

The Hindu Important News Articles For UPSC CSE

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The passage of the **MMDR Amendment Act, 2026** has ignited a federal controversy between the Centre and major mineral-bearing States like Odisha. While the Union government frames the legislation as a necessary reform for uniform regulation and economic stability, States perceive it as an encroachment on their fiscal autonomy and federal balance.

SPOTLIGHT

Satyasundar Barik

In the second week of August, former Chief Minister Naveen Patnaik wrote to Chief Minister Mohan Charan Majhi urging him to convene a special session of the Odisha Legislative Assembly.

The immediate trigger was the Mines and Minerals (Development and Regulation) Amendment Bill, 2026, which was passed by both Houses of Parliament on August 13. It became an Act after it got the assent of President Droupadi Murmu.

According to the Ministry of Mines' 2024-25 annual report, mineral production (excluding Atomic, Fuel and Minor Minerals) was estimated in 20 States, of which about 97.70% of the total value was confined to eight States.

Odisha accounted for the largest share, at 43.49%, followed by Rajasthan (16.26%), Chhattisgarh (13.69%), Karnataka (12.42%), Maharashtra (4.76%), Jharkhand (3.26%), Madhya Pradesh (2.78%) and Andhra Pradesh (1.04%). Remaining States contributed 2.30%.

The MMDR Act states its objective: "extraction and management have to be guided by long-term national goals". It also cites heavy and non-uniform taxes as adversely affecting mineral production. Under the MMDR Act, "the Union

will take under its control the regulation of mineral-bearing lands". It also provides that "no tax, cess or such other levy (by whatever name called) shall be imposed by the State government on mineral rights or mineral-bearing lands".

In its press release, the Central government said, "The amendment... will not take away any of the rights of the States on land and minerals or any tax on minerals collected by the States." It also says the amendment will not impact minor minerals.

Several stakeholders in Odisha, however, feel that they could significantly erode the State's authority over its mineral resources and adversely affect its fiscal interests. This is not just about mining policy or government revenue, but also about the people, mostly tribals, who have been living with the environmental and social costs of mining for generations.

People impacted

In Ransol village, in Odisha's Jajpur district, Ishwar Chandra Mohanta is battling cancer. He does not know how he developed the disease. However, Mohanta claims seven other people from his village have already died of cancer. His home lies in the Sukinda Valley, which contains 98% of India's chromite resources.

The first chromite mine near his village was suspended in 2000, but for people like Mohanta, the

Digging for gold

Parliament passed the Mines and Minerals (Development and Regulation) Amendment Bill, 2026, which put the extraction and management of minerals in the hands of the Central government.

Many in Odisha fear that the new law will impact the State's fiscal health



In Jajpur's Sukinda valley, residents say monsoon run-off from mines turns the area red. BISWARAN JAN ROUT

consequences of decades of mining have not disappeared with the closure of a mine. Chromite mines are a source of dangerous hexavalent chromium pollution that has carcinogenic effects. While the State's vast reserves of iron ore, coal, chromite, and other minerals have attracted industries and generated enormous revenues, communities living around mining belts have often borne the environmental and health burdens.

Their grievances have traditionally been directed at the State government, which remains accountable to them for regulation,

rehabilitation, environmental protection, and local development. The concern now is that the MMDR amendment could create a situation in which that accountability is blurred.

Patnaik says, "If the Central government takes away the State's authority over mineral-bearing lands and its right to levy cesses, only pollution, displacement, and the burden of mining will remain with Odisha."

What the tweak means

The MMDR Amendment Act, 2026, is an amendment to the 1957 Act. Section 2 now provides that

the phrase "regulation of mines" will be followed by "and mineral-bearing land".

"By insertion of 'mineral-bearing land', the Union government has expanded its control over larger areas. It is tampering with the State's power. Land is a subject which is on the State list," says Umesh Jena, former Additional Director of Mines, who has over 30 years of experience in dealing with regulation pertaining to mining.

Umesh says the insertion of Section 9D has two implications: it prohibits States from earning from

new taxes, and also stops States from collecting taxes due through court orders.

The immediate repercussion for Odisha is the loss of thousands of crores in penalties. In 2021-22, Odisha had imposed a ₹22,000 crore penalty on different miners for excess mining in violation of environmental clearance. "The State had collected ₹16,000 crore from defaulting lessees before my retirement. Still, a large chunk is left to be collected. This will not come to the State's exchequer, because of the amendment," says Umesh.

In a statement accompanying the Act, justifying the amendment, G. Kishan Reddy, Union Minister of Coal and Mines, says, "Unbalanced imposition of steep taxes and levies will prompt the industry to completely bypass local supply lines, leading to sub-optimal development of markets, increased transportation costs and the resultant pollution load."

In 2004, the Odisha government had enacted the Odisha Rural Infrastructure and Socio Economic Development (ORISED) Act. This was challenged by miners in the Orissa High Court. The HC subsequently struck down the law. The State government took the fight to the Supreme Court. Now, the Odisha government's two-decade-long efforts to tax miners have come to an end. The taxes raised under ORISED were meant to

benefit mining-affected areas and communities through spending on infrastructure, education and employment.

Srikant, the former Union Minister, asserts that following the SC judgment, Odisha stood to reclaim over ₹1 lakh crore in retrospective dues since 2005, which it could have collected from April 1, 2026. Besides, Odisha would have earned ₹50,000 crore annually through the cess on future mining operations, he points out. The State has, however, not officially estimated the extent of potential loss.

A mineral powerhouse

The scale of Odisha's mineral resources explains why the amendment has triggered such strong apprehension in the State. According to the Ministry of Mines' 2024-25 report, Odisha produced minerals valued at ₹67,955.89 crore, the highest among Indian States.

Mining accounted for 37.59% of Odisha's total projected State revenue in 2026-27.

"In the aftermath of the MMDR Act, the possibility of losing such a substantial amount of potential revenue is a matter of serious concern for Odisha's economic interests," says Suresh Panigrahi, State secretary of the CPI(M).

The economic debate also has a human dimension. Environmentalist Prafulla Samantara points out that much of Odisha's mineral-

bearing land is inhabited by tribal communities, many of whom continue to remain poor despite living amid some of the country's richest mineral deposits.

"In one stroke, the Centre has taken away the State's ability to design welfare programmes for these tribal communities," alleges Samantara, a recipient of the Goldman Environmental Prize, an international award honouring those working at the grassroots.

Political tensions rise

Opposition parties alleged that the Bharatiya Janata Party's MPs did not raise their voices against the amendment in Parliament.

"It is clear that the main objective of this amendment is to centralise powers," Odisha Pradesh Congress Committee president Bhakta Charan Das alleges.

Social media platforms, meanwhile, have been flooded with reactions from political parties and civil society groups, with voices across the spectrum demanding that the Majhi government clarify its position and explain how it proposes to protect Odisha's fiscal and constitutional interests.

