



7 PM COMPILATION

1st and 2nd week October, 2026

Features of 7 PM compilation

- ❖ Comprehensive coverage of a given current topic
- ❖ Provide you all the information you need to frame a good answer
- ❖ Critical analysis, comparative analysis, legal/constitutional provisions, current issues and challenges and best practices around the world
- ❖ Written in lucid language and point format
- ❖ Wide use of charts, diagrams and info graphics
- ❖ Best-in class coverage, critically acclaimed by aspirants
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- ❖ Best cost-benefit ratio according to successful aspirants

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India-EFTA Trade & Economic Partnership Agreement (TEPA) – Explained Pointwise

The **India-EFTA Trade and Economic Partnership Agreement (TEPA)** is a comprehensive trade agreement between India and **Switzerland, Norway, Iceland and Liechtenstein**. It was signed on 10 March 2024 and entered into force **exactly one year ago, on 1 October 2025**. PM Narendra Modi had termed the signing of the trade pact as a '**watershed moment**' in India-EFTA relations.



INDIA- EFTA TEPA

PM Narendra Modi has termed the signing of India-EFTA TEPA as a '**watershed moment**' in India-EFTA relations

ABOUT EFTA

The EFTA is an intergovernmental body comprising **Switzerland, Norway, Iceland, and Liechtenstein**. These countries that are all in Europe but not a part of the EU.

ECONOMIC SIGNIFICANCE OF EFTA- EFTA countries have a **combined GDP of over \$1 trillion**. EFTA nations are the **world's ninth-largest merchandise trader** and its fifth largest in commercial services. **India is the EFTA's fifth-largest trading partner** after the European Union, the United States, Britain and China.

FEATURES OF INDIA-EFTA TEPA

INVESTMENT AND EMPLOYMENT- EFTA nations have **committed to invest \$100 billion** in India in **15 years**. (\$50 bn in the first 10 years and \$10 bn in the next 5 years). It also aims to **create 1 million direct jobs** within 15 years.

TARIFF REDUCTION- India has offered **83% of its tariff lines**, which covers **95.3% of the EFTA grouping's exports**. This eliminates duties on most of industrial goods like Swiss watches, pharmaceutical products, chocolates etc.

VITALITY OF SERVICE SECTOR- Different provisions in the agreement provide improved market access to different services like **financial, telecommunication, maritime personnel**

TECHNOLOGY TRANSFERS- Investments and key technology transfers in the **agricultural sector, renewable sectors, pharmaceuticals, garments, and medical instruments**

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What is India-EFTA TEPA?

- It is a trade deal signed between-India & four European countries (Members of EFTA)- **Iceland, Liechtenstein, Norway and Switzerland**.

European Free Trade Association (EFTA):

- EFTA is an **intergovernmental organisation of 4 European countries** that promotes **free trade and economic integration** among its members and with other countries.
- Members: **Switzerland, Norway, Iceland and Liechtenstein**
- Members are not part of the European Union (EU).
- EFTA negotiates **free trade agreements (FTAs)** with countries and regional blocs around the world.

Economic Significance of EFTA Bloc:

1. EFTA countries have a **combined GDP of over \$1 trillion**.
2. EFTA nations are the **world's ninth-largest merchandise trader** and its **fifth largest in commercial services**.
3. India is the EFTA's **fifth-largest trading partner** after the European Union, the United States, Britain and China.
4. EFTA is among the **most important trading partners in goods and services** for the EU.

Read More about EFTA- [EFTA-India Relations- Explained Pointwise](#)

Objectives of the Deal:

1. EFTA nations have committed to invest **\$100 billion in India** in 15 years. (\$50 bn in the first 10 years and \$10 bn in the next 5 years).
2. It aims to create **1 million direct jobs** within **15 years**.
3. It aims to **eliminate/reduce tariffs and non-tariff barriers** on a wide range of products and create **opportunities for trade and investment** between India and EFTA.
4. It aims to ensure **fair and transparent market access conditions** for service providers and investors. It will also enhance cooperation on **intellectual property rights protection and enforcement**.
5. TEPA aims to establish **effective mechanisms for dispute resolution**.

