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Top court judge says PIL has become 'paisa interest litigation'

Krishnadas Rajagopal
NEW DELHI

The Supreme Court judge Justice B.V. Nagarathna on Tuesday said public interest litigation (PIL), a unique mechanism initiated by the Indian judiciary post-Emergency to "bring social justice within the reach of the common man", has lately metamorphosed into 'private interest litigation', 'publicity interest litigation' and even 'paisa' and 'political' interest litigation.

The judge, who is part of a nine-judge Bench hearing the Sabarimala review petitions, said articles are being published in newspapers merely for the sake of filing PIL pleas.

Justice Nagarathna's oral observations follow submissions made by the Centre in the Sabarimala case to do away with PIL jurisdiction. "The time has come not merely to recalibrate PIL, but to remove it," the Centre had submitted through Solicitor-General Tushar Mehta.

One of the arguments raised by the Centre was about the locus standi of the original writ petitioner, Indian Young Lawyers Association. The NGO was the first to challenge the prohibition on women aged 10 to 50 from entering the Sabarimala temple.

The legal challenge, which dated back to 2006, culminated in a five-judge Bench upholding the right of women of all ages to enter and worship at the temple. The September 2018 judgment, delivered by a Bench headed by then Chief Justice Dipak Misra (now retired), had compared the bar on women to the practice of untouchability.

The Indian Young Lawyers Association first challenged the ban on women aged 10 to 50 from entering the temple. FILE PHOTO

However, on Tuesday, Chief Justice of India Surya Kant asked the NGO's lawyer, advocate Ravi Prakash Gupta, what "business" his client had to question the temple prohibition.

Mr. Gupta submitted that the petition was triggered by news articles on a sex scandal involving a priest of the Sabarimala temple.

Chief Justice Kant asked how the question of the prohibition on women of a certain age at the temple was in any way connected to the scandal involving the priest. The CJI said the apex court could instead have done better by taking *suo motu* cognisance of the allegations against the priest, ordering a day-to-day trial and ensuring that he was brought to justice if found guilty. The CJI said the Supreme Court should have thrown the association's writ petition into the "dustbin".

At one point, Chief Justice Kant asked whether the NGO had considered itself "the chief priest of the country". The CJI said there was a real difference between a meddler and a bona fide PIL petitioner.

Mr. Gupta submitted that PILs were not considered adversarial.

Rejecting the need for a review of the 2018 judgment, Mr. Gupta questioned the very reason given for the existence of the prohibition - that the presence of young women was anathema to the Sabarimala deity.

"They say the deity does not like the presence of young ladies... Is that said as an expression of regard towards the deity, or is it meant as an insult to the deity? Are they putting words in the mouth of Lord Ayyappa?" Mr. Gupta asked.

Justice B.V. Nagarathna interjected sharply, querying, "How are you concerned with all this, tell us? Is it in any way your business?"

- **Key Terms and Explanations**
- **Public Interest Litigation (PIL):** A legal action initiated in a court of law for the enforcement of public interest or general interest in which the public or a particular class of the community has some pecuniary interest or some interest by which their legal rights or liabilities are affected.
- **Locus Standi:** Literally "right to appear." In traditional law, only the aggrieved party can approach the court. PIL relaxed this rule, allowing any public-spirited citizen to file a case on behalf of those unable to do so (e.g., the poor or illiterate).
- **Writ Jurisdiction:** The power of the High Courts (Art. 226) and Supreme Court (Art. 32) to issue orders for the enforcement of Fundamental Rights.
- **Suo Motu Cognisance:** An action taken by a court on its own motion, without a formal petition being filed, usually based on news reports or personal knowledge of a grievance.
- **Judicial Recalibration:** The process of adjusting or refining the scope and application of a legal doctrine to prevent its misuse while preserving its core intent.
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Main Arguments and Substantive Parts

- **Dilution of Purpose:** The judiciary has expressed concern that PILs are shifting from 'Public' to 'Private', 'Publicity', or 'Paisa' (Money) interest litigation. The core thesis is that the mechanism is being weaponized for non-judicial ends.
- **The Locus Standi Debate:** The Centre argues that organizations with no direct connection to a religious practice (meddlers) should not have the standing to challenge centuries-old traditions.
- **Judicial Overreach vs. Restraint:** Some argue that the Court should have focused on criminal aspects (like the priest's conduct) rather than constitutionalizing religious practices through a PIL.
- **Counter-argument (Petitioner’s side):** PILs are non-adversarial. They are intended to assist the court in protecting the Constitution, and the identity of the petitioner is secondary to the legal question of discrimination or rights violation.

- **Historical Evolution of the Issue**
- **1970s (The Genesis):** Post-Emergency, the judiciary sought to reclaim its legitimacy. Justice P.N. Bhagwati and Justice V.R. Krishna Iyer pioneered PILs in cases like *S.P. Gupta v. Union of India* (1981).
- **1980s-90s (The Expansion):** The focus shifted to environmental protection (*MC Mehta cases*), bonded labor, and custodial torture.
- **2000s (The Institutionalization):** PILs became a standard tool for governance issues and transparency (e.g., the 2G scam, Coal block allocations).
- **2018-Present (The Friction):** High-profile cases like Sabarimala and the Hijab row brought PILs into the realm of sensitive religious and personal laws, leading to calls for "recalibration" or "removal" by the executive.

- **Way Forward**
- **Codification of PIL Rules:** The Supreme Court should frame uniform guidelines (as suggested in *State of Uttaranchal v. Balwant Singh Chaufal*) to filter petitions at the entry point.
- **Suo Motu Shift:** The Court should favor taking *suo motu* notice of issues rather than relying on potentially biased NGOs, ensuring the focus remains on the victim.
- **Verification Mechanism:** Establishing a registry to verify the credentials and funding sources of NGOs filing PILs to ensure transparency.
-

Previous Years' Questions (PYQs)

- **UPSC Mains 2020 (GS 2):** "Judicial activism has its own hazards. To what extent do you agree?"
- **UPSC Mains 2017 (GS 2):** "The local standi of the PIL has been diluted. Analyze."
- **UPSC Mains 2014 (GS 2):** "Explaining the concept of PIL, examine its role in providing justice to the poor and marginalized."

PIL: FROM INSTRUMENT OF SOCIAL JUSTICE TO MULTI-DIMENSIONAL DEBATE - A UPSC ANALYSIS

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1 PIL EVOLUTION & CORE PURPOSE

KEY POINTS:

- ORIGIN: POST-EMERGENCY

- PRIMARY GOAL: SOCIAL JUSTICE FOR COMMON MAN

METAMORPHOSIS OR MISUSE? (THE JUDICIAL CONCERN)

PIL
(PUBLIC INTEREST LITIGATION)

- PRIVATE INTEREST (Self-Gain)
- PUBLICITY INTEREST (Attention)
- PAISA/POLITICAL INTEREST (Manipulation)

ORIGINAL INTENT	MODERN CONCERN
• MC Mehta	• Frivolous Litigation
• S.P. Gupta	• Stalling Projects
• Crirrician	• Retaving Litigation
• Preamns & Communities	• Telegominy/ Empotioral Debate

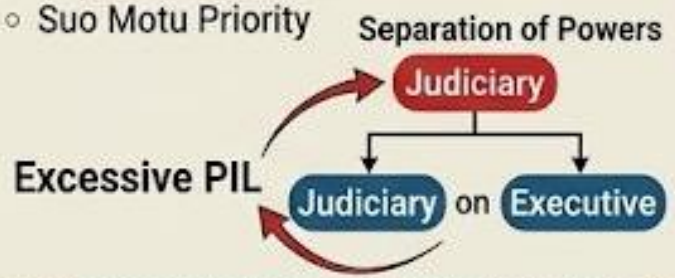
SABARIMALA CASE CONTEXT

- NGO locus standi question
- To religious/social debate

RECALIBRATION & THE WAY FORWARD

KEY POINTS:

- CENTRE'S ARGUMENT: REMOVAL VS RECALIBRATION
  - Comrament Removal vs. Recalibration
- UDICIAL RECALIBRATION STRATEGIES
  - Verification of NGO Credentials
  - Imposition of Costs
  - Suo Motu Priority



4 UPSC CSE LINKAGES & KEY TAKEAWAYS

→ GS PAPER 2 (Structure & Function of Judiciary) → GS PAPER 4 (Ethics in Governance) → ESSAY & INTERVIEW →

- PIL SUSTAINABILITY: A BASIC STRUCTURE ELEMENT?
- WAY FORWARD: STRICTER THRESHOLDS & ACCOUNTABILITY

Cabinet gives nod to make insult to *Vande Mataram* an offence

The Prevention of Insults to National Honour Act, 1971 will have to be amended to bring the move into effect and add clauses on punishment

Vijaita Singh
NEW DELHI

The Union Cabinet on Tuesday gave the go-ahead to amend the Prevention of Insults to National Honour Act, 1971 to make any insult or obstruction to the singing of National Song *Vande Mataram* a punishable offence, a government source told *The Hindu*.

At present, insults to the National Anthem *Jana Gana Mana*, the National Flag and the Constitution is mentioned in the 1971 Act and is punishable by imprisonment of up to three years or a fine or both.

The Cabinet decision comes a day after the Bharatiya Janata Party (BJP) secured a landslide victory in West Bengal winning 207 out of 293 contested Assembly seats and was all set to form the government for the first time in the State.

Vande Mataram, the salutation of India imagined as a mother, was written by Bankim Chandra Chattopadhyay and published with his novel *Anandamath* in the early 1880s.

In 1937, leaders of the Congress, which was leading the national movement, decided to use the first two stanzas at its gatherings, and the Constitution of the modern Republic of India accorded it the status of the National Song.

On February 6, the Union Home Ministry directed the States to play *Vande Mataram* at all official events. FILE PHOTO

Prime Minister Narendra Modi has accused the Congress of truncating the song to appease the Muslim League during the British rule.

Set of instructions

On February 6, the Union Home Ministry, in a set of instructions to States and government bodies, said that all the six stanzas of *Vande Mataram*, that comes to a little over three minutes long, should be sung or played at official events. It said that the National Song should be given precedence before the National Anthem, written and composed by Rabindranath Tagore, when both the songs are played at an event.

The Ministry guidelines on *Vande Mataram* are advisory in nature and did not have a statutory backing.

The Cabinet's decision to amend the 1971 Act would make any insult to the national song a punishable offence.

- **Key Terms and Explanations**
- **Prevention of Insults to National Honour Act, 1971:** A central legislation enacted to prevent the desecration of or insult to the country's national symbols, including the National Flag, the Constitution, and the National Anthem.
- **National Song (Vande Mataram):** A poem written in Sanskrit-laden Bengali by Bankim Chandra Chattopadhyay. While it holds a status equal to the National Anthem in sentiment, it previously lacked the same statutory penal protection.
- **Statutory Backing:** This refers to the legal authority provided by an Act passed by the Legislature. Currently, guidelines for the National Song are advisory; statutory backing would mean they are enforceable by law with defined penalties.
- **Precedence:** In this context, it refers to the protocol of playing or singing the National Song before the National Anthem during official ceremonies.
- **Appeasement Politics:** A political strategy of making concessions to a specific group to avoid conflict or gain favor. This term is often used in debates regarding the historical "truncation" of the National Song.
-

Main Arguments and Substantive Parts

- **Legal Parity:** The core argument is that the National Song deserves the same legal protection as the National Anthem. Currently, while the Anthem has protected status under the 1971 Act, the Song does not.
- **Standardization of Protocol:** The government emphasizes a standardized three-minute duration for all six stanzas, moving away from the traditional practice of singing only the first two stanzas.
- **Restoration of Original Form:** The proposal seeks to reverse what is described as the historical "truncation" of the song, arguing that the full version represents the true spirit of the independence movement.
- **Political Context:** The timing—following significant electoral shifts in West Bengal—suggests a cultural and ideological realignment, emphasizing the song's origin and its role in regional and national identity.
- **Enforcement vs. Advisory:** The shift from "advisory guidelines" to "punishable offenses" represents a move toward mandatory patriotism, where "insult" or "obstruction" carries criminal liability.

- **Historical Evolution of the Issue**
- **1880s:** Bankim Chandra Chattopadhyay writes *Vande Mataram*, later including it in the novel *Anandamath* (1882). It becomes a rallying cry for the anti-partition movement in Bengal (1905).
- **1937:** The Indian National Congress, led by a committee including Nehru and Azad, adopts the first two stanzas as the National Song to accommodate diverse religious sensibilities, as later stanzas contained imagery associated with Hindu deities.
- **1950:** Dr. Rajendra Prasad, President of the Constituent Assembly, declares that *Vande Mataram* shall be honored equally with *Jana Gana Mana* and shall have an equal status with it.
- **1971:** The Prevention of Insults to National Honour Act is passed, but notably excludes the National Song from its penal provisions.
- **2026 (Current Context):** The Union Cabinet moves to amend the 1971 Act to include the National Song and mandates the singing of all six stanzas at official events.

- **Way Forward**
- **Clarity in Legislation:** The amendment should clearly define "insult" to prevent arbitrary arrests and ensure that dissent or silence is not mistaken for criminal intent.
- **Public Awareness:** Instead of relying solely on penal provisions, the government should focus on educational campaigns about the song's history and its role in the freedom struggle.
- **Inclusivity:** Engaging with diverse community leaders to address historical or religious reservations regarding the full song could prevent social friction.
- **Judicial Balance:** Ensuring that the law adheres to the "Doctrine of Proportionality," where the punishment for an insult is not disproportionately harsh compared to the act.
-

Previous Years' UPSC Questions

- **2015 (GS II):** "To what extent, in your opinion, has the goal of a secular state been achieved in India?" (Relevant due to the religious imagery in the song).
- **2017 (GS II):** "Examine the scope of Fundamental Duties under Article 51A of the Constitution."
- **2019 (Essay):** "Neglect of primary education and prevalence of functional illiteracy are perhaps the most important causes for the lack of civic sense in India." (Relates to how national respect is taught).
- **2021 (GS I):** "The Swadeshi Movement gave a great fillip to Indian nationalism. Discuss." (Directly involves the history of Vande Mataram).

UPSC CSE CURRENT AFFAIRS ANALYSIS: PROPOSED AMENDMENT TO THE PREVENTION OF INSULTS TO NATIONAL HONOUR ACT, 1971

VANDE MATARAM: EQUAL STATUS, LEGAL PROTECTION?

