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Assam disburses ₹3,600 cr. to women in biggest single-day direct benefit transfer in State

40 lakh beneficiaries of Orunodoi scheme in poll-bound State get ₹9,000, including ₹4,000 Bihu bonus; 90% women covered, says Sarma, seeks vote for BJP to extend scheme benefits to others

The Hindu Bureau
GUWAHATI

Nearly 40 lakh women received ₹9,000 each under a beneficiary scheme in poll-bound Assam on Tuesday. The total cash disbursed – ₹3,600 crore – marked the biggest ever single-day direct benefit transfer (DBT) in the State.

Chief Minister Himanta Biswa Sarma said the payment under the flagship Orunodoi scheme for families below the poverty line included a Bihu bonus of ₹4,000. Bohag Bihu, also called Rongali Bihu, is celebrated for a month from mid-April.

The remaining ₹5,000 comprised four monthly instalments from January to April. Under the scheme launched in 2020, each beneficiary receives ₹1,250 per month. Mr. Sarma insisted that the additional payment was not an election freebie.

"We have been doing it for the last six years... We are doing it in a controlled



The BJP, if re-elected, will give free pulses, sugar, salt, oil, and half kg tea to beneficiaries, said Assam CM Himanta Biswa Sarma. #1

manner. The scheme has seven criteria and we are following those," he told mediapersons.

The Chief Minister added, "It has nothing to do with the election; otherwise, everyone would have got it [the financial assistance]. There is nothing called a freebie."

In a post on X, he stated: "Through #Orunodoi, one of India's first beneficiary transfer schemes, we have been assisting eligible families with monthly financial assistance since 2020, and

it continues."

Mr. Sarma said the scheme, along with other welfare programmes, had helped pull lakhs of people in Assam out of poverty and provided them with a comprehensive security net.

₹17,000 crore disbursed

The Bharatiya Janata Party (BJP)-led government has disbursed ₹17,000 crore since the scheme was launched to empower people affected by the COVID-19 pandemic.

The Chief Minister said that the pandemic had affected women the hardest, making them struggle to run their households.

"The Jan Dhan bank accounts were instrumental in implementing Orunodoi. It could not have been possible if people did not have bank accounts," he said while addressing beneficiaries during one of the 3,800 gatherings across the State where the transfers were made online. Mr. Sarma said the scheme covered about 90% of the eligible women in the State.

"We will need a BJP government to cover the remaining 10%," he said, vowing to take more people out of poverty.

He added that the BJP, if re-elected, would provide free pulses, sugar, salt, and mustard oil to eligible families, as well as half a kilogram of tea.

At present, the Assam government provides monthly provisions of 1 kg each of pulses, salt and sugar for ₹100.

- **Key Terms and Explanations**
- **Direct Benefit Transfer (DBT):** A mechanism where subsidies or cash are transferred directly into the bank accounts of beneficiaries. This minimizes "leakages" (intermediary corruption) and ensures transparency.
- **Orunodoi Scheme:** A flagship poverty alleviation program in Assam. It targets women as the primary recipients to ensure financial autonomy within households.
- **Jan Dhan-Aadhaar-Mobile (JAM) Trinity:** The technological backbone mentioned in the article. *Jan Dhan* provides the account, *Aadhaar* provides the identity, and *Mobile* provides the notification/access.
- **Bohag Bihu:** The Assamese New Year (Rongali Bihu) marking the harvest season. In this context, it is used as a cultural milestone for disbursing "bonuses" or top-ups.
- **Poverty Line (BPL):** An economic benchmark used by the government to identify individuals and households in need of state assistance.

- **Main Arguments and Substantive Parts**
- The core thesis of the report is that **mass-scale DBT is an effective tool for immediate poverty relief and female empowerment.**
- **Scale and Scope:** The disbursement of ₹3,600 crore in a single day to 40 lakh women highlights the state's administrative capacity to execute high-volume digital transactions.
- **Gender-Centric Welfare:** By making women the "lead" of the household for the scheme, it shifts the domestic power dynamic and ensures that the money is more likely to be spent on nutrition, health, and education.
- **The "Safety Net" vs. "Freebie" Debate:** The administration argues that these payments are not "freebies" but a necessary "security net" to help families recover from the economic shocks of the pandemic.
- **Inclusivity:** The claim that 90% of eligible women are covered suggests a high penetration rate, though the remaining 10% represents a gap in administrative reach.



- **Historical Evolution of the Issue**
- **Pre-Independence:** Early concepts of welfare were limited to famine relief and basic charity by the colonial state.
- **Post-Independence (1950s–1980s):** The "Trickle Down" theory dominated. Welfare was mostly indirect, provided through price subsidies (e.g., PDS) where the government controlled the supply chain of grains.
- **The Rights-Based Era (2000s):** Significant shift with the MGNREGA (2005), where the state recognized a "right to work" and began moving toward cash transfers for wages.
- **The DBT Revolution (2013–Present):** The launch of DBT in 2013, followed by the JAM Trinity in 2014, transformed the landscape from "kind" (giving goods) to "cash" (giving money). Schemes like PM-KISAN and Orunodoi are the modern iterations of this evolution.

- **Previous Years' Questions (PYQs)**

- **UPSC Mains (2014, GS2):** "The basis of providing houses to the houseless is completely different from the basis of providing food to the hungry. Discuss."
- **UPSC Mains (2018, GS2):** "Appropriate local community-level healthcare intervention is a prerequisite to achieve 'Health for All' in India. Explain." (Related to welfare reach).
- **APSC Mains (2020):** Questions regarding the Orunodoi scheme and its impact on the rural economy of Assam.
- **UPSC Prelims (2017):** Question on the purpose of the 'Vidyanjali Yojana' and DBT (General awareness of schemes).

Orunodoi Scheme: A Paradigm Shift in Women-Centric Welfare

A comprehensive overview of Direct Benefit Transfer (DBT), women's empowerment, and digital governance for UPSC/APSC aspirants.

THE ARCHITECTURE OF EMPOWERMENT



UNPRECEDENTED ADMINISTRATIVE SCALE:

Disbursed ₹3,600 crore to 40 lakh women in a single day.

SCHEME IMPACT (Metrics)



Monthly Benefit:

₹1,250
per household



Coverage:

90%
of eligible families
(~40 Lakh households)



Total Disbursed:

Over
₹17,000
Crore
since inception

JAM Trinity Backbone



Women as the "Welfare Anchor":

Targets women as primary recipients to shift domestic power dynamics toward health and education spending.

STRATEGIC ANALYSIS & CHALLENGES

Core philosophical underpinnings:



The "Safety Net" vs. "Freebie" Debate: Framed as a necessary security net for post-pandemic recovery rather than mere populism.



Capability & Agency (Sen's Approach):

Provides cash to expand real choices in medicine, nutrition, and child education.



Critical Implementation Hurdles: Digital illiteracy, "last-mile" withdrawal issues, and potential inflationary pressures in local rural markets.

LS takes up resolution on removal of Speaker as MPs trade accusations in House

Sandeep Phukan
Nirada Hebbar
NEW DELHI

The Lok Sabha on Tuesday took up a resolution moved by the Opposition seeking the removal of Speaker Om Birla, with both the Treasury and Opposition benches trading sharp accusations over the neutrality of the Chair.

Parliamentary Affairs Minister Kiren Rijiju described the motion as an "attack on democracy itself", while the Congress Deputy Leader in the Lok Sabha, Gaurav Gogoi, said the resolution was brought from compulsion to "protect the neutrality" of the institution of the speaker.

Initiating the debate, Mr. Gogoi slammed the Speaker's conduct, alleging partisan behaviour and arguing that the motion was necessary to "save the Constitution".

"We are saddened that we had to bring such a resolution because we all have personal relations with the Speaker. But it is our dharm and duty to protect the decorum and dignity of this House," he said.

The discussion, for which 10 hours have been allotted, will continue on Wednesday and conclude with a vote.

Union Home Minister Amit Shah is expected to intervene in the debate on Wednesday before the House votes on the motion.

The proceedings began with Congress MP Moham-mad Jawed reading out the notice seeking to move the resolution for Mr. Birla's removal. The motion was also moved by fellow Congress MPs K. Suresh and Mallu Ravi.

A brief procedural row erupted over who would preside over the proceedings during the debate. NIMM MP Aadolkhan Owasi raised a point of order, asking why BJP MP Juglamb-



Lok Sabha Deputy Leader and Congress MP Gaurav Gogoi speaks during the budget session of Parliament on Tuesday. (AAP/PTI)

ha Pal was chairing the session, and arguing that Mr. Pal had been appointed to the post of chairperson by the Speaker himself.

The objection was countered by BJP MP Nubikant Dubey and Mr. Rijiju, who said the claim was "irrelevant" and that Mr. Pal was competent to preside over the House during the debate.

After the presiding officer asked members supporting the notice to stand up, more than the required 50 MPs rose in their seats, allowing the motion to be admitted for discussion.

The Congress Deputy Leader, in his remarks, alleged that the Opposition had repeatedly been denied the opportunity to raise critical issues in the House and cited the treatment of Leader of the Opposition Rahul Gandhi during the debate on the Motion of Thanks to the President's Address.

"In the month of February, when the Leader of the Opposition tried to speak during the Motion of Thanks, he was interrupted 20 times. The interruptions came from the Chair, members of the panel, and senior leaders of the Treasury benches," Mr. Gogoi said.

'MPs silenced'

"There was an expectation that the Chair would be neutral. But research of the uncorrected transcripts will show the number of times the Leader of the Op-

position was interrupted. While he was on his feet, another member was called upon to speak," Mr. Gogoi said.

"Is this the parliamentary tradition we want to show? Microphones are being used to silence MPs. This stands in direct contradiction with the (tradition) of this House," he added.

Mr. Gogoi also cited instances where Opposition members' remarks were expunged, while allegations made by treasury bench members were allowed to remain on record.

Intervening during the debate, Mr. Rijiju rejected the Opposition's charges and strongly defended Mr. Birla, saying that the Speaker had always acted impartially and had, in fact, provided many opportunities to Opposition members to raise issues.

He accused the Congress of targeting constitutional institutions since losing power in 2014 and said the latest move was aimed at undermining the office of the Speaker.

"This resolution against the Speaker is akin to an attack on democracy itself," Mr. Rijiju said.

Mr. Rijiju also dismissed allegations of bias, claiming that Opposition members had been given ample opportunity to ask supplementary questions and raise matters of public importance.

- **Key Terms and Explanations**
 - **Speaker of the Lok Sabha:** The presiding officer of the Lower House, elected by members. The Speaker is the "conscience of the House" and must remain neutral.
 - **Resolution for Removal:** A formal proposal under **Article 94** of the Constitution to remove the Speaker. It requires a 14-day notice.
 - **Treasury Benches:** The side of the House where the ruling party or coalition sits.
 - **Opposition Benches:** The side where parties not in government sit, tasked with holding the executive accountable.
 - **Panel of Chairpersons:** A group of MPs nominated by the Speaker to preside over the House in the absence of the Speaker and Deputy Speaker.
 - **Expunging Remarks:** The process where the Speaker orders certain words or portions of a speech to be removed from the official record because they are defamatory or unparliamentary.
 - **Point of Order:** A query raised by an MP who believes that the rules of the House are being violated.
-
- **Main Arguments and Substantive Parts**
 - **The Opposition's Case**
 - **Allegation of Partisanship:** The core thesis is that the Speaker has failed to maintain the neutrality required of the office, acting in favor of the ruling party.
 - **Silencing of Dissent:** Claims that microphones of Opposition leaders are frequently turned off and their remarks expunged disproportionately compared to the Treasury benches.
 - **Procedural Fairness:** Arguments that the Speaker's choice of presiding officers during sensitive debates (like the removal resolution itself) lacks impartiality.
 - **The Government's Counter-Argument**
 - **Attack on Institutions:** The government views the resolution not as a procedural check, but as a direct assault on the dignity of a constitutional office.
 - **Upholding Tradition:** Supporters of the Speaker argue he has provided ample opportunity for supplementary questions and has strictly followed the Rule Book.
 - **Political Motivation:** The move is framed as a strategy to undermine the Chair because of the Opposition's inability to accept electoral outcomes.

- **Historical Evolution of the Issue**

- **Pre-Independence:** The office of the "President" (now Speaker) was established under the Government of India Act, 1919. Vithalbai Patel (1925) was the first Indian to hold the post, famously asserting the office's independence from the British Executive.

- **Constituent Assembly Debates:** Dr. B.R. Ambedkar and others emphasized that the Speaker should be a person of "extraordinary independence."

- **Post-Independence:** While the UK follows the "once a Speaker, always a Speaker" rule (where the Speaker resigns from their party), India adopted a model where the Speaker remains a member of their party but is expected to act neutrally.