What was the Status of India-EFTA Trade Relations before TEPA?

1. **Trade Deficit of India with EFTA countries:** India has a huge trade deficit with the countries in EFTA. In 2023, India-EFTA bilateral trade was around \$25 billion. India's exports to the EFTA touched \$2.8 billion and imports were about \$22 billion during that period.
2. **India-EFTA trade Merchandise Trade:** In 2022-23, the combined EFTA-India merchandise trade stood around \$6.1 billion. The main imports into EFTA States from India consisted of **organic chemicals (27.5%)**. The main imports into India from EFTA consisted of **Machinery (17.5%)** and pharmaceutical products (**11.4%**).
3. **Investment and Trading Partners:**
 - a. EFTA investment stood at **\$10.7 billion in 2022**.
 - b. **Switzerland is India's largest trading partner** in EFTA, followed by Norway. Switzerland accounts for 91% of trade between India and EFTA.
4. **High tariffs on EFTA goods:** Goods arriving from the EFTA group face high tariffs. **For e.g.** India levies an **import duty of 20% on Swiss watches** and **30% on chocolates** from European countries.

What are the features of India-EFTA TEPA?

1. **Tariff Reduction:** India has offered 83% of its tariff lines, which covers 95.3% of the EFTA grouping's exports. This **eliminates duties** on most of industrial goods like **Swiss watches, pharmaceutical products, fertilizers, chocolates, minerals, textiles, smartphones, iron and steel products**.
2. **Enhanced Market Access:** EFTA has offered concessions on 92.2% of tariff lines, covering about 99.6% of India's exports to EFTA. It provides **100% coverage of non-agricultural products** along with concessions for processed agricultural products.
3. **Greater Access to Services:** India has commitments across **105 services sub-sectors**, while EFTA countries have made commitments covering more than 100 sub-sectors each. Opportunities are enhanced in **IT, business services, education, audio-visual services and professional services**.
4. **Investments and Technology Transfers:** The agreement seeks to promote cooperation in precision engineering, health sciences, renewable energy, innovation and R&D. It can facilitate technology partnerships, joint ventures and integration into global value chains..
5. **Collaboration in Infrastructure Sector:** Swiss transport companies to collaborate in the **development and advancement of the Railways**. Collaboration with **Flughafen Zürich AG**, the operator of the Zürich airport for improved air-transport connectivity.
6. **Investment and employment commitment:** EFTA countries aim to increase FDI into India by **\$100 billion over 15 years** (\$50 billion in the first 10 years and another \$50 billion in the next five). The agreement also aims to facilitate **1 million direct jobs** in India. This is a distinctive feature because investment and job creation are directly linked to the trade agreement.
7. **Protection of sensitive Indian sectors:** India has maintained protection for sensitive sectors such as **dairy, soya, coal and certain agricultural products**. Tariff reductions for some strategically important products are phased over **5, 7 or 10 years**.
8. **Professional Mobility:** TEPA facilitates greater certainty regarding the temporary entry and stay of key personnel involved in services. It also provides for **Mutual Recognition Agreements (MRAs)** in professions such as nursing, architecture and chartered accountancy.

What is the Significance of India-EFTA TEPA?

1. **Boosts India's exports:** The India-EFTA TEPA provides Indian exporters with preferential access to high-income EFTA markets by reducing or eliminating tariffs on a wide range of products. This can improve the price competitiveness of Indian products, diversify export destinations and strengthen India's integration into global value chains.
2. **Comprehensive Trade Pact:** India-EFTA TEPA is a wide-ranging agreement which delves into a **multitude of issues that would be crucial to economic ties** in the coming decade. It covers **labour issues, human rights**, apart from the trade in goods and services, strong rules of origin clause and strong intellectual property rights (IPR). It is India's **second most comprehensive trade pact** after its pact with the UAE.
3. **Template for other Trade Agreements:** 'Behind-the-border' requirement included in the India-EFTA TEPA is a **condition that lowering of tariffs must be complemented with mobilization of large-scale investment** by the EFTA countries. This could serve as a template when India negotiates trade agreements with other developed countries.
4. **Better Prices for Indian Middle Class Customers:** The reduced tariff rates would lower the prices on **seafood such as tuna and salmon, Swiss chocolate, biscuits, watches, medical equipment, and energy drinks**. Indian incomes are set to rise by 70% by 2030 to breach a per-capita level of \$4,000 (Standard Chartered Report).

