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# DAILY CURRENT AFFAIRS — **ENGLISH FILE** —

**BEST FOR UPSC | UP PCS EXAM**

DATE : **AUGUST 24, 2026**



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## 1. National Horticulture Board Revises Eligibility Rules and Subsidy Norms

### Key Highlights & Summary

- **Ineligibility Introduced:** The Centre amended guidelines for Commercial Horticulture and Cold Storage Schemes under the National Horticulture Board (NHB) to bar public office holders and government employees.
- **Barred Categories:** Ineligible groups include holders of constitutional posts, ministers, MPs, MLAs, MLCs, mayors, district panchayat chairs, and government staff (excluding Group D/MTS staff).

- **Expanded Definition of Family:** The term 'family' now includes the applicant's spouse, father, mother, sons, and daughters, replacing the earlier definition restricted to spouse and dependent minor children.
- **One-Family-One-Assistance Rule:** Assistance is capped at one member per family across all NHB schemes. Any prior assistance availed counts as the full entitlement for the entire family.
- **Subsidy Percentage Reduced:** Subsidies for general areas were reduced from 50% to 35% of eligible project costs. Maximum financial assistance for cold storage construction remains capped at Rs 2 crore.
- **Provision for Exit:** Beneficiaries can voluntarily opt out of schemes during the lock-in period by refunding the complete subsidy amount along with applicable interest.

## Essential Definitions

- **National Horticulture Board (NHB):** An autonomous organization under the Ministry of Agriculture and Farmers Welfare established to promote commercial horticulture and cold storage infrastructure.
- **Credit-Linked Back-Ended Subsidy:** A financial assistance mechanism where government subsidy is released directly to the lending bank to adjust against the beneficiary's loan principal upon successful joint inspection.



## Legal and Constitutional Framework

- **Article 12:** Categorizes autonomous bodies like NHB performing public functions under the definition of 'State', subjecting their guidelines to administrative law principles.
- **Article 14:** Guarantees equality before the law and protection against arbitrary allocation of public resources and executive conflict of interest.
- **Prevention of Corruption Act, 1988:** Provides statutory safeguards against conflict of interest and misuse of official position by public servants to gain undue financial advantages.

**Conclusion** The rationalization of NHB subsidy norms establishes stronger conflict-of-interest safeguards and prevents elite capture of agricultural welfare funds. These reformative measures ensure equitable distribution, improved transparency, and targeted financial support for genuine farming communities.

## UPSC Relevance

- **GS Paper II:** Governance—mechanisms, laws, institutions, and bodies for protection and welfare; ethical issues in public administration and prevention of conflict of interest.
- **GS Paper III:** Major crops and cropping patterns; Agricultural subsidies, supply chain management, and storage infrastructure for horticultural produce.

## 2. ICMR Rules Out New Strain Amid H1N1 Swine Flu Surge in Delhi



## Key Highlights & Summary

- **Surge in Capital Caseload:** Delhi recorded over 2,000 cases of Swine Flu (H1N1) this year, accounting for nearly 70% of respiratory infections in recent weeks.
- **No Mutation or New Strain:** The Indian Council of Medical Research (ICMR) clarified that no new H1N1 strain has emerged, ruling out public panic as nationwide numbers begin to drop.
- **Identified Viral Lineage:** The circulating strain is identified as A/Missouri/11/2025 (H1N1) pdm09-like virus (clade 6B.1A.5a2a, subclade D.3.1.1), circulating since 2025.
- **Vaccine Alignment:** Circulating viral strains remain well-matched with Northern Hemisphere seasonal influenza vaccine formulations.
- **Etiological Factors:** Environmental pollution, extreme monsoon weather, dust, and weakened immune defense mechanisms contributed to heightened transmission.
- **Self-Limiting Nature:** H1N1 remains a self-limiting illness requiring supportive care, though high-risk groups (children, elderly, immunocompromised) face greater risk of complications.

## Essential Definitions

- **Influenza A (H1N1) pdm09:** A subtype of the Orthomyxoviridae family containing Hemagglutinin (H) and Neuraminidase (N) surface proteins, derived from the 2009 pandemic lineage and now circulating as seasonal flu.
- **Clade and Subclade:** Genetic classifications used in epidemiological surveillance to track evolutionary branches and subtle mutations of viruses over time.



## Legal and Constitutional Framework

- **Article 47:** Directive Principle of State Policy directing the State to improve public health, level of nutrition, and standard of living.
- **Epidemic Diseases Act, 1897:** Grants special executive powers to administrative authorities to implement containment measures and control infectious disease outbreaks.
- **National Public Health Advisory Mechanisms:** Governed under the Ministry of Health and Family Welfare alongside ICMR for Integrated Disease Surveillance Programme (IDSP) monitoring.

**Conclusion** The ICMR's technical assessment reassures that existing diagnostic and preventive tools remain effective against the circulating H1N1 strain. Strengthening seasonal surveillance, public health hygiene, and targeted vaccination for vulnerable populations remains critical to mitigating respiratory infection surges.