Despite repeated attempts to contact Odisha Steel and Mines Minister Bibhuti Bhushan Jena and Steel and Mines Secretary Deorajan Kumar Singh for comment, they were unavailable.

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Key Highlights of MMDR Amendment Act, 2026

- **Expansion of Union Control:** Modifies Section 2 by adding "and mineral-bearing land" after "regulation of mines," giving the Centre broader regulatory authority.
- **Prohibition on State Taxes/Cesses:** Insertion of Section 9D bars State governments from imposing any tax, cess, or additional levy on mineral rights or mineral-bearing lands.
- **Bar on Retrospective Dues:** Restricts States from collecting pending revenue/penalties stemming from past judicial verdicts or legislative levies (e.g., Odisha's ORISED Act efforts).
- **Scope Exclusions:** Minor minerals and existing core territorial rights over land remain technically outside the centralizing scope per Central clarifications.

Core Concerns for Odisha & Mining States

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Daily News Analysis

- **Fiscal Health Erosion:** Odisha—contributing 43.49% of India's mineral value—stands to lose vast sums in potential prospective cesses (estimated up to ₹50,000 crore annually) and retrospective collections.
- **Federal Asymmetry:** Land is a **State Subject (List II, Item 18)**. Expanding Central control over mineral-bearing land blurs constitutional boundaries under **List I (Item 54)** vs **List II (Item 23)**.
- **Blurred Accountability for Local Impacts:** While the Centre consolidates fiscal benefits, the social, environmental, and health burdens (e.g., hexavalent chromium pollution in Sukinda Valley) remain fully borne by the State and local tribal populations.

Related Static Dimensions

- **Constitutional Dimensions:**
 - **Seventh Schedule Dynamics:** Division of powers regarding minerals—Entry 54 of List I (Union List) vs Entry 23 of List II (State List).
 - **Cooperative & Fiscal Federalism:** Impact on State revenue generation after GST centralization and constraints on non-tax revenue sources.
- **Economic Governance:**
 - Resource curse dynamics in mineral-rich states (Odisha, Jharkhand, Chhattisgarh).
 - Distortions in local infrastructure development funded through District Mineral Foundations (DMF).
- **Environmental & Social Impact:**
 - **Fifth Schedule & Rights:** Protection of tribal land rights (PESA Act, 1996 and Forest Rights Act, 2006).
 - **Environmental Justice:** Managing industrial pollution, heavy metal toxicity, and rehabilitation of displaced communities.

Way Forward

- **Rebalancing Fiscal Federalism:** Establish a revenue-sharing mechanism or compensating grant framework to offset revenue losses suffered by top producer States.
- **Strengthening DMF Governance:** Ensure District Mineral Foundation funds directly address localized health and environmental crises without central diversion.
- **Inter-State Council Dialogue:** Utilize constitutional bodies like the Inter-State Council (Article 263) to build consensus on mineral extraction policy rather than unilateral central legislation.

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UPSC Prelims Practice Questions

Question: Which of the following constitutional mechanisms can facilitate dialogue between the Union and States on matters affecting federal relations?

1. Inter-State Council
2. Zonal Councils
3. Finance Commission

Select the correct answer using the code below:

- A. 1 and 2 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. 1, 2 and 3

Ans: D)

UPSC Mains Practice Questions

Question: "The governance of mineral resources represents a complex intersection of Union authority, State powers and local interests." Discuss in the context of India's federal structure. **(10 Marks, 150 Words)**

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The Central Empowered Committee (CEC), appointed by the Supreme Court, criticized the Assam government for its lax response to illegal mining around the **Parkup Pahar Range** near **Kaziranga National Park (KNP)**. Despite a strict 2019 Supreme Court order banning mining in critical catchment areas and eco-corridors, mining activity has continued under various pretexts, threatening the ecological integrity of the World Heritage Site and the surrounding **Karbi Anglong Elephant Reserve**.

SC committee pulls up Assam government for inaction over mining activity near Kaziranga

The Hindu Bureau
GUWAHATI

Amid a controversy over a plan to reduce the Eco-Sensitive Zone of Kaziranga National Park, a Supreme Court-constituted panel has pulled up the Assam government over its handling of mining on the southern boundary of the one-horned rhino habitat.

The Central Empowered Committee (CEC) said the government did not address the issue in and around the Parkup Pahar Range, a declared wildlife sanctuary and vital ecological corridor, with the seriousness it deserved. The latest development follows a June 15 Right to Information (RTI) application filed by environmental activist Rohit Choudhury, seeking details of compliance with the CEC's directions to the Assam Chief Secretary on May 30, 2025.

Mr. Choudhury sought



The CEC said the government did not address the issue near the Parkup Pahar Range.

the comprehensive Watershed Drainage Analysis Report along with quarterly status reports on action taken against reported violations.

The CEC's July 17 response to the RTI stated it did not receive the comprehensive Watershed Drainage Analysis Report. It also said the quarterly status reports had been attached, but the response does not show that the wa-

tershed exercise the CEC ordered was completed.

The CEC had fixed October 2025 as the deadline for submitting the watershed report.

The issue predates the RTI application. In its May 30, 2025, report on "Application No.1592 of 2024", the CEC recorded allegations of renewed mining in Parkup Pahar despite the Supreme Court's April 12, 2019, order restraining all mining and related activities along the southern boundary of Kaziranga and throughout the catchments of rivers and streams originating in the Karbi Anglong hills and flowing into the park.

The same order prohibited new construction on private lands forming part of nine identified animal corridors.

On March 3, the CEC wrote to the Assam Chief Secretary, noting that mining and related activities had been going on "in

some way on one pretext or the other", and that the Karbi Anglong Autonomous Council (KAAC) was not presenting a holistic picture to the courts. The KAAC administers Karbi Anglong, the district that forms Kaziranga's southern boundary.

Terming the issues sensitive, the CEC asked the Chief Secretary to take immediate action. The letter further noted the failure to identify the catchment areas of the streams and rivers originating in the Karbi Anglong hills even after more than six years. "The committee, vide its letter dated May 6, 2021, specifically requested that the action taken by the State government to notify the animal corridors connecting KNP be communicated to the committee at the earliest. However, no response has been received from the State government," it stated.

The panel also pointed

to areas of the Karbi Anglong Elephant Reserve (covering Karbi Anglong and Kaziranga National Park) which had been ravaged by large-scale mining and the death of several elephants due to conflicts with humans. It questioned how mining leases around Borjuri could have been sanctioned at all, given that the area forms part of the elephant reserve.

"The KAAC seems oblivious of all these notifications and is not conscious of the measures that need to be taken to protect the ecology and wildlife of the area," the CEC said.

In its latest communiqué, the panel, reiterating that its May 30, 2025 recommendations remain unimplemented, asked the government to ensure speedy implementation of all its recommendations and immediately notify the nine identified animal corridors.