5. **Enhanced cooperation in service sector:** The agreement would help to stimulate services exports in areas such as **information technology**, **audio-visual capabilities** and **facilitate the movement of key skilled personnel**.
6. **Facilitate Technology Transfer:** The technology transfer as part of the India-EFTA deal will **increase India's productivity** and **export competitiveness** in agricultural sector, renewable sector, pharmaceutical, garments, and medical instruments.
7. **Employment Generation:** The increased trade and investment opportunities due to TEPA will help to **generate ~1 million jobs in direct employment**, particularly in the manufacturing and services sectors.
8. **Increased Investment opportunities:** The trade deal aims to spur financial investment in India through **Switzerland's banking sector**, **Norway's sovereign wealth fund** and **Liechtenstein's ESG (environment, social, governance) investing sector**.
9. **Diversification of India's trade:** Stronger economic engagement with EFTA provides India with additional European economic partners beyond its existing major trading relationships. It also contributes to India's strategy of building multiple and resilient supply-chain partnerships.

What are the challenges associated with TEPA?

1. **Trade imbalance:** A major challenge is the possibility of a persistent trade imbalance in favour of EFTA countries, particularly given their strength in high-value sectors such as pharmaceuticals, precision engineering, machinery, chemicals and financial services. Greater Indian market access could increase imports from these technologically advanced economies faster than India's exports grow.
2. **Limited export capacity:** Indian MSMEs may struggle to fully utilise preferential market access because of limitations in scale, technology, quality standards and certification.
3. **No reduction on Gold Tariffs:** Gold Trade is the biggest component of trade between India-EFTA (**Out of the \$19 billion India-EFTA trade, \$13 billion was just gold imports from Switzerland**). Since no real tariff benefits are being offered on gold, the **impact of the deal is limited to the remaining \$6-7 billion bilateral trade**.
4. **Switzerland's policy of tariff-free entry:** Switzerland's policy of tariff-free entry for all industrial goods from any country would **affect benefits to Indian companies**.
5. **Non-tariff Barriers:** The presence of non-tariff barriers in Switzerland, like **quality standards** and **approval requirements**, would affect India's agricultural exports to Switzerland.
6. **Exclusion of Agricultural Products:** Sensitive agricultural items like **dairy**, **soya** have been kept in the exclusion list.
7. **Uncertainty over investment commitment:** The \$100-billion investment objective is substantial, but converting the commitment into actual investment will depend on the investment climate, project viability and business conditions in India.

What Should be the Way Forward?

1. **Maximise utilisation of tariff preferences:** India should ensure that exporters, particularly **MSMEs**, are fully aware of the tariff concessions available under TEPA and the procedures for claiming them. Export promotion bodies should also identify products with high demand in EFTA markets and help firms meet their quality, packaging, traceability and regulatory requirements.
2. **Address non-tariff barriers:** India should strengthen its testing, certification and quality-control infrastructure to help exporters comply with EFTA's stringent technical, sanitary, environmental and sustainability standards.

3. **Facilitate EFTA investment:** India should create a predictable and investor-friendly business environment by simplifying regulatory procedures, ensuring faster clearances, improving infrastructure and reducing compliance costs.
4. **Ensure investment translates into employment:** India should establish transparent monitoring and accountability mechanisms to ensure that the investment envisaged under TEPA translates into tangible employment outcomes. Investments can be directed towards labour-intensive manufacturing, MSMEs, skill development and emerging sectors such as clean technology and advanced manufacturing.
5. **Proactive Measures:** Proactive measures such as **Establishment of Dispute Resolution Mechanisms, establishment of EFTA offices** to fully reap the benefits of India-EFTA TEPA.
6. **Strong Political Involvement and Guidance:** Strong political involvement and guidance must be provided for **fructification of the TEPA agreement** between the two parties.

