

SANSKRITI IAS EDITORIALS HIGHLIGHTS

24-08-2026

1. Global space norms find a firm footing in India's new re-entry rules (THE HINDU PAGE NO 7)

• Syllabus

- GS Paper III: Awareness in the field of Space, Indigenization of technology, and Scientific policy developments.
- GS Paper II: Important international treaties, agencies, and global governance frameworks.

• Syllabus Sub-topics

- IN-SPACE guidelines for planned re-entry, Space sustainability, Space debris mitigation, Outer Space Treaty 1967, and Space Liability Convention 1972.

• Key Themes

- **Space Governance and Debris Management:** Balancing the rapid expansion of private commercial launches with regulatory accountability to prevent orbital crowding and unmanaged re-entry hazards.
- **Translating Global Soft Law into Domestic Regulation:** Operationalizing international non-binding principles into legally binding liability and safety mandates for Indian space entities.

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-I, 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



GSVL Mk-III 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.

By requiring quantitative studies and attaching a number to the acceptable risk threshold, the guidelines make sustainability measurable and thus trackable.

(iii) **Permissions** – Per the guidelines, IN-SPACe will re-verify the latest re-entry parameters approximately three months before the proposed operation. If planned re-entry is decided upon after launch, the operator must apply at least six months in advance. Operators must also obtain an IN-SPACe advisory note to issue warnings to airborne and marine vessels in the re-entry area at least 45 days before the re-entry begins.

If a re-entry site falls within the territorial control of a non-Indian state, including in its exclusive economic zones, the applicant must also submit the relevant clearance or authorisation from that state.

These checkpoints ensure that the regulator has fixed windows and mechanisms to intervene when the re-entry parameters change after the mission has launched or the risk pattern has changed for some reason.

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 U.N. 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-I, 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

2. Not ‘delulu’ — an AI tutor for every child in India(

THE HINDU PAGE NO 8)

Syllabus

- GS Paper III: Science and Technology developments and applications, Awareness in the field of Artificial Intelligence, and Digital Public Infrastructure (DPI).
- GS Paper II: Issues relating to the development and management of education and human resources.

Syllabus Sub-topics

- AI in education, Open Network protocols in edtech, Democratizing test preparation, APAAR ID and DigiLocker integration, and Data Empowerment and Protection Architecture (DEPA).

Key Themes

- DPI Model for Learning:** Unbundling coaching monopolies by establishing open public digital rails that connect students with diverse content creators and AI-driven adaptive tutors.
- Equity and Accessibility:** Reducing the private household expenditure on competitive exam prep for rural and economically disadvantaged students through state-enabled digital infrastructure.

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 open 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

3. A civilisational approach to social media(THE HINDU PAGE NO 8)

- **Syllabus**
 - GS Paper II: Government policies and interventions for development in various sectors, Child rights, and Welfare mechanisms.
 - GS Paper IV: Role of family, society, and educational institutions in inculcating values, and Ethics in digital technology.
- **Syllabus Sub-topics**
 - Social media regulation for minors, Digital citizenship, Cyber safety, Cultural values in digital governance, and Limitations of outright platform bans.
- **Key Themes**
 - **Regulation vs Cultural Resilience:** Moving beyond blunt legislative bans or firewalls toward institutional and familial mechanisms that nurture digital literacy and critical discernment.
 - **Navigating Disruptive Technology:** Drawing on civilisational traditions of mentorship and self-discipline to counter algorithmic addiction, mental health risks, and online manipulation.

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

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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.

4. The rural-urban divide in female labour force participation(THE HINDU PAGE NO 9)

- Syllabus

- GS Paper III: Indian Economy and issues relating to planning, employment, and inclusive growth.
- GS Paper I: Role of women and women's organizations, Social empowerment, and Regional development disparities.

- Syllabus Sub-topics

- Periodic Labour Force Survey (PLFS) trends, Female Labour Force Participation Rate (FLFPR), Rural versus urban employment dynamics, and Post-pandemic economic recovery.

- Key Themes

- Regional and Sectoral Disparities:** Marked divergence between rural female employment driven by agricultural distress or recovery and sluggish urban female participation growth.
- Quality of Employment:** The need to look beyond headline participation numbers to evaluate whether increased rural participation represents productive wage work or distress-driven unpaid family labour.

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. In contrast, Madhya Pradesh, Punjab, Jharkhand, Chhattisgarh, Uttarakhand, Maharashtra, Goa, Himachal Pradesh and the five southern States recorded AAPP below the national 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, 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.