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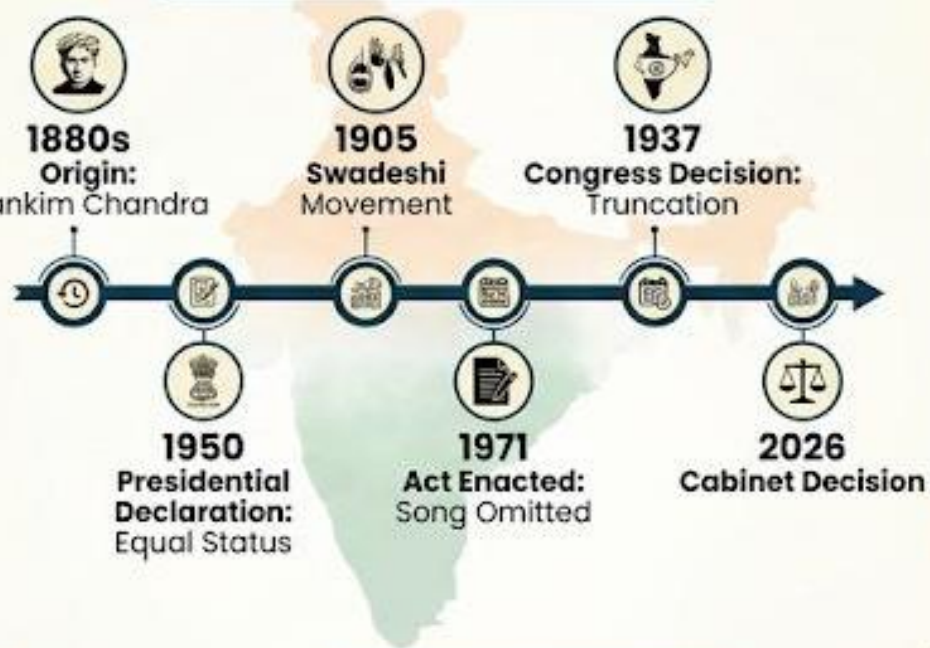
KEY CONCEPTS

- **Prevention of Insults to National Honour Act, 1971** review analyst of amendmen:ts proposed amendent to the Prevention of Insults to National Honour Act, 1971
- **Vande Mataram (National Song):** Vande Mataram "Song"..sed for cr:oan?:in nenal·i. Act of National offense
- **Statutory Backing:** Prevention of Insults to National Honour Act

MAIN ARGUMENTS & IDEAS

- **Standardization** (All 6 Stanzas)
- **Criminalizing Obstruction**
- **Ideological Realignment**
- **Mandatory Patriotism**

HISTORICAL EVOLUTION



LEGAL FRAMEWORK

Advisory Guidelines → **Punishable Offense**

Home Ministry — Act Amendment

	Anthem	Song
Penal Provisions	• Preventit:of Anthem vs Anthem	• Song Omitted. Punishable Offense
Penal Provision	• Punishable Anthem • Song	• Punishable Offense • Anthem

UPSC Relevance → GS & Essay
→ Prieviuse Essay

MULTIDIMENSIONAL ANALYSIS

- **SOCIAL** — Identity, pluralsim
- **POLITICAL** — Aims, dissent
- **ETHICAL** — Conscience, duty
- **CONSTITUTIONAL** — Art 19(1)(a) vs Art 51A

CHALLENGES

- Clarity in 'Insult'
- Implementation
- Judicial Overreach

WAY FORWARD

- Legislation Clarity - minde to aaarity
- Public Awareness of oulamination
- Public Awareness at Isian to prentotion

PREVIOUS YEARS' QUESTIONS:

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30 banks integrated with UDGAM portal to help legal heirs trace funds

Aaratrika Bhaumik
NEW DELHI

The Reserve Bank of India (RBI) told the Supreme Court on Tuesday that 30 banks have been integrated into its centralised web portal, UDGAM (Unclaimed Deposits - Gateway to Access InforMation), to enable legal heirs to trace funds belonging to deceased account holders.

A three-judge Bench headed by Justice Vikram Nath was hearing a public interest litigation (PIL) petition filed by journalist Sucheta Dalal, contending that funds lying in dormant or inoperative accounts were increasingly being transferred to government-managed pools.

The petitioner sought directions for the creation of a centralised platform to provide information on financial assets held by deceased persons.

Senior advocate Ranjit Kumar, appearing for the RBI, submitted that the UDGAM portal had already been operationalised to address the petitioner's concerns. "The UDGAM portal is an interactive platform. There are around 20 lakh registered users who have carried out around 44 lakh searches on the portal as of April 1," he said.

Mr. Kumar added that the 30 banks integrated into the portal account for nearly 90% of the funds held in the Depositors' Education and Awareness Fund (DEAF), a corpus set up by the RBI in 2014 to house unclaimed deposits from commercial and co-operative banks.

The RBI clarified that

30 banks integrated into the portal account for nearly 90% of the funds held in DEAF.

the UDGAM portal that enables individuals to look up unclaimed deposits and accounts, but does not function as a claims settlement mechanism. "The object of the portal is to facilitate the identification and tracing of unclaimed deposits, so that the concerned depositor or claimant may approach the respective bank for settlement of the claim in accordance with the applicable procedure," it said.

Challenges for heirs

Advocate Prashant Bhushan, appearing for the petitioner pointed out that deposits held in post offices, provident funds, and insurance schemes had not yet been integrated into the portal, thereby posing challenges for legal heirs seeking to claim such assets.

Taking note of the submissions, the Bench granted one week to the Centre and the Securities and Exchange Board of India (SEBI) to place on record the relevant circulars and outline the steps taken to enable the return of unclaimed funds of deceased persons held with banks and financial institutions.

- **Key Terms and Explanations**
- **UDGAM (Unclaimed Deposits – Gateway to Access InforMation):** A centralized web portal developed by the RBI. It acts as a single point of entry for citizens to search for unclaimed deposits across multiple banks simultaneously.
- **Unclaimed Deposits:** Specifically, these are balances in savings or current accounts that have not been operated for **10 years**, or fixed deposits (FDs) not claimed within 10 years from the date of maturity.
- **DEAF (Depositor Education and Awareness Fund):** Established by the RBI in 2014 under the Banking Regulation Act, 1949. Banks transfer the amount held in unclaimed deposits to this fund. However, even after transfer, the depositor is entitled to claim the money back from the bank.
- **Inoperative/Dormant Accounts:** An account becomes "inoperative" if there are no customer-induced transactions (like ATM withdrawals, internet banking, or cheque deposits) for a period of over **two years**.
- **PIL (Public Interest Litigation):** A legal mechanism (under Article 32 or 226) that allows any member of the public to seek judicial redress for a public grievance. Here, it addresses the "right to property" of legal heirs.
-

Main Arguments and Substantive Parts

- The discourse revolves around the balance between state custody of funds and individual ownership.
- **The Accessibility Gap:** While the RBI has created UDGAM, the petitioner argues that the portal is currently limited. It excludes non-banking financial assets like Post Office savings, Provident Funds, and Insurance, which constitute a massive chunk of "forgotten" national wealth.
- **Transparency vs. Settlement:** A critical distinction made by the RBI is that UDGAM is an **information gateway**, not a **payment gateway**. It helps "trace" but does not "transfer." The actual settlement remains a physical, bank-led process, which can be bureaucratic for grieving families.
- **Concentration of Funds:** With 30 banks (covering 90% of DEAF funds) integrated, the scale is massive. However, the remaining 10% often belongs to smaller co-operative banks where rural, less-digitally-literate populations hold accounts, creating a "last-mile" information vacuum.
- **Judicial Oversight:** The Supreme Court is acting as a catalyst for a "Whole-of-Government" approach, pushing SEBI and the Finance Ministry to synchronize with the RBI’s digital efforts.

- **Historical Evolution of the Issue**
- The management of unclaimed money has evolved from simple bookkeeping to complex fund management.
- **Pre-2014 Era:** Unclaimed deposits sat on bank balance sheets. There was no centralized mechanism to utilize these funds for public good or to help heirs find them.
- **2014 (The DEAF Milestone):** The RBI introduced the DEAF scheme. This was a paradigm shift—idle private money was moved to a fund used for "depositor education," though the liability to pay the depositor remained with the bank.
- **2023 (Launch of UDGAM):** Recognizing the "Search Cost" (the effort required by an heir to visit 50 different banks), the RBI launched the portal as part of its "Statement on Developmental and Regulatory Policies."
- **Present (The Integration Phase):** The current litigation marks the move from "Banking-only" solutions to a proposed "Universal Financial Asset" search engine.

- **Way Forward**
- A roadmap for comprehensive reform:
- **Unified Financial Search:** Expand UDGAM to include SEBI, IRDAI (Insurance), PFRDA (Pensions), and Department of Posts.
- **Standardized KYC for Claims:** The RBI should issue a uniform, simplified "Claim Settlement Protocol" for all banks to prevent harassment of heirs at the branch level.
- **Proactive Outreach:** Banks should use the "Nominee" data to proactively contact heirs rather than waiting for them to search the portal.
- **Digital Succession:** Encourage the "e-Will" and digital nomination culture during account opening to prevent future "unclaimed" scenarios.

Previous Years' Questions (PYQs)

- **UPSC Prelims (2014):** With reference to 'Depositor Education and Awareness Fund', consider the following statements... (Directly related).
- **UPSC Mains (GS III, 2018):** "Is inclusive growth possible without financial inclusion?" (Link with the use of unclaimed funds for awareness).
- **UPSC Mains (GS II, 2020):** "The jurisdiction of the Supreme Court of India is better than that of any other Supreme Court in the world." (In context of its role in PILs like the one filed by Sucheta Dalal).

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UPSC CSE: UNCLAIMED DEPOSITS, THE DEAF SCHEME & THE UDGAM PORTAL | COMPREHENSIVE ANALYSIS

KEY TERMS

- **Unclaimed Deposits:** Unclaimed Depositor semote > 2 yrs activity ars and cold charges.
- **DEAF:** Depositor Education ard propriedured transfer to RBI's DEAF Depositor Euscationitor Education and Awareness Fund
- **Dormant Acct.:** Depositor malcorit liability remains within the bank
- **UDGAM:** Lamcle digital ia depositor education and Awarness Fund.

LIFE CYCLE OF UNCLAIMED DEPOSITS

Savings/ Current Acct. (no activity > 2 yrs) → DORMANT Acct. → Deposits unclaimed for 10 Yrs → Transfer to RBI's DEAF (Depositor Educstion and Awareness Fund) → Digital Search via UDGAM Portal

THE DEAF SCHEME

- **Setup:** 2014 by RBI
- **Use:** Financial Literacy & Education
- **Status:** Depositor liability remains with the bank

MULTIDIMENSIONAL IMPACT (UPSC RELEVANCE)

- **Social** Empowerment
- **Economic** Liquidity
- **Legal** Right to Property
- **Political** Digital Governance

WAY FORWARD

- **Unclaimed Deposits**
- **Protective** the recgalcer communnees, deposits and reprecoperts a posiutive manangers or control affortlines

UDGAM PORTAL

(Gateway to Access InforMation)

- **Purpose:** Identification & Tracing of deposits
- **Not a** Claim Settlement Mechanism
- **Inter-Regulatory** Coordination (Banks, LIC, PF, etc.)
- **Challenges:** Last-mile digital divide, bank-level KYC hurdles

PROACTIVE OUTREACH

- **Relack outreach** and oowniles for muital oncromvrercial community to top emonious or paoactive outreach

PYQS

Question #1-32, 3137, 39, 1237, 337?
Question #2-61, 3230, 1273

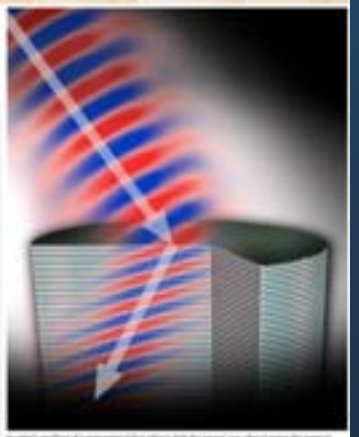
Scientists build metamaterial that can 'learn' to change shape

All life must adapt over time to changing conditions or they could go extinct; on the other hand, most non-living materials do not actively adjust their internal structure in response to conditions once they are made, but in a new study researchers from Europe have challenged this difference

Vanderson Rabanelli

Top: A robotic metamaterial under the word 'LEARN'. A metamaterial is a special material whose properties are not determined by its chemical composition alone but also by the structure giving rise to unusual properties.

Bottom: An artist's rendition of a metamaterial that refracts light the 'wrong' way when it enters the material.



When you exercise, your muscles become stronger. When you sow a plant, its stem will bend to one side to leave get more sunlight. Both these changes are examples of adaptation – when a biological material senses its environment, then reorganises its internal structure to survive better. All life must adapt over time to changing conditions. Populations that don't could become extinct.

However, most non-living materials do not actively adjust their internal structure in response to new conditions after they are made. When a metalsmith forges a bar of steel, its internal structure is mostly fixed from that point on, though it can still change due to heat, stress, etc. If you want a new bar with different properties, you need to engineer it anew.

Recently, in a new study in *Nature Physics*, researchers from Europe have challenged this difference. The team has reportedly built a synthetic material that can learn physically, by actively changing their internal mechanical properties based on external conditions.

Chain of units

The team used metamaterials for this work. These are special materials whose properties are not determined by their chemical composition alone but also by the structure – or the way in which they're physically arranged. As a result, they often have properties that natural materials don't.

In the last decade or so, scientists have used metamaterials to bend light in counterintuitive ways, shield buildings from earthquakes, and hide objects from radar, among other feats.

In the new study, the team built a robotic metamaterial consisting of a chain of connected units. Each unit had a small motor, an angle sensor, and a microcontroller.

Using these components, a unit could send and receive data to/from its adjacent units and change how much it bent in response. This way, the whole metamaterial could be as rigid as a metal spring or as flexible as a rubber band, or something else in between. Based on how each unit responded to feedback from the two units attached to it. The researchers used a method called contrastive learning to 'teach' the metamaterial a particular shape.

While contrastive learning exists in machine learning or an algorithm, the researchers implemented it here using only a hardware-based system.

Four steps to learn

First, the researchers kept the metamaterial chain in a straight line and set starting values for the stiffness of each unit. The stiffer a unit, the more it would bend in response to feedback.

Second, they applied an input bending one unit in the chain by a fixed angle. This would change the rest of the chain into a particular shape, called the first state. Then, they would hold the input fixed and manually turn the other units so that the chain formed a new shape, like a 'J' or an 'L'. This was called the clamped state.

Finally, the microcontroller in each unit would compare its angle in the first state to that in the clamped state, and use the difference to adjust its stiffness using the motor. When the researchers repeated these four steps again and again, the metamaterial chain went from the first state to the clamped state in fewer steps. This is called contrastive learning because each unit 'learns' by comparing the first and clamped states to figure out what it should do.

Thus, as the researchers explained in their paper, "Unlike traditional materials that are designed once and for all, our metamaterials have the ability to forget and learn new shape changes in sequence, to learn several shape changes that break symmetry, and to learn multistable shape changes, which in turn allows them to perform other gripping actions and locomotion."

"Our findings establish metamaterials as an exciting platform for physical learning, which in turn opens avenues for the use of physical learning to design adaptive materials and robots."

The researchers reported that in one test, a chain of six units eventually 'learnt' to form a U shape in a single step from a straight line.

Another 6-unit chain also 'learnt' to spell each letter of the word 'LEARN' in sequence, at each step 'forgetting' one shape and 'learning' the next one.

The researchers likened this ability with some qualifications to the adaptability of simple organisms.

Talking to each other

A usual question that arises after researchers report a successful feeling is to ask whether they would find the same thing at a larger scale or in the real world. The authors of the study addressed this question using only simulations, where they ran computer models of metamaterial chains with thousands of units. These models were not very complicated, however, as each unit had only the three components and 'learnt' only based on two inputs – the units on either side.

However, the models showed that as the chains became longer, the metamaterial 'learnt' at a slower pace. This was because the amount of information passing through the chain dropped over a particular length. Put differently, a 'signal' arising from one unit weakened significantly by the time it reached a distant unit.

The researchers found a simple fix: they allowed each unit to 'talk' to the nearest unit as well as the next-nearest unit, i.e. the units one and two steps away. With this rule, each unit's microcontroller received data about the angle of the unit two steps away, and used it with the 'knowledge' that the angle was 1/2 two steps away, not one. This allowed the inputs to propagate further along the chain than before. The researchers were able to have a 40-unit chain morph into the outline of a cat using just three inputs as a result.

The way the chain works is an example of local decision-making. It is unlike, say, the human body, where the brain receives inputs from multiple senses and makes many decisions, which the nervous system finally relays to different parts. Machine-learning models also use techniques like backpropagation, where the output generated near the end of a model is used to 'teach' components near the beginning.

The metamaterial chain, however, made no such effort. Its 'learning' was based on the units before and after (or the next-nearest). This is useful as technological applications because it removes the need for complex networks to transfer data.