Conclusion: The success of TEPA will depend not merely on tariff concessions but on India's ability to improve domestic competitiveness, reduce compliance costs, strengthen MSMEs and convert the investment and employment objectives into actual economic outcomes,

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UPSC Syllabus- GS 2- India's relations with Developed nations, International organisations, GS-3 Indian Economy;

Cybersecurity – Significance & Challenges – Explained Pointwise



The recent ransomware leak exposing blueprints and supplier data for the Kudankulam Nuclear Plant underscores the growing threat of cyber espionage. While the core reactor networks remained safe and isolated, breaches targeting third-party contractors expose operational vulnerabilities. It highlights that robust cybersecurity is paramount to safeguard critical infrastructure, national security, and public trust.

What is cybersecurity?

- **Cybersecurity** refers to the body of technologies, processes & practice of protecting computer systems, networks, programs, and data from digital attacks, unauthorized access, damage, or theft.
- Cybersecurity is not merely an IT issue. it is a **strategic necessity** that ensures the **confidentiality, integrity, and availability** (the **CIA Triad**) of a nation's critical information infrastructure.
- **Key Dimensions:**
 1. **Confidentiality:** Ensuring information is accessible only to authorized users.
 2. **Integrity:** Ensuring data is accurate and unaltered by unauthorized parties.
 3. **Availability:** Ensuring systems and data remain accessible when needed.
- **The Three Pillars of Cybersecurity:**



What are the major cyber threats faced by India?

1. **Ransomware Attacks:** Malicious software that encrypts/locks data, demanding ransom for release. Increasingly targets critical infrastructure and PSU contractors for e.g. the 2026 Kudankulam-linked breach.

2. **Attacks on Critical Information Infrastructure (CII):** Targeting power grids, nuclear facilities, banking systems, telecom networks, and transport systems for e.g. 2020 Mumbai power grid outage suspected to involve Chinese state-linked malware (RedEcho).
3. **State-Sponsored Cyber Espionage:** Attributed largely to China- and Pakistan-linked Advanced Persistent Threat (APT) groups targeting defence, government, and strategic sectors for intelligence gathering for e.g. China-linked **RedEcho** and Pakistan-linked **Transparent Tribe** continuously run target campaigns against the Indian defense sector, aerospace, and government networks.
4. **Cyberterrorism and Radicalisation:** Use of encrypted platforms and dark web by terrorist organisations for recruitment, propaganda, fundraising, and coordination.
5. **Data Breaches and Data Theft:** Theft of personal, financial, or corporate data from government portals, banks, e-commerce platforms, and healthcare systems. For e.g. AIIMS patient data breach, various Aadhaar-linked data leak controversies.
6. **Financial Cyber Fraud:** India is among the world's leading countries in digital payment volumes. However, a major concern arising from the rapid expansion of digital financial inclusion is the increasing incidence of cyber frauds, including UPI and digital payment frauds, phishing attacks, SIM-swap frauds, and banking trojans.
7. **Social Media Manipulation and Disinformation:** The spread of fake news, deepfakes, and coordinated inauthentic behaviour poses a significant threat to democratic processes, social harmony, and national security. Deepfake technology has intensified these challenges.
8. **Supply Chain and Third-Party Risks:** Attacks are increasingly entering organizations through third-party service providers or software supply chains. For e.g. Kudankulam 2026 breach – where sensitive data was compromised not from the core nuclear network, but from a contractor's third-party server.

What is the significance of cybersecurity for India's digital economy and governance?