## UPSC Relevance

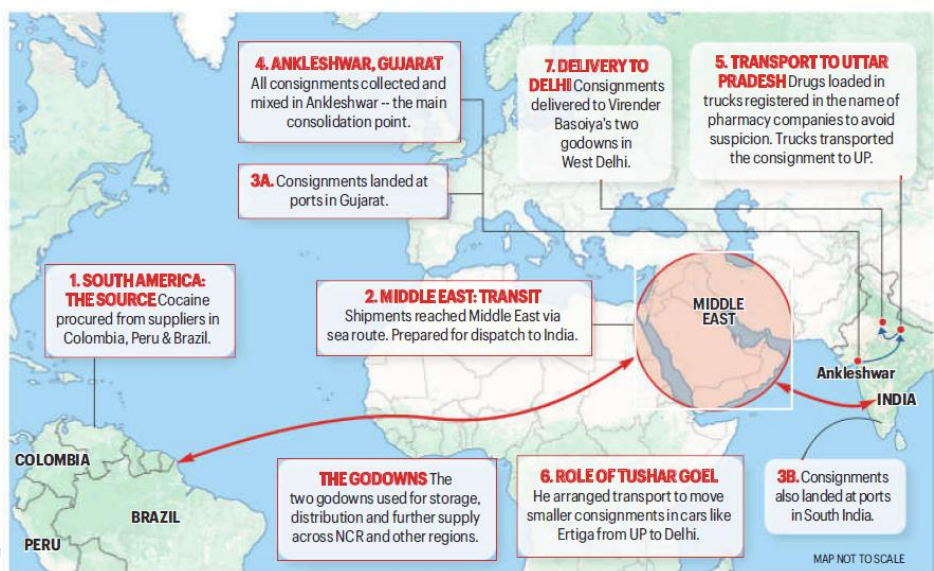
- **GS Paper II:** Issues relating to development and management of Social Sector/Services relating to Health; Role of apex research bodies (ICMR) and government interventions.
- **GS Paper III:** Science and Technology—developments and application in health; awareness in the fields of biotechnology and communicable viral diseases.

## 3. Extradition of Alleged Kingpin Virender Baisoya and Dismantling of Transnational Cocaine Cartel

### Key Highlights & Summary

- **Extradition of Racket Kingpin:** Enforcement agencies secured the return of fugitive Virender Singh Baisoya from the UAE, marking a key breakthrough in dismantling a major transnational narcotics network.
- **Multi-Tiered Supply Chain:** Raw cocaine procured from South American nations (Colombia, Peru, Brazil) was processed and routed through Dubai to Gujarat and Uttar Pradesh before final distribution in New Delhi.
- **Use of Shell Companies:** The cartel deployed shell pharmaceutical firms and forged documentation to bypass regulatory checks while fraudulently procuring raw precursor materials from legitimate chemical entities.
- **Significant Narcotics Recoveries:** Investigative operations led to massive drug busts, including over 1,200 kg of high-purity cocaine, 40 kg of Thai hydroponic marijuana, and 867 kg of mephedrone across Delhi and Maharashtra.
- **Modus Operandi:** The syndicate disguised illicit shipments as routine commercial packages (e.g., shirt packaging and snacks), distributing them through courier networks, local middleman, and digital platforms.
- **Inter-Agency Coordination:** The enforcement action involved coordinated operations between the Narcotics Control Bureau (NCB), Delhi Police Special Cell, Central Bureau of Investigation (CBI), and Interpol.

#### • THE COCAINE SUPPLY CHAIN



### Essential Definitions

- **Extradition:** The official process where one sovereign state surrenders an individual accused or convicted of a crime to another state for trial or punishment under a bilateral treaty.
- **Narcotic Drugs and Psychotropic Substances (NDPS):** Chemical substances regulated under national and international law due to their potential for abuse, addiction, and severe socio-economic harm.

### Legal and Constitutional Framework

- **Narcotic Drugs and Psychotropic Substances (NDPS) Act, 1985:** Provides stringent provisions for control, regulation, forfeiture of illegally acquired property, and severe penalties for illicit trafficking.
- **Extradition Act, 1962:** Regulates the procedure for the extradition of fugitive criminals from India and foreign nations with whom India maintains bilateral treaties.
- **UN Convention Against Illicit Traffic in Narcotic Drugs (1988):** Mandates global legal and law-enforcement cooperation to counter international organized drug syndicates.

**Conclusion** The extradition of transnational narcotics kingpins underlines India's commitment to a zero-tolerance policy against organized drug syndicates. Strengthening cross-border intelligence-sharing, tightening pharmaceutical supply chain surveillance, and leveraging Interpol cooperation remain vital to eliminating illicit drug networks.

## UPSC Relevance

- **GS Paper III:** Internal Security—Organized crime and its links with drug trafficking; Role of external state and non-state actors in security threats; Security challenges in border areas.
- **GS Paper II:** Bilateral agreements and international treaties (Extradition treaties, Interpol collaboration); Statutory bodies and enforcement agencies (NCB, CBI).