Taking a walk

The researchers also found that the chain responded differently depending on which side it was nudged. When they nudged one unit each chain from the left end, the right and bent one way. But when they pushed it from the right end, the left end bent in a different way. This non-reciprocity, the researchers argued, allowed the metamaterial to 'learn' different ways to attain a final shape without requiring separate training.

In a commentary accompanying the paper, Karen Sohn, of the Technical University of Munich, Germany, who wasn't associated with the study, wrote that such non-reciprocity runs a counter understanding of 'intelligence' in materials beyond the bounds of traditional physics.

> The pre-programmable metamaterial was presented by [the team] in a brilliant collection of simplicity that is key to disentangling the essential physics concepts that enable learning and constrain the space of learnable states.
>
> **LIBIN LIN**
> Researcher at Technical University of Munich, Germany

For example, physics dictates that when you push a spring, it will push back. This is because the spring wants to settle into its lowest energy state – where it is not compressed.

In this context, the spring can be said to 'learn' by finding the valley in its energy landscape. That is, if you take the spring to a different point in the landscape, by compressing or extending it, its inner restraint – it will respond by making a beeline for just one spot: the valley.

However, per Dr. Lin, the chain metamaterial is non-reciprocal, so it doesn't have a simple energy landscape. In non-reciprocal systems, the energy required to move from point A to point B depends on the path the object takes – since there is more than one option. In these cases, it becomes a question of how much physical effort each path takes.

As while the spring 'learns' by minimising energy, the metamaterial chain 'learns' by minimising work – in this case the work done by the motors. As a result, the chain was able to 'learn' different paths to a final shape the way a spring never can.

"Breaking down the complexity of learning in artificial intelligence systems and the brain into physical concepts appears to be an insurmountable task. The programmable metamaterial was presented by [the team] in a brilliant collection of simplicity that is key to disentangling the essential physics concepts that enable learning and constrain the space of learnable states," Dr. Lin wrote.

Like a switch

The researchers also unexpectedly found bistable units – meaning they could act like switches. For example, when a moving object came in contact with a six-unit chain, the chain coiled itself around the object and gripped it. To release the object, the researchers only had to nudge one particular unit, which unrolled the rest of the chain. (The unit was bistable.)

This is also why Dr. Lin wrote that the metamaterial chain should first be seen as a dynamical system, i.e. something capable of adapting. According to her, the chain was able to perform the like actions like gripping an object, because it could 'navigate' through different stable states by minimising the work along specific paths.

Indeed, while the chains in the team's experiments illustrated what a metamaterial chain with just a few controllable parameters was capable of, they are also not ready for real-world use. The team worked on an table and implemented only large components to make their work. But if these requirements are eased, such metamaterial chains could in future be used as advanced prosthetic limbs and in soft robots that need to respond agilely to obstacles.

Overall, they concluded, their "work paves the way for the design of adaptive metamaterials as well as soft and distributed robots".

indianexpress.com

- **Key Terms and Explanations**
- **Metamaterials:** Artificial materials engineered to have properties not found in naturally occurring substances. Their behavior is derived from their **geometric structure** rather than their chemical composition (e.g., "Invisibility cloaks" that bend light).
- **Contrastive Learning:** A machine learning approach where a system learns by comparing two different states. In this context, the material compares its "free state" (natural shape) with a "clamped state" (desired shape) to adjust its own stiffness.
- **Non-Reciprocity:** A physical property where the relationship between input and output is not reversible. If pushing point A moves point B by 5cm, pushing point B might move point A by only 2cm (or not at all). This is crucial for purposeful movement like walking.
- **Bistability:** The ability of a system to have two stable equilibrium states. Think of a light switch that can stay either "on" or "off" without constant power; here, it allows the material to "grip" or "release."
- **Local Decision-Making:** A decentralized process where individual units of a system act based only on information from their immediate neighbors, rather than a central "brain" or processor.
- **Energy Landscape:** A conceptual map of all possible configurations of a system and their corresponding energy levels. Systems naturally seek the "valleys" (lowest energy states).
-

Main Arguments and Substantive Parts

- **The Core Thesis:** The traditional boundary between "learning" biological life and "fixed" non-living matter is blurring. Materials can now be programmed to "learn" and "forget" mechanical behaviors through physical interaction rather than software code.
- **Mechanism of Learning:** By integrating microcontrollers, sensors, and motors into a chain of units, the researchers created a **Hardware-based AI**. The material adjusts its internal stiffness iteratively until it "remembers" a shape, such as a "U" or "L" curve.
- **Scaling and Communication:** Simulations suggest that as these chains get longer, the signal weakens. The solution—allowing units to "talk" to next-nearest neighbors—enables complex shape-shifting (e.g., forming a cat outline) without a central CPU.
- **Intelligence via Work Minimization:** While a simple spring returns to its shape by minimizing *potential energy*, this metamaterial learns by minimizing the *mechanical work* done by its internal motors. This allows for "intelligent" responses like gripping.

- **Historical Evolution of the Issue**
- **Pre-2000s (Foundational Physics):** Material science focused on metallurgy and polymers where properties were dictated by chemistry and heat treatment (fixed state).
- **Early 2000s (The Metamaterial Revolution):** Initial breakthroughs focused on electromagnetism (negative refractive indices) and "cloaking" technologies. Properties became structural rather than chemical.
- **2010s (Soft Robotics & Programmable Matter):** Development of 4D printing (materials that change shape over time) and soft actuators. However, these still required external "pre-programming."
- **Present Day (The Learning Era):** Transition from "Automatic" (doing what is told) to "Autonomous" (learning what to do). The *Nature Physics* study represents the first successful hardware-realization of physical contrastive learning.

- **Way Forward**
- **Miniaturization:** Investment in Nanotechnology to move from motor-based units to molecular-level switches.
- **Hybrid Systems:** Combining central AI (the "brain") with these adaptive materials (the "reflexes") to create more resilient robots.
- **Policy Framework:** Governments must start looking at "Smart Materials" within their National Strategy for AI, ensuring that standards for "programmable matter" are established early.
- **Interdisciplinary Research:** Encouraging collaboration between biologists (to study simple neural circuits) and material scientists.

Previous Years' UPSC Questions (Themes)

- **GS-3 (2022):** "What are the different elements of Cyber-security?" (Relevance: Security of programmable materials).
- **GS-3 (2019):** "How can biotechnology help to improve the living standards of farmers?" (Relevance: Use of adaptive materials in agri-robotics).
- **Prelims (2020):** Question on the application of "Carbon Nanotubes." (Relevance: Materials with unique properties).

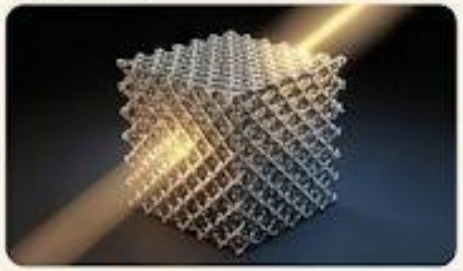
AXIA IAS ACADEMY
RISE ABOVE THE REST

PHYSICAL LEARNING METAMATERIALS:
FROM FIXED STRUCTURE TO BIOLOGICAL ADAPTATION

UPSC CSE: GS PAPER 3 (SCIENCE & TECHNOLOGY), ROBOTICS & AI.

BACKGROUND

METAMATERIALS
Properties from geometry, not chemistry



BIOLOGICAL ADAPTATION

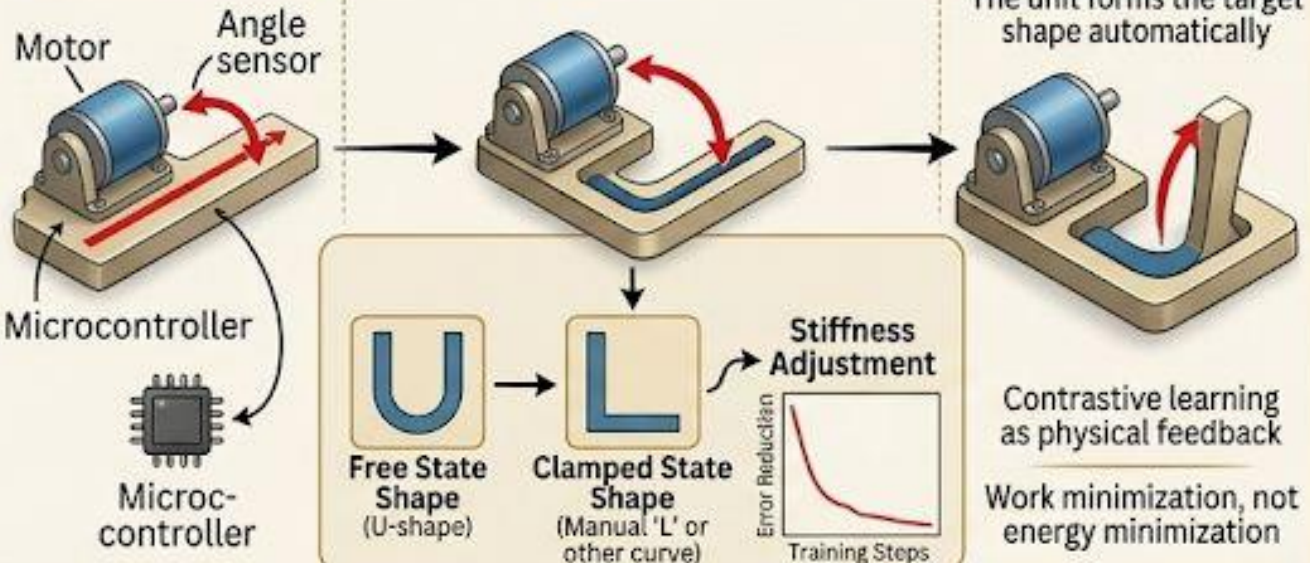
LEARNING FORGETTING

THE MECHANISM OF HARDWARE-BASED PHYSICAL LEARNING

1 INITIAL STATE
Straight, defined stiffness

2 CONTRASTIVE LEARNING CYCLE
Iterative

3 SINGLE-STEP LEARNED SHAPE.
The unit forms the target shape automatically

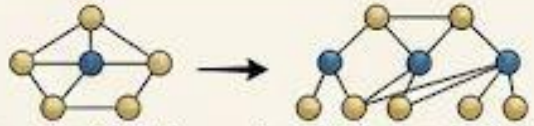


Contrastive learning as physical feedback

Work minimization, not energy minimization

SCALING AND COMMUNICATION

Decentralized control is optimized.



Nearest-Neighbor only → Next-Nearest-Neighbor Talking to two steps away

Enabling complex shape-shifts.

NEW FEATURES & UNSTABLE STATES

1 Non-Reciprocity

→ Path-Dependent Learning

2 Bistability

→ Reflex Gripping

MULTIDIMENSIONAL LINKAGES FOR UPSC

SOCIAL/ETHICAL
- Advanced Prosthetics
- Blurring living/non-living boundaries, defining intelligence

ECONOMIC
- Zero-Waste manufacturing
- One-size-fits-all components
- Allosed technologies, for mush and scatems

POLITICAL/STRATEGIC
- Adaptive defense hulls
- Stealth technology
- New 'Materials Race'

NCERT LINKAGES
- **Class 11 Physics** (Mechanical Properties)
- **Class 12 Biology** (Evolution)
- **Class 12 Physics** (EM Waves)

WAY FORWARD
- Miniaturization
- Hybrid AI systems
- Interdisciplinary Policy (GS-3, Ethics)

SUMMARY **PHYSICAL EMBODIED INTELLIGENCE:** Bridging the gap between life and material science.

Scientists examine a specialised refrigerator for cooling quantum computing chips at the Google Quantum AI lab in California, U.S. in 2024. REUTERS

A radiation 'glitch' limits quantum computing

Vasudevan Mukunth

What is the world's next great frontier in technology? There are multiple contenders: artificial general intelligence, programmable biology, sustainable energy, metamaterials, human-machine interfaces, and quantum computing. The future could in fact be more wondrous but also more difficult to predict because of how some of these technologies can work together. But there is still a long way to go — and quantum computing of late has illustrated that well.

Quantum computers are a new type of computer that promises to solve calculations significantly faster than today's 'traditional' computers. The problem is that these machines are also very fragile. They operate in temperatures lower than outer space and the slightest vibration or heat can cause them to stop working.

On May 4, researchers from Google Quantum AI published a paper in *Physical Review X* reporting that they had found a new ghost in the machine that poses another major threat to these computers — called correlated phase error bursts.

Scientists are working on a technology called quantum error correction — a safety net to allow a quantum computer to keep working even if a few qubits fail

High-energy particles from outer space and trace elements in the earth's crust both emit ionising radiation. When even a small dose of it strikes the silicon substrate of a quantum chip, it creates a splash of vibrations that ripple across the chip. These vibrations break apart the pairs of electrons that allow a superconductor to work. Many quantum computing chips are based on superconductors. The break-ups create a swarm of quasiparticles. It's like a cloud of electronic debris has flooded the chip.

A conventional chip is made of many semiconductors. A quantum chip is made of many qubits. Scientists were worried that the quasiparticles would interfere with sensitive parts of the qubits, causing a crash. So they developed a hardware design where a component acts like a fence that prevents the quasiparticles from jumping into sensitive parts of the qubit.

The solution worked too — until the current study revealed the new problem. Its authors found that even if the quasiparticles couldn't jump the fence, their mere presence near a qubit caused its frequency to shift. This is like some soldiers walking at a different pace than others in a march-past, falling out of sync and breaking up the parade.

A single dose of radiation could shift the frequencies of many qubits together by as much as 3 megahertz for 1 millisecond — an eternity in quantum computing. Because these shifts happen to many qubits at once, they hit the computer like a sudden loss of coordination.

Scientists are working on a technology called quantum error correction — a safety net to allow a quantum computer to keep working even if a few qubits fail. Among others, it depends on the assumption that errors in different qubits are independent of each other. The correlated burst nullifies this assumption. In fact, the authors of the study have said correlated phase error bursts could set an upper limit on how reliable current quantum computers can be.

Gianluigi Catelani, a scientist at the Jülich Research Centre, Germany, wrote in *Physics* that researchers already have at least two solutions in the works: 'traps' that absorb the static before it hits the qubits and technologies to dampen the splash.

- **Key Terms and Explanations**
- **Qubits (Quantum Bits):** Unlike classical bits (0 or 1), qubits exist in a "superposition" of states. They are the fundamental processing units of quantum computers, utilizing properties like entanglement to perform complex calculations.
- **Superconductivity:** A state where certain materials have zero electrical resistance, usually occurring at extremely low temperatures. This allows electrons to flow without energy loss, which is essential for maintaining qubit stability.
- **Ionising Radiation:** High-energy particles from cosmic rays or terrestrial radioactive isotopes. These particles have enough energy to detach electrons from atoms, creating disturbances in sensitive hardware.
- **Quasiparticles:** In this context, they are disturbances that act like particles. When radiation hits a chip, it breaks electron pairs (Cooper pairs) in the superconductor, creating a "cloud" of these debris-like entities that interfere with qubits.
- **Quantum Error Correction (QEC):** A set of algorithms designed to protect quantum information from errors due to decoherence and noise. It traditionally assumes that an error in one qubit doesn't affect its neighbor.
- **Correlated Phase Error Bursts:** A newly identified phenomenon where a single event (like a radiation strike) causes multiple qubits to lose synchronization simultaneously, breaking the fundamental assumption of QEC.