- **Recent Milestones:** The 10th Schedule (Anti-Defection Law, 1985) increased the Speaker's power significantly, leading to increased litigation and claims of political bias in disqualification cases.

- **Previous Years' Questions (PYQs)**

- **UPSC Mains 2020 (GS 2):** "Once a Speaker, Always a Speaker! Do you think the practice should be adopted to impart objectivity to the office of the Speaker of Lok Sabha? What could be its implications for the robust functioning of parliamentary business in India?"

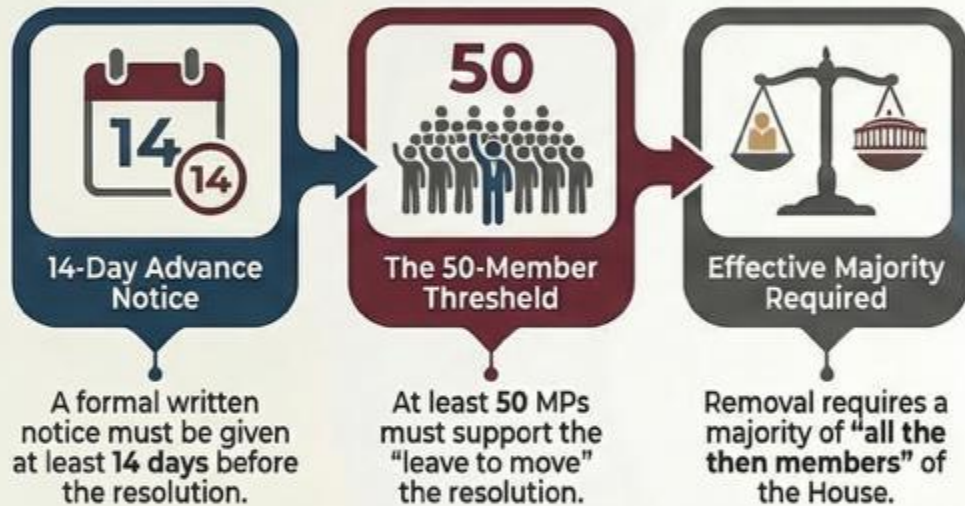
- **UPSC Mains 2017 (GS 2):** "The Speaker's office in India is one of the most powerful. However, it is often criticized for being partisan. Discuss."



The Removal of the Lok Sabha Speaker: Constitutional Process & Democratic Debate

The Speaker of the Lok Sabha is the "conscience of the House," expected to remain neutral. This infographic details the rare constitutional process of their removal under Article 94 and the tension between the ruling party's defense of the office and the Opposition's claims of partisanship.

CONSTITUTIONAL PROCEDURE (ARTICLE 94)



THE NEUTRALITY DEBATE & IMPLICATIONS

Allegations of Partisanship
Opposition claims include silencing dissent, switching off microphones, and selective expunging of remarks.

The "Dharma" of the Chair
Philosophically, the Speaker protects minority rights to ensure the legislature remains democratic.

The UK Model Comparison
Unlike India, UK Speakers resign from their party to ensure structural neutrality.

INDIAN MODEL

Party Membership: Remains a member of their political party.

Neutrality Style: Expected neutrality through conduct/convention.

Role in Elections: Participates in partisan election campaigns.

UK (WESTMINSTER) MODEL

Party Membership: Remains a member of their political party.

Neutrality Style: Expected neutrality through conduct/convention.

Role in Elections: Participates in partisan election campaigns.

Party Membership: Resigns from the party immediately upon election.

Neutrality Style: Structurally enforced neutrality; often re-elected unopposed.

Role in Elections: Does not participate in active party politics.

SC agrees to look into plea against law on Muslim inheritance

Krishnadas Rajagopal

NEW DELHI

The Supreme Court on Tuesday orally observed that it would be better to defer to Parliament's wisdom to bring a Uniform Civil Code rather than judicially strike down the Shariat Application Act, 1937, on the ground of discrimination for giving Muslim women a smaller share of family inheritance compared with their male counterparts.

The law for inheritance among Indian Muslims, providing widows with children a one-eighth share, or a further reduced

one-fourth share if they do not have children, and daughters half of a son's share.

The petition had challenged what it called "artificial discrimination" between Muslim women and men regarding their right to inheritance.

The Bench, comprising Chief Justice Surya Kant and, Justices R. Mahadevan and Joymalya Bagchi, posed a practical question, asking which law would govern Muslim inheritance if the Shariat Act were struck down.

FULL REPORT ON
» **PAGE 4**

- **Key Terms and Explanations**

- **Shariat Application Act, 1937:** A pre-independence law that mandates the application of Islamic personal law to Muslims in India regarding marriage, inheritance, and succession, replacing "customary law."
- **Article 14 (Right to Equality):** A fundamental right in the Indian Constitution ensuring equality before the law and equal protection of the laws.
- **Article 44 (Uniform Civil Code):** A Directive Principle of State Policy (DPSP) stating that the State shall endeavor to secure for the citizens a Uniform Civil Code throughout the territory of India.
- **Ultra Vires:** A Latin phrase meaning "beyond the powers." If a law is declared *ultra vires* Article 14, it means it is unconstitutional and void.
- **Indian Succession Act, 1925:** A secular law governing inheritance for several communities (like Christians and those in civil marriages) who are not covered by specific personal laws.
- **Legal Vacuum:** A situation where no law exists to govern a particular matter. The Court fears that if the Shariat Act is struck down without a replacement, there would be no rules to distribute property.

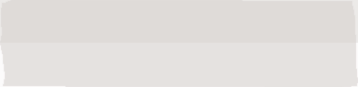
- **Main Arguments and Substantive Parts**

- **The Petitioner's Argument**

- The core thesis is that current inheritance rules under the 1937 Act are "artificially discriminatory." Specifically:
- **Gender Disparity:** Daughters generally receive half the share of sons. Widows receive one-eighth if they have children and one-fourth if they do not.
- **Constitutional Violation:** These provisions are argued to violate the right to equality (Article 14).
- **The "Mary Roy" Precedent:** The petitioner cites the case of Syrian Christian women in Kerala, where the Supreme Court struck down discriminatory succession laws in favor of the Indian Succession Act.

- **The Judicial Perspective**

- The three-judge Bench (led by CJI Surya Kant) raised practical and institutional concerns:
- **Avoidance of a "Vacuum":** The Court questioned what law would apply the day after the Shariat Act is struck down.
- **Judicial Restraint vs. Legislative Wisdom:** The judges suggested that instead of "judicially striking down" a law, it might be better to defer to Parliament to bring in a UCC.
- **Societal Complexity:** Justice Bagchi noted that even monogamy (one man-one woman) hasn't been fully realized or enforced across all personal laws, suggesting that radical judicial changes might face ground-level friction.



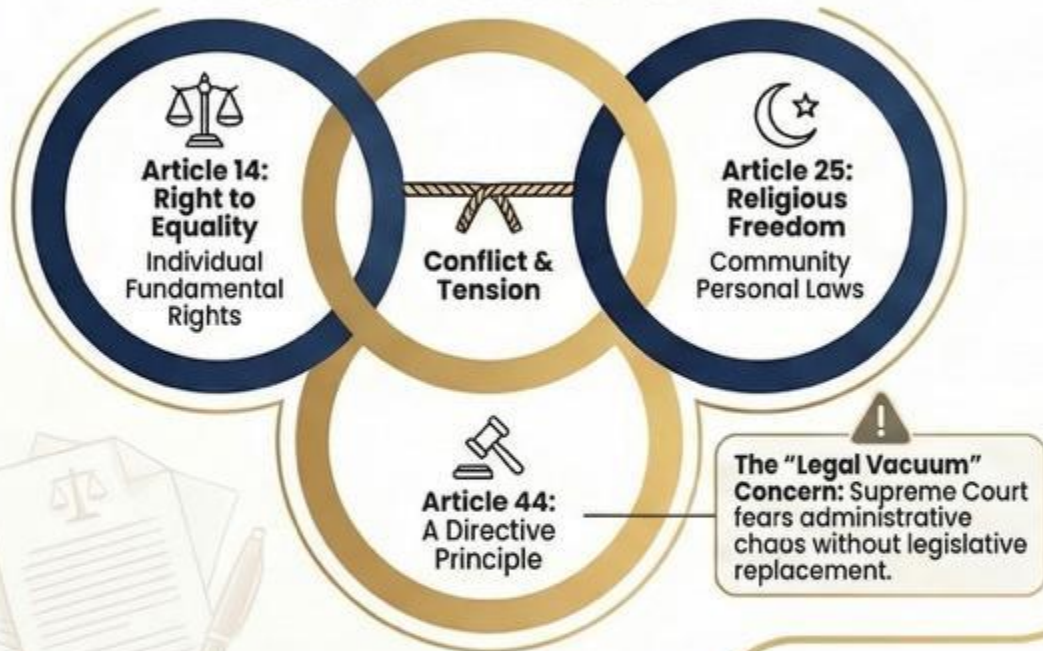
- **Historical Evolution of the Issue**
- **Pre-1937:** Muslims were often governed by local customary laws, many of which denied women property rights entirely.
- **1937:** The Shariat Application Act was passed to bring uniformity among Muslims and, ironically at the time, to *improve* women's status by giving them a guaranteed (though smaller) share compared to certain customs.
- **1950:** The Constitution is adopted. Article 44 (UCC) is placed in the DPSP, reflecting a compromise between reformers and conservatives.
- **1985 (Shah Bano Case):** The SC upheld a Muslim woman's right to maintenance, sparking a massive political backlash and leading to the Muslim Women (Protection of Rights on Divorce) Act, 1986.
- **2017 (Shayara Bano Case):** The Supreme Court declared Triple Talaq unconstitutional, signaling a shift toward prioritizing individual fundamental rights over community personal laws.
- **Present:** Increasing judicial and political discourse on implementing Article 44.

- **Previous Years' Questions (PYQs)**
- **Mains (2015, GS 2):** "Discuss the possible factors that inhibit India from enacting for its citizens a uniform civil code as provided for in the Directive Principles of State Policy."
- **Mains (2017, GS 2):** "Examine the scope of Fundamental Rights in the light of the latest judgement of the Supreme Court on Right to Privacy." (Relevant for how the Court interprets "Dignity").
- **Mains (2019, GS 1):** "Are women in post-Independent India more empowered than the previous generation? Give reasons."

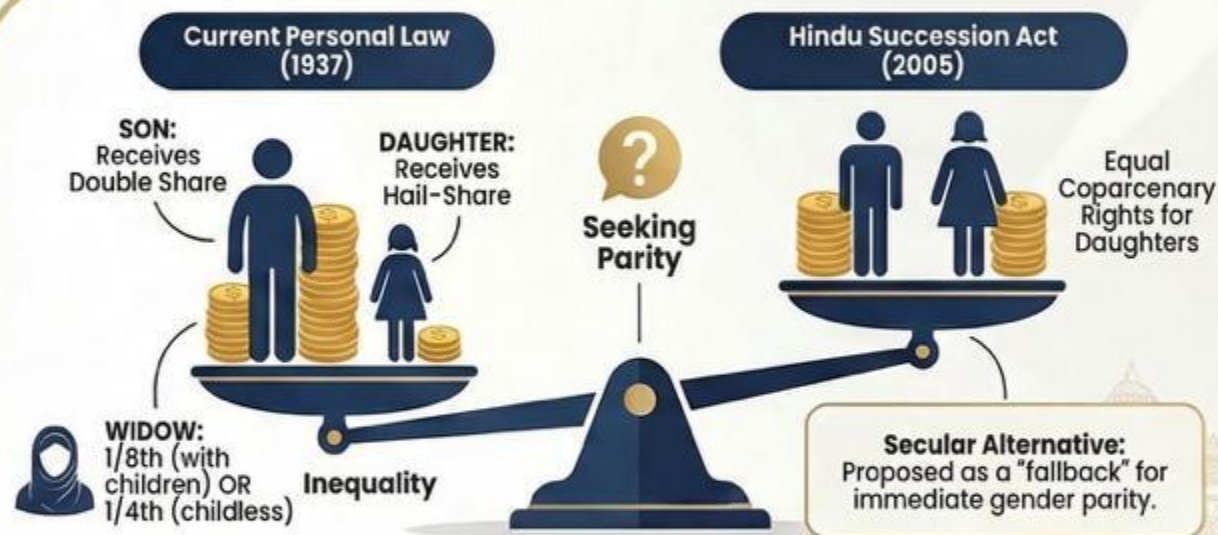
Gender Justice vs. Personal Laws: The Roadmap to a Uniform Civil Code (UCC)

An academic overview for civil service aspirants on Muslim inheritance reform and constitutional debates in India.