Key Highlights of the CEC Directions & Compliance Lapses

- **Non-Compliance on Watershed Analysis:** The Assam government failed to submit the mandatory Watershed Drainage Analysis Report (deadline October 2025) to identify stream catchments originating in the Karbi Anglong hills.
- **Failure to Notify Animal Corridors:** Over six years after directions were issued, the State government has not formally notified the **nine identified animal corridors** connecting Kaziranga with the Karbi Anglong hills.
- **Unsanctioned Mining Leases:** The panel questioned how mining leases near **Borjuri** were granted inside a declared elephant reserve, highlighting negligence by the Karbi Anglong Autonomous Council (KAAC).
- **Violation of SC Directives:** Continued mining violates the Supreme Court's April 12, 2019, order prohibiting all mining along KNP's southern boundary and stream catchments, as well as new construction on private corridor lands.

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Core Ecological & Governance Issues

- **Fragmented Wildlife Corridors:** Kaziranga's fauna—notably the one-horned rhinoceros and Asian elephant—rely on Karbi Anglong hills as elevated refuges during annual monsoon floods. Unregulated mining and construction sever these vital migration pathways.
- **Institutional Negligence & Inter-Agency Friction:** The CEC pointed to a disconnect between the state administration, the Karbi Anglong Autonomous Council (KAAC), and judicial bodies, leading to incomplete or misleading representations in court.
- **Escalating Human-Wildlife Conflict:** Destruction of the Karbi Anglong Elephant Reserve has disrupted natural habitats, leading to an increase in human-elephant encounters and elephant fatalities in the region.

Related Static Dimensions (UPSC Syllabus Linkage)

- **Environmental Governance & Law (GS Paper III):**
 - **Role of Judicial Committees:** Powers and mandates of the Supreme Court-appointed **Central Empowered Committee (CEC)** in monitoring Forest Rights and Wildlife Protection compliance.
 - **Wildlife Protection Act, 1972 & EPA, 1986:** Declarations of Eco-Sensitive Zones (ESZ), National Parks, and Wildlife Sanctuaries.
- **Biodiversity & Ecosystem Conservation (GS Paper III):**
 - **Kaziranga National Park:** A UNESCO World Heritage Site, key habitat for the Great One-Horned Rhinoceros (Rhinoceros unicornis), and part of the UNESCO Man and the Biosphere Program footprint.
 - **Landscape-Level Conservation:** Significance of ecological corridors, catchment area protections, and elephant reserves (Project Elephant).
- **Constitutional & Federal Governance (GS Paper II):**
 - **Sixth Schedule Governance:** Role and administrative powers of Autonomous District Councils like the **Karbi Anglong Autonomous Council (KAAC)** over local land management versus environmental protection mandates.

Way Forward

- **Immediate Corridor Notification:** Expeditiously complete and formally notify the nine identified animal corridors connecting Kaziranga to Karbi Anglong to provide legally enforceable protections.
- **Hydrological & Watershed Mapping:** Complete the comprehensive Watershed Drainage Analysis using remote sensing and GIS tools to delimit non-mining buffer zones precisely.

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Daily News Analysis

- **Joint Governance Framework:** Establish an integrated coordination mechanism involving the Assam Forest Department, KAAC, and local conservation activists to monitor illegal mining and enforce eco-sensitive zone mandates.

UPSC Prelims Practice Questions

Question: Which of the following technologies can assist in identifying and protecting wildlife corridors?

1. GIS
2. Remote sensing
3. Satellite imagery
4. Camera trapping

Select the correct answer:

- A. 1 and 2 only
- B. 1, 2 and 3 only
- C. 2, 3 and 4 only
- D. 1, 2, 3 and 4

Ans: D)

UPSC Mains Practice Questions

Question: Why is watershed protection important for biodiversity conservation in and around protected areas? (10 Marks, 150 Words)

Page 07: GS III : Science and Tech / Preliminary Examination

With Low Earth Orbit (LEO) growing increasingly congested due to private megaconstellations and expanding space activity, orbital re-entry has transformed from a rare event into an urgent sustainability and security concern. Released by **IN-SPACE** (Indian National Space Promotion and Authorisation Centre), India's first guidelines on **Planned Re-entry** establish a regulatory framework for private space operators, transitioning global space sustainability "soft law" into legally binding national obligations.

Key Pillars of the IN-SPACE Re-entry Guidelines

- **Mandatory Prior Authorisation:** Any planned re-entry by an Indian entity (domestically or abroad) requires IN-SPACE approval. Foreign entities operating over Indian jurisdiction must act through an Indian-incorporated subsidiary or partner.
- **Quantitative Risk Threshold:** Operators must scientifically demonstrate that human casualty risk remains below **1 in 10,000** through ballistic coefficients, fragmentation models, and de-orbit strategy submissions.
- **Strict Timelines & Advisories:** Post-launch re-entry approvals require a **6-month lead time**; final parameters are re-verified **3 months prior**. Issuance of NOTAM (Notice to Airmen) and maritime danger notifications is mandatory **45 days in advance**.
- **Liability & Financial Indemnification:** Shifts absolute financial liability to the private operator. Companies must secure mandatory third-party insurance, indemnifying the Indian Government against international claims under the **1972 Space Liability Convention**.

Global space norms find a firm footing in India's new re-entry rules

For many decades, there were few rocket launches and few new satellites in orbit every year, so there were also few re-entries, and most of them simply burned up in the atmosphere with little consequence; but today, low-earth orbit hosts several thousand satellites, with private companies planning for many, many more

Shrawani Shagun

In August 23, India marked its third National Space Day, three years since the Chandrayaan-3 mission's lunar lander 'Vikram' touched down on the moon's south pole region.

Between then and Hyderabad-based Skyroot Aerospace launching India's first privately built rocket to orbit, India has come a long way – even as it is also just beginning to regulate the responsibilities that follow from expanding its orbital footprint.

As part of this endeavour, and days after the success of Vikram-1, the Indian National Space Promotion and Authorisation Centre (IN-SPACE) released the country's first guidelines on planned re-entry.

A sustainability problem

For many decades, there were few rocket launches and few new satellites in orbit every year, so there were also few re-entries, and most of them simply burned up in the atmosphere with little consequence. But today, low-earth orbit hosts several thousand satellites, with private companies planning for many, many more. Satellite operators are also deliberately bringing satellites down at the end of their operational lives as part of post-mission disposal in great numbers.

A spacecraft returning to the earth has to negotiate many risks, including deviating from its planned path and breaking up into smaller pieces. It may also affect airspace and maritime zones and potentially crash in the territory or jurisdiction of another state.