Main Arguments and Substantive Parts

- **The Fragility of the Frontier:** While quantum computing is a "great frontier," its physical requirements—temperatures colder than space and absolute stillness—make it inherently unstable compared to classical silicon chips.
- **The "Ghost" in the Silicon:** The core thesis is that ionizing radiation creates "vibrational splashes" on the chip substrate. These vibrations act as a systemic threat rather than a localized one.
- **The "March-Past" Analogy:** Even when hardware "fences" prevent quasiparticles from physically entering a qubit, their proximity shifts the qubit’s frequency. This desynchronization (like soldiers losing pace) destroys the coherence required for computation.
- **The Challenge to Error Correction:** Current safety nets (QEC) rely on the independence of errors. The discovery of correlated bursts suggests that errors can be "contagious," hitting many qubits at once and potentially setting a hard ceiling on the reliability of current quantum architectures.
- **Counter-Solutions:** The research doesn't suggest a dead end but a pivot. Proposed solutions include "traps" to absorb static and dampening technologies to minimize the spread of vibrations across the chip.

- **Historical Evolution of the Issue**
- **Early 1980s:** Richard Feynman and Paul Benioff propose the concept of a quantum computer to simulate physics that classical computers cannot handle.
- **1990s - 2000s:** Peter Shor develops an algorithm for factoring large numbers; Lov Grover develops a search algorithm. The theoretical potential of quantum advantage is established.
- **2010s:** The "Race for Supremacy" begins. Companies like Google, IBM, and Rigetti start building physical superconducting qubit systems. The focus is on increasing qubit counts.
- **2019:** Google claims "Quantum Supremacy" with its Sycamore processor, performing a specific task in minutes that would take classical supercomputers years.
- **Present (2024-2026):** The shift moves from "Quantity of Qubits" to "Quality and Error Mitigation." The discovery of correlated phase error bursts represents the current "bottleneck" phase, where environmental interference is the primary hurdle to practical utility.

- **Way Forward**
- **Investment in "Clean" Substrates:** Developing ultrapure silicon or synthetic diamond substrates that are less susceptible to ionizing radiation "splashes."
- **Hybrid Architectures:** Combining different types of qubits (e.g., trapped ions vs. superconductors) to mitigate specific environmental weaknesses.
- **Global Collaboration:** Since cosmic radiation is a planetary challenge, fundamental research into radiation-shielding for quantum chips should be an open-science initiative.
- **Underground Labs:** Moving high-precision quantum research to deep underground facilities (like India's INO project sites) to naturally shield chips from cosmic rays.
- **Software-Hardware Co-design:** Developing "Radiation-Aware" algorithms that can detect a "burst" and pause computation before errors propagate.

Previous Years' UPSC Questions

- **Prelims (2022):** Which one of the following is the context in which the term "qubit" is mentioned? (Answer: Quantum Computing).
- **Mains (2023, GS 3):** What is the National Quantum Mission? Discuss its importance for India's strategic interests.
- **Mains (2019, GS 3):** What is "Quantum Supremacy"? How will it change the landscape of computing?
- **Prelims (2017):** Regarding "DigiLocker," and other IT initiatives (shows the trend of UPSC asking about digital frontiers).

XIA IAS ACADEMY

RISE ABOVE THE REST

ANALYSIS OF QUANTUM COMPUTING'S GHOST IN THE MACHINE

KEY TERMS

COSMIC RAYS & TERRESTRIAL RADIATION

TERRESTRIAL RADIATION

CLOUD OF QUASIPARTICLES

QUBITS

QUANTUM ERROR CORRECTION

TRAPS

QUANTUM ERROR ERROR (QEC)

QUANTUM CORRECTION

PHASE 1: THE PROBLEM: IONIZING RADIATION & QUASIPARTICLES

COSMIC RAYS & TERRESTRIAL RADIATION

Vibrational Splash across Chip

CLOUD OF QUASIPARTICLES

HARDWARE FENCES FALL SHORT

DILUTION REFRIGERATOR @ < SPACE TEMPS

QUBITS

DILUTION REFRIGERATOR @ < SPACE TEMPS

SUPERCONDUCTING QUANTUM CHIP

(+) HARDWARE FENCES FALL SHORT

QUBIT FREQUENCY SHIFT

QUBIT FREQUENCY SHIFT, Desynchronization

CORRELATED PHASE ERROR BURST

Soldiers out of sync

PHASE 2: THE CHALLENGE: BREAKING ERROR CORRECTION

QUANTUM ERROR CORRECTION (QEC)

(QEC)

INDEPENDENCE ASSUMPTION (NULLIFIED)

Correlated errors break QEC assumption

SYSTEMIC RELIABILITY CEILING

PHASE 3: THE WAY FORWARD: MITIGATION SOLUTIONS

TRAPS FOR STATIC

DAMPENING TECHNOLOGIES

ABSORBED VIBRATIONS

REDUCED PARTICLE DRIFT

PISTURE FOR FOF APPEAL

DILUTION REFRIGERATOR

SIMULATION OF Drug Discovery

India's energy security amid conflicts

The conflict in West Asia has shown how geopolitical shocks can transmit to India's domestic economy, given that the country imports over 85% of its crude needs. In a fragmented energy market, India's edge lies not in self-sufficiency but in optionality.

EXPLAINER

Deepanshu Mohan
Aditi Lazarus

The conflict in West Asia has demonstrated the speed with which geopolitical shocks have been transmitted to India's domestic economy. The head of the International Energy Agency has described the current geoeconomic crisis as more severe than the combined shocks of 1973, 1979 and 2022.

The price of Brent crude oil rose to $109.03 per barrel after having highs of around $120 during the conflict. At a domestic level, India is projected to see its economy slow from 7.4% growth in FY26 to 6.3% in FY27 with a projected increase in inflation from 2.1% to 4.4% due to the impact of disruptions observed in the energy supply chains.

Energy security can no longer be defined solely as purchasing fuel at the lowest possible price. It now rests on resilience, diversification, and protection of macroeconomic stability.

Breakdown of the old energy market order

The Russia-Ukraine War was the first major warning to the pre-existing energy market order. It exposed the perils of energy dependence overnight.

Europe once relied on Russia for 40% of its gas imports. By 2025, that had fallen to 12%. Europe did not respond by chasing efficiency, it did so by buying insurance. Gas consumption by European Union (EU) countries fell by 18% between 2021 and 2024, while the combined imports of gas and liquified natural gas (LNG) declined by 18%.

Even when average LNG terminal utilisation was only 52% in the first half of 2025, Europe accepted spare capacity as the price of security.

While the war in Ukraine revealed the reliance on pipeline-based supplies, the conflict in West Asia demonstrated the reliance on sea transportation.

The Strait of Hormuz, through which approximately 20% of the world's crude oil is transported, has once again become an extremely important chokepoint, transmitting price shocks rapidly across global markets.

Other powers have adapted differently. China has locked in nearly 25 million metric tons of LNG per year through contracts, South Korea has secured 272 million barrels of crude oil that will transit from outside the Strait of Hormuz, while Japan has stockpiled 470 million barrels, which is equivalent to 254 days of consumption.

Gulf state exporters have regained much of their bargaining power due to spare capacity. The International Energy Agency (IEA) forecasts a contraction of $4 bb/d in the global demand for oil on average in 2026, with a decrease of 220 kb/d for OECD (Organisation for Economic Co-operation and Development) and 250 kb/d for Middle East, while non-OECD demand still rises 052 bb/d. In this weaker market, India's demand growth becomes strategically valuable.

How India gained more room to manoeuvre

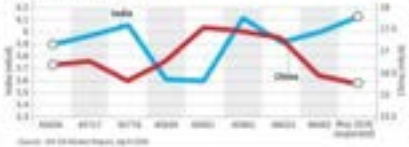
The potential threat of disruption of the Indian oil imports is real and immediate, since the country imports over 85% of its crude needs, with roughly 40% of its imports transiting through the Strait of Hormuz.

Navigating the crisis: An Indian flagged tanker carrying crude oil that traveled through the Strait of Hormuz, is seen docked in Mumbai, on

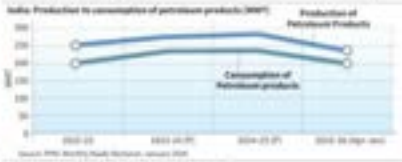
Energy requirements

India is now the world's third largest oil consumer, with high dependence on crude imports. As a result, fluctuations in crude oil prices, freight rates, and currency exchange rates remain a concern, especially during geoeconomic conflicts.

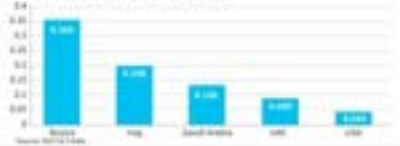
India and China oil demand (2010-26)



India: Production Vs consumption of petroleum products (MMT)



India's FY2024-25 Crude import shares: Top 5 sources



For years, India has depended heavily on imports. But the country has handled repeated shocks better than many comparable importers. It is now the world's third largest oil consumer.

According to OPEC's forecast, India's consumption is expected to reach 5.74 million barrels per day (mb/d) in 2025 and 5.99 mb/d in 2026, while the IEA projects that Indian crude demand will rise approximately 130 kb/d, compared with 80 kb/d for China.

As Chinese demand becomes flatter and more cyclical, India has become one of the few large engines of incremental oil demand.

Before 2022, Russia supplied barely 2% of India's crude imports, however, by FY2024-25, that figure was around 36%, making Russia India's largest supplier. Flows from Russia picked up again as Gulf disruptions intensified.

Now, India's import basket also includes countries such as Iraq, Saudi Arabia, UAE, and the United States, while remaining geographically diversified. In a fragmented energy market, India's edge lies not in self-sufficiency, but in optionality.

Tactical gains and structural risks

India has managed successive shocks well. First, India's crude oil dependence is extremely high, reaching 89.4% in FY2024-25. During that period, India produced only 28.7 million metric tons of crude oil domestically. As a result, fluctuations in crude oil prices, freight rates, and currency exchange rates continue to be a concern.

Second, geography still constrains strategy. Significant redundancy in flows along Gulf sea lanes occurred due to tensions in 2026, and Indian LPG carriers, carrying a combined cargo of 95,000 metric tonnes required naval escort under Operation Sankalp. Diversification cannot bypass chokepoints.

Third, the energy transition creates fresh vulnerabilities. India's expansion into solar, batteries, electric vehicles (EV), and storage may reduce oil use over time. However, the reliance on lithium, cobalt, nickel, copper, and rare earths may increase in the future.

The way forward

India's dependence on critical minerals is tied to processing networks dominated elsewhere, especially by China, which controls over 38% of global rare earth production, while India currently processes less than 5% of its projected 2030 battery grade mineral requirements domestically. While India has adapted to the new oil order with considerable agility, having such tactical flexibility does not provide security in the long term.

The next phase must focus on increasing larger strategic reserves, reducing the oil intensity in transport, strengthening maritime resilience, and ensuring security for supply chains of critical minerals. The real question is no longer whether India can switch suppliers during crises, but whether future crises will carry lower economic costs when they occur.

Deepanshu Mohan is professor and dean, O.P. Jindal Global University. He is a visiting professor at LSE and a visiting academic fellow at University of Oxford. Srivatsa Subramanyam contributed to this column. Srivatsa and Aditi Lazarus are both research analysts with Centre for New Economics Studies, O.P. Jindal Global University.

THE GIST

- India has long relied on crude oil imports but has handled repeated geoeconomic shocks better than many comparable importers.
- Its import basket—spanning Iraq, Saudi Arabia, the UAE, Russia, and the United States, remains geographically diversified.
- While expansion into solar, batteries, and EVs may reduce oil use over time, reliance on lithium, cobalt, nickel, copper, and rare earths may increase in the future.

- **Key Terms and Explanations**
- **Energy Security (Resilience-based):** Moving beyond just "low cost," it is defined as the ability of a nation to withstand geopolitical shocks, ensure supply continuity, and protect macroeconomic stability.
- **Optionality:** The strategic ability to choose between multiple suppliers, routes, and energy types to minimize risk. For India, this means not being tied to one region like West Asia.
- **Geoeconomic Shocks:** Large-scale economic disruptions caused by geopolitical events (like wars). Example: The spike in Brent crude to $109-$120 during the West Asian conflict.
- **Chokepoints:** Narrow maritime passages through which massive amounts of global trade pass. The **Strait of Hormuz** is a critical example, handling 25% of global crude.
- **Incremental Oil Demand:** The additional amount of oil a country requires year-on-year. India is currently one of the few global engines for this growth.
- **Strategic Reserves:** Large stockpiles of crude oil maintained by a country to release during supply disruptions.
- **Critical Minerals:** Elements like Lithium, Cobalt, and Nickel essential for EVs and solar panels. They represent the "new" frontier of energy dependency.

- **Main Arguments and Substantive Parts**
- **The End of the Old Market Order:** The Russia-Ukraine and West Asian conflicts have destroyed the old, predictable energy market. Europe's rapid shift from Russian gas (45% down to 12%) proves that energy security now carries a "premium" price.
- **India’s Strategic Agility:** India has managed recent shocks better than most by diversifying its import basket. Notably, Russia went from providing 2% of India’s imports to 36% by 2024-25.
- **Vulnerability of Transit:** Even with diverse suppliers (Iraq, Saudi Arabia, UAE, USA), geography remains a constraint. 45% of India's imports still pass through the Strait of Hormuz, requiring naval protection like "Operation Sankalp."
- **The Green Transition Paradox:** While moving to solar and EVs reduces oil dependence, it creates a new dependency on critical minerals. China currently controls 91% of global rare-earth production, whereas India processes less than 5% of its needs.

- **Historical Evolution of the Issue**
- **Pre-1970s:** Era of relatively stable, low-cost oil dominated by Western "Seven Sisters" oil companies.
- **1973 & 1979 Shocks:** OPEC-led embargoes caused global crises, prompting India to start looking at domestic production (Bombay High).
- **1990s-2000s:** India’s liberalization led to massive demand growth. Dependency on West Asian "pipeline" and tanker supply became the norm.
- **2022-Present:** The Russia-Ukraine war marked a turning point. India ignored Western pressure to diversify toward Russian oil, signaling a move toward "interest-based" energy diplomacy.
- **Future (2030+):** A shift toward the "Critical Mineral" era, where security is defined by battery supply chains rather than just oil barrels.

- **Way Forward**
- **Expanding Strategic Petroleum Reserves (SPR):** India must increase its storage capacity to handle longer disruptions.
- **Critical Mineral Mission:** Rapidly scaling up domestic processing and acquiring mining assets abroad (e.g., in the Lithium Triangle) to counter China’s dominance.
- **Maritime Resilience:** Strengthening the Indian Navy’s role in securing Sea Lines of Communication (SLOCs).
- **Demand Management:** Improving energy efficiency in transport and industry to reduce "oil intensity" per unit of GDP.

- **Previous Years’ UPSC Questions**
- **Mains 2022 (GS3):** "Cleaning up the energy sector is critical to achieving India's climate goals. Analyze."
- **Mains 2021 (GS2):** "The USA is facing an existential threat in the form of a rising China. How does this impact India's energy interests?"
- **Prelims 2020:** Question on the location of Strategic Petroleum Reserves in India (Visakhapatnam, Mangaluru, Padur).