1. **Protecting Economic Value and Growth:** The digital economy is a significant and growing part of India's GDP. It contributes **13.42% of GDP**. Cybersecurity is essential to protect this economic value from being eroded by financial crimes, data breaches, and ransomware attacks.
2. **Building Digital Trust and Resilience:** India's DPI stack – Aadhaar, UPI, DigiLocker, CoWIN, ONDC - handles billions of transactions and vast citizen data. A breach or systemic compromise could undermine public trust in the entire digital governance architecture that underpins DBT, financial inclusion, and service delivery.
3. **Enabling Trust in E-Governance:** Government services (income tax e-filing, e-courts, DigiLocker, GeM procurement) depend on citizens trusting that their data is secure. Cybersecurity breaches in government systems damage the legitimacy of "Digital India" as a governance model.
4. **Securing Critical Infrastructure:** Power grids, banking, telecom, transport, and nuclear facilities are increasingly getting connected to each other. A successful attack can cause cascading economic and safety consequences. Economic sectors like BFSI (banking, financial services, insurance) are prime targets given their centrality to GDP.
5. **National Security Dimension:** Cyberattacks are now a recognized tool of hybrid warfare. Espionage, sabotage of defence networks, and disinformation campaigns directly threaten sovereignty and internal security.
6. **Enabling India's Global Digital Leadership Ambitions:** India champions DPI exports (UPI stack, Aadhaar model) to Global South countries. Credible cybersecurity practices are essential to sustaining this soft-power and technology-diplomacy role e.g. G20 DPI agenda, India-UAE UPI linkages.

7. **Protecting Citizen Rights and Constitutional Values:** Post the **Justice K.S. Puttaswamy** judgment (2017) recognizing privacy as a fundamental right under Article 21, cybersecurity is integral to operationalizing the right to privacy in the digital realm, especially under the DPDP Act, 2023.
8. **Economic Cost of Cyber Incidents:** Cyberattacks impose direct costs (ransom, remediation, downtime) and indirect costs (reputational damage, regulatory penalties, loss of investor confidence). In 2024 alone, India reported cyber fraud losses exceeding **₹22,845 crore**, with over 36 lakh fraud cases logged.

What are the major challenges in ensuring cybersecurity in India?

1. **Fragmented Institutional Architecture:** Multiple agencies such as CERT-In, NCIIPC, I4C, RBI, SEBI, and TRAI are involved in cybersecurity. However, overlapping responsibilities and limited coordination among them often create confusion in incident response and accountability. Moreover, India lacks a single unified cybersecurity authority or national cyber command to coordinate efforts effectively.
2. **Weak Supply Chain and Third-Party Security:** Weak cybersecurity practices among contractors, vendors, and third-party service providers pose a major risk to critical infrastructure. The Kudankulam data leak exposed this vulnerability, highlighting the need for mandatory cybersecurity audits of vendors in strategic sectors.
3. **Legacy and Outdated IT Systems:** Many public sector systems, especially in critical infrastructure (power, railways, PSU banks), run on legacy software with unpatched vulnerabilities, increasing exposure to exploitation.
4. **Dependence on Foreign Technology:** A significant portion of India's cybersecurity infrastructure (estimated at **30-40%** in critical segments) depends on foreign "black-box" technologies. This creates supply chain risks in a volatile geopolitical environment and undermines strategic autonomy.
5. **Shortage of Skilled Cybersecurity Workforce:** India faces a significant shortage of trained cybersecurity professionals, limiting its ability to prevent, detect, and respond to cyber threats. The country has an estimated **300,000** cybersecurity professionals, but this falls far short of demand. A shortage of **1 to 1.5 million** skilled workers is projected, with about **39,000** positions currently unfilled.
6. **Low Cybersecurity Awareness and Cyber Hygiene:** A lack of awareness about cyber threats, weak passwords, unsafe online practices, and poor adherence to security protocols make individuals and organizations vulnerable to phishing, malware, identity theft, and financial fraud.
7. **Inadequate Regulatory and Legal Framework:** India's cybersecurity governance is constrained by an evolving regulatory framework that has not fully kept pace with the rapidly changing cyber threat landscape. The primary law governing cybercrime, the **Information Technology (IT) Act, 2000**, was enacted before the emergence of modern threats such as ransomware, deepfakes, AI-enabled cyberattacks, and large-scale data breaches.
8. **Rise of Sophisticated and Evolving Threats:** Ransomware-as-a-service, AI-generated phishing/deepfakes, and zero-day exploits evolve faster than defensive capacities. State-sponsored APT groups (often linked to China and Pakistan) possess resources and sophistication that outpace many Indian institutions' defensive capabilities.