Here, the idea of sustainability is important. The UN Guidelines for the Long-term Sustainability of Outer Space Activities define 'sustainability' as maintaining space activities while preserving the outer space environment for future generations. In this context, re-entry poses a question: how can an increasingly crowded orbital environment remain usable as more objects are launched, operated, and eventually brought back to the earth?

Therefore, re-entry is a physics problem as well as a governance problem. And the new IN-SPACE guidelines are intended to give Indian operators clarity on how the Indian government expects them to solve these problems.

'Conditions of permission'

The guidelines have three important elements.

(i) **Accountability** – Any Indian entity undertaking a planned re-entry, whether within or outside Indian territory, now requires the IN-SPACE's authorisation. Non-Indian entities seeking to undertake



ISRO's Vikram-1 rocket carries the Crew Module Atmospheric Re-entry Experiment (CARE) on a suborbital flight after lifting off from Sriharikota in 2015. FILE PHOTO

planned re-entry over Indian territory must route the activity through an Indian-incorporated entity, such as a subsidiary, joint venture or partnership, which will be responsible for complying with Indian laws, regulations, and national security requirements.

This has been done because commercialisation creates an accountability gap: i.e. the spacecraft may belong to a private company but the consequences of its return can lie across maritime zones, and jurisdictions. And India has responded by attaching regulatory responsibility to a re-entering entity even before the risk materialises.

Objects designed to survive re-entry or intentionally controlled towards a particular landing or impact area also require separate authorisation. This is what makes a re-entry 'planned'. On the other hand, objects expected to burn up, melt or fragment sufficiently during natural orbital decay do not count as a planned re-entry.

(ii) **Risk must be acceptable** – The guidelines say the expected casualty risk must remain below 1 in 10,000, supported by survivability and ground-casualty assessments.

As a result, operators have to analyse failure scenarios, fragmentation patterns, ballistic coefficients, de-orbit plans, flight path angles, and danger zones, and share the results. They must also identify components likely to survive re-entry and hazardous systems such as batteries and pressure vessels.

Soft law to domestic rule

For nearly two decades, the international community has developed principles for sustainable space activities. Notable among them are the Inter-Agency Space Debris Coordination Committee's 'Space Debris Mitigation Guidelines' and the 'Guidelines for the Long-term Sustainability of Outer Space Activities' of

the UN Committee for the Peaceful Uses of Outer Space. Article IX of the Outer Space Treaty 1967 also provides an important foundation for environmental responsibility.

However, most of the contemporary sustainability architecture works on guidelines and other similar forms of 'soft law', which operators are not obligated to follow.

The IN-SPACE guidelines solve this problem for India by tying an operator's fragmentation analysis and insurance policies to the national regulator.

The guidelines also address the financial risks that follow from the Space Liability Convention 1972, which places absolute liability on a launching state for damage caused by its space object on the surface of the earth or to aircraft in flight.

The IN-SPACE guidelines, on the other hand, require operators to undertake planned re-entries at their own risk and say they remain liable for third-party damage and claims. They also indemnify the Government of India and its agencies for liability incurred under India's international commitments while satisfying the applicable third-party insurance requirements.

Taken together, the IN-SPACE guidelines translate international principles into obligations that private operators in India must satisfy before the government gives them permission to act. (Shrawani Shagun is a researcher focusing on environmental sustainability and space governance. shrawani.shagun@gmail.com)

THE GIST

A spacecraft returning to the earth has to navigate several risks. It could affect airspace and maritime zones, or even crash within the territory or jurisdiction of another state. This makes sustainability an important consideration.

Days after the success of Vikram-1, IN-SPACE released the country's first guidelines for planned re-entry.

The current international principles for sustainable space activities are soft laws that need not be followed by the operator.

The IN-SPACE guidelines solve this problem for India by tying an operator's fragmentation analysis and insurance policies to the national regulator.

Significance of the Reform

- **Addressing the Commercial Accountability Gap:** Prevents private entities from externalizing environmental or financial risks onto sovereign states during cross-border trajectory re-entries.

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Daily News Analysis

- **Bridging Governance & Physics:** Converts abstract international principles into measurable, verifiable technical thresholds.
- **Enabling Commercial Growth:** Gives private startups (e.g., Skyroot, Agnikul) clear operational predictability as India expands into Reusable Launch Vehicles (RLVs) and satellite constellations.

Related Static Dimensions

- **International Law & Outer Space Governance :**
 - **Outer Space Treaty (1967):** Article IX obligations regarding environmental responsibility and avoiding adverse contamination of space/Earth.
 - **Space Liability Convention (1972):** Sovereign "Launching State" strict liability vs. domestic private operator indemnification.
 - **UN-COPUOS Guidelines:** UN Principles for the Long-term Sustainability of Outer Space Activities and IADC Space Debris Mitigation Guidelines.
- **Institutional Architecture (GS Paper III):**
 - **Role of IN-SPACE:** Single-window autonomous nodal agency under the Department of Space governing Non-Government Entities (NGEs) as mandated under the **Indian Space Policy 2023**.
- **Space Debris & Environmental Security (GS Paper III):**
 - **Kessler Syndrome:** Escalating collision cascade risks in LEO.
 - **Chemical & Heavy Metal Contamination:** Toxicity from unburned satellite components (e.g., hydrazine fuel, heavy alloys, hexavalent components) entering marine and atmospheric ecosystems.

Way Forward

- **Strengthening Space Situational Awareness (SSA):** Expand national tracking capabilities (like ISRO's NETRA project) to independently verify private operators' trajectory and fragmentation data.
- **Harmonizing Cross-Border Approvals:** Establish bilateral coordination protocols with neighboring nations for trajectory clearances over overlapping Exclusive Economic Zones (EEZs).
- **Encouraging Design-for-Demise (D4D):** Incentivize satellite manufacturers to use materials that completely disintegrate during natural decay, minimizing the need for complex planned re-entries.

UPSC Prelims Exam Study Questions

Question: Design-for-Demise (D4D) primarily seeks to:

- A. Design spacecraft so that they completely avoid orbital decay.
- B. Design spacecraft/components to reduce risks and hazards during atmospheric re-entry.
- C. Increase the mass of satellites.
- D. Make satellites permanently remain in geostationary orbit.

Ans:B)

UPSC Mains Exam Study Questions

Question:"The Outer Space Treaty establishes State responsibility even when space activities are undertaken by non-governmental entities." Explain its significance in the era of private space companies. **(10 Marks, 150 Words)**

As global debates intensify over restricting or banning social media access for minors (e.g., Australia's legislation, UK proposals), India faces a key policy choice. Author Milinda Moragoda argues that instead of relying solely on reactive, Western-style regulatory bans, India should leverage its unique civilisational heritage—focusing on digital resilience, ethical grounding, and institutional responsibility.