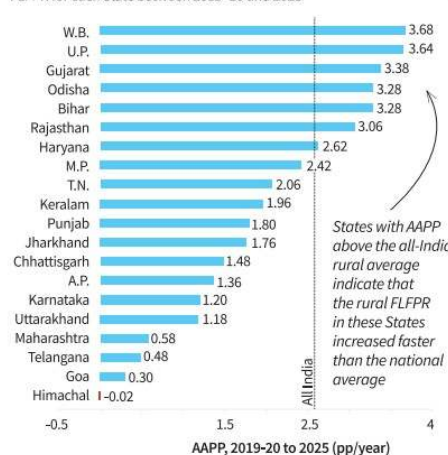
Chart 4 shows the urban baseline-AAPP relationship. Rajasthan, Gujarat, Uttarakhand and Bihar started from relatively low baseline levels but recorded AAPP above the all-India average. In contrast, Uttar Pradesh, Jharkhand, Haryana and Punjab also started from relatively low levels but recorded below-average 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

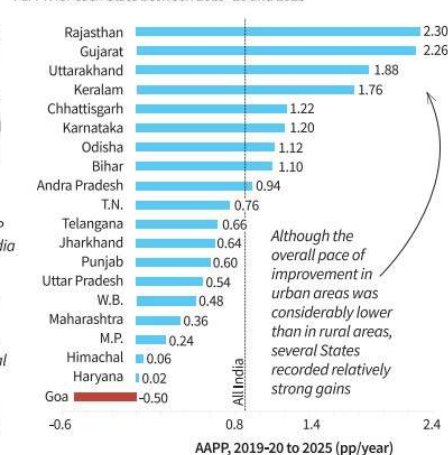
The data for the charts were sourced from PLFS 2025. The author is an Indian Statistical Service Officer serving as Joint Director in MoS&PI

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



States with AAPP above the all-India rural average indicate that the rural FLFPR in these States increased faster than the national average

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



Although the overall pace of improvement in urban areas was considerably lower than in rural areas, several States recorded relatively strong gains

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

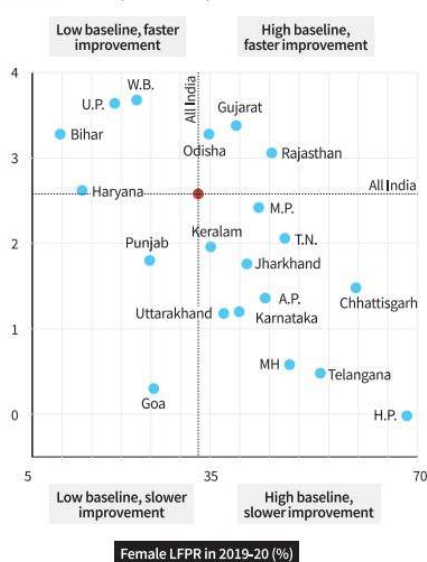
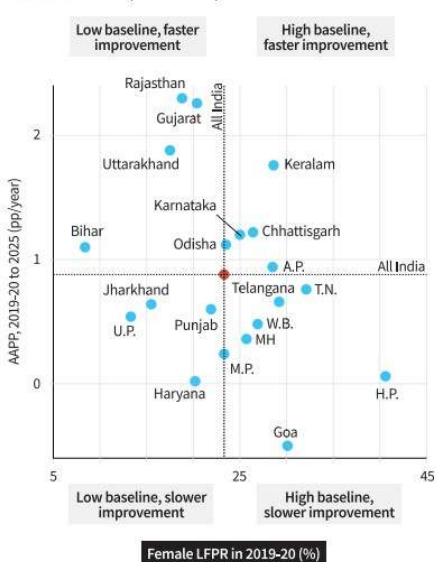


Chart 4: Baseline (2019-20 FLFPR) and AAPP relation for urban FLFPR



5. What changes when AI moves from reading viral genomes to designing them?(THE HINDU PAGE NO 11)

Syllabus

- GS Paper III: Awareness in the fields of Biotechnology, Science and Technology, and Internal security threats linked to dual-use technologies.
- GS Paper IV: Ethical dilemmas in frontier science and biological safety.

Syllabus Sub-topics

- Generative AI in biology, Bacteriophage design, Antimicrobial resistance (AMR), Biosecurity protocols, and Dual-use research risks.

Key Themes

- Revolutionizing Therapeutics:** Using AI models to design targeted phages and vaccines that overcome drug resistance and fast-track biomedical development.
- Biosecurity and Governance:** Crafting dynamic regulatory guardrails that prevent the proliferation of synthesized pathogens while avoiding blanket prohibitions on critical scientific innovation.

What changes when AI moves from reading viral genomes to designing them?

The Stanford experiment does not show that AI can casually manufacture dangerous human viruses; it shows that computers are beginning to move from analysing biological information towards proposing biological designs that scientists can physically build