What measures has the Government of India undertaken to strengthen India's cybersecurity architecture?

Institutions & Bodies	<ul style="list-style-type: none"> ● CERT-In (Indian Computer Emergency Response Team): The national nodal agency for responding to cybersecurity incidents. It issues alerts, conducts mock drills, coordinates response, and provides guidelines on security practices. ● NCIIPC (National Critical Information Infrastructure Protection Centre): Nodal agency for protecting Critical Information Infrastructure (CII). It provides threat intelligence and advice to sectors like power, banking, and transport. ● I4C (Indian Cybercrime Coordination Centre): Established by the MHA to combat cybercrime in a coordinated manner. It manages the National Cybercrime Reporting Portal and the Cyber Fraud Mitigation Centre. ● NCCC (National Cyber Coordination Centre): Operates as a control room to scan cyberspace for threats. It shares metadata with other agencies for coordinated action. ● NCSC (National Cyber Security Coordinator): Coordinates cyber security efforts among different agencies under the National Security Council Secretariat. ● CyMAC (Cyber Multi Agency Centre): A unified platform for real-time monitoring, threat intelligence sharing, and coordinated response among agencies like IB, CERT-In, and NCIIPC.
Legal, Regulatory and Policy Framework	<ul style="list-style-type: none"> ● IT Act, 2000 (amended 2008): Primary legislation criminalizing hacking, data theft, and cyberterrorism (Section 66F). ● Digital Personal Data Protection Act (DPDPA), 2023: This Act is a major step forward, creating a comprehensive framework for processing personal data, emphasizing accountability, informed consent, and mandatory breach notifications. ● National Cyber Security Policy, 2013: India's first comprehensive policy framework. It aims to create a secure cyber ecosystem, strengthen the regulatory framework, and train cybersecurity professionals. ● National Cyber Security Strategy: Envisages a 5-pillar approach: secure (large-scale digitization), strengthen (proactive defence), synergise (institutional coordination), skill (capacity building), and safeguard (citizen protection).
Capacity Building & Awareness	<ul style="list-style-type: none"> ● Cyber Surakshit Bharat (CSB) Initiative: A public-private partnership program that has trained over 1,662 Chief Information Security Officers (CISOs) and IT officials. ● CERT-In Training Programs: CERT-In trained 12,014 officials in 2024 on securing IT infrastructure and mitigating cyberattacks. ● Cyber Swachhta Kendra (CSK): A citizen-centric initiative that provides free botnet cleaning and malware removal tools, extending the vision of "Swachh Bharat" to cyberspace.

What should be the way forward?

1. **Building Domestic Cyber and AI Capacity:** India must build indigenous technology across models, data, and computing infrastructure, as there is “no other option” given the sensitive nature of national systems. This includes developing sovereign alternatives in cloud, email, and operating systems to reduce dependence on foreign supply chains and protect metadata.
2. **Unified and Updated Legal Framework:** Enact a comprehensive, dedicated **Cybersecurity Act** (moving beyond the IT Act, 2000) that addresses ransomware, AI-enabled threats, and critical infrastructure protection with clear penal and civil liability provisions. Finalize and adopt a revised **National Cyber Security Strategy** to replace the outdated 2013 policy, with clear timelines and measurable targets.
3. **Strengthening Institutional Coordination:** Establish a unified national cybersecurity authority to improve coordination among agencies such as CERT-In, NCIIPC, NSCS, and sectoral regulators. This would reduce fragmentation, ensure clear responsibilities, and provide a single point of accountability during cyber incidents.
4. **Building a Future-Ready Cyber Workforce:** India must invest in cybersecurity education, skill development, and continuous training to address the shortage of cyber professionals. Scale up dedicated cybersecurity education (undergraduate/postgraduate programs, CoEs) and public-private training partnerships to close the skilled workforce gap.
5. **Citizen Awareness and Cyber Hygiene:** Expand digital literacy and cyber awareness programmes such as Cyber Surakshit Bharat and ISEA, especially for first-time internet users, to promote safe online practices amid the rapid growth of smartphones and UPI-based transactions. Integrate basic cybersecurity education into school and college curricula.
6. **Technology and Infrastructure Modernization:** India must continuously upgrade its cybersecurity infrastructure by adopting advanced technologies such as Artificial Intelligence (AI), Machine Learning (ML), threat intelligence platforms, and secure cloud systems. Phase out legacy IT systems in critical infrastructure through time-bound modernization programs.