THE CONSTITUTIONAL TUG-OF-WAR



GENDER DISPARITY IN INHERITANCE



EVOLUTION & PATH FORWARD



Trump claims war will come to an end 'soon' but Iran vows it will fight 'as long as necessary'

**Agence France-Presse
Associated Press**
TEHRAN

Iran's Foreign Minister Abbas Araghchi said on Tuesday his country would keep fighting as long as necessary, casting doubt on U.S. President Donald Trump's insistence that the conflict would be over "soon".

The remarks from one of Iran's top leaders, who also ruled out negotiations with Washington, came as Tehran launched a new wave of attacks on U.S.-allied Gulf nations hours after Mr. Trump's assurances of a swift end to the rapidly widening conflict.

"It's going to be ended



Hit hard: Rescuers work in the rubble of residential buildings after air strikes hit Tehran on Monday. REUTERS

soon, and if it starts up again they'll be hit even harder," Mr. Trump told a news conference in Florida on Monday, after telling lawmakers that the campaign would be a "short-

term excursion." Mr. Trump said, "We've already won in many ways, but we haven't won enough".

He threatened an attack of "incalculable" size if Tehran blocks oil supplies.

"We will hit them so hard that it will not be possible for them or anybody else helping them to ever recover that section of the world, if they do anything."

Widespread strikes

In Bahrain, authorities said an Iranian attack hit a residential building in the capital, Manama, killing a 29-year-old woman and wounding eight persons. Saudi Arabia said it destroyed two drones over its oil-rich eastern region and Kuwait's National Guard said it shot down six drones.

In the United Arab Emirates, firefighters battled a blaze in the industrial city of Ruwais – home to petro-

chemical plants – after an Iranian drone strike.

Sirens also sounded in Jerusalem, and sounds of explosions could be heard in Tel Aviv as Israel's defence systems worked to intercept barrages from Iran.

At the Pentagon, U.S. Secretary of War Pete Hegseth warned that on Tuesday "will be yet again our most intense day of strikes inside Iran: The most fighters, the most bombers, the most strikes, intelligence more refined and better than ever."

Shortly before the statement, he said "the last 24 hours have seen Iran fire the lowest amount of missiles they have fired yet".

- **Key Terms and Explanations**

- **Asymmetric Warfare:** A conflict where the relative military power of belligerents differs significantly. In this context, Iran uses drones and proxies to counter the conventional air and naval superiority of the U.S.
- **Strategic Chokepoints:** Geographic features like the **Strait of Hormuz**. If Tehran "blocks oil supplies" as mentioned, it impacts 20-30% of global oil consumption.
- **Interception Systems:** Technical defense mechanisms (like Israel's Iron Dome or Arrow) designed to neutralize incoming projectiles.
- **Calculated Ambiguity:** A strategy where a state (like the U.S. in this text) uses vague threats ("incalculable size") to deter an enemy without committing to a specific course of action.

- **Main Arguments and Substantive Parts**

- **The "Quick End" Fallacy:** The U.S. leadership argues that the war can be ended "soon" through overwhelming force. However, historical precedents in the region suggest that "short-term excursions" often evolve into long-term quagmires.
- **The Endurance Doctrine:** Iran's stance of fighting "as long as necessary" reflects a strategy of strategic patience and survivalist nationalism, intended to outlast the political will of Western powers.
- **Regional Spillover:** The conflict is no longer bilateral. The involvement of Bahrain, Saudi Arabia, the UAE, and Israel indicates a breakdown of regional security architectures.
- **Energy Security as a Weapon:** The threat to block oil supplies is the ultimate economic leverage, used to balance against the military superiority of the U.S. coalition.

- **Historical Evolution: U.S.–Iran Relations**

- **1953 (The Catalyst):** The CIA-backed coup against PM Mossadegh, which reinstated the Shah, planting seeds of anti-Western sentiment.
- **1979 (The Turning Point):** The Islamic Revolution and the subsequent Hostage Crisis led to a permanent rupture in diplomatic ties.
- **2015 (The Brief Thaw):** The signing of the JCPOA (Nuclear Deal) under the Obama administration, which aimed to reintegrate Iran into the global economy.
- **2018–Present (The Maximum Pressure):** The U.S. withdrawal from the JCPOA and the re-imposition of sanctions, leading to the current cycle of "tit-for-tat" military strikes.

- **Previous Years' Questions (PYQs)**

- **UPSC 2017 (GS II):** "The western nations are perceiving the 'Islamic State' as a global threat. How can India help to combat this threat?" (Theme: Regional Instability).
- **UPSC 2020 (GS II):** "The Middle East is a region of great complexity. Discuss the changing dynamics of the region and its impact on India."
- **UPSC 2022 (GS II):** "Clean energy is the order of the day. Describe the impact of the Russia-Ukraine war on global energy security." (Analogous to the Iran-U.S. conflict's impact).

West Asia in Turmoil: A Strategic Analysis for UPSC Aspirants

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CONFLICT DYNAMICS & KEY CONCEPTS



Asymmetric & Grey-Zone Warfare
Iran utilizes drones and proxies to counter conventional Western naval and air superiority.



The Hormuz Chokepoint
The Strait of Hormuz controls 20-30% of global oil, serving as economic leverage.



The Security Dilemma
One side's defensive measures are perceived as offensive, triggering a cycle of escalation.

US-IRAN RELATIONS: KEY HISTORICAL ERAS

Era	Key Event	Strategic Outcome
1979	Islamic Revolution	Permanent rupture in US-Iran diplomatic ties and ideological shift.
2015	JCPOA (Nuclear Deal)	Brief period of de-escalation through nuclear limits and sanctions relief.
2018-2026	Maximum Pressure	US withdrawal from JCPOA leading to direct strikes and shadow wars.

THE INDIA ANGLE: STRATEGIC INTERESTS



60% Energy Dependency
Majority of India's crude oil imports transit through the volatile Strait of Hormuz.



Diaspora & Remittances
8 million Indians in the Gulf face safety risks and potential displacement.



Strategic Connectivity (Chabahar)
Conflict jeopardizes India's gateway to Central Asia and the INSTC trade corridor.

Blossoms of hope: Kashmir banks on almonds, tulips to revive tourism

Peerzada Ashiq
SRINAGAR

Facing a major setback after the Pahalgam terror attack last year, the Jammu and Kashmir government is banking on the blooming gardens of tulips and almonds to revive tourism in Kashmir this spring.

Chief Minister Omar Abdullah will inaugurate a spring festival later this week at Srinagar's Badamwari, an almond garden that offers mesmerising blooming pink and white flowers.

300 trees planted

"An additional 300 fresh almond trees have been planted to add to the bloom this year. A lavender patch spread over 50 kanals (6.25 acres) of Badamwari is being curated to extend the spring flowering



A gardener tending to flowers at Srinagar's Indira Gandhi Memorial Tulip Garden. The garden, which will be opened to the public on March 16, offers a rare Netherlands' Keukenhof-like experience. IMRAN NISSAR

up to May-June. Many new plants have been introduced to add to the colour palette and fragrance of the garden," Mathooru Masoom, Director of Floriculture, Kashmir, told *The Hindu*.

Spread over 300 kanals (37.5 acres) of land, the Badamwari garden, which predates the 14th century,

has an Afghan-era fort – Hari Parbat – nearby.

It also houses the shrines of religious figures revered by Hindus, Muslims and Sikhs.

'All-season garden'

"We aim to transform the garden into an all-season garden. The idea is to introduce visitors to the rich



varieties of floral beauty Kashmir offers. The garden's traditional aesthetic is being integrated into modern visitor-friendly features," Ms. Masoom said.

The Floriculture Department has introduced selfie points in the garden and refurbished all-wood rain shelters to popularise the

garden on social media platforms.

Limited window

The blooming garden is being curated on the lines of Japan's cherry blossom festivals, "to make it part of tourists' itinerary", even though the spring bloom offers a limited short period.

Besides the almond blooming, the department will open the Indira Gandhi Memorial Tulip Garden in Srinagar from March 16, which offers blooming tulips. With over 1.8 million tulip bulbs, comprising 70 to 75 different varieties, the garden offers a rare Netherlands' Keukenhof-like bloom experience.

Selfie points will be set up to allow tourists to record their memories.

"We are fully prepared to receive visitors in the

garden," said the official.

The tulip garden hosted a record 8.25 lakh visitors in April 2025.

However, the terrorist attack on the 26th of that month, which left 26 civilians dead, including 25 tourists, flattened the tourism graph for many months.

Operation Sindoor in May further dented the flow of visitors. In fact, the tulip garden was among 44 destinations closed for tourists last year.

Security audit

However, it was reopened this year after a security audit. Only 11.16 lakh tourists visited Kashmir in 2025 compared to 26 lakh tourists in 2024.





The tourism sector contributes nearly 7% to the Gross State Domestic Product of J&K.



- **Key Terms and Explanations**

- **Floriculture:** A branch of ornamental horticulture concerned with growing and marketing flowers and ornamental plants.
- **Gross State Domestic Product (GSDP):** The sum total of the value of all goods and services produced within the boundaries of a state. In J&K, tourism contributes nearly 7% to the GSDP.
- **Keukenhof-like Experience:** Referring to the famous Keukenhof Park in the Netherlands; it signifies high-standard, organized floral tourism.
- **Security Audit:** A systematic evaluation of the security of an area or organization to ensure safety protocols are met before public reopening.
- **Operation Sindoor:** A specific security-related event or counter-insurgency operation that impacts the socio-economic fabric of a region.

- **Main Arguments and Substantive Parts**

- The core thesis is that **Nature-based Tourism** acts as a primary tool for economic rehabilitation in conflict-prone zones.
 - **Economic Reliance:** The region is heavily dependent on seasonal tourism. The article highlights a "banking on" strategy where the government uses the blooming of tulips and almonds to trigger a multiplier effect in the local economy.
 - **The Impact of Conflict:** Security incidents (like the Pahalgam attack or Operation Sindoor) act as "decelerators." The article provides evidence of a massive drop in tourist footfall: from 26 lakh in 2024 to roughly 11.16 lakh in 2025.
 - **Diversification of Attractions:** To mitigate the "limited window" of spring blooms, there is a push for "All-season gardens" (e.g., adding lavender patches) to ensure year-round revenue.
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- **Historical Evolution of the Issue**

- **Pre-Independence:** Kashmir was a preferred retreat for Mughal Emperors (who built many of the original gardens) and later the British.
- **1947–1989:** The "Golden Era" of Bollywood-led tourism, where the valley was the primary destination for Indian cinema.
- **1990s–2010s:** The rise of militancy led to a complete collapse of the tourism infrastructure. Gardens fell into disrepair.
- **2007-Present:** The inauguration of the Indira Gandhi Memorial Tulip Garden marked a shift toward specialized, high-density spring tourism to kickstart the season earlier than the traditional summer peak.

- **Previous Years' Questions (PYQs)**

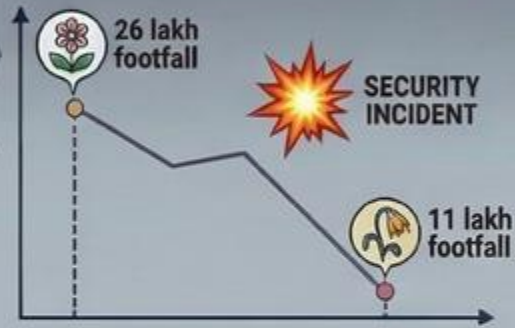
- **UPSC Mains (2020, GS3):** "Analyze the internal security threats and transborder linkages... and its impact on the economy."
 - **UPSC Mains (2022, GS3):** "The process of liberalization... has led to the growth of the tourism sector. Discuss."
 - **UPSC Prelims (2018):** Questions related to "Tulip Gardens in India" and "Mughal Architecture."
-

Blossoming Resilience: Kashmir's Floriculture & The Peace Dividend

THE FRAGILITY CHALLENGE (THE PROBLEM)

Volatility of 'Fragile' Tourism

The Volatility of 'Fragile' Tourism



A single security incident can 'flatten the graph,' causing footfall to drop from 26 lakh to 11 lakh.

The 'Limited Window' Vulnerability



Economic reliance on a short spring bloom makes the region highly susceptible to climate change.

Security-Tourism Synchronization



Implementing 'Security Audits' as a prerequisite to opening public spaces ensures safety without stifling liberty.

THE FLOURISHING STRATEGY (THE SOLUTION)

7% GSDP & The Multiplier Effect



The 'Peace Dividend' Theory



Making locals stakeholders in the tourism economy increases the community's cost of conflict.