## 4. Opening of 22 Unopened Excavation Boxes from Rajghat Site by Banaras Hindu University

### Key Highlights & Summary

- **Historic Artifact Discovery:** Banaras Hindu University (BHU) opened 22 sealed boxes containing over 10,000 artifacts excavated in 1957 from the Rajghat site in Varanasi that lay unopened for nearly 70 years.
- **Pottery and Cultural Continuity:** Recovered material includes painted black pottery estimated to be nearly 3,000 years old, helping trace continuous human settlement across six distinct cultural periods from 800 BC through the medieval era.
- **Rare Documentation and Visual Records:** The collection contains over 3,000 glass slides and 5,000 photographic negatives documenting ancient Indian archaeological sites including Rajghat, Manjhi, Ratnagiri, Ajanta, and Ellora.
- **Epigraphic Discoveries:** Findings include copper, ivory, and bone tools, alongside stamp seals bearing ancient inscriptions written in the Brahmi script, explicitly confirming the name "Varanasi".
- **Interdisciplinary Conservation:** BHU constituted three specialized research teams to undertake restoration, epigraphic analysis, and advanced bio-archaeological research on the material.
- **Ancient DNA Study On Human Remainder:** The initiative follows the recent sampling of a 70-year-old complete human skeleton recovered from the site for genetic and ancient DNA analysis to establish population linkage with the Indus Valley Civilization.



## Essential Definitions

- **Epigraphy:** The study, interpretation, and scientific analysis of ancient inscriptions, scripts, and seals carved on durable surfaces like stone, copper plates, or terracotta.
- **Bio-Archaeology:** An interdisciplinary field combining archaeology and biological anthropology to analyze human skeletal remains, ancient DNA, and dietary isotopes from archaeological contexts.

## Legal and Constitutional Framework

- **Seventh Schedule (List I, Entry 67):** Assigns exclusive legislative competence over ancient and historical monuments, records, and archaeological sites of national importance to the Union Parliament.
- **Ancient Monuments and Archaeological Sites and Remains (AMASR) Act, 1958:** Governs the protection, regulation, excavation, and scientific conservation of ancient monuments, antiquities, and archaeological sites across India.
- **Article 49 (Directive Principles of State Policy):** Obligates the State to protect every monument, place, or object of artistic or historic interest from spoliation, disfigurement, destruction, or export.

**Conclusion** The systematic unboxing and scientific evaluation of the Rajghat excavation materials bridge important historical gaps regarding urban settlement patterns in the Ganga Valley. Leveraging modern genetic and epigraphic tools on archived artifacts will redefine our understanding of civilizational continuity and cultural trade routes in ancient India.

## UPSC Relevance

- **GS Paper I:** Indian Culture—salient aspects of Art Forms, Literature, and Architecture from ancient to modern times; Ancient Indian History, urban settlement, and Mahajanapada era (Kashi).
- **GS Paper III:** Science and Technology—developments and applications in ancient DNA analysis, bio-archaeology, and scientific conservation of national heritage assets.

## 5. Prime Minister Envisions Private Space Start-Ups as Global Innovation Magnet

### Key Highlights & Summary

- **Interaction with Space Start-Ups:** Prime Minister Narendra Modi and National Security Advisor Ajit Doval met founders and CEOs of over 20 space start-ups ahead of National Space Day (commemorating Chandrayaan-3's lunar landing).



- **Global Talent Attraction:** The Prime Minister emphasized that India's emerging private space ecosystem can become a major force globally, attracting talent, Indian diaspora experts, and international scientific partnerships back to India.
- **Rapid Expansion of Ecosystem:** Fueled by policy reforms, India's private space sector has grown to over 400 space start-ups—including firms like Agnikul, Skyroot, GalaxEye, and Serendipity Space—up from just a handful a few years ago.
- **Diversified Space Applications:** Start-ups are developing cutting-edge applications, such as space-based manufacturing facilities for specialized pharmaceuticals, satellite constellations, and advanced launch vehicles.
- **Policy Stability Assurance:** The government reiterated its commitment to providing a stable, predictable, and risk-tolerant space policy framework to support high-risk entrepreneurial ventures.
- **Socio-Economic Orientation:** Space entrepreneurs were encouraged to leverage space technology to address real-world challenges, enhance public welfare, and simplify citizens' lives.



## Essential Definitions

- **Non-Governmental Entities (NGEs):** Private sector companies, start-ups, and academic institutions authorized to undertake commercial end-to-end space activities under national space regulations.
- **IN-SPACe (Indian National Space Promotion and Authorisation Centre):** An autonomous single-window agency under the Department of Space created to promote, authorize, and handhold private space entities.

## Legal and Constitutional Framework

- **Indian Space Policy 2023:** Delineates clear roles across the sector—ISRO focuses on core R&D, NewSpace India Limited (NSIL) handles commercial operations, and IN-SPACe facilitates private NGE participation.
- **FDI Policy in Space Sector (2024 Amendments):** Liberalized Foreign Direct Investment (FDI) norms, allowing up to 100% FDI under automatic/government routes for satellite manufacturing, launch vehicles, and component production.
- **Seventh Schedule (List I, Entry 14):** Grants the Union Parliament exclusive legislative domain over foreign affairs, international agreements, and outer space exploration.