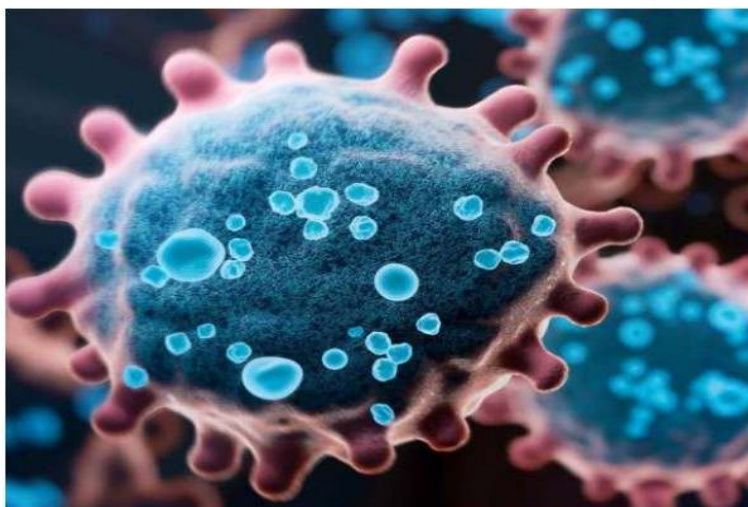
Abdul Ghafur

The computer did not create a virus. It did not touch a test tube or handle a living cell. What it did may ultimately be more consequential: it helped decide what the virus's genome should be. Researchers at Stanford University and the Arc Institute used artificial intelligence (AI) to design complete genomes of bacteriophages - viruses that infect bacteria. Of 285 AI-generated designs physically synthesised and tested in the laboratory, 16 produced functioning phages. Some were able to overcome bacterial resistance that defeated the original virus. The phrase 'AI-created viruses' therefore needs qualification. Humans have been synthesising viral genomes and deliberately modifying viruses for decades. What is new is not the physical manufacture of a virus. AI has entered the design stage of biology. For medicine, that creates remarkable opportunities. For biosecurity, it raises equally important questions.

From reading genomes to designing Bacteriophages - literally "bacteria eaters" - have been known for more than a century and are among the most abundant biological entities in nature. In 1977, one particularly small phage, ΦX174, pronounced roughly 'phi-X-one-seventy-four', became the first complete DNA genome to be sequenced. By the early 2000s, scientists had shown that viral genetic material could be synthesised from known sequence information and used to recover functioning viruses. Humans had progressed from reading viral genomes to writing them. Scientists then became increasingly capable of deliberately altering viruses. The controversial influenza gain-of-function experiments of 2011-12 showed that genetic changes could modify important properties such as transmission in experimental animals. Such research highlighted a dilemma that remains unresolved: the same science that can improve pandemic preparedness may also create biosafety and biosecurity risks.

The Stanford-Arc experiment represents the next step. The scientists already knew the ΦX174 genome and already knew how to synthesise viral DNA and recover functioning phages. What changed was who -or what -proposed the genome. They used Evo 1 and Evo 2, genome language models. The principle resembles a large language model, except that instead of learning patterns in words, Evo learns patterns in DNA. It studies the genetic alphabet - A, C, G and T - across vast numbers of genomes and then generates new genetic sequences. For this experiment, the models were further trained on thousands of bacteriophage genomes related to ΦX174.

AI did not invent a completely unrelated virus from nothing: it generated previously unseen ΦX174-like whole genomes within a known biological framework. Scientists selected some of these sequences, physically manufactured the DNA and introduced it into *E. coli*. If the genetic instructions were biologically coherent, the bacterial machinery produced new phage particles. 16 designs succeeded. The progression is striking: we learnt to read viral genomes, then to write them, then to



GETTY IMAGES

modify them. Now AI is beginning to help decide what should be written.

One finding shows why this matters. An AI-designed phage successfully combined a viral protein with other genetic changes in a way that conventional engineering had struggled to achieve. The significance is not simply that AI can propose individual mutations; it may increasingly be able to identify multiple genetic changes that work together across an entire genome, exploring combinations that would be extremely difficult for humans to test one by one.

The medical opportunity

The most immediate application may be phage therapy. Antibiotic resistance is steadily eroding conventional treatment options, while bacteriophages offer another way of killing bacteria. Their major limitation is specificity: a phage effective against one bacterial strain may fail against another, and bacteria can also develop resistance to phages.

Traditionally, researchers have searched nature and phage libraries for suitable candidates or modified existing viruses. Generative biology introduces another possibility. Instead of asking only, "Can we find the phage we need?", medicine may increasingly ask, "Can we design the phage we need?"

The Stanford experiment offered an early demonstration. Combinations of AI-designed phages overcame resistance in *E. coli* strains against which the original ΦX174 failed. For clinicians confronting antimicrobial resistance, this is potentially important.

The possibilities extend beyond phage therapy. AI can assist the design of vaccine antigens, antibodies, therapeutic proteins and viral vectors used to deliver genetic treatments. It may eventually help optimise oncolytic viruses that selectively attack cancer cells. The larger revolution is therefore not simply 'AI making viruses'. It is AI becoming capable of designing biological function.

The danger is acceleration

It is tempting to be reassured because ΦX174 is an exceptionally simple bacteriophage, while dangerous human

viruses are vastly more complicated. Human pathogens must negotiate receptor binding, host range, tissue tropism, replication, immune escape and transmission. But complexity should not become false reassurance. Human scientists already understand much about these determinants. Decades of virology, reverse genetics and gain-of-function research have linked many genetic changes to viral behaviour.