Transition to All-Season Tourism



SPRING

All-Season Viability



'BULB FORCING' TECHNOLOGY

Diversifying into lavender, cherry blossoms, and 'bulb forcing' technology ensures year-round economic viability.

Historical Shift in Tourism Drivers & Governance Focus

Era	Primary Driver	Governance Focus
1947-1989	Cinema/Bollywood	'Golden Era' of Recreation
1990s-2010s	Conflict/Militancy	Infrastructure Collapse
2007-Present	Specialized Floriculture	Specialized Tourism & Economic Integration

Researchers publish first-of-its-kind checklist on fireflies across India

Shilpa Elizabeth

BENGALURU

Researchers have brought out a first-of-its-kind checklist of fireflies in India by putting together data from more than 260 years of scattered scientific records from 1881 to 2025.

A study published in the *Zootaxa* journal on March 10 documents 92 species across 27 genera, with more than 60% of them endemic.

According to the authors of the study, many of these species were described in the 1800s and have never been studied again in modern taxonomy, leaving large gaps in understanding the glowing

insects. The paper titled 'A checklist of fireflies (Coleoptera: Lampyridae) from India' was authored by Parvez, Akshay Kumar Chakravarthi, Oliver Keller, Devanshu Gupta and Amlan Das.

The researchers note that while there have been attempts to build research on firefly taxonomy, the results have been fragmented so far. Parvez, lead author of the paper, notes that more than 50 species have not been recorded again from India since their original descriptions.

"In light of the lack of accessible resources for the Indian fireflies, a literature survey was taken to produce a modern check-



Lakhs of fireflies seen at the Anamalai Tiger Reserve in Tamil Nadu. FILE PHOTO

list of species from the sub-continent. This checklist of the Lampyridae of India is presented as a first step to remedy the situation, and to provide researchers with a resource to conduct re-

search on fireflies," reads the study.

The checklist provides names of species, names of scientists who documented them originally and subsequently, years of documentation, and geographies in which the species are found. Fireflies were found in 22 States, including one Union Territory, and it was found that several species occurred across geographies.

According to Parvez, the insufficiency of modern literature on fireflies has been a major stumbling block for researchers who to study the insects.





It took close to three years for the scientists to compile the checklist.



- **Key Terms and Explanations**

- **Taxonomy:** The branch of science concerned with classification, especially of organisms. In this context, it refers to the naming and categorization of firefly species.
- **Lampyridae:** The scientific family name for fireflies. They are actually beetles (order *Coleoptera*), not "flies."
- **Endemic:** A species found only in a specific geographic area and nowhere else in the world. High endemism indicates a region's unique biological value.
- **Checklist:** A systematic list used by scientists to catalog species within a region, serving as a baseline for future conservation and research.
- **Type Locality:** The specific geographical location where a specimen was first found and used to describe the species.

- **Main Arguments and Substantive Parts**

- The core thesis of this research is that India's firefly diversity has been vastly under-researched and fragmented for over two centuries.
 - **The Data Gap:** While scientific records date back to 1881, there has been a massive "knowledge vacuum." Over 50 species have not been sighted or recorded since their original discovery in the 19th century.
 - **Species Richness:** The study identifies **92 species** across **27 genera**.
 - **High Endemism:** More than **60%** of these species are endemic to India, making their conservation a matter of national and global priority.
 - **Geographic Spread:** Fireflies are documented across 22 States and one Union Territory, indicating they are a vital component of diverse Indian ecosystems, from the Western Ghats to the Northeast.
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- **Historical Evolution of the Issue**
 - **Pre-Independence (1881–1947):** Initial documentation was primarily driven by British and European naturalists. Most descriptions were "one-off" records with little follow-up on life cycles or habitat requirements.
 - **Post-Independence Stagnation:** For decades, entomological focus in India shifted toward agricultural pests or disease vectors (like mosquitoes), leaving "non-economic" insects like fireflies neglected.
 - **Modern Era (2025–26):** The publication of the first comprehensive checklist marks the transition from fragmented "hobbyist" records to a formal, digitized, and systematic database.
-
- **Linkages with NCERTs**
 - **Class 12 Biology (Ecology & Environment):** Chapters on "Biodiversity and Conservation" (concepts of endemism and species richness).
 - **Class 7/8 Science:** Basic concepts of light, bioluminescence, and the role of insects in the food chain.

Illuminating the Unseen: India's First Comprehensive Firefly Checklist

Significance of the first systematic documentation of Indian fireflies for biodiversity conservation and UPSC aspirants.

THE DISCOVERY OF THE UNSEEN (The Status Quo)



92 SPECIES & 60%+ ENDEMISM

Over 60% of India's 92 firefly species are found nowhere else on Earth.

THE 260-YEAR KNOWLEDGE VACUUM

50+ species have not been recorded since their initial 19th-century discovery.

Total Genera:	27 Genera
Geographic Spread:	22 States and 1 Union Territory
High Endemism:	>60% of total species

VITAL ECOSYSTEM INDICATORS

Firefly presence signals healthy soil, moisture levels, and low light pollution.

ILLUMINATING THE FUTURE (The Strategic Way Forward)



COMBATTING "LIGHT POLLUTION"



Establishing "Dark Sky" reserves to protect bioluminescent mating signals from artificial light.

CITIZEN SCIENCE & DNA BARCODING

Merging public sighting apps with modern genetic tools to find missing species.

CONSTITUTIONAL & LEGAL TEETH

Using data to fulfill Article 51A(g) and the Wildlife (Protection) Act.



Defence Minister Rajnath Singh with defence officials at the unveiling event in New Delhi on Tuesday. [AP](#)

Rajnath Singh unveils 'vision document' to advance military

The Hindu Bureau
NEW DELHI

Defence Minister Rajnath Singh on Tuesday released the "Defence Forces Vision 2047: A Roadmap for a Future-Ready Indian Military" at an event in South Block, here, outlining a long-term strategy to transform India's armed forces into a modern, integrated and technologically advanced military by the centenary of Independence.

According to the Ministry of Defence (MoD), the comprehensive vision document lays out a blueprint to strengthen the capabilities of the Indian armed forces in line with the country's ambition of be-

coming a developed nation by 2047.

Officials said the roadmap identifies key strategic reforms, capability enhancements, and organisational changes required to address the rapidly evolving geopolitical, technological, and security landscape. The document envisages transforming the military into an integrated, multi-domain, and agile force capable of deterring adversaries, responding across the full spectrum of conflict and safeguarding India's expanding strategic interests.

A central pillar of the vision document is greater jointness among the Army, the Navy and the Air Force.

- **Key Terms and Explanations**

- **Vision 2047:** A strategic long-term plan aiming to transform the Indian military into a top-tier global force by the centenary of India's independence.
- **Multi-Domain Operations (MDO):** A combat philosophy where the military operates simultaneously across land, sea, air, cyber, and space, rather than in silos.
 - *Example:* Using a cyberattack to disable an enemy's radar before launching an air strike.
- **Jointness:** The integration of the three services (Army, Navy, Air Force) in planning, command, and execution to maximize efficiency.
- **Strategic Interests:** The protection of a nation's vital goals, which for India includes the Indian Ocean Region (IOR), energy security, and territorial integrity.
- **Modernization vs. Transformation:** Modernization refers to upgrading equipment (better tanks/jets); transformation involves changing the very structure, doctrine, and culture of the forces.

- **Main Arguments and Substantive Parts**

- The core thesis is that India requires a **paradigm shift** in its military posture to meet the challenges of a "vibrant but volatile" world.
- **Integration over Isolation:** The document argues that future wars cannot be won by any single service. "Jointness" is the cornerstone of the 2047 strategy.
- **Technological Sovereignty:** A major pillar is reducing dependency on foreign imports and focusing on indigenous "niche" technologies like AI-driven surveillance and hypersonic systems.
- **Deterrence through Capability:** The roadmap emphasizes that a technologically advanced military is the best deterrent against both state and non-state actors.
- **Agility:** Moving away from heavy, slow-moving traditional structures toward leaner, faster-responding units.

- **Historical Evolution of the Issue**

- **1947–1962:** Post-independence focus was on nation-building; the 1962 war highlighted the need for urgent military modernization.
- **1999 (Kargil Review Committee):** The first major formal recommendation for a "Chief of Defence Staff" (CDS) and greater integration.
- **2016–2020 (Shekatkar Committee):** Recommendations focused on enhancing combat capability and rebalancing defense expenditure.
- **2020 (Appointment of first CDS):** Marked the beginning of the "Theatrization" era—grouping forces based on geographical theaters rather than service branches.
- **Present Day:** Shifting from "buying" technology to "building" it, as seen in the Atmanirbhar Bharat initiative and Vision 2047.

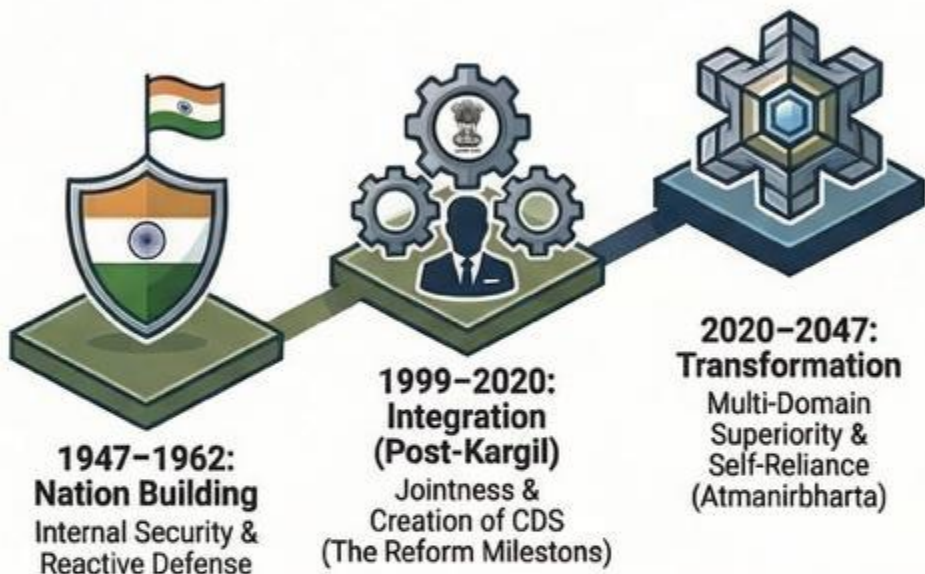
- **Previous Years' UPSC Questions**

- **Mains (2020, GS3):** "Analyze the internal security threats and transborder crimes along Myanmar, Bangladesh and Pakistan borders... also discuss the role played by various security forces."
- **Mains (2017, GS3):** "The term 'Cyberwarfare' has been in the news... discuss the threats it poses to India's security."
- **Prelims (2022):** Questions on indigenous missile systems (S-400, Brahmos) and the role of the CDS.

India's Defence Vision 2047: From Modernization to Transformation

Paradigm Shift Towards a Self-Reliant, Integrated, and Technologically Superior Global Force

Strategic Evolution & Sustainability



Overcoming Bureaucratic Inertia



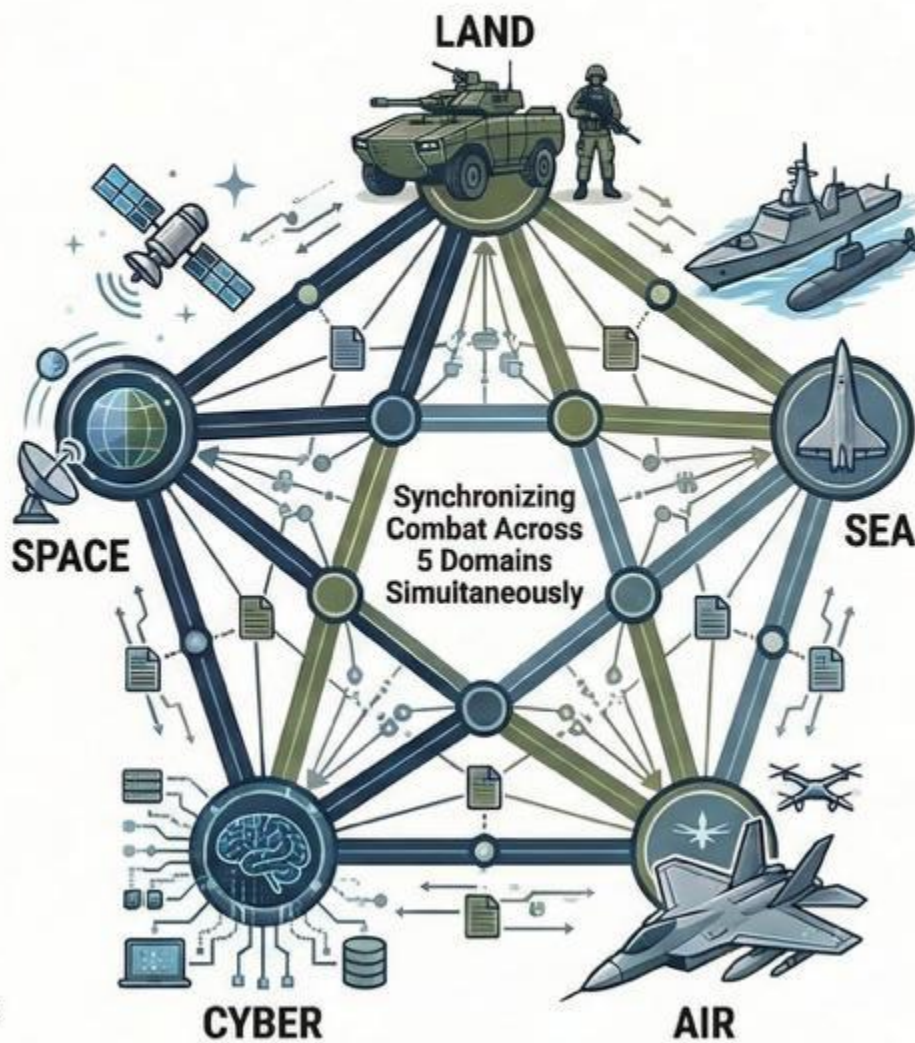
Success depends on bridging civil-military gaps and legislative updates for new command structures.