Key Highlights of the Editorial

- **Limits of Technological Bans:** Regulatory barriers (firewalls, age limits) are easily bypassed via VPNs, encrypted tools, and AI circumvention. Regulation alone cannot outpace rapid technological evolution.
- **The AI Frontier:** The challenge has evolved beyond social media into real-time engagement with autonomous AI agents that educate, mentor, or potentially manipulate youth.
- **Fear vs. Institutional Readiness:** Public anxiety during technological shifts is historical (printing press, TV). Policy driven by fear risks stifling innovation rather than building management capacity.
- **Civilisational Framework:** Reinterpreting traditional structures—like the Guru-Shishya tradition—not to recreate the past, but to foster internal character, critical judgment, self-discipline, and ethical reasoning.

Core Arguments for Indian Policy

- **Internal Guidance over External Enforcement:** External bans attempt to keep youth away from tech; a civilisational approach prepares them to navigate it responsibly.
- **Multi-Stakeholder Mentorship:** Digital literacy requires an ecosystem: digitally engaged parents, schools teaching digital citizenship, and cultural bodies offering ethical orientation.
- **Absorptive Resilience:** India's historical strength lies in integrating external disruptions without losing its foundational values, demonstrating that technological progress and cultural continuity can coexist.

Related Static Dimensions

- **Ethics, Integrity & Aptitude**

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A civilisational approach to social media

The debate over banning social media for minors is rapidly becoming one of the defining policy questions of the digital age. As countries around the world move toward restrictions, India is faced with a choice: follow regulatory models developed elsewhere or draw upon its own traditions to address the challenge.

Recent measures in Australia, proposals in the U.K., and differing approaches in the U.S. have intensified calls for similar action elsewhere. The arguments are often compelling, particularly when framed around the safety and well-being of children.

The concerns are not imaginary; social media can expose young people to manipulation, addiction, bullying, and harmful content. While these dangers deserve serious attention, it does not automatically follow that bans are the answer. Regulation is important but the more important question is whether regulation alone can prepare the next generation for a world increasingly shaped by AI and digital technologies.

Fear is not the answer

History suggests that every major communications revolution has generated anxiety. The printing press triggered fears about the uncontrolled spread of information; radio, television, and the Internet provoked similar concerns. The enduring challenge has never been about whether information should flow but how societies can encourage its responsible use.

Today's challenge is magnified by scale and speed. The smartphone has become the printing press, library, marketplace, classroom, and public square of the modern age combined. Social media, AI, and emerging digital technologies are together driving perhaps the greatest transformation in society since the Industrial Revolution.

Many young people understandably find this transition



Milinda Moragoda
Former Sri Lankan Cabinet Minister, diplomat, and founder of the Pathfinder Foundation, a strategic affairs think tank

unsettling. They are growing up amid rapid technological disruption, geopolitical uncertainty, widening inequality, and a pervasive sense of instability. In such an environment, fear can become a powerful political force. However, societies should be careful not to allow fear to become the principal driver of policy. Policymakers should ensure that legitimate concerns about children's well-being do not evolve into a broader resistance to innovation itself. The challenge is not to stop technological change, but to ensure that society develops the institutions to manage it.

Governments are now attempting to erect barriers against technologies that are becoming more sophisticated, personalised, and difficult to control. The contest between regulation and innovation is increasingly unequal. Sophisticated technology will easily enable people to circumvent the barriers the government creates. Virtual private networks, encrypted applications, alternative platforms, and future AI-driven tools will make circumvention increasingly easy. The real question is therefore not how to keep young people away from technology, but how to prepare them to live with it.

Indeed, the debate may already be overtaken by events. The next generation will interact not merely with social media platforms but with intelligent AI systems that can educate, entertain, mentor, and potentially manipulate. The challenge before us is therefore much larger than social media.

Governments unquestionably have a role. They should demand greater transparency from platforms, establish clear standards for child protection, combat criminal activity, and encourage responsible innovation. However, regulation alone cannot solve what is fundamentally a social, cultural, and civilisational challenge. India should explore a broader response rooted in its

own civilisational experience.

Drawing from one's roots
For centuries, Indian society developed mechanisms to transmit values, wisdom, and social responsibility across generations. Family structures, religious traditions, and educational institutions helped young people navigate periods of change and uncertainty. Among the most enduring of these was the *guru-shishya* tradition, a relationship that extended far beyond the transmission of knowledge. It sought to cultivate character, self-discipline, and a sense of responsibility.

The challenge today is not to recreate the past but to adapt its strengths to the realities of the 21st century. Parents must become more digitally literate and engaged in the online lives of their children. Schools should teach not only technological skills but also digital citizenship, critical thinking, ethical reasoning, and resilience. Religious and cultural organisations should engage with technology rather than retreat from it. Technology companies, educators and civil society should work together to encourage responsible behaviour online.

Just as previous generations learned how to navigate the physical world responsibly, future generations must learn how to navigate the digital world responsibly. This is not simply a technological challenge. It is an educational and cultural one.

India's civilisational strength has always been its ability to absorb powerful external influences without losing its cultural core. As one of the world's oldest civilisations with a growing digital society, India is positioned to demonstrate that tech progress and cultural continuity can coexist. The challenges posed by social media will not be resolved by building a bigger firewall. They will be addressed by combining safeguards with the human institutions that shape judgment, resilience, and responsibility.

Regulation alone cannot solve what is fundamentally a social, cultural, and civilisational challenge

Daily News Analysis

- **Digital Ethics:** Moral challenges of algorithmic manipulation, addictive tech design, and data privacy.
- **Role of Family & Educational Institutions:** Inculcating values, ethical reasoning, and emotional intelligence in digital spaces.
- **Attitude & Behavioral Change:** Cultivating internal self-regulation (Samyama) versus relying strictly on external legal compliance.
- **Governance & Social Justice**
 - **Data Governance & Child Protection:** Balancing legislative measures (DPDP Act, 2023, IT Rules) with digital rights and freedom of expression.
 - **Role of Civil Society & EdTech:** Community-driven digital literacy campaigns vs. state control.
- **Science & Society**
 - **Impact of Emerging Technologies:** Psychological, social, and cognitive effects of social media and Generative AI on minors.
 - **Technological Determinism vs. Human Agency:** Designing policy that promotes innovation while safeguarding social cohesion.

Way Forward

- **Embed Digital Citizenship in Curricula:** Integrate critical thinking, media literacy, and online ethics into school education (aligning with NEP 2020 objectives).
- **Adopt Co-Regulation Models:** Encourage technology platforms to implement default safety settings (Safety-by-Design) alongside transparent algorithmic audits.
- **Promote Parental Digital Empowerment:** Roll out grassroots digital literacy programs targeted at parents and educators to bridge generational digital divides.
- **Formulate a Human-Centric AI Strategy:** Focus national policy on building cognitive resilience and ethical awareness rather than resorting to unenforceable blanket digital bans.

UPSC Prelims Exam Study Questions

Question: Which of the following best describes algorithmic bias?