AI does not need to rediscover virology. Its power lies in integrating what humanity already knows, examining vastly more combinations than humans can explore manually and accelerating the path from hypothesis to experimental design. This is the real biosecurity concern: capability amplification. The relevant question is not whether an untrained individual can ask today's chatbot to generate a pandemic virus. It is whether increasingly capable AI could make a knowledgeable and well-equipped laboratory substantially more effective at designing biological systems.

Future systems may compress months or years of literature review, modelling and experimental planning into much shorter cycles. Combined with increasingly automated laboratories, that acceleration could become profound. Even the apparently modest success rate in the Stanford study deserves this perspective. Only 16 of 285 designs worked, but digital systems can generate enormous numbers of candidates. A low success rate is reassuring only while the number of attempts remains small. Biosecurity will therefore also have to evolve. Traditional DNA-synthesis screening often asks whether an ordered sequence resembles a known pathogen or toxin. In the age of generative biology, researchers increasingly argue that screening must also consider biological function: not simply whether a sequence looks dangerous, but what it might actually do.

Safety without paralysing science

AI companies are already confronting this dilemma. Claude Fable 5 was initially deployed with strong safeguards around biology, chemistry and cybersecurity. Legitimate scientific work could

sometimes trigger a fallback to a less capable model. The intention was understandable, but the experience illustrated the problem: too little restriction creates risk, while too much restriction can obstruct legitimate science.

Those safeguards have since been refined to reduce false-positive biology fallbacks, while more sensitive capabilities remain restricted. This points towards a more practical model: graduated, auditable access in which legitimate researchers can obtain stronger capabilities under appropriate institutional and security controls. Biosecurity also cannot rest entirely on what an AI model agrees or refuses to answer. Safeguards are needed throughout the chain - AI systems, DNA-synthesis providers, laboratories and institutional biosafety oversight.

India must build capability

There is an important implication for India. If frontier AI becomes central to drug discovery, genomics, vaccines, protein engineering and experimental design, access to advanced AI becomes part of national scientific infrastructure. Smaller and specialised models will be sufficient for many tasks. But a country can choose to use a small model because it is sufficient; it should not be forced to use one because somebody else owns the frontier. If researchers elsewhere receive trusted access to highly capable biomedical models while Indian scientists depend on restricted public versions, the resulting disadvantage could accumulate across drug discovery, vaccines, antimicrobial resistance and other fields.

India is already investing through the IndiaAI Mission and indigenous foundation-model programmes. That ambition should include scientific and biomedical AI, secure compute, high-quality datasets and trusted-access frameworks for legitimate researchers. AI sovereignty without biosecurity would be reckless; biosecurity without AI sovereignty could leave us scientifically dependent.

Governing biological intelligence

The Stanford experiment does not show that AI can casually manufacture dangerous human viruses. It shows something more precise: computers are beginning to move from analysing biological information towards proposing biological designs that scientists can physically build. That capability could transform antimicrobial resistance research, vaccines and therapeutics. It could also accelerate harmful biological engineering. The answer is neither prohibition nor unrestricted access, but controlled acceleration - allowing beneficial science to progress while safeguards increase with capability and risk.

The challenge is no longer simply whether AI should be allowed to understand biology. It is how we govern AI when understanding biology increasingly becomes the ability to design it. India must be capable not only of regulating and consuming that revolution, but of participating in its science and helping shape its safeguards. (Dr. Abdul Ghafur is a senior consultant in infectious diseases, Apollo Hospital, Chennai and coordinator, Chennai Declaration on AMR)

6. 5 years on, how India has warmed up to the Taliban(INDIAN EXPRESS PAGE NO 9)

- Syllabus
 - GS Paper II: India and its neighborhood relations, Bilateral and regional groupings, and Effect of policies of other nations on India's interests.
- Syllabus Sub-topics
 - India-Afghanistan relations, Regional security dynamics, Chabahar port and connectivity, Counter-terrorism safeguards, and Humanitarian assistance.
- Key Themes
 - **Strategic Realism:** Shifting from absolute non-engagement to pragmatic, phased diplomatic interactions to protect past developmental investments and maintain regional leverage.
 - **Balancing Security and Human Rights:** Managing core national security priorities (preventing anti-India terror safe havens) while navigating the erosion of women's rights and civil liberties under the Taliban regime.

• GEOPOLITICS

5 years on, how India has warmed up to the Taliban

In August 2021, the last US plane flew out of Kabul. The years since have been marked by India's deepening engagement with the Afghan regime