The Economic Growth Mandate



Sustainability requires consistent GDP growth to fund high-tech capital acquisitions.

Multi-Domain Operations (MDO)



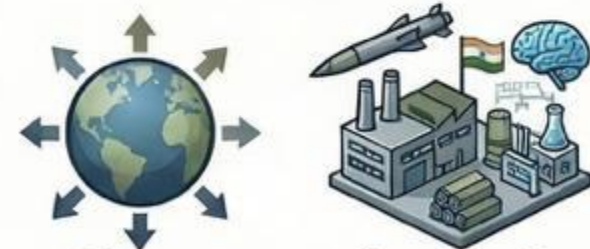
Jointness & Integrated Theatre Commands

Merging Army, Navy, and Air Force silos into unified commands for optimized resource use.



Merging Army, Navy, and Air Force silos into unified commands for optimized resource use.

Technological Sovereignty (Atmanirbharta)



Global Arms Importer
Transitioning from...

Indigenous Producer (AI & Hypersonic Systems)
...to an indigenous producer of advanced technologies.

SC seeks balance; govt. says IT Rules do not curb satire

Petitioners question who decides if content about the government is 'fake or misleading', and warn against the state becoming the 'sole arbiter of truth'; Centre tells SC 'we know it when we see it'

Krishnadas Rajagopal
NEW DELHI

The Supreme Court on Tuesday sought balance between protecting the nation against fake online content and safeguarding the right to free speech while the Centre defended that its Information Technology Rules was not meant to curb humour, satire or criticism of the government.

"There is no intention under the statute [Information Technology Act] or the Rules to curb any humour, satire, expression of view, critical expression of view and criticism," Solicitor-General Tushar Mehta, for the Union government, addressed a Bench headed by Chief Justice of India Surya Kant.

In fact, the government had notified the formation of a Fact Checking Unit (FCU) under the Press Information Bureau through a notification issued in March 2024 via the Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, amended in April 2023. The FCU was meant to act as a "deterrent" against the creation and dissemination of fake news or misinformation regard-



ing the "business" of the Centre. The Amendment Rules and the establishment of the FCU had come under the judicial scrutiny of the Bombay High Court through petitions filed by the Editors Guild of India and stand-up comedian Kunal Kamra.

The High Court had, in September 2024, struck down the FCU notification and concluded the amended IT Rules of 2023 "unconstitutional" and violative of Article 14 (right to equality), 19 (freedom of speech and expression) and 19(1)(g) (freedom and right to profession) of the Constitution. It had concluded that the expression "fake, false and misleading" in the Rules was "vague and hence wrong" in the absence of any definition. The High Court had said the government cannot assume the role of the

"sole arbiter of truth".

The Centre appealed in the Supreme Court against the High Court decision, saying it had no subversive intention to crush free speech.

Senior advocates Arvind Datar and N.H. Seervai, for parties including the Editors Guild, Association of Indian Magazines, News Broadcasters of Digital Association and Mr. Kamra, asked who in the FCU would decide if a particular content was fake or not.

"Who mans the FCU? How can such a unit be formed on the basis of a notification? The High Court had merely asked the government to frame proper Rules," Mr. Datar submitted.

"The question raised in the case is of paramount importance. It would be better for the Supreme Court to lay down the law.

The issues flagged by the High Court leads to the question of how to balance rights without destroying the individual constitutional rights," Chief Justice Kant observed.

The Chief Justice however indicated that some of the online platforms conducted themselves in an offensive manner. "You can damage a personal life... you can damage the nation... I am bothered about the impact on the nation," the CJ said.

Mr. Datar said whatever was misleading or fake should be taken down. "But then who defines 'misleading'?" he asked.

Need clear guidelines

"There should be clear guidelines," the CJ responded, "but, at the same time, shifting all the onus on the state machinery without putting any obligations on those who play mischief requires a lot of consideration" the CJ responded.

"When we see it, we know it is fake," Mr. Mehta interjected.

Issuing notice on the special leave petition by the Centre, the court refused Mr. Mehta's request to stay the High Court decision.

- **Key Terms and Explanations**
- **Fact Check Unit (FCU):** A government-mandated body established under the Press Information Bureau (PIB) to identify "fake, false, or misleading" information regarding the "business of the Central Government" on social media platforms.
- **Intermediary:** Entities like X (formerly Twitter), Facebook, or YouTube that host third-party content. Under the IT Rules, if the FCU flags content as fake, intermediaries must remove it or risk losing their "Safe Harbour" protection.
- **Safe Harbour Protection:** A legal immunity under Section 79 of the IT Act, 2000, that protects intermediaries from being held liable for content posted by their users.
- **Sole Arbiter of Truth:** A legal concern that if the government alone decides what is "true" or "false" regarding its own affairs, it creates a conflict of interest and eliminates independent verification.
- **Article 19(1)(a):** The Constitutional guarantee of the Right to Freedom of Speech and Expression.
- **Article 14:** The Right to Equality, which prohibits "arbitrary" state action.

- **Main Arguments and Substantive Parts**
- **The Government's Stance (The Centre)**
- **National Security & Harmony:** Fake news can damage personal lives and national interests. The state has a duty to act as a "deterrent" against misinformation.
- **No Curb on Satire:** The government argues the rules are not intended to stifle humor, criticism, or satire, but only factual misinformation.
- **"We know it when we see it":** The Solicitor General argued that blatant falsehoods are easily identifiable and do not require complex definitions.
- **The Petitioners' Stance (Journalists & Satirists)**
- **Vague Terminology:** Terms like "fake" and "misleading" are not defined in the IT Act, making them prone to misuse.
- **Chilling Effect:** The fear of losing legal immunity will lead platforms to engage in self-censorship, silencing critical voices and satirists (e.g., Kunal Kamra's plea).
- **Natural Justice:** The government cannot be the judge in its own cause (deciding what news about itself is true).
- **The Judicial Perspective (Supreme Court & High Court)**
- **The Balance:** The Court seeks to balance the "individual's constitutional rights" against the "impact on the nation" caused by viral falsehoods.
- **Unconstitutionality:** The Bombay High Court previously struck down the FCU, citing violations of Article 14 and Article 19.

- **Historical Evolution of the Issue**

- **Pre-Independence:** Laws like the Vernacular Press Act (1878) showed early state attempts to control "seditious" or "false" narratives against the Crown.
- **IT Act, 2000:** Provided the first framework for the digital age but lacked specific provisions for social media "fake news."
- **Shreya Singhal Case (2015):** The SC struck down Section 66A of the IT Act, establishing that speech cannot be curtailed merely because it is "offensive" or "annoying."
- **IT Rules 2021:** Introduced a three-tier grievance redressal mechanism for digital media.
- **2023 Amendment:** Introduced the FCU, leading to the current legal standoff between the Bombay High Court's stay and the Centre's appeal in the Supreme Court (2024-25).

- **Previous Years' Questions (PYQs)**

- **UPSC Mains (2018, GS3):** "What are the social networking sites and what are their advantages and disadvantages? Discuss the role of social media in increasing the challenges to internal security."
- **UPSC Mains (2020, GS2):** "The erosion of the 'Right to Privacy' and 'Freedom of Expression' in the digital age. Comment."
- **UPSC Prelims (2017):** Question on the "Right to Privacy" being a fundamental right.

'The Truth Arbiter: Decoding the IT Rules & Fact Check Unit (FCU) Controversy'

The 2023 Amendment to the IT Rules introduced a government-mandated Fact Check Unit (FCU) to flag "fake or misleading" information regarding the Central Government. This has sparked a high-stakes legal battle between the State's duty to curb misinformation and the citizen's right to dissent, currently under review by the Supreme Court of India.



The Centre
Government FCU

Petitioners
Free Speech Advocates

- [1. User Posts Content]
- [2. Gov FCU flags as 'Fake']



[3. Platform removes content to keep 'Safe Harbour']

The "Safe Harbour" Leverage
Platforms must remove FCU-flagged content or lose legal immunity (Section 79) for user posts.

The "Sole Arbiter" Concern
Critics argue the Government shouldn't be the judge of truth regarding its own affairs.

Constitutional Benchmarks
The debate centers on Article 10(1)(a) (Free Speech) and Article 14 (Right to Equality).



The Legal Standoff

The Centre	Judiciary	Petitioners
Deterrent against viral misinformation	Balance rights vs. national impact	Vague terms cause self-censorship
Primary concern: National Security & Harmony	Primary concern: Constitutional Sustainability	Primary concern: "Chilling Effect" on Satire/Press

The Way Forward & Judicial Logic

The "Shreya Singhal" Precedent
The SC previously ruled that vague speech restrictions (Section 66A) are unconstitutional.

Doctrine of Proportionality
Any restriction must be the "least restrictive" measure possible to achieve the goal.

Recommended "Middle Path"
Shift oversight to an independent, multi-stakeholder body instead of a government-run unit.

Scientists rewire bacteria to build 'designer' proteins on demand

By engineering a protein called a 'nutrient transporter', scientists have found a way to smuggle artificial amino acids into bacterial cells. The feat allows them to manufacture complex designer proteins that can carry drugs to precise locations inside the body or perform multiple different tasks at the same time.

by Dr. Joseph
@josephschultz

Researchers have found a way to hijack the natural protein-making facilities of bacteria to manufacture specific proteins of interest. They did this by turning a 'nutrient gate' on a bacterial cell into a Trojan horse that could ferry artificial amino acids into cells to make these proteins.

The study, conducted by teams at ETH Zurich in Switzerland and the Technical University of Munich in Germany, was published in *Nature*.

All proteins are made of some combination of the 20 natural amino acids. In the lab, chemists can also synthesize thousands of artificial amino acids, many of which have completely new properties. For example, if an amino acid called *p-azido-L-phenylalanine* can be built into a protein, it would allow scientists to attach drugs to the protein at a precise spot, helping it treat some disease.

The challenge however has been to get cells' protein-making machines to use these artificial amino acids.

Idea and bottleneck

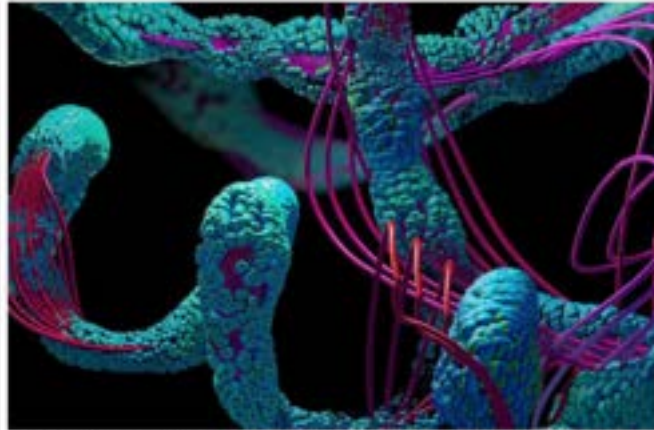
In the 1960s, Peter Schultz and his colleagues at the University of California, Berkeley, laid the foundation of inserting artificial amino acids into proteins at specific sites. Over the years, scientists have expanded this toolkit to incorporate artificial amino acids in proteins that cells make.