**Conclusion** Integrating private enterprise into India's space ecosystem transitions the nation from a state-led space program into a global commercial space hub. Consistent policy backing, FDI liberalization, and IN-SPACe authorization foster deep-tech innovation, commercial self-reliance, and international competitiveness.

## UPSC Relevance



- **GS Paper III:** Science and Technology—developments and applications in daily life; Awareness in the field of Space; Indigenization of technology and developing new technology.
- **GS Paper III:** Indian Economy—Government policies fostering start-up ecosystems, industrial growth, and deep-tech entrepreneurship.

## 6. Evolution of India's Diplomatic Engagement with the Taliban Regime

### Key Highlights & Summary

- **Shift to Practical Engagement:** Five years after the US withdrawal from Kabul in August 2021, India transitioned from initial evacuation to pragmatic, non-formal diplomatic relations with the Taliban dispensation.
- **Protecting Strategic Investments:** Realpolitik considerations driven by India's USD 2-3 billion infrastructure investment and a desire to retain regional leverage prompted New Delhi to upgrade engagement without granting formal recognition.
- **Countering Regional Adversaries:** Strained relations between Pakistan and the Taliban, alongside expanding Chinese influence in Central Asia, opened geopolitical opportunities for India to rebuild influence in Afghanistan.
- **Upgraded Diplomatic Footprint:** Following high-level discussions between External Affairs Minister S. Jaishankar and Afghan Foreign Minister Amir Khan Muttaqi, missions in New Delhi, Mumbai, and Hyderabad operate under Taliban-appointed diplomats at the Charge d'Affaires level.
- **Security Imperatives:** Engagement is anchored on the core principle that Afghan territory must not be utilized for anti-India terrorism by groups like Jaish-e-Mohammad or Lashkar-e-Taiba.
- **Humanitarian Assistance:** India delivered extensive relief supplies, including 50,000 metric tonnes of wheat, 445 tonnes of medicines, disaster assistance, and development cooperation despite ongoing human rights concerns in Afghanistan.



### Essential Definitions

- **De Facto Recognition:** Tacit acceptance of a government's effective control over a territory and population without granting formal legal status or official diplomatic recognition.
- **Charge d'Affaires:** A diplomatic officer who heads an embassy or diplomatic mission in the absence of an accredited ambassador or full diplomatic representative.

### Legal and Constitutional Framework

- **Article 51:** Directs the State to promote international peace, security, maintaining just and honorable relations between nations, and respect for international law.

- **UN Security Council Resolution 2593 (2021):** Mandates that Afghan territory must not be used to threaten or attack any country, shelter or train terrorists, or plan terrorist acts.
- **UNSC Sanctions Regime (1267 Committee):** Governs global sanctions, asset freezes, travel bans, and arms embargoes imposed on designated terrorist entities including the Taliban and ISIL-K.

**Conclusion** India's foreign policy towards Afghanistan reflects a calibrated pivot toward hard-nosed realism, prioritizing national security, connectivity, and regional stability. Balancing humanitarian commitments with strategic counterweights against regional adversaries ensures New Delhi remains an indispensable stakeholder in Central Asian geopolitics.

## UPSC Relevance

- **GS Paper II:** India and its neighborhood—relations; Effect of policies and politics of developed and developing countries on India's interests; Bilateral, regional, and global groupings involving India.
- **GS Paper II:** Important International institutions, agencies, and fora—their structure, mandate, and security implications (UNSC resolutions, international recognition models).

## 7. Supreme Court Directs Fresh Survey of Elephant Corridors to Curb Conflict

### Key Highlights & Summary

- **Judicial Intervention on Corridors:** A Supreme Court Bench led by Chief Justice of India Surya Kant directed the Centre to conduct a fresh survey of elephant corridors across states to ensure unhindered natural movement.
- **Prohibition of Coercive Measures:** The apex court barred the use of coercive methods such as fireballs, spikes, and hazardous barriers used to divert or drive away elephant herds from human habitats and agricultural fields.
- **Spatial and Seasonal Migration:** Male elephants require a home range of 50–300 sq km, while seasonal migrations (such as dry-season movement into Kerala's Western Ghats) are driven by water and forage availability.
- **Major Landscape Distributions:** India's elephant population is broadly divided into four key landscapes: Western Ghats, North-Eastern Hills and Brahmaputra floodplains, Shivalik Hills and Gangetic plains, and Central India and Eastern Ghats.
- **Severe Habitat Fragmentation:** Linear infrastructure development—highways, railway tracks, canals, power lines, alongside mining and expanding farmland—has severely fragmented traditional movement pathways.
- **Central India Challenges:** The Central India–Eastern Ghats complex faces acute conflict, with elephant herds expanding their traditional ranges into parts of Chhattisgarh, Odisha, Jharkhand, Madhya Pradesh, and Maharashtra.



## Essential Definitions

- **Elephant Corridor:** A narrow strip of forested or vegetative land that connects two larger natural habitats, facilitating the ecological movement and gene flow of wild elephant populations.
- **Home Range:** The total geographic area utilized by an individual animal or herd to satisfy basic biological needs, including food, water, shelter, and breeding requirements.