- A. Random failure of computer hardware.
- B. Systematic or unfair outcomes generated or amplified by an algorithm due to data, design or implementation choices.
- C. Encryption of user information.
- D. Increasing the speed of internet connectivity.

Ans: B)

UPSC Mains Exam Study Questions

Question: "Digital governance should move from platform-centric regulation towards a multi-stakeholder model involving government, technology companies, schools and families." Discuss. **(10 Marks, 150 Words)**



Page 09 : GS II : Governance / Preliminary Examination

The Periodic Labour Force Survey (PLFS) 2025 highlights a post-COVID-19 surge in India's Female Labour Force Participation Rate (FLFPR) for ages 15+, rising from 30% in 2019-20 to 40% in 2025. However, this growth exhibits a pronounced spatial divide: rural FLFPR expanded significantly (33% to 45.9%), whereas urban growth remained modest (23.3% to 27.7%). Combining the Average Annual Percentage Point (AAPP) change with baseline levels reveals significant cross-State dynamics.

The rural-urban divide in female labour force participation

The participation of women in the labour market has increased, with the rise being more pronounced in rural areas than urban areas

DATA POINT

Chandrasekar K.

The Periodic Labour Force Survey (PLFS) 2025 reveals a significant increase in the Female Labour Force Participation Rate (FLFPR) since 2020, following the COVID-19 pandemic. The overall FLFPR for those aged 15 years and above increased from 30% in 2019-20 to 40% in 2025. The increase was more pronounced in rural areas, where the FLFPR rose from 33% to 45.9%, compared with an increase from 23.3% to 27.7% in urban areas. This substantial rural-urban difference warrants a more granular analysis.

Chart 1 shows the Average Annual Percentage Point (AAPP) change in rural FLFPR for each State between 2019-20 and 2025. West Bengal, Uttar Pradesh, Gujarat, Odisha, Bihar, Rajasthan and Haryana recorded AAPP above the all-India rural average; but most continued to register positive annual changes.

Similarly, Chart 2 shows the AAPP change for urban areas. Rajasthan and Gujarat, with AAPP above 2 percentage points per year, recorded particularly sturdy improvements. Uttarakhand, Kerala, Chhattisgarh, Karnataka, Odisha, Bihar and Andhra Pradesh also recorded AAPP above the all-India urban average. In contrast, the remaining States recorded AAPP below the national average. This indicates that several States recorded relatively strong gains despite overall pace of improvement being lower in urban areas than in rural areas.

However, AAPP alone is insufficient as it measures only the pace of change and does not consider the level of female labour force participation from which a State

started. Therefore, combining the baseline level – 2019-20 FLFPR for each State – with the AAPP helps better assess the States.

Chart 3 shows the rural baseline-AAPP relationship. Bihar, Uttar Pradesh, West Bengal and Haryana started with relatively low female FLFPR but recorded AAPP above the all-India average, indicating a relatively faster pace of improvement. In contrast, Goa and Punjab started from relatively low baseline levels but recorded AAPP below the national average, indicating slower improvement despite having considerable scope. Odisha, Gujarat and Rajasthan started with relatively higher baseline rural FLFPR and recorded an above-all-India-average AAPP, indicating that faster improvement is not confined to States starting from a low base. Madhya Pradesh, Jharkhand, Uttarakhand, Chhattisgarh, Maharashtra, Himachal Pradesh and the five southern States had relatively higher baseline levels but recorded AAPP below the national average.

Chart 4 shows the urban baseline-AAPP relationship. Rajasthan, Gujarat, Uttarakhand and Bihar started from relatively low baseline levels but recorded AAPP above the all-India average. In contrast, Uttar Pradesh, Jharkhand, Haryana and Punjab also started from relatively low levels but recorded below-average AAPP, indicating slower improvement. Among the States with relatively higher baseline urban FLFPR, Kerala, Karnataka, Chhattisgarh, Odisha and Andhra Pradesh recorded above-average AAPP, showing that some States with already higher participation continued to make relatively rapid gains.

Taken together, all charts show that female labour force participation differs substantially across States and between rural and urban areas. It also demonstrates why AAPP should not be interpreted in isolation: a State with a lower AAPP may already have a relatively high FLFPR.

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 FLFPR for each State between 2019-20 and 2025

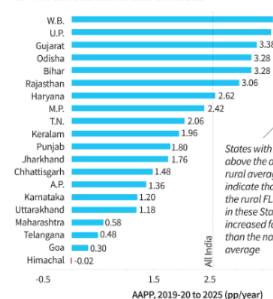
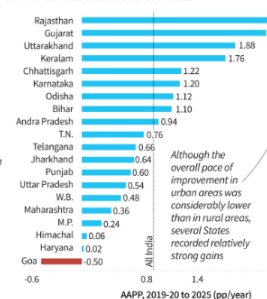


Chart 2: Average annual percentage point (AAPP) change in urban FLFPR for each State between 2019-20 and 2025



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 FLFPR) and AAPP relation for rural FLFPR

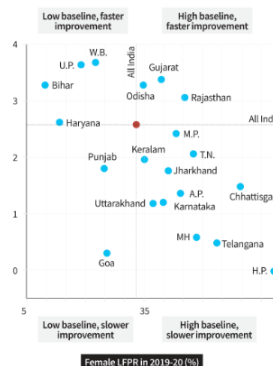
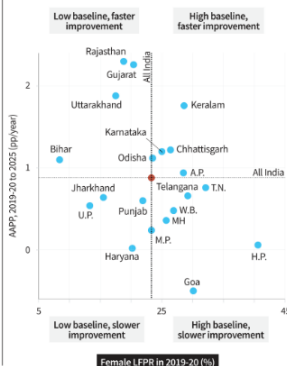


Chart 4: Baseline (2019-20 FLFPR) and AAPP relation for urban FLFPR



Key Highlights & State Categorization

• Rural Dynamics (Baseline vs. Pace of Growth):

- **Catch-Up Growth (Low Base, High AAPP):** Bihar, Uttar Pradesh, West Bengal, and Haryana started with low baseline levels but recorded above-average annual growth.
- **Stagnant/Lagging Growth (Low Base, Low AAPP):** Goa and Punjab started with low baselines and continued to record below-average growth, showing persistent structural barriers.

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Daily News Analysis

- **Sustained High Performers (High Base, High AAPP):** Odisha, Gujarat, and Rajasthan maintained strong participation rates alongside above-average growth rates.
- **Plateauing Performers (High Base, Low AAPP):** Madhya Pradesh, Jharkhand, Chhattisgarh, Maharashtra, Himachal Pradesh, and the five southern States started with relatively high baselines but experienced below-average growth rates.
- **Urban Dynamics:**
 - **Rapid Urban Growth:** Rajasthan and Gujarat demonstrated robust urban improvements with AAPPs exceeding 2 percentage points per year.
 - **High-Baseline Gainers:** Kerala, Karnataka, Chhattisgarh, Odisha, and Andhra Pradesh continued making rapid urban gains despite starting from high baseline levels.
 - **Urban Lag:** Uttar Pradesh, Jharkhand, Haryana, and Punjab struggled with low baselines and low growth rates.