But one problem has prevented the struggle to get enough artificial amino acids into the cell. Most labs made amino acids struggle to cross the cell membrane and enter the cytoplasm, where the ribosomes operate protein factories. This is because the side chains on artificial amino acids are very water-loving whereas the core of the cell membrane is water-repelling.

To solve this problem, scientists have used one of three approaches in the past: (i) adding large concentrations of artificial amino acids to the medium so they passively cross the cell membrane; (ii) engineering membrane-binding proteins to smuggle small peptides (short chains of amino acids) across the cell membrane and break them down to amino acids once inside the cell; or (iii) engineering metabolic pathways within the cells to produce artificial amino acids inside the cells.

These methods showed some progress but they were still specific to certain amino acids. They couldn't be generalised.

In the new study, the researchers pinned down the exact molecule ferrying the peptides into the cell. In the absence of the transporter – the main bacterial system that normally imports small protein fragments as food – the cells



An illustration of a chain of amino acids. All proteins are made of some combination of the 20 natural amino acids. In the lab, chemists can also synthesize thousands of artificial amino acids, many of which have completely new properties. © ETH researchers

almost completely lost the ability to use the artificial amino acids bound to the peptides. That was a sign this specific molecule was the smuggler. Once the peptides were inside, the cell's own protein-making machines took over.

The researchers were able to confirm this when they removed the enzymes that normally cut peptides into individual amino acids, the cell's protein production dropped. Taken together, the transporters brought the cargo in, then ordinary enzymes freed the artificial amino acid so the cell's ribosome could use it.

Across the membrane

Karsten Lang and his colleagues at ETH Zurich started from the same idea, by attaching the artificial amino acid to a short peptide. But this group pushed the idea further to the bacteria *Escherichia coli*.

Laura Isenhardt, assistant professor of biology at Adolfo University in Bogotá, explained that the group engineered an ARC transporter, a specific membrane protein that imports other proteins into the cell, using directed evolution to take up peptides carrying artificial amino acids.

The ARC transporter normally transports tripeptides (i.e. three amino acids) and tetrapeptides (four amino acids) into the cell as sources of nutrients. Dr. Lang and his designed tripeptides and tetrapeptides in which they had an artificial amino acid between two natural

The recent study has also shown that the approach could deliver two different artificial amino acids, allowing a single protein to carry two engineered features at different positions.

amino acids, thus causing the transporter to smuggle artificial amino acids into the cell. Once inside, the special peptide-cleaving enzymes inside the cell chopped them into individual amino acids, making artificial amino acids available for cells to make new proteins.

Unlike previous reports, this study engineered the transporter to alter a protein located in the space between the inner and the outer membranes of the bacterial cell. The researchers first identified residues that changed onto the cargo. Then they prepared mutants of the transporter that would take up 10x more amounts of unconventional amino acids than an unmodified transporter. This is double the efficiency in the uptake of artificial amino acids when compared to previous studies.

Easier to use

The findings matter because in many standard lab broths, there are already lots of natural peptides floating around, and they all compete for the same transporter, reducing how much of the cargo is smuggled inside the cell. In the

researchers evolved the transporter step by step to make sure it worked even in these crowded conditions, repeatedly selecting bacterial cells that imported the artificial amino acid's peptides best. Then they built the improved version into the bacteria's genomes. The resulting system, they reported, was easier to use to produce proteins in a routine way instead of having to carefully control the media like the first.

As Matthias Fritzer, senior scientist in Lang's group and a lead author of the study, said in a press note, the study makes it "possible to produce designer proteins containing unusual amino acids just as efficiently as their natural counterparts". These could be genuinely multifunctional proteins, such as an antibody that carries a drug at one engineered position.

The team also showed that its approach could deliver two different artificial amino acids, allowing a single protein to carry two engineered features at different positions.

Dr. Lang and colleagues are working on designing a similar system to human cells to produce artificial human proteins that could be used for several therapeutic applications. The idea could extend to import molecules other than amino acids to produce complex chemical compounds, she added. (Dr. Joseph is a freelance science journalist and researcher. joseph@2000@gmail.com)

THE GIST

In the 1960s, Peter Schultz and his colleagues at the University of California, Berkeley, laid the foundation of incorporating artificial amino acids into proteins at specific sites.

Over the years, scientists have expanded this toolkit to incorporate artificial amino acids in proteins that cells make.

But one problem has prevented the struggle to get enough artificial amino acids into the cell.

The recent findings matter because in many standard lab broths, there are already lots of natural peptides floating around, and they all compete for the same transporter, reducing how much of the cargo is smuggled inside the cell.

- **Key Terms and Explanations**

- **Designer Proteins:** Proteins engineered with specific, non-natural properties to perform tasks like drug delivery or enzymatic catalysis that natural proteins cannot.
- **Artificial/Unnatural Amino Acids (uAAs):** While life typically uses a standard set of 20 amino acids, chemists can synthesize thousands of others. These uAAs have unique chemical "handles" (e.g., $\text{p-azido-L-phenylalanine}$) that allow scientists to attach drugs or sensors to precise locations.
- **ABC Transporter:** A major class of membrane proteins that use energy (ATP) to move substrates (like nutrients) across the cell membrane. In this context, it was the "Trojan Horse" used to sneak in artificial building blocks.
- **Peptide:** A short chain of amino acids. The study used "tripeptides" (3 amino acids) and "tetrapeptides" (4 amino acids) as the delivery vehicle.
- **Directed Evolution:** A method used in protein engineering that mimics natural selection to steer proteins toward a user-defined goal (e.g., making a transporter 10x more efficient).

- **Main Arguments and Substantive Parts**

- The core thesis is that **bacterial "nutrient gates" can be re-engineered to bypass the natural cellular barriers that previously prevented the mass production of synthetic proteins.**
- **The Bottleneck:** Most artificial amino acids are "water-loving" (hydrophilic), making it impossible for them to pass through the "oil-loving" (hydrophobic) fatty core of the bacterial cell membrane.
- **The Solution:** Instead of trying to force single amino acids through, researchers disguised them within small nutrient chains (peptides) that the bacteria naturally want to eat.
- **The "Trojan Horse" Mechanism:** Scientists modified a specific transporter protein in *E. coli*. This transporter pulls in the peptide chain; once inside, the cell's own enzymes "unpack" the chain, releasing the artificial amino acid for use by the ribosome (the protein factory).
- **Dual-Functionality:** The research proved that two different types of artificial amino acids can be incorporated into a single protein simultaneously, enabling "multifunctional" molecules.

- **Historical Evolution of the Issue**
- **Pre-1980s:** Understanding the "Central Dogma" (DNA → RNA → Protein) and the fixed nature of the 20-amino-acid genetic code.
- **1980s (The Breakthrough):** Peter Schultz (UC Berkeley) laid the foundation by showing it was theoretically possible to add an "extra" amino acid to a protein's sequence.
- **1990s–2010s (Expansion):** Scientists expanded the "toolkit," creating various unnatural amino acids, but struggled with "yield"—cells simply wouldn't take up enough of the synthetic raw materials.
- **Present (The Current Milestone):** Transition from "proof-of-concept" to "high-efficiency manufacturing" by re-wiring the bacteria's internal logistics (transporters) rather than just the genetic code.

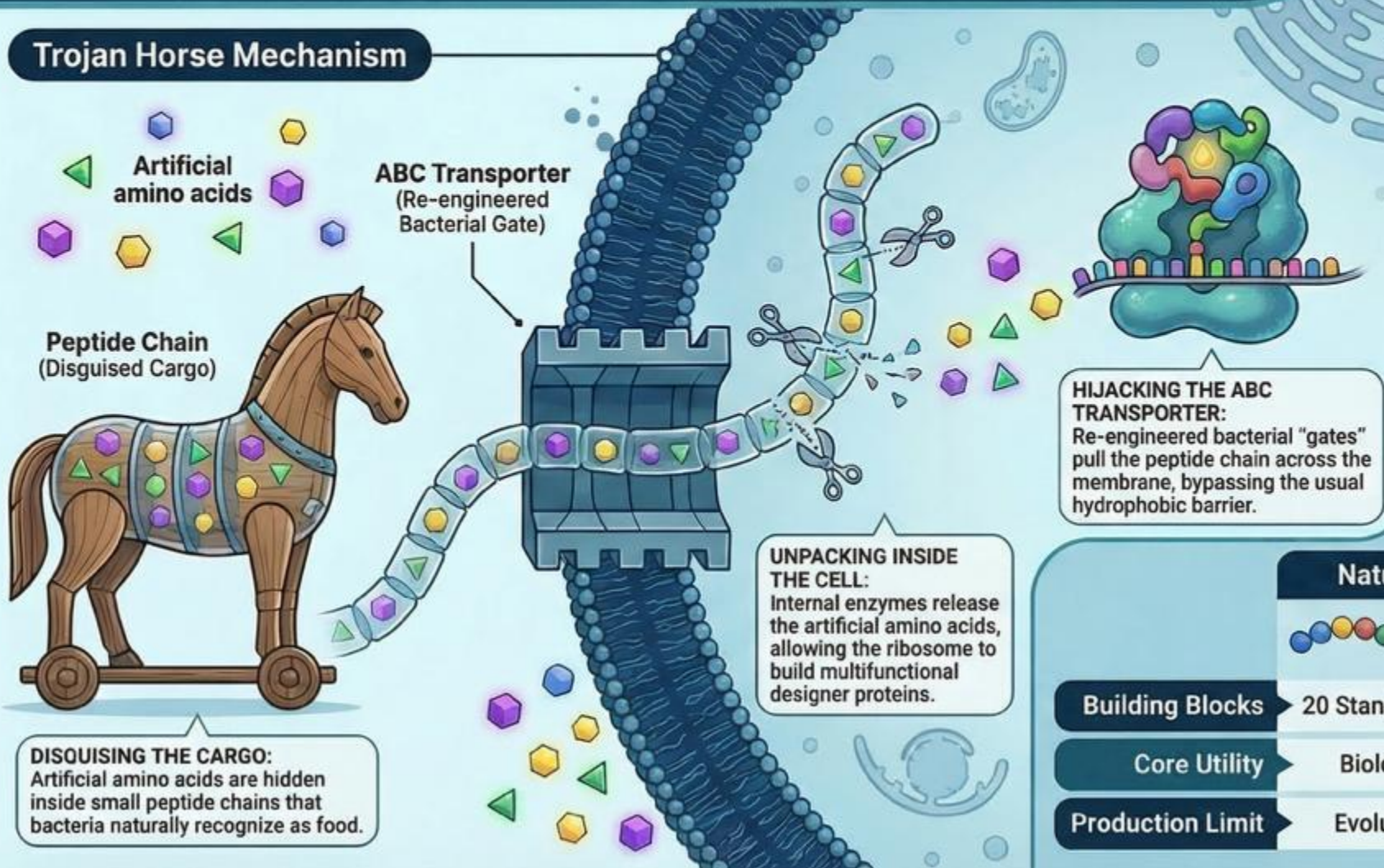
- **Previous Years' UPSC Questions**
- **Prelims (2022):** "Which one of the following statements best describes the role of B cells and T cells in the human body?" (Theme: Applied Biology).
- **Mains (2019, GS III):** "What can India learn from the developed countries, for the focus on 'Research and Development'?"
- **Mains (2021, GS III):** "Describe the benefits of deriving electric energy from sunlight... and the importance of the 'National Solar Mission'." (Theme: Technological transitions—parallels the transition to Bio-economy).



Designer Proteins: The 'Trojan Horse' Breakthrough in Synthetic Biology

Synthetic Summary: Synthetic biology has reached a milestone by re-engineering bacterial 'nutrient gates' (ABC Transporters) to bypass natural cellular barriers. This allows scientists to smuggle artificial amino acids into cells, enabling the mass production of 'designer proteins' with non-natural properties for medicine and industry.

Trojan Horse Mechanism



IMPACT & UPSC RELEVANCE

HIGH-EFFICIENCY BIO-MANUFACTURING
Overcomes the 'yield bottleneck,' producing synthetic proteins at rates comparable to natural ones.

TARGETED DRUG DELIVERY
Designer proteins can carry anti-cancer drugs directly to tumor sites using precise chemical "handles".

GS PAPER III LINKAGE
Crucial for topics on "Disruptive Technologies," "Bio-Economy," and "Achievements of Indians in S&T."

	Natural Proteins	Designer Proteins
Building Blocks	20 Standard Amino Acids	20 Natural + 1000s of Artificial (uAAs)
Core Utility	Biological Survival	Drug Delivery, Catalysis, Sensors
Production Limit	Evolutionarily Fixed	Engineered for High Yield & Precision

'41%' illusion: a quiet re-engineering of India's fiscal federal landscape

With Finance Commission retained States' share in the divisible pool at 41% even as the divisible pool as a proportion of gross tax revenues has shrunk, various grants have been discontinued, the gap between a State's entitlement and its actual receipt depends on its capacity to meet Central monitoring requirements

BY ANURAG MITTAL

Delhi/Chennai/Mumbai

An Explanatory Memorandum issued by the Ministry of Finance on February 4, 2026, is seen as a useful document, not only for what it states or suggests but also for observing a pattern of what it does not.