INDIA'S ENERGY SECURITY AMID CONFLICTS: UPSC CSE COMPREHENSIVE ANALYSIS

AXIA IAS ACADEMY

KEY TERMS & CONCEPTS

- Energy Security (Resilience-based)
- Optionality
- Geoeconomic Shocks
- Chokepoints (e.g., Strait of Hormuz)
- Incremental Oil Demand
- Strategic Reserves
- Critical Minerals

HISTORICAL EVOLUTION

Pre-1970s stability	Diversification (e.g., Russian oil shift)	Critical Minerals focus
Pre-1970s Stability	2020s e.g. Diversification (e.g. Russian oil shift)	2030+ Critical Minerals Mineral focus

OLD VS. NEW MARKET ORDER

OLD (Pipeline & Pipeline Dependence)

NEW (Tanker & Optionality)

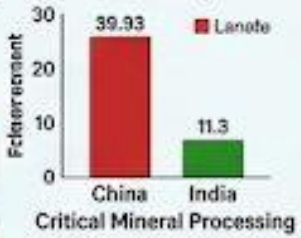
LOGICAL & PHILOSOPHICAL BASE

- Realism (Realpolitik) over Idealism
- Interdependence over Atmanirbharta
- Hedging over Single Source

CHALLENGES

Geographic Chokepoints

China Gap



Inflationary Pressures

MULTIDIMENSIONAL ANALYSIS

SOCIAL

- Social, security resilience baseds
- Political, developmentar and aohonrity

POLITICAL

- Political and politicat proxected commans
- Political oil and semetal geonconomic shocks

LEGAL

- Legal geoeconomic chocewacy
- Legal loan contributed

ETHICAL

- Develop geoconomic models
- Chokepoints chokepoints e.g., Strait of Hormuz

INTERNATIONAL

- International internansation for orgariic mone in India
- Incremental oil demand to the internationall market

ECONOMIC

- Economic and oecurrity, inseeles, resources and critical minerals
- Economic dimension and strategic economics

LINKAGES WITH UPSC SYLLABUS

- Precentirats (GS Papers 1-4)
- Maindependence (GS Papers 1-2)
- Exploded topics (GS Papers 1-4)
- 1International topics (GS Papers 1-4)

LINKAGES WITH NCERTs

- Class 10/12 books / Begin
- Chapters-In India
- Chapters · Class 10/12

WAY FORWARD (STRATEGIC SOLUTIONS)

- Expand SPRs
- Critical Mineral Mission
- Naval SLOC Security
- Demand Management

CLEAN

Industrial heat pumps and the case for cleaning industrial heat

Industry accounted for nearly half of India's final energy consumption in 2025, much of it still tied to fossil fuels. Cleaning up industrial heat is therefore not just a climate issue, but also one of air quality, competitiveness, energy security, and worker health.

Srishtee Abhraj

Industrial decarbonisation is often framed through solutions that promise deep emissions reductions (e.g. green hydrogen and carbon capture). These pathways are essential, particularly for hard-to-abate sectors, but are still several years away from large-scale adoption.

Every day, a significant share of manufacturing functions under very different operating conditions: one defined not by extreme temperatures but by the widespread demand for low-to-medium temperature process heat. Across sectors such as textiles, food processing, chemicals, pharmaceuticals and paper and pulp, this heat forms the backbone of production and continues to be largely met through combustion.

Industry accounted for nearly half of India's final energy consumption in 2025, much of it still tied to fossil fuels. The story becomes even sharper when we look at process steam. Industrial process steam alone is estimated to have generated 162 million metric tonnes of CO_2 annually in India, along with 300 kilotonnes of SO_2, 520 kilotons of particulate matter, and 350 kilotonnes of NO_x.

This is why cleaning up industrial heat is not just a climate question. It is also an air quality, competitiveness, energy security, and worker health question.

The opportunity is especially important for micro, small, and medium enterprises (MSMEs) in India, spread across millions of units. MSMEs form the backbone of the country's manufacturing economy. Although they account for a smaller share of total industrial emissions (around 15%), their emissions are more fragmented and concentrated in sectors such as textiles, food processing, and paper. These are the sectors where coal, firewood, biomass, gas and furnace oil continue to run the conventional thermal systems such as boilers, thermic fluid heaters, dryers, evaporators and hot-water systems, etc.

Heat pumps as a solution

Heat pumps enter this conversation as one of the most practical technologies for this specific frontier of industrial heat. Unlike boilers, heat pumps do not create heat by burning fuel. They move and upgrade heat from one stream to another, using electricity. This is why they can deliver more useful heat than the electricity they consume. Industrial heat pumps often have a coefficient of performance of 3 or 5, meaning they can provide three to five units of thermal energy for every unit of electricity consumed. Even at higher output temperatures, where performance falls, they can remain more efficient than simple electric resistance-based heating. This efficiency is the core of their decarbonisation value. It reduces the amount of electricity needed to electrify heat and improves the economics of switching away from combustion. If renewable electricity is available at competitive rates, the effective cost of heat from a heat pump becomes attractive even against conventional fuels.

What makes this transition compelling is the way industrial heat is currently produced and used. In a medium-sized textile finishing unit studied in Surat, around 70 percent of energy load was thermal, delivered through steam and industrial heat using a mix of Indonesian coal and lignite. The unit consumed roughly 0.42 kg of Indonesian coal per metre of processed fabric, illustrating the material intensity of fuel use embedded in routine operations. Despite this, steam is often used indirectly for generating hot water, maintaining vessel temperature, or heating surfaces rather than directly heating the product.

This reflects a central inefficiency. Conventional industrial thermal systems in such factories are often designed around the highest heat requirement, with boilers sized to meet peak demand. But many loads require lower-quality heat. As such cases, steam is generated at higher temperature and pressure, then reduced or throttled for lower-temperature applications. However, industrial heat pumps require a different engineering solution: start with the lowest temperature heat demand, then boost heat only where needed. This reverses the legacy boiler approach and can reduce overall energy use by 40-60 percent in suitable applications.

This right-sizing logic is particularly relevant in brownfield MSME clusters. Many boilers are old, oversized, manually operated in such settings, and run below optimal capacity. Replacing every boiler with a single large electric system is often not practical. But heat pumps can be modular. They can first serve specific loads, pre-heating boiler feedwater, supplying hot water, supporting dyeing and washing processes, recovering waste heat from effluents, or reducing steam demand in evaporators and drying streams.

Their role becomes even more interesting when heating and cooling are considered together. Industrial heat pumps can simultaneously generate hot water, steam, or hot air while producing cooling or dehumidified air as a by-product. In food processing and digital textile printing, where process heat is required alongside controlled cooling for process stability and equipment performance, heat pumps can simultaneously supply useful heat while reducing chiller or air conditioner loads.

Health, safety and emission control

Beyond system efficiency, heat pumps can also improve worker health and safety. Workplace heat exposure is emerging as a serious occupational health risk, especially in labor-intensive factory environments where internal process heat compounds rising ambient temperatures. Globally, over 2.4 billion workers are exposed to excessive heat at work, with the highest exposure rates in Asia and the Pacific. Prolonged workplace heat is linked to heat exhaustion, heart stroke, cardiovascular strain, kidney disease, accident risk, and reduced cognitive performance.

In parallel, combustion-based process heat contributes to emission of harmful air pollutants exacerbating respiratory and cardiovascular health risks. The public health dimension is significant: fossil fuel-driven air pollution caused an estimated 1.72 million premature deaths in India in 2022, with industrial heat systems being a key source of these emissions. In this context, increasing the use of electrified heating systems such as industrial heat pump technologies, particularly within the temperature ranges in which they are technically feasible can significantly improve air quality, mitigate greenhouse gas emissions and reduce health harms associated with both air pollution and climate change. By displacing on-site combustion and enabling the integration of heating and cooling, heat pumps can create opportunities for spot and space cooling to improve thermal comfort on factory floors.

What emerges, then, is not just a technology shift but a systems transition. Scaling industrial heat pumps will depend on how well they are embedded into existing industrial ecosystems through better process integration, reliable access to low-cost electricity, and financing models that work for industries, especially MSMEs. Done right, it can unlock not just emissions reduction, but a more resilient, efficient, and safer model of industrial growth.

(Srishtee Abhraj is assistant manager, Energy Transition, at the Vasudha Foundation.)

- **Key Terms and Explanations**
- To understand the technical shift, we must first decode the terminology surrounding thermal energy:
- **Process Heat:** This is the thermal energy used in industrial manufacturing to treat materials or power chemical reactions. Think of a textile mill needing steam to dye fabric or a food plant needing hot water for pasteurization.
- **Industrial Heat Pump (IHP):** Unlike a boiler that creates heat by burning fuel, a heat pump "moves" and upgrades heat from one source to another using electricity.
- **Coefficient of Performance (COP):** A measure of efficiency. If a heat pump has a COP of 4, it means for every 1 unit of electricity used, it delivers 4 units of useful heat. Traditional electric heaters have a COP of only 1.
- **Hard-to-Abate Sectors:** Industries like steel and cement where high temperatures (above 1000°C) are required, making them difficult to decarbonize with current technology.
- **Low-to-Medium Temperature Heat:** Heat requirements typically below 200°C. This accounts for a massive share of the energy needs in textiles, chemicals, and pharmaceuticals.
- **Brownfield MSME Clusters:** Existing industrial areas dominated by Micro, Small, and Medium Enterprises that currently rely on legacy, inefficient equipment like coal-fired boilers.

- **Main Arguments and Substantive Parts**
- The core thesis revolves around the idea that industrial decarbonization is not just an environmental goal but a public health and economic imperative.
- **The Problem of Inefficiency:** Current systems often generate high-pressure steam even when low-temperature heat is needed, leading to massive energy wastage. This "top-down" approach is inherently inefficient.
- **The Heat Pump Solution:** Heat pumps offer a "bottom-up" engineering mindset—starting with the lowest temperature needed and boosting it only as required. This can reduce overall energy use by **40–60%**.
- **Beyond Decarbonization:** The shift is framed as a solution for air quality (reducing SO_2 and NO_x), worker safety (reducing ambient heat exposure), and economic competitiveness (lowering long-term energy costs).
- **Economic Feasibility:** The argument posits that as renewable electricity prices drop, the cost of heat from IHPs becomes competitive with conventional fuels like coal and furnace oil.

- **Historical Evolution of the Issue**
- The trajectory of industrial energy in India has moved through several distinct phases:
- **Pre-Independence to 1970s:** Heavy reliance on local biomass and early coal-fired steam engines; industrialization was localized and unregulated.
- **1970s – 1990s:** Shift toward furnace oil and natural gas as India sought more "modern" fuels, though efficiency remained low and coal remained the primary driver for power.
- **2001 (Energy Conservation Act):** The first major legislative push to mandate energy audits and introduce the Bureau of Energy Efficiency (BEE), setting the stage for industrial standards.
- **2015 – Present (The Net Zero Era):** Following the Paris Agreement and India's "Panchamrit" targets at COP26, the focus has shifted from mere "efficiency" to "electrification" and "decarbonization."

- **Way Forward**
- **Financial Incentives:** Create a "Heat Decarbonization Fund" to provide low-interest loans specifically for MSMEs to adopt IHP technology.
- **Policy Mandates:** Gradually phase out the use of furnace oil in specific industrial clusters where heat pump viability is high.
- **R&D Investment:** Focus on indigenous manufacturing of high-temperature heat pumps to lower costs under the "Make in India" initiative.
- **Pilot Projects:** Establish "Demonstration Centers" in major textile and food processing hubs (e.g., Tirupur or Surat) to build trust among manufacturers.

Previous Years' Questions (PYQs)

- **UPSC Mains 2022 (GS3):** "Discuss the global warming and mention its effects on the global climate. Explain the control measures to bring down the level of greenhouse gases."
- **UPSC Mains 2021 (GS3):** "Describe the major outcomes of the 26th session of the Conference of the Parties (COP26) to the United Nations Framework Convention on Climate Change (UNFCCC)."
- **UPSC Prelims 2023:** Question regarding "Green Hydrogen" and "Decarbonization" pathways.

AXIA IAS ACADEMY

UPSC CSE: KEY TRENDS & ANALYSIS

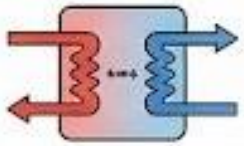
INDUSTRIAL HEAT PUMPS: CLEANING INDUSTRIAL HEAT

1 TITLE & KEY TERMS

INDUSTRIAL DECARBONIZATION FRONTIER: HEAT PUMPS

PROCESS HEAT

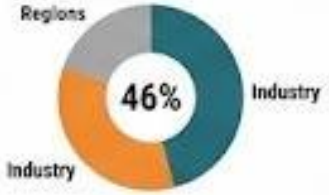
HEAT PUMP



COP (Coefficient of Performance)

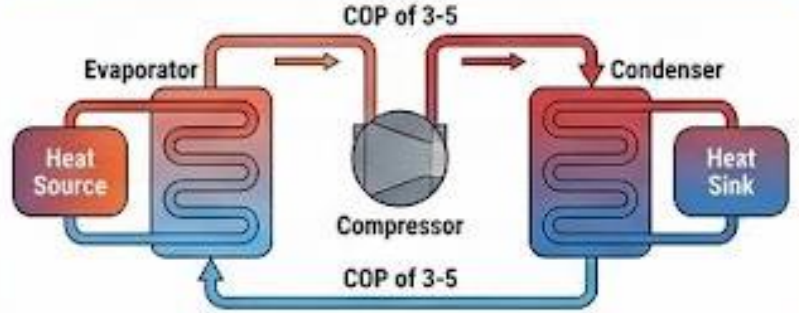
2 THE PROBLEM & OPPORTUNITY

INDIA'S ENERGY CONSUMPTION IN 2025



- Process Steam = 182 MT CO_2/yr
- **Low-to-Medium Temp Heat** (e.g., Textiles, Chemicals, Food Processing)

3 THE HEAT PUMP SOLUTION & KEY SYLLABUS LINKAGES



UNIQUE BENEFITS:

- Recover Waste Heat from Effluents
- Simultaneous Heating & Cooling (A/C and Hot Water)

STRONGEST SYLLABUS LINKS:

- **GS 3** : Economy, Energy, Environment)

4 MULTI-DIMENSIONAL ANALYSIS

5 KEY CHALLENGES & WAY FORWARD

CHALLENGES

High CAPEX
High CAPEX, stonn import and econominal heat

Skill Gap
Cominun, grid stability heats maintained on industrams

Grid Stability
High stability, of prociscal roads, concestablition, skilling, furnaest, condumtc of proints and grid-oostevments

WAY FORWARD

Low-interest Loans for MSMEs
Low-in-interest Loans for MSMEs

Phase out Furnace Oil
Phase out furnace Oil to collect and wastes-of-conpenties.

R&D in High-Temp Pumps
R&D in High-temp Pumps and promove in demonstration:

Demonstration Pilots
Demonstration Pilots attacking redinasration pilots

6 NCERT & UPSC CSE RELEVANCE

NCERTs

- **Class 11 Economics** (Sustainability)
- **Class 10 Geography** (Energy)
- **Class 12 Physics** (Thermodynamics)

UPSC

- Model Answer for question on Industrial Electrification
- Model Answer for question on Industrial Electrification
- Model Answer for question on Industrial Electrification
- Model Answer for question on Industrial Electrification

Consider Teesta water sharing agreement under 'current circumstances', says Bangladesh Minister

Kallol Bhattacherjee
NEW DELHI

In the wake of the Bharatiya Janata Party's victory in the West Bengal Assembly election, Bangladesh has issued an urgent call to consider the long-pending Teesta water sharing agreement under the "current circumstances."

Outgoing Chief Minister Mamata Banerjee has long been seen as a hurdle in efforts to resolve the dispute between India and Bangladesh.

In Dhaka's first-high level response to the poll results, Foreign Minister Khalilur Rahman on Tuesday reiterated Bangladesh's demand for a greater share of the Teesta's waters.

Khalilur Rahman

In case of any further "push in" from the Indian side, he said, Bangladesh will take "whatever measures are necessary".

India and Bangladesh had reached an in-principle agreement to seal the deal on the Teesta's waters in 2011 during the Manmohan Singh-era, but the matter remained unresolved for several reasons including an alleged lack of coordination between the Central government and the Trinamool government in West Bengal led by Ms. Banerjee.