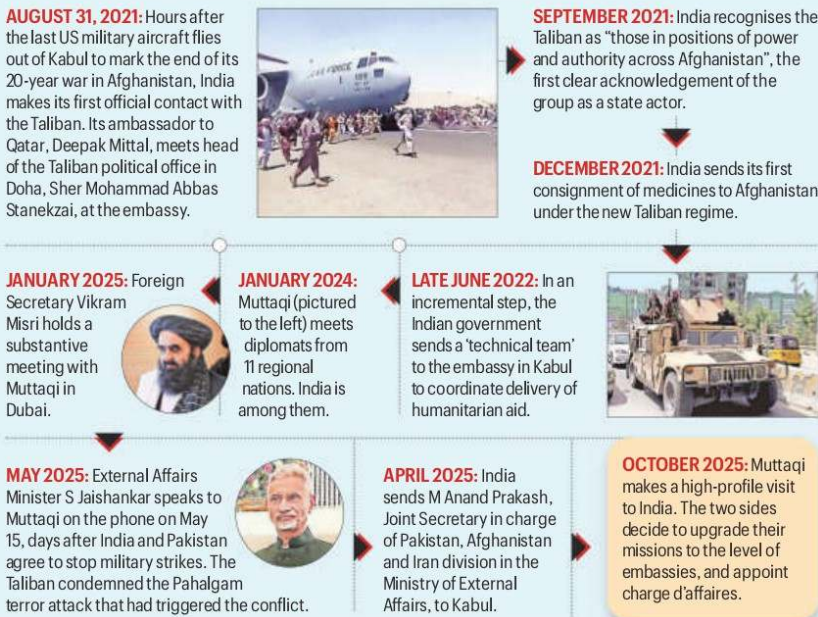
SHUBHAJIT ROY

THE AFGHANISTAN embassy in New Delhi celebrated "victory day" on August 15, marking the Taliban's takeover of the country five years ago. Much has changed in these five years when it comes to the Indian position on the Taliban dispensation. On August 17, 2021, New Delhi had hurriedly evacuated its entire embassy from Kabul. Now, it is conducting business with the Islamist regime, albeit without granting it official diplomatic recognition. The "victory day" celebration, attended by Indian diplomats and about two dozen foreign diplomats, was the latest sign that the India-Taliban relationship is now increasingly moving away from the shadows. While Indian officials have called this a case of "cautious engagement", others have criticised it as "opportunistic".

Why India is deepening ties

India has stepped up diplomatic exchanges with the hardline Islamist group. Taliban Foreign Minister Amir Khan Muttaqi made a high-profile visit to New Delhi in October 2025. The Afghan embassy has been under the control of the Taliban since around that time. And the Taliban-appointed Charge d'affaires, Mufti Noor Ahmad Noor, has been part of multiple key events in Delhi — the Prime Minister's Independence Day address, the President's At Home reception, and even a diplomatic event at the Norwegian embassy. So, what's behind all this? India invested for years in Afghanistan after the fall of the Taliban in 2001. In August 2021, the Ashraf Ghani-led government collapsed — ahead of the August 31 deadline set by President Joe Biden for withdrawal of US troops from the country. In the months and years since, the Indian government came to the conclusion that it was time to upgrade the level of engagement without giving official recognition — or watch its or watch its USD 2-3 billion investment go down the drain. That was meant for the people of Afghanistan, and to create some kind of leverage and influence in the country.

• ACKNOWLEDGEMENT TO ENGAGEMENT



A key factor has been the fact that the Taliban's once-benefactor and ally, Pakistan, has turned into a deadly adversary. Both sides have seen multiple clashes along their contested border. For New Delhi, this has been a window of opportunity. Another factor hastening India's engagement is China. Beijing has started building bridges with and eyeing natural resources in Afghanistan — filling the vacuum left behind by the West. Russia, too, has been engaging with the Taliban, and is the only country to have established diplomatic ties with them. Delhi has been working with Moscow on Taliban to keep track of the Chinese influence. New Delhi started sending signals back in December 2021, when it sent a consignment of medicines to Afghanistan. The government was choosing to distinguish the Taliban regime from the Afghan people.

The security concerns

New Delhi has operated on the simple principle that Afghanistan's territory

should not be used for anti-India activities and support for terrorist groups. An August 10 report by the UN Security Council's 1267 sanctions committee states: "The terrorist threat emanating from Afghanistan remained largely unchanged. The ability of numerous terrorist groups to operate in Afghanistan constituted an enduring threat to neighbouring countries and the Central Asian region. Despite efforts by the *de facto* authorities to combat Islamic State in Iraq and the Levant-Khorasan (ISIL-K) and contain other terrorist groups, the authorities were unable to suppress the terrorist problem." It also said that the Al-Qaeda's status and strength in Afghanistan remains unchanged. New Delhi would be relieved that the report contains no mention of anti-India terror groups, such as Lashkar-e-Taiba and Jaish-e-Mohammad, among others. But it is keeping its fingers crossed. So far, New Delhi's engagement has been "limited" and the Taliban has indicated that it will be "reasonable" in the way it "handles"

Eroding rights

Since taking control, the Taliban has been eroding the rights of Afghanistan's 22 mn women. It barred access to school for girls over 12, curbed travel without a male chaperone and brought a law implying legal approval for child marriage.