The Union government accepted the twelfth Finance Commission's (FC) recommendation to retain the States' share in the divisible pool at 41%, it also accepted the horizontal formula, the local body grants, and the disaster management corpus. However, it defined everything structural, such as amending the Fiscal Responsibility Legislation, controlling off-budget borrowings, reforming power sector distribution commission, and rationalising subsidies. This observed autonomy is not harmonised with it to secure the welfare.

The twelfth Finance Commission's scheme leaves the outcome clear, a 41% share across the country to be earned over, it is. But the divisible pool is not gross tax revenues.

Cross and surcharges, linked and retained centrally by the Union, sit outside the pool, and their share has been growing.

As the FCII report documents, the divisible pool as a proportion of gross tax revenues averaged 38.2% during the FCII period, fell to 32.1% during FCIII, and dropped further to 16.2% during FCIV.

The Commission acknowledges this trend, notes its unlikelihood, and declares to its A. Annex, 41% of a shrinking base is not 41% of total collection.

FCIV has also discontinued revenue deficit grants, set-aside for grants, and State-specific grants, instruments that offered regional local relief to States. The Commission projects that combined general government debt will fall from 77.2% of GDP in 2024-25 to 71.2% by 2029-30.

The aggregate trajectory looks orderly, it is the disaggregated picture where the real adjustment begins.

Structural deficits
FCIV was aware of the full line it chose not to repeat. Its disquiet on State borrowings, power sector losses, and subsidies were clear already. The Commission identified States with structurally unsustainable local infrastructures, it called for reforms, it attached no binding outcome mechanism to achieve them.

The most consequential part is the residual autonomy left by the end of FCII compensation in June 2012. States had a guaranteed 10% annual growth in GSDP revenues, unless a structural adjustment.

Central banks also estimated a dividend of nearly 120,000 crore in 2024-25. The Commission made aggregate GSDP increases as evidence of recovery. The distributional drive has not followed.

The second delivery outcome of budget borrowings and local rates FCIV discontinued have States borrow through governments controlled entities and service these facilities from the budget, keeping them available in

Drop in shareable revenue

Divisible Pool as % of Gross Tax Revenue (GSDT), From 2001-02 to 2024-25

Year	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Shareable Revenue	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2

Horizontal distribution formula of FCII vs FCIII

Criterion	FCII Weightage	FCIII Weightage	% Change	Change
Population (2001 Census)	25%	27.5%	11%	1.5
Area	25%	25%	0%	0
Per capita income	25%	25%	0%	0
State's fiscal effort	25%	22.5%	-11%	-2.5
Contribution to GDP	0%	20%	20%	20



THE GIST

- The Union government accepted the twelfth Finance Commission's (FC) recommendation to retain the States' share in the divisible pool at 41%.
- A 41% share would be available to States, if the divisible pool is not gross tax revenues.
- Cross and surcharges, linked and retained centrally by the Union, sit outside the pool, and their share has been growing.

The Union accepts what gives it budgetary predictability: the 41% share, the formula, and the grants. It defers what would require sharing structure of authority, local rate reforms, off-budget liability controls, and power sector reform being.

Residual deficit figures

It is recommended that States discontinue the practice and that the Fiscal Responsibility Legislation (FRL) framework be amended. The Explanatory Memorandum accepted the question of borrowing ceilings in principle, there listed that all budget controls, FRL, amendments, and the Union's own fiscal deficit path would be examined separately. The phrase has a history to indicate of individual, it means not now.

The Commission's own later than comparison documents the backlog. Punjab carried a debt to GDP ratio of 42.3% in 2012-13 and a revenue deficit of 1.7% of GDP, borrowing primarily to address revenue deficits rather than build capital assets.

Against its outstanding liabilities stand at 17.7% of GDP, West Bengal's at 38.2%, and Madhya Pradesh's at 24.5%. Each operates under fiscal rules that, by the Commission's own assessment, are effectively unenforced. The recommendation to reform these rules was made. The Union asked it for help.

Rewarding the Center's priorities

The choice is FCIV's transfer architecture may clear reading. The first is the replacement of the tax and fiscal effort criterion in the horizontal distribution formula with a contribution to GDP criterion. Under FCII, States received a 2.5% weight based on their own tax revenue efficiency relative to economic capacity, awarded for rising faster.

The new criterion, assigned a 40% weight, allocation increases in proportion to each State's contribution to national GDP, measured as the square root of its

GDP relative to all States. Maharashtra, Gujarat, and Karnataka, large, high-GDP States that already generate substantial own revenues, benefit most heavily from this shift.

What, **Bihar**, and **Tripura**, which are States with lower per capita incomes and greater fiscal need, do not. This is not a technical adjustment. It is an assertion of equalisation logic: the previous criterion rewarded effort, the new one rewards weight.

The shift from tax to fiscal effort (2.5% to contribute to GDP-GDP) is the defining structural change. The second is the conditional on-fiscal effort of local body grants. The 7,36,400 crore recommended for rural and urban local bodies in divided into basic and performance components, with access contingent on city-level conditions covering constrained bodies, audited accounts, and the timely submission of State Finance Commission.

Performance grants add further layers to a one source revenue formula that met fiscal need, whose structural stress is difficult to dislodge. Together, they constitute a system to which the gap between a State's entitlement and its actual receipt depends on its capacity to meet Central monitoring requirements.

States with weaker governance infrastructure, which tend also to be States with greater fiscal need, face the gap most acutely. The FCII period offers a precedent, where urban local body grants were reduced at only 10.6% of the recommended amount.

Read alongside the Commission's report, the Explanatory Memorandum reveals a consistent logic. The Union accepts what gives it budgetary

predictability: the 41% share, the formula, and the grants.

It defers what would require sharing structural authority, local rate reforms, off-budget liability controls, and power sector restructuring. Where FCIV diagnosed a problem and recommended a remedy, the Union took note. Where FCII designed a flow and set an amount, the Union accepted it to fall.

What makes the FCII recommendation to that it arrives after years of discredited State level fiscal liberalisation, the Commission's own data confirms.

FCIV's intention to pay urban and service existing debt, not to build infrastructure. Andhra Pradesh carries infrastructure via facilities that no Finance Commission has reached. Against its revenue deficit persists across multiple period periods. The Commission can see of them. The Memorandum took note.

A federal structure whose transfer increasingly reward economic weight over fiscal need, whose structural stress is difficult to dislodge after years, and whose only reliable income is the perpetuation of Centre from autonomy is rarely not a system in good health. It has nowhere learned to look like it is - and that is simply troubling and unsettling for the fiscal character of India's constitutional republic which cannot sit long-term implications and an unrelenting rate deficit.

Respectful, which is professor and Anu, O.P. Jindal Global University, and Director, Centre for New Economic Studies (CNES), supported ideas and solutions that contributed to this column from Centre for New Economic Studies, O.P. Jindal Global University.

- **Key Terms and Explanations**

- **Divisible Pool:** The portion of Gross Tax Revenue (GTR) that is constitutionally mandated to be shared between the Centre and the States.
- **Vertical Devolution:** The percentage of the divisible pool allocated to all States combined (currently maintained at 41%).
- **Horizontal Devolution:** The formula used to distribute the States' share among individual states based on criteria like population, area, and income distance.
- **Cesses and Surcharges:** Taxes levied by the Union for specific purposes (e.g., Education Cess). Crucially, these are **not** part of the divisible pool and are retained 100% by the Centre.
- **Fiscal Federalism:** The division of functions and financial resources among different levels of government (Union, State, and Local).
- **Income Distance:** The difference between a state's per capita GSDP and that of the highest-income state. It acts as a measure of equity.
- **Off-budget Borrowings:** Loans taken by government-controlled entities (like state PSUs) that do not appear in the official budget but are serviced by the government.

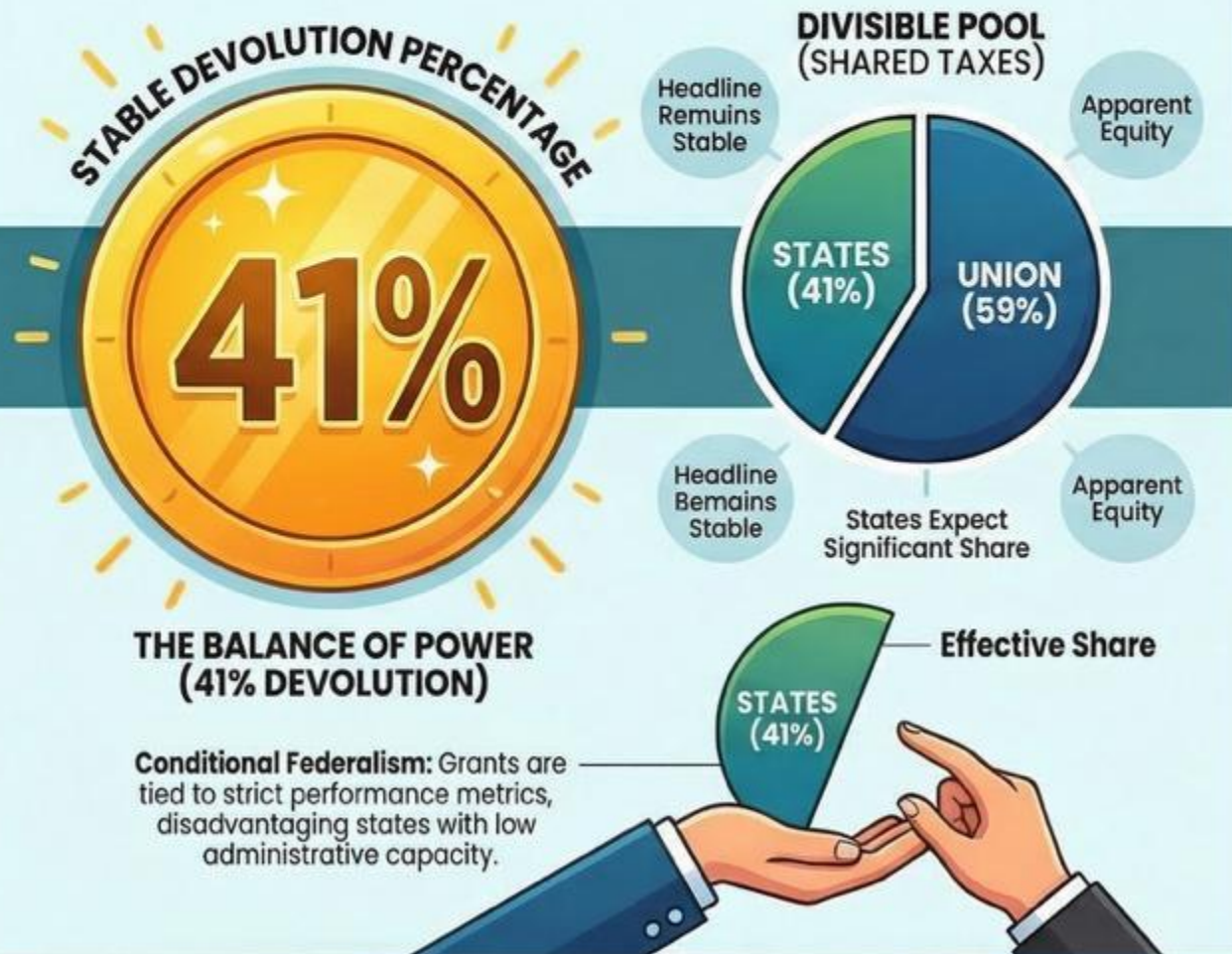
- **Main Arguments and Substantive Parts**

- The core thesis suggests that while the "41%" figure implies stability, a "quiet re-engineering" is hollowed out the actual fiscal autonomy of States.
- **The "Shrinking" Divisible Pool:** While the percentage share (41%) remains constant, the pool itself is shrinking as a proportion of Gross Tax Revenue. This is due to the rising share of Cesses and Surcharges.
- **Structural Deferrals:** The Union has accepted the "easy" parts (the 41% share) but deferred critical structural reforms recommended by the FC, such as fixing the Fiscal Responsibility Legislation (FRBM) and addressing power sector losses.
- **Performance-Based Grants:** There is a shift toward "conditional" federalism. Grants for local bodies are increasingly tied to entry-level conditions like audited accounts and online data entry, making actual receipts dependent on administrative capacity.
- **Change in Horizontal Logic:** The introduction of "Contribution to GDP" (10% weight in FC16) marks a shift from "need-based" devolution to "efficiency-based" rewards. This favors high-growth states (Maharashtra, Gujarat) while potentially disadvantaging states with higher developmental needs (Bihar, UP).