Referring to the 2011 agreement, Mr. Rahman said, "We hope that the agreement reached at that time can be 'considered' again under the current circumstances."

Talks with Beijing

Mr. Rahman was speaking to journalists in Dhaka before leaving for Beijing, where he is expected to meet his counterpart Wang Yi. He indicated that, during his meetings there, he would discuss the Teesta River Comprehensive Management and Restoration Project that China has been campaigning for.

"Of course, Teesta will be discussed, absolutely. This is a matter of life and death for the people of that region."

Earlier on Monday, Minister of State for Foreign Affairs Shama Obaid had described the election in West Bengal as a "domestic development" of India. This was followed by Bangladesh Nationalist Party's Media Cell member Syrul Kabir Khan, who had expressed hope for positive developments in Dhaka-Delhi relations as both the Central and State governments will now be headed by the BJP.

Concerns remain

Meanwhile, commentators in Dhaka have expressed concern about the role played by the BJP's Suvendu Adhikari, who has complained about illegal immigrants from Bangladesh in West Bengal.

Mr. Adhikari had earlier supported ousted Bangladesh Prime Minister Sheikh Hasina, saying she had received a death sentence in October 2025 due to influence of Pakistan in Bangladesh.

- **Key Terms and Explanations**
- **Riparian Rights:** The legal rights of owners of land bordering a river or other body of water to use that water. In international law, it refers to the rights of countries (Upper vs. Lower Riparian) to a river's flow.
    - *Example:* India is the upper riparian state for the Teesta, while Bangladesh is the lower riparian.
- **Teesta River Comprehensive Management and Restoration Project:** A mega-project proposed by China involving dredging, embankment construction, and reservoir creation to manage the Teesta within Bangladesh.
- **Hydro-Diplomacy:** The use of diplomatic instruments to manage transboundary water resources and mitigate potential conflicts.
- **"Push-in":** A colloquial political term referring to the forced deportation or movement of suspected illegal immigrants across a border.
- **Federalism (Article 253):** The constitutional division of power. While the Center has the power to make laws for implementing international treaties (Article 253), "Water" is primarily an entry in the State List (Entry 17), creating a constitutional tug-of-war.

Main Arguments and Substantive Parts

- **The Shift in Political Alignment:** The primary thesis suggests that with the BJP now in power at both the Center (New Delhi) and the State (West Bengal), the "double engine" government might remove the long-standing domestic veto that stalled the 2011 agreement.
- **Strategic Leverage of Bangladesh:** Dhaka is signaling a shift toward Beijing for technical and financial support on the Teesta project. This serves as a "pressure tactic" to nudge India into a formal water-sharing treaty.
- **Security vs. Diplomacy:** The article highlights a friction point: while water sharing is a diplomatic necessity for Dhaka, the Indian side (specifically the West Bengal BJP leadership) remains focused on "illegal immigration," which could complicate the bonhomie.
- **The "Life and Death" Argument:** For Bangladesh, the Teesta is not just a political issue but an ecological and economic necessity for its northern districts, which face severe water scarcity during the lean season.

- **Historical Evolution of the Issue**
- **Pre-1983:** The river flowed without a formal sharing mechanism. Following the 1971 independence of Bangladesh, the Joint Rivers Commission (JRC) was established in 1972.
- **1983 Ad-hoc Agreement:** A temporary arrangement allocated 39% of water to India and 36% to Bangladesh, leaving 25% unallocated.
- **2011 Breakthrough & Collapse:** During PM Manmohan Singh's visit to Dhaka, a deal was ready (42.5% for India, 37.5% for Bangladesh). However, Mamata Banerjee pulled out at the last minute, citing the impact on North Bengal's farmers.
- **2015–2024 Stalemate:** Despite the Land Boundary Agreement (LBA) being signed, the Teesta remained "in-principle" only. West Bengal's government maintained that the Teesta has too little water to share.
- **2025–26 Pivot:** The recent elections and the entry of China into the Teesta management discourse have fundamentally altered the timeline, making it a matter of regional security.

- **Way Forward**
- **Basin-wide Management:** Move from "water-sharing" to "basin-sharing." Treat the river as a single ecological unit from Sikkim to Bangladesh.
- **Inter-State Council:** Use the Inter-State Council to bring West Bengal and the Union Ministry of External Affairs onto the same page before going to the negotiating table.
- **Augmentation of Flow:** Explore the possibility of linking the Teesta with the Manas and Sankosh rivers (part of the National River Linking Project) to increase the overall water availability.
- **Data Transparency:** Real-time sharing of flow data to build trust and prevent the "blame game" during the lean season.

Previous Years' Questions (PYQs)

- **UPSC Mains (2017, GS 2):** "With respect to the South China Sea, maritime territorial disputes and rising tension affirm the need for reaching a strategic as well as defensive understanding..." (Theme: Regional Hegemony/China's Influence).
- **UPSC Mains (2013, GS 2):** "The protest in Shahbagh Valley in Bangladesh reveals a fundamental split between secularism and radicalism... What is its impact on India?" (Theme: Internal dynamics of Bangladesh affecting India).
- **UPSC Mains (2014, GS 2):** "Projectize the Teesta river water dispute in the context of India-Bangladesh relations." (Directly relevant).
- **APSC Mains (2020):** "Discuss the significance of Bangladesh for the development of North East India."

ANALYSIS: THE TEESTA WATER DISPUTE & REGIONAL DYNAMICS FOR UPSC CSE

AXIA IAS ACADEMY
RISE ABOVE THE REST

KEY DEVELOPMENTS

- **BJP VICTORY IN WEST BENGAL:** Creates 'Double Engine' government (Center & State) → Nudges reconsideration of 2011 agreement.
- **DHAKA'S CALL:** Foreign Minister reiterated demand → Cites 'Current Circumstances' & concerns over 'Push-in'.

FEDERALISM VS. FOREIGN POLICY

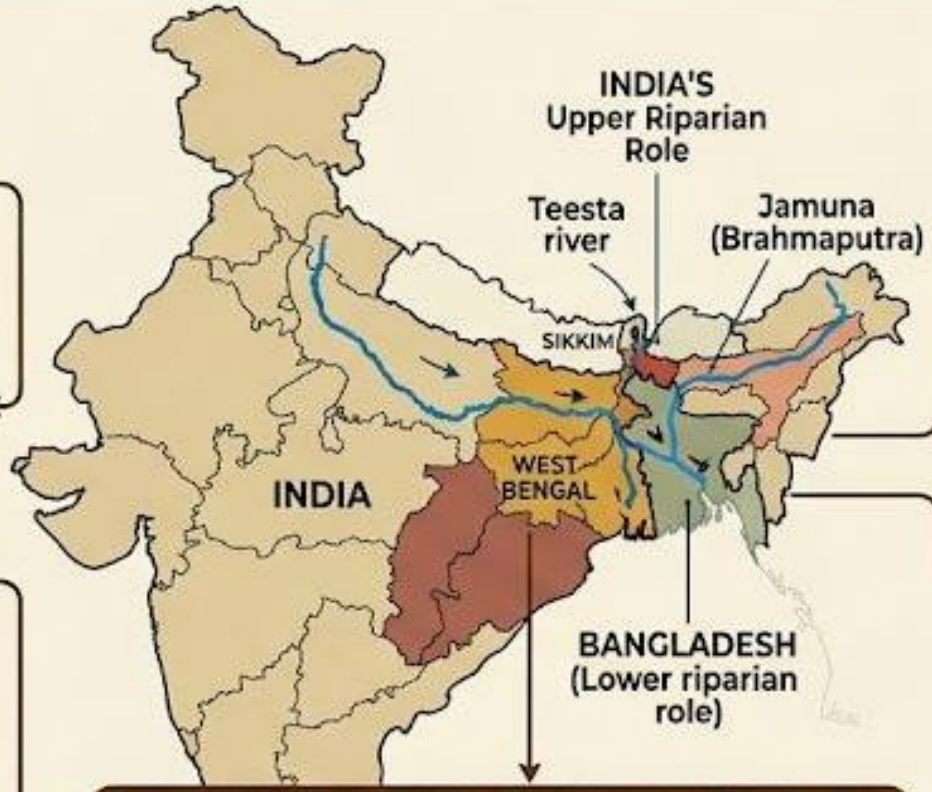
INDIAN PARLIAMENT — WEST BENGAL

AGREES THE PREVIOUS 'STATE VETO'

-> Cites state governmentsd & State governments

GEOPOLITICAL FACTORS

THE CHINA FACTOR
Bangladesh eyes Teesta (dredging, management) with Chinese support.



ANALYSIS & MULTIDIMENSIONAL OVERVIEW

GEOPOLITICAL FACTORS

THE CHINA FACTOR:
Bangladesh eyes Teesta Project (dredging, management) with Chinese support.

SOCIETAL & ECONOMIC IMPACT

LIFE & DEATH FOR BANGLADESH
Essential for northern districts' water security.

WEST BENGAL'S ANGLE
Concerns over North Bengal's water for agriculture & tea industry.

WAY FORWARD

1. **BASIN-WIDE MANAGEMENT:** Integrated approach for ecology.
2. **TECHNO-DIPLOMACY:** Joint data sharing & river restoration projects.
3. **BALANCED SOLUTION:** Meeting India's state-level needs while ensuring Bangladesh's right to water.

Cabinet approves two more semicon units worth ₹3,900 crore

CENTRE'S MISSION. India's first commercial mini/micro-LED display facility based on GaN tech, packaging unit

Our Bureau
New Delhi

The Cabinet on Tuesday approved two more semiconductor manufacturing units, with a cumulative investment of ₹3,936 crore, which are expected to generate employment for 2,230 skilled professionals.

BOOST TO SECTOR

The approved semiconductor projects — Crystal Matrix Ltd and Suchi Semicon — under the India Semiconductor Mission (ISM) includes country's first commercial Mini/Micro-LED display facility based on GaN (Gallium Nitride) Technology and a semiconductor packaging facility, to be set up in Gujarat, Ashwini Vaishnaw, Minister of Electronics and Information Technology, said at a briefing here.

With these two approvals, semiconductor ecosystem in the country would get a significant boost with the total number of approved projects under India Semiconductor Mission (ISM) reaching 12, at an outlay of around ₹1.64 lakh crore, from the earlier target of ₹1.60 lakh crore.

These would complement the growing world-class chip design capabilities coming up in the country which are propelled by design infrastructure support provided by government to 315 academic institutions and 104 start-ups, Vaishnaw said, adding that momentum is building up further in the semiconductor ecosystem in India with the 10 approved projects already in various stages of execution.

Two projects have already started commercial shipments from India and two more are expected to start commercial shipments soon, he added.

'CHIP'PING IN. Union Minister Ashwini Vaishnaw speaks during a Cabinet briefing, in New Delhi on Tuesday NAVEEN SHARMA

OUTPUT APPLICATION

"Crystal Matrix Limited (CML) will establish an integrated facility for compound semiconductor fabrication and ATMP in Dholera, Gujarat for manufacturing mini/micro-LED display modules. The integrated facility will also provide GaN foundry services, including epitaxy on 6-inch wafers. The annual proposed production capacity for mini/micro-LED Display Panels is 72,000 sq meters, and for Mini-Micro-LED GaN epitaxy wafers is 24,000 sets of RGB (red, green, blue) wafers," Vaishnaw explained.

The proposed products will have applications in large displays for TVs and signages/commercial displays, medium-sized displays for tablets, smartphones and in-car displays, and micro-displays for extended reality (XR) glasses and smart watches.

Similarly, Suchi Semicon (SSPL) will be setting up an outsourced semiconductor assembly and test (OSAT) facility in Surat, Gujarat, for manufacturing discrete semiconductors. The proposed production capacity of the Suchi Semicon unit is 1,033.20 million chips per annum.

The target applications include power electronics, analog ICs and industrial systems, serving automotive, industrial automation and electronics sectors.

Commenting on the approval, Ashok Mehta, Founder and Chairman at SSPL, said, "This facility will serve domestic and global demand across power electronics, analog ICs and industrial systems."

- **Key Terms and Explanations**
- **India Semiconductor Mission (ISM):** A specialized business division within the Digital India Corporation that aims to build a vibrant semiconductor and display ecosystem to enable India's emergence as a global hub for electronics manufacturing.
- **GaN (Gallium Nitride) Technology:** A "wide-bandgap" semiconductor material. Unlike traditional silicon, GaN can handle higher voltages and temperatures, making it essential for high-speed, high-efficiency electronics like 5G and power adapters.
- **Fair and Remunerative Price (FRP):** The minimum price that sugar mills are legally required to pay to farmers for sugarcane. It is determined by the Central Government on the recommendation of the Commission for Agricultural Costs and Prices (CACP).
- **Emergency Credit Line Guarantee Scheme (ECLGS):** A scheme launched during the pandemic to provide 100% guarantee coverage to Banks and NBFCs, enabling them to provide emergency credit to business enterprises/MSMEs to meet their operational liabilities.
- **A2 + FL Formula:** A method of calculating the cost of production in agriculture. "A2" covers all paid-out expenses (seeds, fertilizers, fuel), and "FL" includes the imputed value of unpaid family labor.
- **OSAT (Outsourced Semiconductor Assembly and Test):** A third-party service provider for semiconductor assembly, packaging, and testing. They are the "finishers" of the chip-making process.
-

Main Arguments and Substantive Parts

- The Cabinet's recent moves are built on three primary pillars of economic strategy:
- **Deepening the Tech Value Chain:** By approving units for Mini/Micro-LED and GaN technology, the government is shifting focus from basic assembly to high-end manufacturing. The goal is to reach a cumulative investment target of ₹1.64 lakh crore.
- **Balancing Agrarian Interests with Industry Viability:** The hike of ₹10 per quintal in sugarcane FRP seeks to ensure farmers receive prices significantly higher (100.5%) than their production costs. However, it also acknowledges the mills' struggle with rising raw material costs and the need for a balanced "Sugar MSP."
- **Buffering Against Geopolitical Shocks:** The ECLGS 5.0, with an outlay of ₹2.55 lakh crore, is a direct response to the West Asia crisis. It argues that MSMEs and the aviation sector (hit by rising fuel costs and supply chain disruptions) need state-backed liquidity to survive.

- **Historical Evolution of the Issue**
- The trajectory of these sectors shows a shift from protectionism to proactive global integration.
- **Pre-1990s:** Agriculture was the sole focus; semiconductors were non-existent in policy. Credit was largely directed through nationalized banks with high collateral requirements.
- **1990s - 2010s:** Liberalization opened the door for electronics imports. Sugarcane pricing shifted from the "Statutory Minimum Price" (SMP) to the more farmer-friendly FRP in 2009.
- **2014 - 2020:** The "Make in India" initiative began. The 2018 Rangarajan Committee recommendations on the sugar industry started being implemented in bits and pieces.
- **2021 - Present:** The COVID-19 pandemic and the subsequent global chip shortage acted as a catalyst. The India Semiconductor Mission was launched in 2021. Post-pandemic, ECLGS became the primary tool for fiscal support to distressed sectors.

- **Way Forward**
- **For Agriculture:** Move toward a "Revenue Sharing Formula" where farmers get a share of the profits from by-products like ethanol and molasses, reducing the mills' burden.
- **For Semiconductors:** Focus on "Design-Linked Incentives" (DLI) to ensure we don't just assemble chips but own the intellectual property.
- **For MSMEs:** Gradually shift from "Credit Guarantees" to "Market Access," helping small businesses integrate into global supply chains so they don't rely on debt.
-

All Previous Years' UPSC Questions

- **Prelims (2023):** Questions on MSME definitions and the ECLGS scheme.
- **Mains (GS3, 2022):** "Is the inclusive growth possible under the market economy? State the significance of financial inclusion in achieving this." (Relates to ECLGS).
- **Mains (GS3, 2018):** "How do subsidies affect the cropping pattern, crop diversity and economy of farmers?" (Relates to Sugarcane FRP).
- **Mains (GS3, 2021):** Questions on the "Applied Science" of semiconductors and their role in the digital revolution.