Core Factors Behind the Rural-Urban Divide

- **Nature of Work & Distress-Driven Entry:** Rural FLFPR growth is frequently driven by unpaid family labor, self-employment, and agricultural work during economic shocks. Urban participation requires formal employment opportunities, which face higher entry barriers.
- **Structural Barriers in Urban Areas:** Lack of affordable childcare, safety concerns, long commutes, and the burden of domestic responsibilities disproportionately restrict urban women from entering formal jobs.
- **Social Norms & Income Effect:** High household incomes in certain urban or semi-urban regions can lead to a withdrawal of women from the labor force (the U-shaped FLFPR curve phenomenon).

Related Static Dimensions

- **Indian Economy & Employment :**
 - **Quality vs. Quantity of Employment:** Examining whether rural FLFPR increases reflect distress-driven informal employment rather than economic empowerment.
 - **Sectoral Transformation:** Slow transition of female labor from low-productivity agriculture to high-value manufacturing and services.
- **Social Justice & Gender Issues**
 - **Care Economy & Care Penalty:** Unpaid domestic work (measured in Time Use Surveys) acting as a primary structural barrier to formal FLFPR.
 - **Regional Disparities:** Interstate variation in female empowerment, literacy, and socio-cultural norms shaping economic outcomes.
- **Governance & Policy Interventions**

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Daily News Analysis

- **Impact of Government Schemes:** Role of MGNREGA in boosting rural female work engagement versus urban employment schemes (e.g., state-level urban wage employment initiatives).

Way Forward

- **Urban Care Infrastructure:** Expand affordable, public-funded creches and childcare facilities in urban commercial centers to lower entry barriers for working mothers.
- **Targeted Urban Employment Programs:** Formulate national-level urban wage employment guarantees aimed specifically at women in informal settlements.
- **Skill Alignment & Formalization:** Bridge the rural-urban gap by providing female-centric vocational training, micro-entrepreneurship support (via SHGs/DAY-NRLM), and enabling flexible/remote work policies in formal sectors.

UPSC Prelims Exam Study Questions

Question: Which of the following best describes quality of employment?

- A. It is determined exclusively by the number of people employed.
- B. It can involve wages, job security, working conditions, social protection, productivity and formalisation.
- C. It refers only to employment in government institutions.
- D. It is synonymous with labour force participation rate.

Ans: B)

UPSC Mains Exam Study Questions

Question: "A rise in female labour force participation is necessary but not sufficient for women's economic empowerment." Discuss with reference to the quality and nature of employment in India. **(10 Marks, 150 Words)**

Not 'delulu' — an AI tutor for every child in India

Indian students rank among the top students almost anywhere in the world. The joke is that, from the womb to the afterlife, they are taught to study maths and science which serves them well throughout life. A report by Redseer says that India's test-preparation market has been estimated at \$14.8 billion in FY26, projected to reach \$23-\$26 billion by FY30 (12%-15% CAGR), with around 2,00,000 coaching centres nationwide. There are 65 million students in classes 9-12, of whom around 27 million attend government schools. A 2025 National Statistical Office survey found that 27% of students were taking or had taken private coaching in the academic year (30.7% urban, 25.5% rural). Across datasets, coaching incidence is around 27%-30%, implying that 17 million to 20 million students in classes 9-12 participate in some form of test-prep coaching.

No single private platform has the capacity or curriculum breadth to serve as the sole national provider. PhysicsWallah, for example, has around 4.9 million paid online users — while the target population is 10 to 100 times larger. This needs to be built as a platform and network play, not a vendor contract.

Better learning, better outcomes

How can the government take the help of Artificial Intelligence (AI) to deliver a free coach and tutor to every Indian child? The objective should not be to bring down the private coaching industry but to improve the learning standards and examination outcomes of the last child in the line who today spends thousands of rupees on dubious coaching centres without achieving the necessary results. Bring the industry in as suppliers, or they will lobby against it and the reputational risk of failing completely, is high for the government to sustain.

We should not nationalise coaching. Build a public rail, private engines model: the state supplies the digital public infrastructure (identity, payments, discovery, data, credentialing) and aggregates demand; the private sector — star teachers, ed-tech firms, local tutors — supplies content and last-mile delivery shared by both. Government becomes the platform and market-maker, not the content producer. This is exactly how UPI beat closed payment apps and how the pen Network for Digital Commerce is attempting to beat closed commerce: unbundle the monopoly, open the protocol, let a thousand providers compete on an open network.

The Indian coaching industry charges high fees because it bundles four things that do not have to be bundled: content; doubt-solving/mentoring; peer group and discipline, a credible signal of quality. DPI lets us unbundle these and drive the marginal cost of the first two toward zero. This can be anchored in an existing centre of excellence such as Bodhan.ai at IIT Madras



Srivatsa Krishna
IAS officer

The government can create the digital infrastructure for every Indian child to access a free Artificial Intelligence (AI) tutor — which was the vision behind the Prime Minister's call

(which has a ₹500 crore, five year government grant) or a similar National Payments Corporation of India (NPCI)-like body that needs to be created for education (a Section 8 not-for-profit steward).

Where it should begin

It should start with the National Eligibility cum Entrance Test (Undergraduate), or NEET, and the Joint Entrance Examination, the two most widely taken examinations in India. JEE/NEET are objective, machine-gradable, and high-volume. The content is already freely available on YouTube; what is scarce is a trusted, standardised rank signal and personalised doubt-solving.

An IIT professor who teaches students who have cleared JEE 30 years ago may not be the best option for teaching test prep. Today's test prep skill and requirement is in a very different age, time, and pedagogy.

Government aggregates demand thereby drives down the customer acquisition cost for the private sector and owns the rails and the trust layer; the private sector and star teachers compete to deliver content and mentoring on an open network; the student owns the data and carries a voucher (optional). That is how you turn a \$15b paywall industry into free, plural, high-quality prep — without the state trying to become the teacher.

As with any private good using public rails, it will use Aadhaar/DigiLocker for student sign-up and to de-duplicate; APAAR ID to tie learning to the academic record. Along with this will be a curated content registry, an open catalogue where any accredited provider publishes lessons, problem sets, and mock tests against a standard syllabus taxonomy (NEET/JEE topic tree) and open metadata (language, difficulty, medium, accessibility tags). The government will set the taxonomy and standards for the content and ensure interoperability.