INDIA'S FISCAL FEDERALISM: UNDERSTANDING THE "41% ILLUSION"

How the 15th-16th Finance Commission Transition Impacts State Fiscal Autonomy Despite Stable Devolution

THE HEADLINE NUMBER (41% DEVOLUTION) & THE ILLUSION



UNDERLYING REALITY: CENTRALIZATION & CONDITIONALITY (THE SHRINKING POOL & BALANCE OF POWER)





Combined with another innovation — subscriber trunk dialling, or STD — the C-DOT digital switch dramatically improved telecom connectivity, especially country-wide.

Lessons from C-DOT saga for technology development in India

The Centre for Development of Telematics heralded a communications revolution by developing indigenous rural telephone-exchange technology. However, in the three months of K.P. Umashankar as Minister for Communications, the project was derailed and a mass exodus of scientists began

Shashi C. Sharma

From Congress and coalition leader K.P. Umashankar, who passed away on September 26, March 13, was an elected Member of Parliament for an area between 1975 and 1980. He will be remembered for his long political and parliamentary career spanning several decades and for his public life. One, however, ought to call the impact of his tenure as the Minister for Communications for about three months — from December 1980 to April 1981 — in the elected government of Prime Minister I.P. Singh. Umashankar's last day to function in office was marked by controversies that derailed one of the most successful technology development programmes of independent India — the Centre for Development of Telematics (C-DOT) — and ended the career of Sam Pitroda as a technology publicist and Umashankar's chief advisor on the telecom R&D organisation, which heralded the communications revolution with its indigenously developed rural telephone-exchange technology, was so severe that it could hardly recover in later decades.

The communications scenario in India of the 1970s and 1980s was pathetic. Telephone connectivity was very poor. The national waiting list for getting a landline connection stood at 8.4 lakh in 1980, translating into a waiting period of three to four years. The connectivity in rural areas was worse, with just 1% of all lakh villages having a telephone connection. The quality of service was also poor, with high drop-outs.

The main reason was the dependence on imports for telecom equipment such as switches, transmission lines, and instruments. Multinational telecom companies determined the level and type of technology India needed. The imported switchgear machines would often break down due to high temperature and dust. They also could not handle high call volume in India.

In 1980, Prime Minister Indira Gandhi formed a committee to review the telecom infrastructure. An Indian technologist from the U.S. made a critical suggestion before this panel that India should develop and manufacture a digital switch instead of importing, as favoured

by the Department of Communications (DoC). Over the next few years, this idea crystallised and C-DOT was born in 1980, with Sam Pitroda as its chairman.

Pitroda did not want it to be another government R&D outfit on the lines of existing laboratories and national institutions administered by different ministries. It was formed as an autonomous society, funded by the government but with functional freedom, on the lines of the Tata Institute of Fundamental Research (TIFR). The agency was given an annual budget and a right to hire 120 core and 500 contract staff to develop an indigenous switch. The idea was to introduce the next level of technology and do so indigenously. The proposed digital switch was locally software-based, unlike the prevailing analogue exchanges.

New work culture

Young engineers and technologists were recruited. They worked in project teams as Bangalore and DSN, a new work culture was promoted. One American industry analyst wrote, "Young blue-printed engineers and programmers pulling all-nighters, walls peppered with PERT diagrams, weekend seminars, employee counselling programs, and performance-linked awards. But it is not Silicon Valley, it is India. It is not Apple Computers, it is C-DOT run by the government."

But at home, C-DOT and Pitroda faced a hostile bureaucracy and an uncooperative DoC. Questions were raised in Parliament and the press about the working of C-DOT. In response to allegations of financial irregularities and flouting of government rules, seven government committees were quickly formed to review the working of C-DOT, but they did not report any financial wrongdoing.

As promised, C-DOT not only developed the digital rural exchange but also developed several other projects in the given timeframe, as well as several steps of switching upgrade and a host of badge readers. All this helped it break the stronghold of American and European telecom suppliers in India. Combined with another innovation — subscriber trunk dialling, or STD — the

C-DOT digital switch dramatically improved telecom connectivity across the country, heralding the communications revolution.

When Umashankar took over as the Minister for Communications in December 1980, Pitroda and I, because of his association with C-DOT, were being targeted by his bureaucracy as well as the political opponents of Indira Gandhi. For Gandhi's political adversaries, including those from the Congress party, Pitroda had become an easy target as he was seen influencing key decisions as an important member of the informal group of "Congress Party" advisors direct access to the prime minister. Pitroda heeded Gandhi's past programme, "Technology Minister". In addition, witness 100's had been perturbed by the success of C-DOT. All this placed Pitroda and C-DOT in a tight spot as Indira Gandhi and the Congress were about to

On the very first day of taking over as the minister, Umashankar publicly humiliated Pitroda, purportedly for being late in receiving files when he arrived at Indira Park. Within a week, he formed a high level expert committee whose main chair was R.P. Nambiar, former chairman of Indian Telephone Industries, to investigate C-DOT. It included eight members from the non-departmental commission that had given the performance of C-DOT twice in 1980 and 1981 and chaired it, G.R. Murugan, corporate director of C-DOT, was also made a member. Nambiar then formed a one-man sub-committee specifically to review C-DOT's purchases.

The deliberations, during the Expert Committee meetings, while covering the findings of the sub-committee, allowed a glowing self-report issued as to the success of the work done by C-DOT. An air of gloom and uncertainty started hanging over 100 young C-DOTians. "Memoranda" were issued to the committee. It and three other members of the committee gave a dissent note. Nambiar did not include the note in his final report and submitted it quickly to Umashankar before the decision day. When the dissent note was submitted to Umashankar, he called it a "sanitized report" and refused to make it a part of the report submitted by Nambiar. The Nambiar report was also submitted

during the weekend. On the next working day, Umashankar issued orders asking those C-DOTians of the first members — Murugan and G.R. Murugan — who had written the dissenting note. Two weeks later, Umashankar was directed of the communications portfolio and replaced by Jawahar Lal Nehru.

The three-month tenure of Umashankar as the Communications Minister is a critical point in technology development and dissemination derailed the whole indigenisation project. Though C-DOT eventually delivered 80,000 line and 80,000 line exchanges as promised, the momentum it generated for innovation and product development was lost. Rattled by the shabby treatment of the founders and workers like Pitroda and Sharma, several young engineers transferred to the Prime Minister's residence in Delhi, and sought a warrant when Umashankar went to address them in Bangalore.

Mass exodus of scientists

Within a few months C-DOT inspired a mass exodus of scientists and engineers, making it a classic case of brain drain. There were readily accepted by multinational telecom firms, which made a comeback in the post 1990 liberalisation years, while others became entrepreneurs.

The episode has many lessons that are still relevant four decades later. Indigenously technology development needs continued support from the political as well as administrative apparatus, irrespective of a change in political dispensation. The development teams and organisations involved need financial autonomy and freedom from excessive bureaucratic restrictions. Technology development is a risky business and cannot be tied down by traditional constraints of time and cost-estimates as well as failures. Young talent is an essential one to attract and it needs to be retained and nurtured in every way possible. Product development requires the help of technology business in India, and there is a lot to be learnt from the history of technology development in Israel. Shashi C. Sharma is a New Delhi-based journalist and author, and has written books on India's post-1947 science and technology journey.

- **Key Terms and Explanations**

- **C-DOT (Centre for Development of Telematics):** An autonomous telecom R&D centre established in 1984. It was designed to develop indigenous digital switching systems suitable for India's rugged conditions.
- **Digital Switching System:** The "brain" of a telephone exchange that connects calls. Before C-DOT, India relied on imported "Crossbar" (electromechanical) or analog switches which were prone to failure in heat and dust.
- **STD (Subscriber Trunk Dialling):** A system allowing users to dial long-distance calls without operator assistance. The integration of C-DOT switches with STD booths democratized communication in rural India.
- **Indigenous Technology:** Technology developed locally using domestic resources and talent, aimed at reducing "technological dependency" on foreign multinationals.
- **Brain Drain:** The emigration of highly trained or intelligent people from a particular country. The article highlights how political instability at home can trigger an exodus of scientists to MNCs or foreign nations.
- **PERT (Program Evaluation and Review Technique):** A statistical tool used in project management to analyze and represent the tasks involved in completing a given project.

- **Main Arguments and Substantive Parts**

- The article presents a cautionary tale of how political interference can derail successful scientific missions.
- **The Problem of Dependency:** In the 1970s, India's telecom sector was "pathetic," with long waiting lists and a heavy reliance on expensive, fragile imports from MNCs.
- **The Mission-Mode Success:** Under Sam Pitroda, C-DOT introduced a "Silicon Valley" culture—young engineers, flat hierarchies, and "pulling all-nighters." This led to the creation of rural exchanges that didn't need air conditioning.
- **Political Interference as a De-stabilizer:** The core argument is that the shift in government in 1989 led to a "witch-hunt." The new administration viewed C-DOT as a political legacy of the previous regime rather than a national asset, leading to investigations that demoralized the scientific community.
- **The Cost of Bureaucracy:** The article highlights that "Technology development is risky business." Applying rigid, traditional bureaucratic yardsticks (like time/cost overruns) to innovative R&D can stifle creativity and lead to project failure.

- **Historical Evolution of the Issue**

- **Pre-1980s:** Era of stagnation. Telephony was a luxury. Import-heavy model dominated by global telecom giants.
- **1980–1984:** Prime Minister Indira Gandhi forms a committee to review the infrastructure. The idea of a digital indigenous switch is born.
- **1984–1989:** The "Golden Age" of C-DOT. Sam Pitroda leads "Technology Missions." Rapid deployment of Rural Automatic Exchanges (RAXs).
- **1989–1990:** Political transition. Minister K.P. Unnikrishnan initiates probes into C-DOT. Mass exodus of scientists begins.
- **Post-1991 (Liberalization):** While India saw a mobile revolution, the "indigenous" manufacturing core struggled to regain the momentum lost in the late '80s, as MNCs once again took center stage.
- **Present Day:** Renewed focus via "Atmanirbhar Bharat" and "Digital India," attempting to recreate the indigenous R&D fervor of the 80s for 5G and 6G.

- **Previous Years' Questions (PYQs)**

- **UPSC Mains:**

- (2019, GS3): "How is the Government of India protecting traditional knowledge of medicine from patenting by pharmaceutical companies?" (Thematic link: Protecting indigenous assets).
- (2016, GS3): "Discuss India's achievements in the field of Space Science and Technology. How has the application of this technology helped India in its socio-economic development?" (Directly relates to the "Mission Mode" success mentioned in the article).

- **APSC Mains:**

- (2022): "Discuss the role of Science and Technology in the socio-economic development of India."

The C-DOT Saga: Indigenous Innovation vs. Institutional Barriers

Established in 1984, the Centre for Development of Telematics (C-DOT) revolutionized Indian telecom by creating indigenous, rugged technology for rural India. However, its success was later stymied by political interference and bureaucratic rigidity, offering a "cautionary tale" on the fragility of scientific autonomy.

THE 'MISSION-MODE' SUCCESS (1984-1989)



"RURAL-FIRST" TECHNOLOGY DESIGN
Created rugged digital switches that functioned in heat and dust without air conditioning.



THE STD/PCO REVOLUTION
Integrated C-DOT switches with STD booths to democratize long-distance communication in villages.



SILICON VALLEY WORK CULTURE
Adopted flat hierarchies and merit-based environments to empower young Indian engineers.

GOVERNANCE CHALLENGES & INSTITUTIONAL RISKS

POLITICAL INTERFERENCE & "REGIME REVENGE"

Shifts in government led to "witch-hunt" investigations, demoralizing the scientific community.



INNOVATION VS. BUREAUCRACY

Innovation thrives on risk-taking, while traditional bureaucracy stifles creativity with rigid procedural auditing.



THE BRAIN DRAIN CONSEQUENCE

Political instability and institutional breakdown triggered a mass exodus of scientists to MNCs.

ERA COMPARISON:

MISSION MODE VS. BUREAUCRATIC INTERFERENCE

ERA	FOCUS	OUTCOME
1984-1989 (Golden Age)	Autonomy & Innovation	Rapid Rural Automatic Exchange (RAX) deployment
1989-1991 (Transition)	Probes & Audits	Scientific demoralization and mass brain drain
Post-1991 (Liberalization)	Market Competition	Indigenous core struggled as MNCs took center stage



Global MNCs



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