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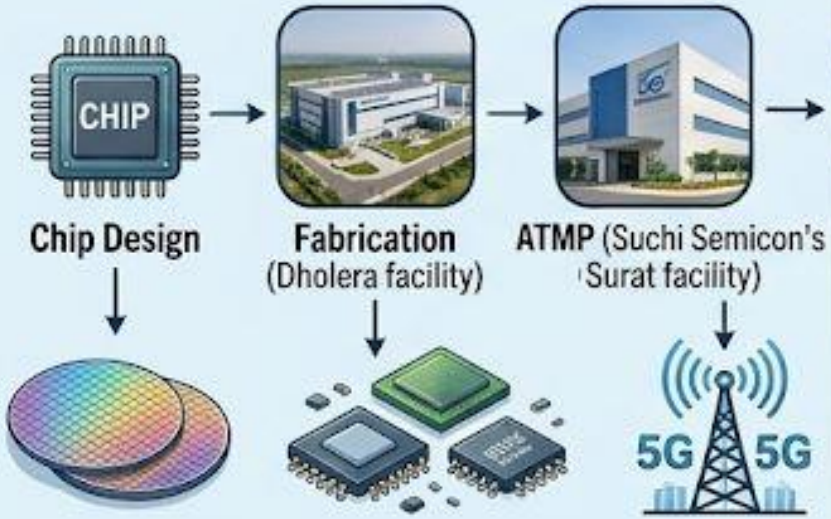
UPSC STRATEGIC ANALYSIS: KEY CABINET DECISIONS & & ECONOMIC IMPLICATIONS

SECTION 1: SEMICONDUCTORS (ISM & GaN Tech)

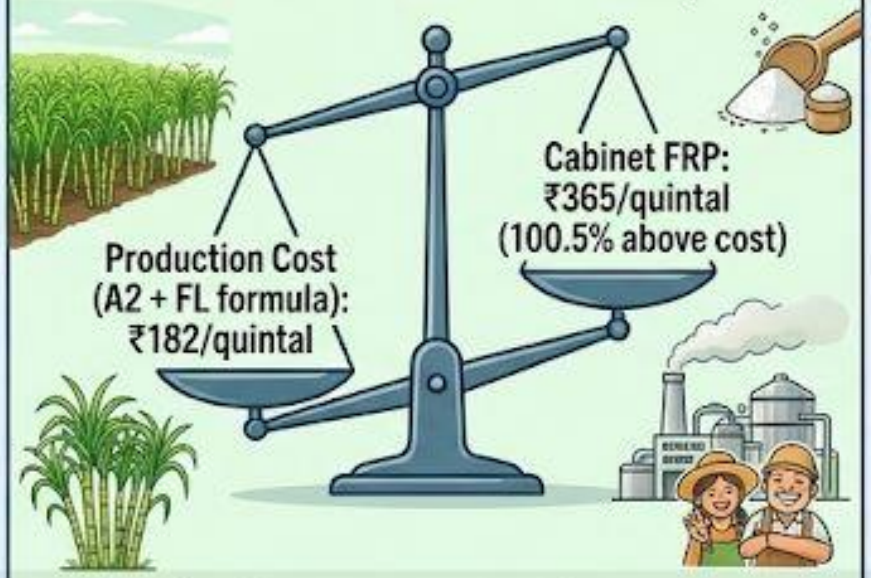
SEMICONDUCTOR ECOSYSTEM BOOST



- **ISM Investment target:** ₹1.64 lakh crore
- **Focus:** Mini/Micro-LED & GaN Tech (High power/efficient)
- **Strategic Goals:** Import Substitution, National Security, Skill Dev (2,230 jobs)
- **UPSC Links:** GS 3 (S&T, Industrial Policy)

SECTION 2: AGRICULTURE (Sugarcane FRP)

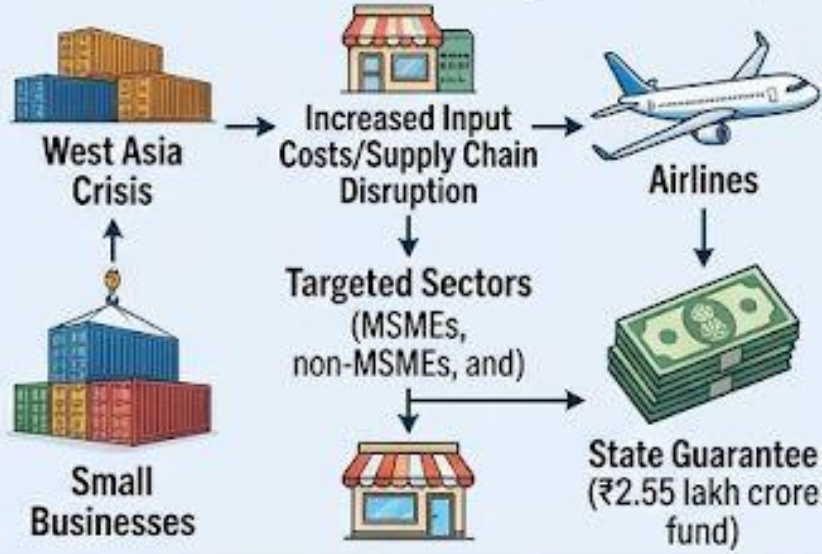
SUGARCANE PRICE REVISION (FRP)



- **Benefit:** ~1 crore sugarcane farmers
- **Lowest arrears:** 88.6% already paid for 2025-26
- **Challenge:** Mill owners' demand for Sugar MSP to match raw material costs
- **UPSC Links:** GS 3 (Agriculture, Food Security)

SECTION 3: CREDIT SUPPORT (MSMEs & Airlines)

ECONOMIC RESILIENCE (ECLGS 5.0)



- **Purpose:** Risk Mitigation, Ensuring liquidity
- **Details:** 100% guarantee for MSMEs, separate ₹5,000 crore crore for Airlines
- **Strategic Intent:** Protect critical infrastructure & livelihoods
- **UPSC Links:** GS 3 (Resource Mobilization, Investment Models)

AMID RISING GLOBAL VOLATILITY...

India Growth to Stay Relatively Robust: ADB

Bank's chief economist calls for sustained reforms to improve biz environment, boost trade integration and FDI

Deepshikha Sikarwar

Samarkand: India's growth outlook remains "relatively robust," but risks have increased due to global disruptions, particularly energy market volatility linked to geopolitical tensions, Asian Development Bank chief economist Albert Park said. He called for sustained reforms, particularly to improve the business environment, boost trade integration and attract foreign investments.

"We're in a global shock... Everyone's struggling. But I think India is still in a relatively robust growth position," Park told **ET**.

India's growth may moderate closer to 6.3% in the current fiscal year from the earlier projection of around 6.9% but the slowdown is likely to be temporary, with growth expected to recover next year, he said.

This negative 0.6% impact on growth this year is in line with the region as a whole except China, he said.

"India is still ahead of many peers in terms of growth prospects. The challenge is to navigate this period of global shocks while continuing structural reforms," Park said, adding that reforms can unleash the underlying potential of the country.

Despite near-term challenges, India remains one of the fastest-growing major economies amid strong domestic demand, ongoing reforms and favourable demographic profile, he said.

Park said not much should be read into slowing foreign investment flows. "I know there's a little bit of a concern in India about foreign direct investment flows. But it's such a crazy world right now. I wouldn't read too much, but certainly, I think that's an area that India should really continue to focus on," he said.

He flagged inflation as a bigger concern. As per the multilateral development bank's estimates inflation in India could rise by an additional 2.4 percentage points this year relative to its earlier baseline, taking it close to 6.9%. A further increase of about 0.8 percentage points is expected in 2027. The Consumer Price Index-based inflation rose marginally to 3.4% in March from 3.2% in February.

The sharper inflationary impact compared to the broader Asia-Pacific region is largely due to India's dependence on imported oil and gas, Park said. "Higher energy prices feed directly into domestic inflation, and the effects are more pronounced in India," he noted.

India Among Most Resilient Emerging Markets: Moody's

New Delhi: India is well positioned to manage global shocks and stands out as one of the most resilient large emerging markets since 2020, supported by early policy reforms and strong buffers, according to a Moody's Ratings report released Tuesday. Clear and predictable monetary policy frameworks, including inflation targeting adopted ahead of recent disruptions, have helped anchor inflation expectations and improve India's ability to absorb external shocks. Large forex reserves have also played a key role in stabilising currency volatility and reinforcing investor confidence during periods of global stress.–**Our Bureau**

- **Key Terms and Explanations**
- **Foreign Direct Investment (FDI):** Investment made by a firm or individual in one country into business interests located in another country. Unlike FPI (speculative), FDI implies a long-term interest and management control.
  - *Example:* A global tech giant setting up a manufacturing unit in Tamil Nadu.
- **Inflation Targeting:** A monetary policy regime where the central bank (RBI) sets a specific target rate for inflation and uses interest rate tools to achieve it. India follows a 4 pm 2 band.
- **Structural Reforms:** Fundamental changes to the "rules of the game" in an economy, such as labor laws, land acquisition, or GST, aimed at boosting long-term productivity.
- **Demographic Profile:** The age structure of a population. India's "demographic dividend" refers to having a high proportion of working-age individuals (15-64 years) compared to dependents.
- **External Shocks:** Unexpected events outside the domestic economy (like a global pandemic or a war in Europe) that disrupt trade, supply chains, or energy prices.
- **Fiscal Year (FY):** In India, the period from April 1 to March 31 used for government accounting and budget purposes.

- **Main Arguments and Substantive Parts**
- **Robustness Amidst Volatility:** Despite a downward revision in growth (from 6.9% to 6.3%), India remains a global outlier. The temporary nature of this dip suggests strong underlying fundamentals rather than systemic decay.
- **The Energy Vulnerability:** India's Achilles' heel remains its heavy reliance on imported fossil fuels. Geopolitical tensions in energy-rich regions translate directly into domestic "imported inflation," affecting the cost of living and production.
- **Resilience Factors:** The stability isn't accidental. It is the result of proactive policy measures, including the build-up of massive Forex reserves and a predictable monetary policy framework that anchors investor expectations.
- **The Reform Mandate:** To transition from "resilient" to "high-growth," India must double down on improving the ease of doing business and integrating more deeply into global value chains (GVCs).
- **Inflation as the Primary Risk:** While growth is healthy, persistent inflation (projected to rise by 2.4 percentage points) threatens to erode purchasing power and dampen domestic demand.

- **Historical Evolution of the Issue**
- **Pre-1991 Era:** A closed, "License Raj" economy characterized by low growth (the "Hindu Rate of Growth") and high vulnerability to external oil shocks (e.g., 1973 and 1979).
- **1991 Liberalization:** The Balance of Payments crisis forced structural reforms (LPG), shifting the focus toward export-led growth and attracting foreign capital.
- **2008 Global Financial Crisis:** India initially showed resilience but later suffered from "policy paralysis" and high NPAs in the banking sector, leading to a period of "Fragile Five" status in 2013.
- **2014–Present:** A shift toward formalization (GST, IBC) and proactive macro-management. The adoption of the Flexible Inflation Targeting (FIT) framework in 2016 marked a turning point in monetary credibility.
- **Post-2020 Pandemic:** The "Atmanirbhar Bharat" initiative and PLI schemes represent the latest evolution, focusing on domestic manufacturing while navigating a fragmented global order.

- **Way Forward**
- **Energy Diversification:** Aggressive expansion of the National Green Hydrogen Mission and solar capacity to reduce "Imported Inflation."
- **Second Generation Reforms:** Focus on "Factor Market" reforms (Land, Labor, and Capital) at the state level.
- **Trade Integration:** Finalizing Free Trade Agreements (FTAs) with the UK, EU, and EFTA to diversify export markets beyond traditional partners.
- **Buffer Management:** Continuing the "Accretion of Forex Reserves" to act as a shock absorber against global currency volatility.
- **Human Capital:** Aligning the education system with the needs of the modern business environment to truly harness the demographic dividend.
-

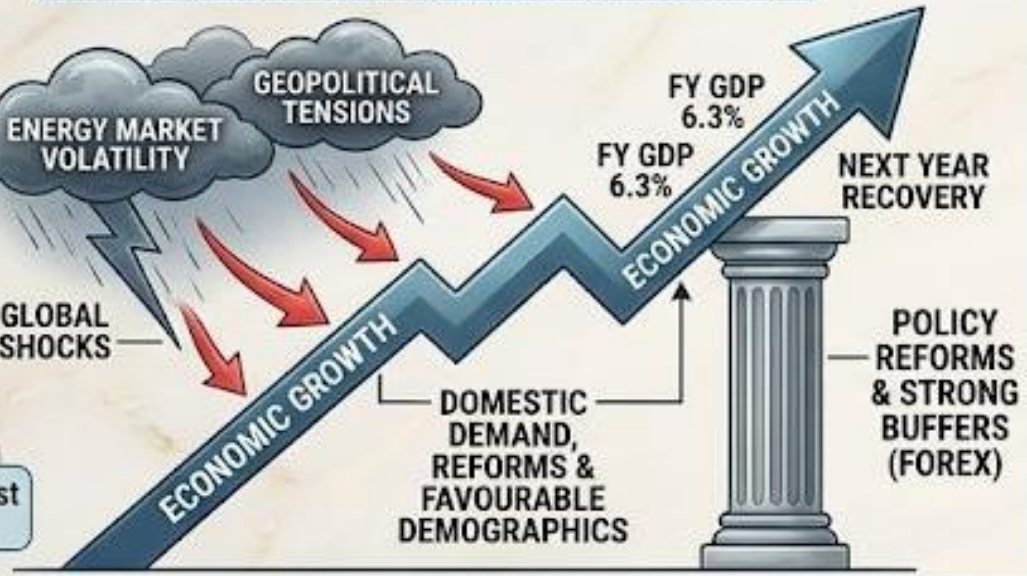
Previous Years' UPSC Questions (PYQs)

- **Mains 2023 (GS 3):** "Faster economic growth requires increased share of the manufacturing sector in GDP, particularly MSMEs. Comment on the present policies of the Government."
- **Mains 2021 (GS 3):** "Explain the difference between computing methodology of India's GDP before and after 2015."
- **Prelims 2022:** Questions on the "Inflation Indexed Bonds" and "Foreign Portfolio Investment."
- **Mains 2020 (GS 3):** "Explain the interrelationship between stagnation and inflation."