Indian concerns. The security provided to Indian diplomats in Kabul has given some confidence to the Indian establishment. At the victory day event, Charge d'affaires Noor delivered a 21-minute speech where he addressed the security concerns on everybody's mind. "A peaceful, stable and responsible Afghanistan creates new opportunities for regional connectivity, trade, investment and economic cooperation, while also playing a constructive role in preventing shared security threats." Noor said: "The Islamic Emirate of Afghanistan believes that Afghanistan's geography should not be a field for negative competition, but rather a bridge for connectivity, cooperation and shared prosperity. Therefore, Afghanistan has continued its practical efforts to expand regional economic and transit cooperation, facilitate trade, and strengthen relations based on mutual interests." This was seen as a message to India and Pakistan, which have long battled for influence in Afghanistan. Rights issues Since August 2021, India delivered substantial humanitarian aid to Afghanistan, including 50,000 metric tonnes of wheat, over 445 tonnes of essential life-saving medicines, vaccines and disaster relief material. But the issue of rights — for minorities and women — is not part of either Taliban's or India's publicly stated red lines anymore. Shortly after the Taliban takeover, the UN Security Council adopted a resolution about the need for upholding human rights and women's rights in Afghanistan. The August 30 resolution was adopted under India's rotating presidency. In December 2022, India expressed concerns over reports that the Taliban had banned women from universities in Afghanistan. Now, the Indian side has not insisted on any of those old red lines. It has agreed to move forward with development cooperation on Indian-funded projects and visas for Afghans visiting India for medical treatment, business and even education. It's a telling silence. India's strategic embrace of the Taliban is nearly complete. The Afghan missions in Delhi, Mumbai and Hyderabad are now manned by Taliban-appointed diplomats; they only lack official diplomatic recognition. Until that happens, the main flagpole of the Delhi embassy will continue to fly the old Afghan Republic's tricolour.

7. What young want, and why creating good jobs is no longer optional(INDIAN EXPRESS PAGE NO 10)

- **Syllabus**
 - GS Paper III: Indian Economy, Employment generation, Mobilization of resources, and Demographic dividend.
 - GS Paper II: Issues relating to human resource development and youth welfare.
- **Syllabus Sub-topics**
 - Labour market aspirations, Formal vs informal sector employment, Job market information asymmetry, and Wage expectations among educated youth.
- **Key Themes**
 - **Aspiration-Opportunity Mismatch:** A growing divergence between youth salary and stability expectations for formal salaried roles versus actual informal market realities.
 - **Demographic Dividend Imperative:** Urgent structural reforms required to formalize employment and create high-productivity jobs to avoid squandering India's demographic window.

What young want, and why creating good jobs is no longer optional

WHAT ARE the hopes and desires of young job seekers in urban India? In the summer of 2023, armed with a long list of questions, we set out to survey over 3,000 randomly sampled men and women, 24 years of age on average, and living in the middle-class residential areas of Delhi. Our interest lay in understanding their journey towards employment — whether they were currently working or looking for work, or were planning to start their job search soon. The answers we got opened a window into the aspirations of this generation.

Almost 70 per cent of respondents — more men than women — told us they were looking for a job opportunity that would put them on their ideal career path from the start, instead of settling for just any job. Their career goal was predominantly being in salaried or formal-sector employment. More women job seekers aspired to these salaried positions, while only 14 per cent of the women we interviewed preferred being self-employed. In contrast, more than a third of men wanted to start their own enterprises. Contrary to the dominant narrative of strong preference for public-sector salaried jobs, a comparable share of these men and women were looking for private-sector salaried jobs.

Let's compare the above statistics with the occupational data from the PLFS in 2023. Less than 50 per cent of India's urban workforce is in salaried jobs, a figure that is even

lower for our age group of respondents — merely one in every three employed 24-year-old holds a salaried job. No more than 10 per cent of our urban workforce is in the public sector or government jobs, and only about 15 per cent are in the formal private sector. Of those working, 40 per cent are self-employed but an overwhelming majority of these are subsistence businesses that do not hire any worker and have an annual turnover of less than Rs 10 lakh. So what are the odds of one of our job seekers landing her preferred salaried job or establishing a unicorn? Undoubtedly, the odds are stacked against these aspirational men and women.

But even if the probability of getting their preferred job is low, could they obtain a job, even if not ideal, that could give them salaries they aspire to? We asked respondents about their salary expectations from a range of jobs — accounts keeper, teacher in primary school, data entry operator, hospital attendant or electrician. We estimate the deviation of these salary expectations from the actual earnings for these jobs in urban India in the PLFS. Our job seekers expect up to 40 per cent higher salary than actual earnings reported in the PLFS for the same occupation. Male job seekers, in particular, show greater over-optimism in salary expectations relative to women, expecting almost Rs 8,000 more per month than the actual average earnings for these jobs and Rs 8,500 more per month for salaried jobs.



FARZANA AFRIDI

These men and women continue to aim for formal-sector jobs or to become dynamic entrepreneurs a year after, because aspirations are long-term goals and not easily malleable. Our job seekers are willing to bide their time

Altogether, salary expectations diverge from reality by more than 30 per cent. When we assess the job aspirations and expectations of job seekers who are below 25 years of age in our sample, we find that expectations are even more skewed — again, more so for young men than young women.