## Legal and Constitutional Framework

- **Article 48A:** Mandates that the State shall endeavor to protect and improve the environment and safeguard the country's forests and wildlife.
- **Article 51A(g):** Imposes a fundamental duty on every citizen to protect and improve the natural environment, including forests, lakes, rivers, and wildlife, and to show compassion for living creatures.
- **Wildlife Protection Act, 1972:** Classifies the Asian Elephant under Schedule I, providing the highest level of legal protection against hunting, capture, or habitat destruction.

**Conclusion** Protecting elephant corridors through comprehensive scientific mapping and community-based conservation is essential to mitigating escalating human-elephant conflict. Restoring fragmented ecological pathways safeguards biodiversity while ensuring the safety and livelihood security of rural populations living along forest fringes.

## UPSC Relevance

- **GS Paper III:** Environment and Ecology—Conservation of biodiversity, wildlife habitat management, human-wildlife conflict mitigation, and environmental impact assessment.
- **GS Paper II:** Governance and Judiciary—Judicial directives on environmental protection, implementation of central conservation policies, and statutory frameworks governing forest conservation.

## 8. Personalized mRNA Vaccine Shows Breakthrough in Skin Cancer Recurrence Reduction

### Key Highlights & Summary

- **Clinical Breakthrough in Oncology:** Phase 3 trial results demonstrated that Intisimeran, a novel personalized mRNA cancer vaccine developed by Merck and Moderna, significantly reduces death risk from recurrence and spread of skin cancer.
- **Synergistic Immunotherapy Combination:** Administered alongside the checkpoint inhibitor Keytruda, the combination therapy reduced death risk from cancer recurrence by 49% and reduced death risk from distant metastasis by 59% compared to Keytruda alone.
- **Targeting Patient-Specific Neoantigens:** Each customized dose encodes for 34 unique neoantigens identified from a patient's tumor sample, training the immune system to recognize specific cancer fingerprints.



- **Low Melanoma Incidence in India:** According to Globocan, melanoma accounts for only 0.26% of all cancer cases and 0.17% of cancer deaths in India, making the immediate epidemiological impact limited compared to Caucasian populations.
- **Affordability and Access Barriers:** High costs present significant adoption hurdles in India, where real-world studies from Tata Memorial Hospital show only 1.6% of patients requiring advanced immunotherapy can currently access it.
- **Manageable Safety Profile:** Reported clinical side effects remained mild to moderate, primarily limited to fatigue, localized injection site pain, and temporary chills.



## Essential Definitions

- **Neoantigens:** Mutated proteins found exclusively on cancerous cells that serve as specific biological identifiers for immune system recognition.
- **Messenger RNA (mRNA):** Single-stranded genetic molecules that carry precise instructions from DNA to cellular ribosomes to produce specific target proteins.

## Legal and Constitutional Framework

- **Article 21:** Supreme Court jurisprudence establishes that the fundamental Right to Life encompasses the right to accessible healthcare, advanced medical treatment, and human dignity.
- **Article 47:** Mandatory Directive Principle directing the State to improve public health standards, healthcare infrastructure, and access to life-saving medicines.
- **National Policy for Rare Diseases and Orphan Drugs:** Regulatory framework under the Ministry of Health providing tax waivers and research incentives for advanced biological therapies.

**Conclusion** The development of personalized mRNA cancer vaccines marks a major advancement in targeted precision oncology. To ensure these therapeutic breakthroughs benefit broader populations in developing nations like India, multi-stakeholder strategies focused on indigenous manufacturing, cost-reduction, and public funding models remain vital.

## UPSC Relevance

- **GS Paper III:** Science and Technology—developments and applications in biotechnology, mRNA platforms, advanced oncology, and public healthcare challenges.
- **GS Paper II:** Governance—issues relating to the development, accessibility, and management of Social Sector services in Health.