INDIA'S ECONOMIC RELATIVE ROBUSTNESS: AN ANALYSIS FOR UPSC CSE

INDIA'S GROWTH & CHALLENGES FRAMEWORK

ADB Chief Economist Albert Park



THE INFLATIONARY CHAIN

Global Geopolitical Tension → Oil & Gas Price Spike

↓

Imported Inflation

↓

Imported Inflation

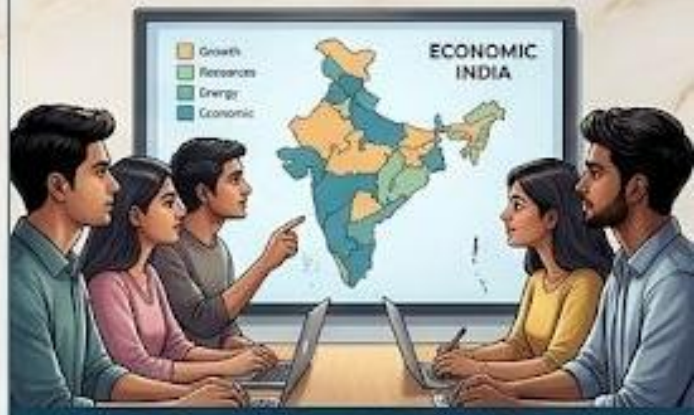
↓

Domestic Inflation (CPI)

Mroig dolon of economic & Soronic aspirants

UPSC GS PAPER 3 & ESSAY LINKAGES

UPSC GS PAPER 3



Demographic Profile

KEY RISKS: INFLATION & ENERGY DEPENDENCE

- Imported oil/gas are nationly infeated & imported oil/aras
- CPI inflation at 6.9% in ɑnovery

STRUCTURAL REFORMS: A MUST

- Business environment
- Trade integration
- Attracting investment & attracting investment

MOODY'S RATING: ONE OF THE MOST RESILIENT LARGE EMERGING MARKETS

• HISTORY

Bengal to J&K: The life & politics of S P Mookerjee

After the West Bengal victory, PM Modi invoked the Bengali leader who founded the BJP's predecessor in 1951. A look at what he stood for

VIKAS PATHAK

IN HIS victory speech at the BJP headquarters on Monday, Prime Minister Narendra Modi said "the soul" of Syama Prasad Mookerjee "must be at peace today". As the party won West Bengal for the first time ever, the PM recalled Mookerjee, the Bengali leader who founded the BJP's predecessor, the Bharatiya Jana Sangh, in 1951.

A year after its formation, the Jana Sangh made a modest electoral debut, winning just three Lok Sabha seats (two of them from Bengal). The party merged with the Janata Party in the 1977 election to defeat Indira Gandhi, but the Janata experiment soon collapsed. It was in 1980 that the Jana Sangh's successor, the BJP, was founded, with Atal Bihari Vajpayee, who had once been associated with Mookerjee, as its first president.

Mookerjee backed partition of Bengal and 'complete integration' of Jammu & Kashmir with India. BHARATIYA JANATA PARTY

Early life and career

Born on July 6, 1901, Mookerjee — son of Ashutosh Mookerjee, Calcutta High Court judge and vice-chancellor of Calcutta University — studied at Presidency College, Calcutta, and Lincoln's Inn. He became the youngest vice-chancellor of Calcutta University at just 33.

He was elected to the Bengal Legislative Council in 1929 and 1930, first as a Congressman and then as an independent. From 1941 to 1942, he joined the Progressive Coalition government of Fazlul Haque as Finance Minister. The government was formed in opposition to the Muslim League. Mookerjee justified his decision by saying that the need of the hour was to organise Hindus and cooperate with Muslims who believed in working together.

A controversial letter decrying the Quit India Movement, purportedly written by Mookerjee to the British, has often been a topic of discussion.

From 1942 to 1946, Mookerjee was the Hindu Mahasabha president. He took up the cause of Bengal's Hindus in the run-up to Partition, opposing Muslim League leader and Bengal Prime Minister H S Suhrawardy's "United Bengal" plan — which called for an independent state separate from India and Pakistan. Mookerjee saw this as an attempt to ensure domination of Hindus by a Muslim majority. He called for the partition of Bengal, with Hindu-majority West Bengal staying with India.

His brand of Hindutva

After the assassination of Mahatma Gandhi, Mookerjee made the Hindu Mahasabha's Working Committee adopt resolutions that "expressed shame that Gandhi's assassin had been connected with the organisation, and declared support for the government in its efforts to suppress terrorism or subversive activities in any shape or form", writes RD Grabani in *Hindu Nationalism and Indian Politics* (2003).

In November 1948, Mookerjee resigned from the Hindu Mahasabha after it rejected his suggestion to broaden its membership if it wanted to be a modern political party.

Bengal's Hindus

When riots broke out in East Pakistan, now Bangladesh, in 1949–50, large numbers of Hindu refugees came to India. Mookerjee, the minister of industry and supply in the Jawaharlal Nehru government at this time, spoke out for them.

In April 1950, Nehru and Pakistan Prime Minister Liaqat Ali Khan signed a pact calling upon both countries to provide equality, freedom and justice to their minorities.

Mookerjee resigned from the cabinet as the pact did not include a clause sought by him — sanctions against any side that failed to honour the agreement. It was after this that Mookerjee formed the Bharatiya Jana Sangh with the help of RSS volunteers.

Jana Sangh to BJP

In its electoral debut in 1952, the Bharatiya Jana Sangh won three Lok Sabha seats (two of them in Bengal).

•

It merged with the Janata Party in the 1977 election. But this experiment soon collapsed.

•

In 1980, the Jana Sangh's successor, the BJP, was founded.

The Kashmir issue

The princely state of Kashmir acceded to India in 1947. Article 370 of the Constitution gave Parliament powers in the fields of defence, foreign affairs and communication in the case of Kashmir. People from outside required a permit to visit the state and were barred from buying land there.

The state's Prime Minister, Sheikh Abdullah, abolished big land holdings in Jammu and Kashmir in 1951 under the Big Landed Estates Abolition Act without compensation. He also adopted Urdu as the official language. Dogra Hindu landlords resented these steps. Prem Nath Dogra, a former Sangh sewasevak and civil servant from Jammu, launched an agitation against the Sheikh Abdullah government through his Praja Parishad, seeking the complete integration of Jammu and Kashmir with India.

Mookerjee joined the movement in 1952.

Mookerjee and Kashmir

The Jana Sangh took up in Parliament the arrest of Dogra and his followers after a clash with the police in the state.

Both parties also opposed the adoption of a state flag, adopting a slogan, "Ek desh mein do vidhan, do pradhan aur do nishan nahin chalenge (one nation cannot have two constitutions, two Prime Ministers and two flags)."

In July 1952, the Nehru government and the Jammu and Kashmir government signed the Delhi Agreement, under which the state accepted the jurisdiction of the Supreme Court. It also accepted the supremacy of the Indian flag, though the state's flag would also remain in use. It accepted the President of India's power to declare a state of Emergency, subject to its concurrence, in the event of internal disturbances.

The Praja Parishad, however, rejected the Delhi Agreement. In November 1952, Dogra and other leaders were again arrested amid protests.

Mookerjee calls for agitation

At its first annual session at Kanpur in December 1952, Mookerjee's Jana Sangh passed a formal resolution supporting the Praja Parishad's Jammu Satyagraha for the complete integration of the state with India.

Nehru saw the Jana Sangh's orientation as 'communal' on this question. His condition for talks was that the Praja Parishad should stop its agitation.

The Jana Sangh then decided to launch its agitation. Vajpayee, who became private secretary to Mookerjee in early 1953, was sent across Hindi-speaking states, including Uttar Pradesh, to popularise the movement. Of the 1,300-odd agitators who came to the capital, 500 were from UP. Mookerjee then travelled to Madhya Bharat — the Gwalior-Indore region of erstwhile princely states — and Rajasthan, along with Vajpayee.

Mookerjee's Jammu visit

In May 1953, Mookerjee decided to go to Jammu without a permit — a symbolic rejection of the state's special status — with Vajpayee. They went by train to Pathankot in Punjab, and addressed several public meetings across the state for three days. Mookerjee was informed at Pathankot that he would be allowed to enter Jammu and Kashmir without a permit.

On May 11, 1953, Mookerjee crossed into Jammu and Kashmir over the Ravi. However, the state police had put up barricades for his arrest. Mentally prepared for this, Mookerjee did not turn back and was arrested. He told Vajpayee to return to Delhi and tell everyone that he had entered Jammu and Kashmir without a permit, if only as a prisoner, writes Abhishek Chowdhary in his biography of Vajpayee.

Mookerjee was kept in a cottage about 12 km from Srinagar. However, the heart patient who had a blood pressure problem could not cope well in the conditions of his detention. On June 23, he suddenly fell ill and died. The RSS family of organisations views his death as "Balidaan" or sacrifice for the cause of Kashmir's integration.

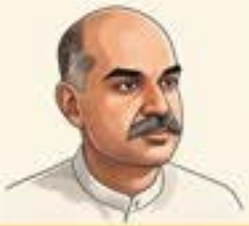
- **Key Terms and Explanations**
- **Bharatiya Jana Sangh (BJS):** Founded by Mookerjee in 1951, it was the ideological predecessor to the modern Bharatiya Janata Party (BJP). It focused on national unity and cultural nationalism.
- **Cultural Nationalism (Hindutva):** An ideological framework that views Indian identity through the lens of shared indigenous culture and civilization, rather than just territorial or civic parameters.
- **"Ek Desh Mein Do Vidhan, Do Pradhan, Do Nishan":** A slogan coined by Mookerjee translating to "One country cannot have two constitutions, two Prime Ministers, and two flags." It was a critique of the special status of Jammu and Kashmir under Article 370.
- **Delhi Agreement (1952):** An agreement between Jawaharlal Nehru and Sheikh Abdullah that defined the constitutional relationship between India and J&K, maintaining significant autonomy for the state, which Mookerjee and the Praja Parishad opposed.
- **Praja Parishad:** A political organization in Jammu that led the movement for the full integration of J&K with India, closely aligning with Mookerjee's Jana Sangh.

- **Main Arguments and Substantive Parts**
- **The Critique of Asymmetric Federalism:** Mookerjee's core thesis was that special provisions like Article 370 hindered the complete psychological and political integration of Jammu and Kashmir into the Indian Union.
- **The "United Bengal" Opposition:** He vehemently opposed the plan for a sovereign, united Bengal outside of the Indian Union during partition, arguing that it would lead to the domination of Hindus by a Muslim majority.
- **Minority Rights and State Accountability:** He resigned from Nehru's cabinet over the Nehru-Liaquat Pact (1950), arguing that it failed to include enforcement mechanisms to protect the Hindu minority in East Pakistan.
- **Democratic Opposition:** He sought to build a "modern political party" that could provide a nationalist alternative to the Congress, leading to the formation of the Jana Sangh.

- **Historical Evolution of the Issue**
- **Pre-Independence (1929–1946):** Mookerjee served in the Bengal Legislative Council and later as Finance Minister in Bengal. He headed the Hindu Mahasabha and opposed the Muslim League's separatist demands.
- **Partition and Cabinet Role (1947–1950):** He supported the partition of Bengal to ensure West Bengal remained with India and joined Nehru's first interim cabinet as Minister of Industry and Supply.
- **Resignation and Party Building (1950–1951):** Resigned from the cabinet over the Nehru-Liaquat Pact and founded the Bharatiya Jana Sangh.
- **The Kashmir Agitation (1952–1953):** Led a nationwide protest against Article 370. He entered J&K without a permit in May 1953 to protest the permit system and died in detention in June 1953.
- **Post-Mookerjee Era (1977–Present):** Jana Sangh merged into the Janata Party (1977) and later evolved into the BJP (1980), which eventually fulfilled Mookerjee's vision by abrogating Article 370 in 2019.

- **Way Forward**
- **Emotional Integration:** Beyond legal integration, focus on the "psychological" integration of J&K through development and democratic participation.
- **Bipartisan Consensus:** On matters of national security and territorial integrity, building a consensus across the political spectrum—as Mookerjee initially tried in the interim cabinet—is vital.
- **Safeguarding Diversity:** Ensuring that "One Nation" does not lead to the erasure of legitimate regional cultural identities.

- **All Previous Years' UPSC Questions**
- **Mains 2023 (GS 1):** "Describe the multifaceted nature of the problem of integration of princely states with the Indian Union."
- **Mains 2019 (GS 2):** "The concept of cooperative federalism has been increasingly emphasized in recent years. Highlight the drawbacks in the existing structure." (Context: Article 370 abrogation).
- **Mains 2016 (GS 1):** "Highlight the importance of the 1940s in the history of India's struggle for independence."



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CONPREHENSIVE ANALYSIS: S.P. MOOKERJEE & INDIAN NATION-BUILDING

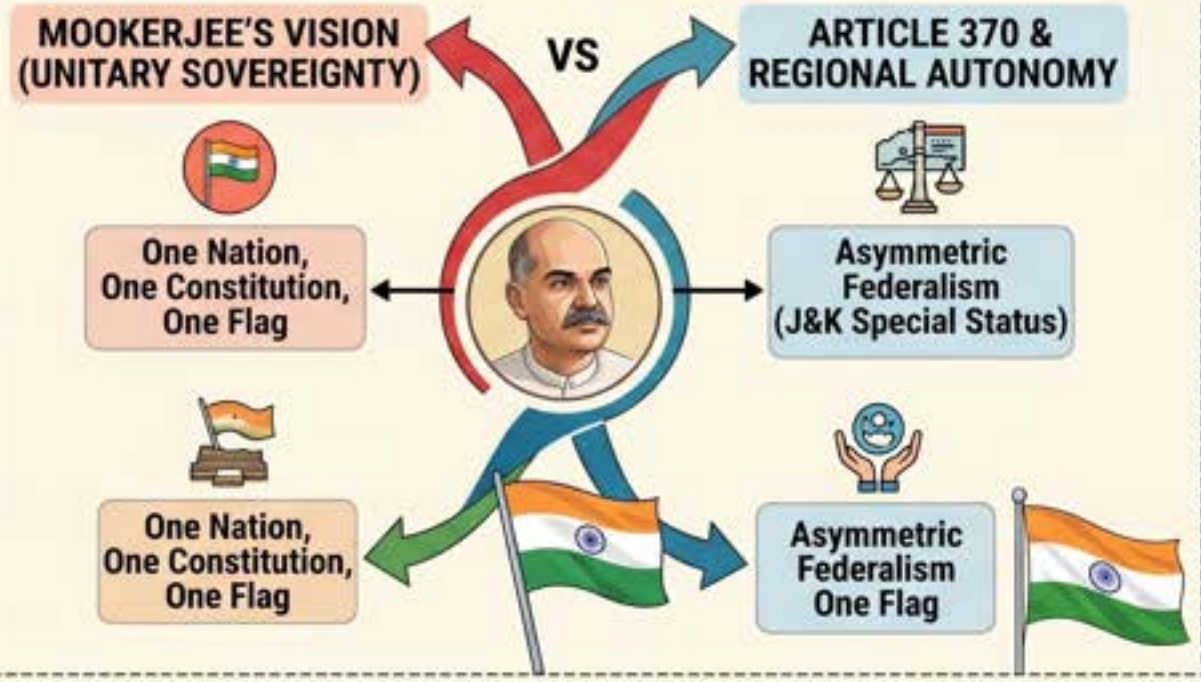
HISTORICAL EVOLUTION (1929-2019)

- **1929:** ELECTED BENGAL COUNCIL
- **1947:** OPPOSITION TO UNITED BENGAL PLAN
- **1951:** FOUNDED BJS (JANA SANGH)

- **1952:** KASHMIR AGITATION BEGINS
- **1953:** DEATH IN DETENTION (BALIDAAN)

- **2019:** ARTICLE 370 ABROGATED

INTEGRATED INDIA VIS-A-VIS ASYMMETRIC FEDERALISM



MULTIDIMENSIONAL IMPACT

- SOCIAL (INTEGRATION)
- POLITICAL (BJS-BJP)
- LEGAL (UNIFICATION)
- ETHICAL (DISSENT)
- INTERNATIONAL (PAK-UN)
- ECONOMIC (INDUSTRY VISIONS)

UPSC SYLLABUS LINKAGES

- **GS PAPER 1** (Consolidation, Communism)
- **GS PAPER 2** (Constitutional Features, Article 370)
- **GS PAPER 4** Political Attitudes, Ethical Dissent)
- **ESSAY** (National Unity)

PYQ THEMES

e.g. Integration of States (Mains)

e.g. Drawbacks of existing existing federal structures (Mains)

WAY FORWARD

- Emotional Integration
- Economic Development in integrated states
- Bipartisan Consensus on National Security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