Are the youth in our cities simply out of touch with labour-market realities? There can be several reasons for these misalignments and high expectations — lack of information or misinformation and inexperience with the job market, to name a couple of obvious explanations. We tested one hypothesis — can information about real-world job opportunities and salaries correct these job-market misperceptions? So we set out to inform and expose a random subset of our 3,000 job seekers to the real world and re-surveyed both the informed and the non-informed a year later. Twelve months after receiving information, we find that providing accurate information about job opportunities significantly dampened job seekers' labour-market expectations of landing their ideal job relative to those who were not informed. Men, in particular, were less likely to report that they were on their ideal career path. This disillusionment is accompanied by a decline in men's job-search intensity. Thus, as preferred job offers fail to materialise, job seekers adjust their expectations downwards and either remain in the

same jobs or drop out of the labour market and enrol at educational institutions.

Not surprisingly, correct information seems to have made the job seekers realise that their expectations were too high. But did it also change the aspirations of these job seekers? The answer is a clear "no". Perhaps it is not surprising that the aspirations did not change. These men and women continue to aim for formal-sector jobs or to become dynamic entrepreneurs a year after, because aspirations are long-term goals and not easily malleable. Our job seekers are willing to bide their time. Add to these aspirations the rising cost of good-quality education — more likely to be accessed through private educational institutions — then their job-market expectations are not just aspirational but necessary to recover the high cost of education.

Policymakers must reckon with the fact that this generation is demanding good career opportunities — and that realising their aspirations will require nothing short of a structural transformation of the economy. The challenge of formalising our labour markets by creating jobs with regular pay and benefits is a first-order concern. While the new labour codes are a step in the right direction, creating "good" jobs and genuine career paths — not just jobs — is no longer optional. Failing to do so risks squandering the potential of an entire generation.

The writer is professor of Economics, ISI (Delhi), and visiting professor, NCAER

8. Israel's West Bank push imperils long-term peace(INDIAN EXPRESS PAGE NO 7 10)

- **Syllabus**

- GS Paper II: Effect of policies and politics of developed and developing countries on India's interests, Important international institutions and conflicts.

- **Syllabus Sub-topics**

- West Asia conflict, Two-State Solution, Israeli settlement expansion in the West Bank, International humanitarian law, and UN resolutions.

- **Key Themes**

- **Erosion of the Two-State Solution:** Expanding settlements and infrastructure partitioning the West Bank, threatening the territorial contiguity of a viable Palestinian state.
- **Regional Instability and Global Diplomacy:** The diplomatic rift between international consensus advocating de-escalation and unilateral ground-level actions exacerbating civilian displacement.

Israel's West Bank push imperils long-term peace

WHILE GLOBAL attention has been fixed on Gaza, Israeli settlers have been intensifying violence against Palestinians in West Bank — under Israeli occupation since 1967 — the larger of the two territories that constitute Palestine. A UN briefing to the Security Council on August 11 said that “the West Bank is at the breaking point”, with 76 Palestinians killed in 2026 by Israeli forces or settlers. In the same period, UN data reveal that about 3,800 Palestinians, nearly half of them children, have been displaced by settler violence, demolitions and evictions. Settlement expansion is widely seen as a state project, as underlined by the Benjamin Netanyahu government's plan to open tenders for the construction of 1,200 settlement homes. Against this backdrop, the joint statement by the UK, France, Germany, Italy and Canada calling the tenders “unacceptable” and urging Israel to “retract the plans immediately” is welcome. Eight Muslim-majority nations, too, have criticised the plans; the US has expressed opposition but stopped short of condemnation.

Successive Israeli governments have facilitated the growth of settlements in West Bank, but this has accelerated since Netanyahu returned to power in 2022, backed by far-right parties championing the settler cause. Of course, Israel's security concerns are not to be dismissed, particularly after the October 7 terror attack by Hamas. But the E1 project would not only exacerbate the displacement of Palestinians, it would also defeat the prospects of a contiguous and viable Palestinian state. All this is consistent, however, with the public posturing by Netanyahu and his allies. Less than a year ago, during a visit to a West Bank settlement, the Israeli PM said: “There will never be a Palestinian state. This place is ours.” With elections looming and the tender deadline falling just a week before polling day in late October, the timing of E1 may not be incidental.

The events in West Bank are part of a systematic effort to alter its demography and geography. Announcements such as last year's recognition of the State of Palestine by multiple Western countries look ineffectual unless backed by pressure on Israel. That the US, which has the greatest leverage, continues to grant Israel cover points to the difficulty of course correction or change.

9. Measuring manufacturing growth afresh: Three questions(INDIAN EXPRESS PAGE NO 11)

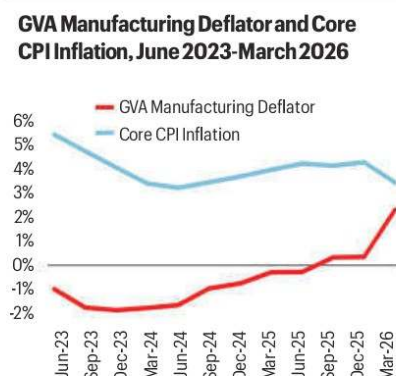
- **Syllabus**
 - GS Paper III: Indian Economy and issues relating to planning, growth, output measurement, and Industrial policy.
- **Syllabus Sub-topics**
 - Gross Value Added (GVA) methodology, Index of Industrial Production (IIP), Wholesale Price Index (WPI) deflators, Make in India, and PLI schemes.
- **Key Themes**
 - **Methodological Divergence in Economic Data:** Disconnect between real GVA growth in manufacturing and volume output tracked by IIP, alongside anomalies in price deflator estimations.
 - **Policy Formulation Reliability:** The critical need for robust, transparent industrial statistics to accurately evaluate the impact of manufacturing revival programs and compete effectively against external market pressures.