## 9. Dual Implications of AI in Transforming Cybersecurity and Cyber Threats for India

### Key Highlights & Summary

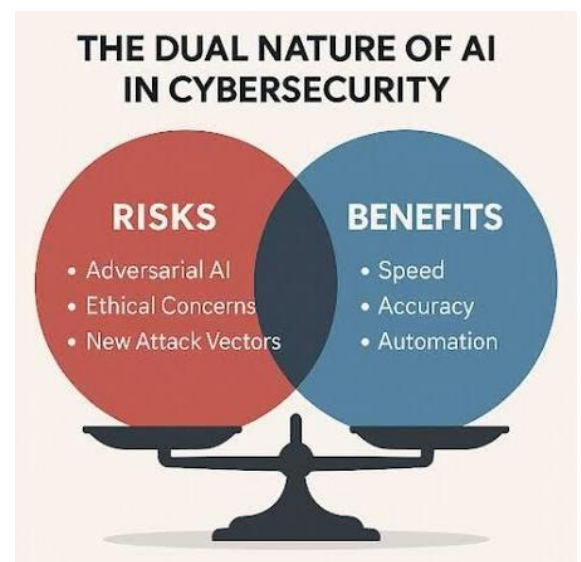
- **Rapid Amplification of Cyber Threats:** Artificial Intelligence (AI) accelerates threat velocity, scale, and sophistication across the entire cyber kill-chain, enabling automated reconnaissance, AI-generated deepfakes, highly targeted phishing, and autonomous offensive cyber operations.
- **Emergence of Polymorphic Malware:** Frontier AI models can autonomously generate, modify, and restructure code into polymorphic malware that dynamically adapts to bypass signature-based traditional antivirus systems and static patches.
- **Critical Infrastructure Vulnerabilities:** AI tools can autonomously uncover zero-day software vulnerabilities at scale across major operating systems, posing severe risks to Operational Technology (OT) and Industrial Control Systems (ICS) in nuclear, defense, and energy sectors.
- **India as a Primary Cyber Target:** Cyber intelligence reports position India as one of the most targeted nations globally, facing AI-driven cyber-espionage and state-sponsored campaigns targeting critical organizations like DRDO, military branches, and energy infrastructure.
- **Asymmetric Capabilities and Dependency:** Cybersecurity capabilities remain concentrated in a few technologically advanced nations, leaving India's indigenous AI ecosystem dependent on foreign computational hardware, GPUs, foundational models, and data-center infrastructure.
- **Policy and Defensive Responses:** Agencies like CERT-In are deploying AI-driven threat detection, trusted frameworks, and advisories to counter agentic AI risks, while MeitY explores consent-based frameworks for synthetically generated content and clear AI liability models.

### Essential Definitions

- **Polymorphic Malware:** Malicious software that constantly alters its identifiable features, such as code structure or encryption keys, to evade detection by traditional signature-based security tools.
- **Agentic AI Autonomy:** AI systems possessing high-level operational autonomy capable of independently planning, adapting, and executing complex sequences of tasks, including offensive cyber operations, without human intervention.

### Legal and Constitutional Framework

- **Information Technology Act, 2000:** Section 66F specifically addresses cyber terrorism, punishing deliberate attacks against critical information infrastructure and national security assets.
- **Seventh Schedule (List I, Entry 1):** Grants the Union Parliament exclusive legislative



competence over national defense, national security, and protection of critical infrastructure from external threats.

- **National Cyber Security Policy:** Framework regulating protection of critical information systems, institutionalizing computer emergency response teams (CERT-In), and establishing cyber resilience standards.

**Conclusion** The convergence of artificial intelligence and cybersecurity creates an urgent national security imperative. Mitigating AI-orchestrated threats requires India to shift from siloed policies toward an integrated doctrine that combines indigenous full-stack AI development, robust liability frameworks, and AI-driven autonomous defense systems to safeguard critical digital infrastructure.

## UPSC Relevance

- **GS Paper III:** Internal Security—Cybersecurity challenges, protection of critical infrastructure, role of AI in offensive and defensive warfare, and state/non-state actor cyber-threats.
- **GS Paper III:** Science and Technology—Developments, ethical concerns, and regulatory frameworks governing Artificial Intelligence and deep-tech innovation.

## 10. Democratizing Competitive Exam Preparation Through AI and Digital Public Infrastructure

### Key Highlights & Summary

- **Massive Coaching Market:** India's test-prep market is projected to reach \$23–\$26 billion by FY30, with 17 to 20 million students in classes 9–12 attending private coaching, highlighting significant educational expenditure.
- **Public Rail, Private Engines Model:** Rather than nationalizing coaching, the state should build Digital Public Infrastructure (DPI) for identity, discovery, and credentialing, while private entities deliver content and last-mile instruction on an open network.
- **Unbundling Test Prep Services:** DPI can unbundle expensive bundled services (content, doubt-solving, peer group, quality signaling) to drive the marginal cost of content and basic doubt-solving toward zero.
- **Open Protocol Architecture:** Inspired by UPI and ONDC, an open education protocol enables multiple front-ends (DIKSHA, private apps) to access a central content registry linked via student APAAR IDs and consent-gated data wallets.
- **Leveraging AI for Personalization:** Open-source AI models (e.g., Gemma) can offer cost-effective, real-time doubt-solving, adaptive diagnostics, and practice modules tailored to examinations like NEET and JEE.
- **Ensuring Educational Equity:** Universal access can be ensured via free data-light streaming, offline downloads, and utilization of 5 lakh+ Common Service Centres (CSCs) for students lacking personal digital devices.





## Essential Definitions

- **Digital Public Infrastructure (DPI):** Interoperable, open-standard digital networks (e.g., Aadhaar, UPI, DigiLocker) built for public benefit that enable private innovation and equitable service delivery at scale.
- **APAAR ID (Automated Permanent Academic Account Registry):** A unique 12-digit lifelong academic ID for students in India that digitally tracks educational progress, credits, and achievements.

## Legal and Constitutional Framework

- **Article 21A:** Mandates the State to provide free and compulsory education to all children aged 6 to 14 years as a Fundamental Right.
- **Article 46:** Directs the State to promote the educational and economic interests of weaker sections of the people with special care.
- **Digital Personal Data Protection (DPDP) Act, 2023:** Regulates the processing of students' personal and educational data, mandating strict consent-gated access patterns.

**Conclusion** Transitioning India's competitive exam preparation from closed corporate platforms to an open DPI ecosystem levels the playing field for underprivileged students. By serving as an open market-maker and leveraging AI-driven adaptive learning, the government can turn commercial test preparation into a free, high-quality public utility.