Content interoperability is the whole game — a student's progress in one provider's module must be portable to another's. There shall be a discovery layer, a government-run reference app plus open APIs so third parties (including the DIKSHA app, state apps, even Google/YouTube) can surface the same content — multiple front ends, one network. For example, PhysicsWallah, Vedantu, Allen or Narayana could offer their material for free and charge for doubt-solving or premium sessions with ranked professors. IIT professors could also upload their lectures and be rated and ranked on the platform. Adaptive personalisation should be a core feature and as a network service, an open recommendation/diagnostic engine that routes say a weak-in-organic-chemistry student to the best-rated module on that topic, regardless of provider. These will be accompanied by a learning wallet and a progress ledger, a student-owned record of what they have studied,

mock scores, and mastery per topic, consent-gated through the DEPA/Account Aggregator pattern. The student — not the ed-tech firm — owns the data, which is the single biggest structural break from today's walled-garden apps. Lastly, while the platform will be mostly free at the point of use, UPI-plumbed premium add-ons (live mentoring, graded assignments) can be micro-charged or voucher-funded, should the government wish to create a DBT-like e-Shiksha wallet. Deliberately thin the government software: The state builds protocols and a reference app; it does not try to build the best learning app. It will not win that race and should not try this. Government alone can aggregate the demand and credential the supply and outcomes — that is all it should do. It should auto-invite every registered Class 11-12 student through schools, CBSE/State boards, and the DIKSHA install base. The system should guarantee reach through free data-light streaming, downloadable content for low-bandwidth areas, and distribution through the five lakh-plus Common Service Centres and school computer labs for students without personal devices. Equity is the mandate — the ₹60,000 crore industry already serves the affluent; the gap is everyone else.

Government should publish open ratings and outcome data: publish, per provider and per module, how students who used it scored on official mocks and the real exam. Quality signal becomes objective, not marketing. This is the credential the coaching industry currently monopolises. Government alone can ensure independent accreditation of providers (content accuracy, no misleading claims), with delisting teeth. Further there should be a no-lock-in rule to ensure that providers cannot hold a student's progress data hostage; portability is enforced at the protocol level.

Models on offer

There is no dearth of content, good and bad, on YouTube but where an AI tutor helps is in practice, doubt solving and adaptive personalisation, which only AI can do. There are good open-source models such as Gemma, which give a million tokens for about 20 to 30 cents or 10,000 tokens per day or 3.6 million tokens per year for just ₹100. Further, every AI minute is equivalent to 1,000 voice minutes of a human; frontier tech companies such as Meta and Google are paying star Kota teachers \$25 to \$30 per hour for commoditising their content. Further, their models will get trained on it and Generative Inference will do the rest on top of it.

We should not be delulu — as Gen Z would put it — government should not become the AI tutor itself. It should only enable the AI tutor through the blueprint given.

The views expressed are personal

GS Paper II: Social Justice

UPSC Mains Exam Practice Questions: "Digital Public Infrastructure can democratise access to quality education, but only if digital connectivity is accompanied by institutional and pedagogical reform." Discuss. (10Marks, 150 Words)

Context :The Problem: India's test-prep market is an unsustainable paywall (\$14.8B in FY26, projected \$23–\$26B by FY30). Out of 65 million students in Classes 9–12, 17–20 million attend private coaching due to a lack of quality signal and personalized doubt-solving in standard schooling.

- **The Solution:** Adopt a **"Public Rails, Private Engines"** model akin to UPI and ONDC. The government builds the foundational protocols and discovery layer, while private ed-techs, star teachers, and AI models supply content and last-mile delivery.
- **Core Mechanisms:**
 1. **Unbundling Coaching:** Decouple content delivery and doubt-solving from quality signalling and discipline.
 2. **DPI Architecture:** Leverage Aadhaar/DigiLocker, APAAR ID, DEPA (Data Governance), and a centralized curated content registry mapping to the NEET/JEE taxonomy.
 3. **Role of AI:** Use cost-effective open-source AI models for adaptive learning, automated doubt-solving, and personalized diagnostics, keeping marginal costs near zero.
 4. **Government's Role:** Market-maker, credentialing authority, and protocol builder—**not** the app developer or AI tutor itself.

UPSC Analytical Breakdown

1. Pedagogical & Policy Alignment (GS Paper II - Education)

- **NEP 2020 Compliance:** Aligns with the National Education Policy's emphasis on equitable access, technology integration, and reducing reliance on rote coaching mechanisms.

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Daily News Analysis

- **Reducing Educational Inequality:** Mitigates the rural-urban and socio-economic divide by providing students in tier-2/3 cities and government schools access to top-tier preparation material at zero marginal cost.

2. Structural Shift via DPI (GS Paper II & III - Governance & Tech)

- **From Walled Gardens to Open Networks:** Replaces proprietary, monolithic platforms with open APIs, creating non-discriminatory market access.
- **Data Sovereignty (DEPA/APAAR):** Ensures student progress data is consent-gated and portable, preventing vendor lock-in and safeguarding data privacy under the DPDP Act, 2023.

3. Economic Efficiency (GS Paper III - Indian Economy)

- **Lowering Customer Acquisition Costs (CAC):** Government aggregation of student demand drives down marketing expenses for private entities, shifting focus to content quality.
- **Demonetizing Basic Prep:** Micro-transactions or government-backed vouchers (e-Shiksha wallet) apply only to premium add-ons, leaving core diagnostic tools and content free.

Static & Governance Dimensions

- **Digital Public Infrastructure (DPI):** India's identity (Aadhaar), payments (UPI), and data-sharing (Account Aggregator) rails applied to social sectors.
- **APAAR ID (Automated Permanent Academic Account Registry):** A 'One Nation, One Student ID' initiative under NEP 2020 to track academic progress seamlessly.
- **DEPA (Data Empowerment and Protection Architecture):** Consent manager framework allowing individuals to control and share their data safely.
- **DIKSHA (Digital Infrastructure for Knowledge Sharing):** Existing national platform for school education acting as a baseline reference front-end.
- **Article 21A & Right to Education (RTE):** Extending the spirit of equitable educational opportunities beyond elementary levels into secondary and competitive stages.

Challenges & Critical Evaluation

- **Digital Divide:** High-bandwidth requirements for AI processing and streaming conflict with internet connectivity issues in remote rural pockets.

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Daily News Analysis

- **Hallucination in AI Models:** AI tutors handling complex STEM subjects risk generating inaccurate solutions, requiring strict guardrails and human-in-the-loop auditing.
- **Private Sector Resistance:** Incumbent coaching conglomerates with high profit margins may resist unbundling and open-rating mechanisms.

Way Forward

1. **Pilot Deployment:** Launch the protocol initially for NEET/JEE in collaboration with institutions like IIT Madras (Bodhan.ai).
2. **Infrastructure Augmentation:** Utilize BharatNet and Common Service Centres (CSCs) to bridge the hardware and bandwidth gap for rural students.
3. **Robust Credentialing:** Enforce independent algorithmic audits of content accuracy and outcome data transparency.