting and help protect satellites, GPS, and other technologies. **Magnetic reconnection releases energy and can trigger auroras and technological disruptions.**

30 JULY

1. Baitarani River

Baitarani is an **east-flowing river in eastern India, mainly through Odisha and partly Jharkhand.** Originates from Gonasika Hills (Keonjhar district, Odisha) at 900 m elevation. Flows underground briefly as **Guptaganga**, making the source sacred. Initially flows north, then east for about 360 km, draining into the Bay of Bengal**. Forms delta with Brahmani and Mahanadi; basin area ~12,790 sq. km.**

Borders: Brahmani (S/W), Subarnarekha (N), Bay of Bengal (E).

Has **65 tributaries, major ones include Salandi, Kusei, Deo, Kanjhari**. Rich in minerals and agriculture, supporting industrial development.

2. Geosynchronous Satellite Launch Vehicle (GSLV)

GSLV is **developed by ISRO to launch payloads into Geosynchronous Transfer Orbit (GTO).** It is a three-stage vehicle with solid, liquid, and cryogenic stages; total lift-off mass: 420 tonnes. Taller and more powerful than PSLV, with payload capacity up to 4 tons (Mk III). Mk I used Russian cryogenic engine; Mk II has an indigenous version.

Notable missions: South Asia Satellite (2017), Chandrayaan-2 (2019).

3. Brihadisvara Temple

Brihadisvara Temple, also known as **Peruvudaiyar Kovil, is located in Thanjavur, Tamil Nadu. Built in 1010 AD by Rajaraja Chola I, it is dedicated to Lord Shiva**. Part of the UNESCO-listed **'Great Living Chola Temples'. Exhibits Dravidian architecture** with a vimana over 200 ft high, symbolizing Mount Meru. The octagonal sikhara rests on an 80-ton granite block. Features a massive Nandi statue and inscriptions narrating the city's history.

4. Majuli Island

World's largest river island, located in Assam, formed by the Brahmaputra and Subansiri rivers. Inhabited by Mishing, Deori, Sonowal Kachari tribes and non-tribal Assamese. Known for lush greenery, water bodies, and paddy fields. **Rice cultivation is the main livelihood; unique varieties like Komal Saul and Bao Dhan are grown.** Cultural hub of Assamese neo-Vaishnavism, founded by Srimanta Sankerdeva. **Famous for Satras, Sattriya dance, bhaona, mask-making, and pottery.**

5. Paithani Sarees

Known as the 'Mahavastra of Maharashtra', symbolizing cultural pride. Originated from Paithan town, on the banks of the River Godavari. Woven by hand using pure silk and gold zari, dyed in vibrant traditional colours. **Distinguished by kath (borders) and padar (pallu) with motifs like parrots, lotuses, and peacocks. Favoured by Maharashtrian brides**, especially in six- or nine-yard form. **Received GI tag in 2010**; valued for its exquisite craftsmanship and heritage significance.

31 JULY

1. International Tiger Day

International Tiger Day is observed annually on July 29 to raise awareness about tiger conservation.

Theme for 2025: "Securing the future of Tigers with Indigenous Peoples and Local Communities at the heart."

Established in 2010 at the Saint Petersburg Tiger Summit with the "Tx2" goal to double tiger population by 2022. **India hosts 75% of the world's wild tigers, despite having only 18% of tiger habitat and high human density**. Over 3,600 tigers now roam India due to sustained efforts like Project Tiger.

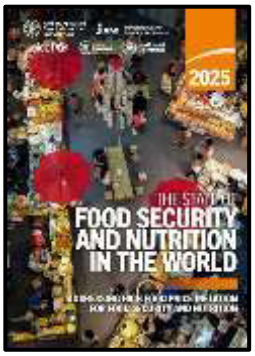
2. Mansa Devi Temple

Mansa Devi Temple is a **Hindu temple dedicated to Goddess Mansa Devi, a form of Shakti (Goddess Durga).** Located in Haridwar, Uttarakhand, atop Bilwa Parvat on the Sivalik Hills (southernmost Himalayas). **Also known as Bilwa Tirth**, it is one of the Panch Tirth (Five Pilgrimages) in Haridwar. **Symbolizes Shakti worship tradition in Northern** India. Constructed by Maharaja Gopal Singh of Manimajra (1811–1815). Temple complex spans 100 acres. Built in traditional North Indian style. **Enshrines Mansa Devi and her sister Chandi Devi.**

3. Exercise Divya Drishti

High-altitude technology demonstration conducted by the Indian Army in East Sikkim. Aimed at enhancing battlefield awareness, surveillance, and decision-making. Trishakti Corps used ground systems and UAVs/drones for simulated combat. Featured AI-enabled sensors integrated with advanced communication systems. **Ensured secure data flow, improved situational awareness, and sensor-to-shooter link.** Tested AI and modern technologies for operational readiness in realistic battle scenarios.

4. SOFI Report 2025



Jointly prepared by **FAO, IFAD, UNICEF, WFP, and WHO**. Tracks global hunger, food security, and nutrition trends. **Global hunger in 2024 remained above pre-pandemic and 2015 levels**. 96 million more people face chronic hunger compared to 2015. 2.3 billion people were moderately or severely food insecure in 2024. **Asia had the highest number of**

undernourished (323 million), followed by Africa (307 million). Food insecurity worsened in parts of Africa despite regional gains elsewhere.

5. Pralay

Pralay is an **indigenously developed quasi-ballistic missile with high-precision guidance and navigation systems.**

Range: 150–500 km; Payload capacity: 500–1,000 kg of conventional warheads.

Speed: Terminal velocity of Mach 6.1.

CEP: Less than 10 meters.

Features: Solid propellant, mobile launcher-based, midair trajectory change capability.

Targets: Radar sites, airstrips, command centers.

Developed by: DRDO's Research Centre Imarat with BDL, BEL, and other MSMEs.