## UPSC Relevance

- **GS Paper II:** Governance, Government Policies and Interventions for development in the Education sector; Issues relating to the development and management of Social Sector/Services.
- **GS Paper III:** Science and Technology—developments and applications of Artificial Intelligence; Digital Public Infrastructure (DPI) and inclusive economic growth.

## 11. State-Wise Divergence in Female Labour Force Participation Rate

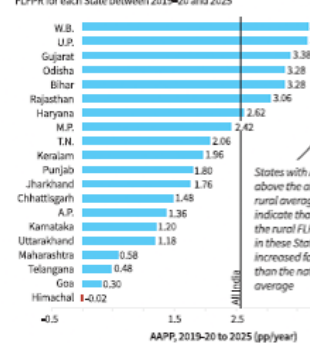
## Key Highlights & Summary

- Surge in Female LFPR:** According to the Periodic Labour Force Survey (PLFS) 2025, overall Female Labour Force Participation Rate (FLPR) for individuals aged 15 and above rose from 30% in 2019-20 to 40% in 2025.
- Rural-Urban Disparity:** The growth was significantly more pronounced in rural areas, where rural FLPR surged from 33% to 45.9%, compared to a modest rise from 23.3% to 27.7% in urban areas.
- Rural Growth Leaders:** West Bengal, Uttar Pradesh, Gujarat, Odisha, Bihar, Rajasthan, and Haryana recorded an Average Annual Percentage Point (AAPP) change above the all-India rural average.
- Urban Trends and Variations:** In urban areas, Rajasthan and Gujarat recorded strong gains with AAPP exceeding 2 percentage points per year, whereas states like Himachal Pradesh, Haryana, and Goa logged negative or minimal urban AAPP.
- Baseline vs. Pace of Growth:** Assessing performance requires analyzing both baseline participation and AAPP; states like Tamil Nadu, Kerala, and Andhra Pradesh maintained high baseline participation despite lower or moderate AAPP growth.
- Drivers of Regional Patterns:** Habitat shifts, agricultural reliance, local socio-economic dynamics, changing land use, and localized employment availability drive significant variations across states and between rural and urban sectors.

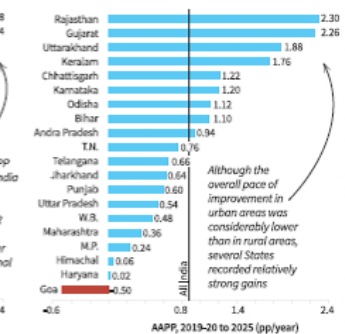
## Wide variations

The data for the charts were sourced from PLFS 2025. The author is an Indian Statistical Service Officer serving as Joint Director in MoS&PI

**Chart 1:** Average annual percentage point (AAPP) change in rural FLPR for each State between 2019-20 and 2025

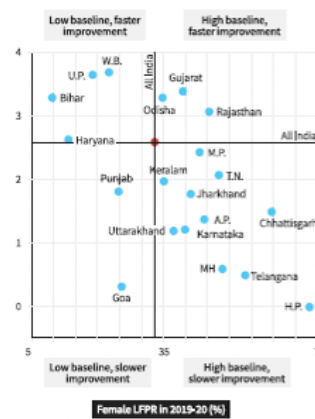


**Chart 2:** Average annual percentage point (AAPP) change in urban FLPR for each State between 2019-20 and 2025

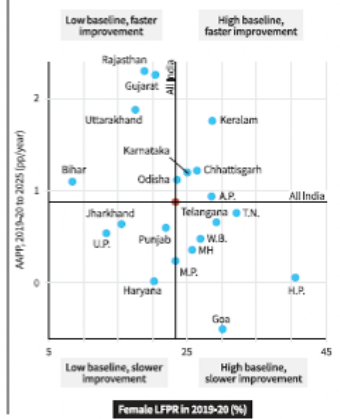


- 1 Average annual percentage point change (AAPP) is used to indicate the pace of improvement and is not intended to rank States
- 2 In Chart 1, Himachal Pradesh is particularly notable, with a marginally negative AAPP, despite nearly 90% of its population residing in rural areas
- 3 As shown in Chart 4, States like Tamil Nadu, Telangana, West Bengal, Maharashtra, Madhya Pradesh, Himachal Pradesh and Goa recorded slower improvement despite their relatively higher starting levels

**Chart 3:** Baseline (2019-20 LFPR) and AAPP relation for rural FLPR



**Chart 4:** Baseline (2019-20 LFPR) and AAPP relation for urban FLPR



## Essential Definitions

- Labour Force Participation Rate (LFPR):** The percentage of persons in the population who are either working (employed) or actively seeking/available for work (unemployed).
- Average Annual Percentage Point (AAPP):** A metric measuring the absolute rate of change per year in percentage points, used to evaluate the speed of improvement independent of initial baseline levels.