Measuring manufacturing growth afresh: Three questions



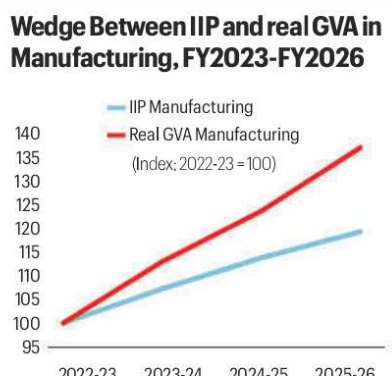
ABHISHEK ANAND,
JOSH FELMAN
AND ARVIND SUBRAMANIAN

GVA Manufacturing Deflator and Core CPI Inflation, June 2023-March 2026



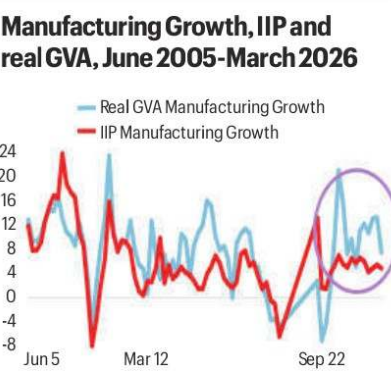
Source: MoSPI. Note: Core CPI through Dec. 2025 is based on the 2011-12 series; Mar. 2026 is based on the 2024 series. Core CPI excludes food and energy-related products.

Wedge Between IIP and real GVA in Manufacturing, FY2023-FY2026



Source: MoSPI and Authors' estimate. Note: Both series as per 2022-23 base.

Manufacturing Growth, IIP and real GVA, June 2005-March 2026



Source: MoSPI. Covid quarters (June 2020-March 2022) are excluded. The vertical dotted line represents the break between the 2004-05 and 2011-12 series.

Question 1: The manufacturing price deflator. In the new numbers, the manufacturing GVA deflator exhibits negative growth (falling price levels) for nine consecutive quarters between 2023 and 2025 (Figure 1). These numbers are difficult to understand, as there were no signs of deflation in the economy during this period, the core CPI index shows. It is true that the wholesale price index (WPI) was negative for some of this time—but not for nine consecutive quarters; and, in any case, the GVA deflator should not move in line with the WPI, which is overly driven by input prices.

So, what explains this negative growth of the manufacturing GVA deflator?

Question 2: The divergence between real Gross Value-Added (GVA) and the Index of Industrial Production (IIP). Figure 2 plots the two series for manufacturing in level terms. The difference is substantial. In 2025-26, the level of real GVA exceeded IIP by no less than 15 percentage points, implying that the annual average real growth of manufacturing between 2022-23 and 2025-26 as measured by GVA is about twice that measured by the IIP (11 per cent versus 6 per cent).

To be sure, the two series have

somewhat different definitions. For example, real GVA includes the informal sector, while this sector is excluded from the IIP. So, if the informal sector had grown much more rapidly than the formal sector, GVA could outpace IIP. But this explanation is mechanically impossible, since for the most recent two years, informal sector performance has been proxied by formal sector data. So, even if the informal sector has been booming (which seems implausible), this could not explain the divergence.

It is also true that the IIP measures output volumes, rather than value added. And there is a widely held perception that real GVA can grow faster than real output when input prices fall. But this perception is misguided or just plain wrong because real GVA is calculated at constant—not changing—prices. In fact, real value-added can grow faster than output volumes only if productivity improves, that is if firms become more efficient in using intermediate inputs.

So, the second question is: why is real GVA manufacturing growth almost twice that of IIP manufacturing growth?

Question 3: Correlation between the growth rates of real GVA and IIP in manufacturing.

Before the 2011-12 methodology changes, GVA and IIP moved closely together, as one would expect and as Figure 3 shows. (The correlation was 0.8.) But afterwards they diverged and that divergence has, if anything, been exacerbated in the new series. Note that since September 2022 the two series move very differently and the real GVA series bounces around a lot while the IIP series is fairly stable (Figure 3, circled segment).

So, the third question is: Why has the correlation between IIP manufacturing and real GVA in manufacturing weakened so sharply, compared to the 2005-2012 period?

None of these three issues is dispositive about the quality of the new series. But having plausible explanations for them will not only engender confidence in the new GDP figures but also help assess the state of manufacturing in India and the impact of recent government actions to revive it. Not just on the border but also in the economy, whether and how India has stood up to China is a critical question that reliable data will help us answer.

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