## Legal and Constitutional Framework

- Article 39(a) & 39(d):** Directive Principles obligating the State to secure adequate means of livelihood equally for men and women, and ensure equal pay for equal work.
- Article 42:** Mandates the State to make provisions for securing just and humane conditions of work and for maternity relief.
- Code on Social Security, 2020:** Integrates social security benefits, maternity entitlements, and gig/informal sector protections to foster inclusive female workforce inclusion.

**Conclusion** While India's overall female labour force participation exhibits a positive upward trajectory—driven largely by rural expansion—substantial regional and sector-specific divides persist. Targeted urban skill development, formalization of care work, and location-specific structural interventions are essential to bridge the rural-urban gap and sustain gender-inclusive economic growth.

## UPSC Relevance

- **GS Paper III:** Indian Economy—Issues relating to planning, mobilization of resources, growth, development, and employment; inclusive growth and female workforce dynamics.
- **GS Paper II:** Social Justice—Welfare schemes for vulnerable sections, gender equality in governance, and human resource development.

## 12. From Reading Genomes to Designing Them: The Dual-Use Dilemma of AI in Synthetic Biology

### Key Highlights & Summary

- **Shift to AI-Designed Genomes:** Generative AI models like Evo 1 and Evo 2 have enabled researchers to design complete functional viral genomes (such as bacteriophage  $\Phi$ X174), transitioning biology from sequence reading to active genomic architecture.
- **Overcoming Antimicrobial Resistance:** AI-designed phages successfully targeted and destroyed drug-resistant *E. coli* strains, offering therapeutic potential against antibiotic-resistant superbugs and accelerating targeted cancer treatments.
- **Biosecurity Risks & Gain-of-Function:** Biological AI amplifies capability, allowing rapid design of synthetic pathogens, raising urgent biosecurity concerns regarding dual-use research and potential gain-of-function risks.
- **Recalibrating Guardrails:** Existing AI guardrails often trigger high false-positive rates for legitimate scientific research; experts advocate for auditable, graduated access models coupled with institutional DNA-synthesis screening.
- **Sovereignty & AI Infrastructure:** Relying on foreign public AI models leaves domestic research vulnerable; building national biological foundational models and secure compute infrastructure is vital for scientific sovereignty.
- **Strategic Capability Amplification:** AI integrates decades of virology and genomics data into accelerated experimental pipelines, enabling rapid drug discovery and targeted biomanufacturing.

### Essential Definitions

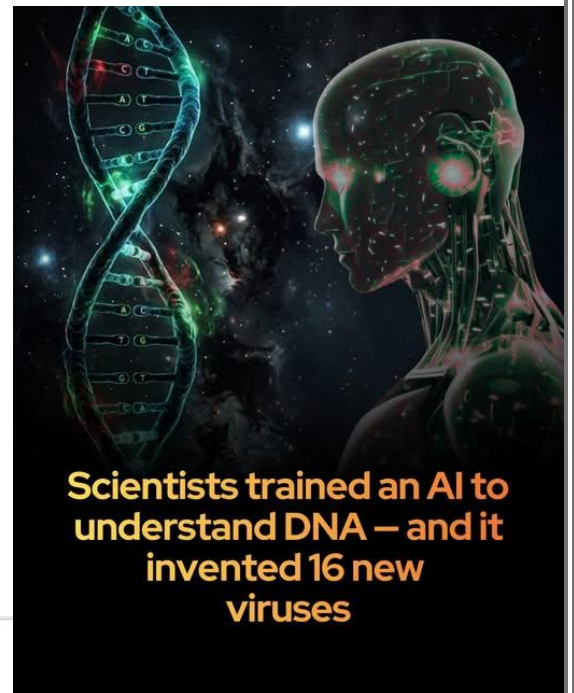
- **Bacteriophages:** Specialized viruses that infect, replicate within, and destroy specific bacterial hosts, used as alternative therapeutic agents against bacterial infections.



- **Gain-of-Function Research:** Scientific experiments that enhance the transmissibility, lethality, or host range of pathogens to study disease mechanisms and advance medical countermeasures.

## Legal and Constitutional Framework

- **Weapons of Mass Destruction and their Delivery Systems (Prohibition of Unlawful Activities) Act, 2005:** Prohibits unlawful activities related to biological weapons and regulates dual-use materials, equipment, and technologies.
- **Manufacture, Use, Import, Export and Storage of Hazardous Micro Organisms/Genetically Engineered Organisms or Cells Rules, 1989:** Promulgated under the Environment (Protection) Act, 1986 to regulate biosafety standards and genetic modifications.
- **Article 51A(h):** Imposes a fundamental duty on every Indian citizen to develop scientific temper, humanism, and the spirit of inquiry and reform.



## Conclusion

The evolution of generative AI in synthetic biology unlocks vast healthcare breakthroughs while escalating biosecurity vulnerabilities. Establishing secure biological data infrastructures, robust DNA synthesis screening protocols, and graduated access frameworks will ensure India balances innovation with national biosecurity.

## UPSC Relevance

- **GS Paper III:** Science and Technology—developments, applications, and implications of Artificial Intelligence, Biotechnology, and Genomics in healthcare and industry.
- **GS Paper III:** Internal Security—Biosecurity threats, regulation of dual-use technologies, and protection of critical biological infrastructure.