UPSC GS-3: Cybersecurity

Read More: [The Hindu](#)

India's Higher Education: Regulation and Reform – Explained Pointwise

India's higher education system has expanded rapidly, but access to affordable, quality seats remains limited. The **Viksit Bharat Shiksha Adhishthan (VBSA) Bill, 2025** proposes to replace the UGC, AICTE and NCTE with a single regulator. It is under review by a Joint Parliamentary Committee (JPC). The debate is whether another overarching regulator will improve quality or reduce it to compliance paperwork.

What is the VBSA Bill and India's regulatory architecture?

- **Proposal:** The Bill was introduced in the Lok Sabha on 15 December 2025 and referred to a 31-member JPC. It replaces the UGC, AICTE and NCTE with a single apex body, the Viksit Bharat Shiksha Adhishthan. It was earlier discussed as the Higher Education Commission of India (HECI) Bill.
- **Three councils:** The Standards Council sets minimum standards. The Regulatory Council handles regulation, coordination and global engagement. The Accreditation Council oversees accreditation.
- **Scope:** Legal and medical education stay outside the Bill and continue under separate laws.
- **Constitutional basis:** The Bill draws on Entry 66 of the Union List (coordination and standards in higher education). Education itself is on the Concurrent List.

- **Current regulators:** UGC, AICTE, NAAC and NCTE together make up the existing architecture.
- **Stated aim:** The government says it will simplify governance, reduce compliance burden and align the sector with National Education Policy 2020.
- **Status:** Reports in July 2026 said the JPC was set to back the Bill with safeguards on autonomy and federalism. The meeting to adopt its draft report was cancelled, so the final outcome is pending.

What recent developments are shaping India's higher education system?

Expansion of capacity	Universities rose from 760 (2014-15) to 1,289 (2023-24), a 69.6% increase. Colleges rose from 38,498 to 48,246. Gross Enrolment Ratio (GER) reached 30.0 in 2023-24, up from 23.7 in 2014-15.
Inclusion	Female enrolment rose from 1.57 crore (2014-15) to 2.24 crore (2023-24). Female GER stands at 31.2.
Role of private institutions	Private unaided colleges make up roughly 70% of all colleges. Private providers are now central to capacity, though quality varies
Student-centric financing	PM-Vidyalaxmi covers 860 quality HEIs and over 22 lakh students. It offers a 75% credit guarantee on loans up to ₹7.5 lakh. Families earning up to ₹8 lakh also get 3% interest subvention on loans up to ₹10 lakh.
Digital and blended learning	SWAYAM has crossed 6 crore enrolments. Under the 2021 UGC credit framework, institutions can offer up to 40% of courses through SWAYAM, and over 450 universities have adopted it.
Research push	Gross Expenditure on Research and Development from ₹60,197 crore (2010-11) to ₹1,27,381 crore (2020-21). The Anusandhan National Research Foundation (ANRF), created by the 2023 Act, targets ₹50,000 crore over 2023-28.
NEP reforms	Four-year undergraduate programmes with multiple entry and exit options are being rolled out. The Academic Bank of Credits stores and transfers credits across institutions.
Internationalisation	Foreign universities such as Deakin and Wollongong have set up campuses at GIFT City. IIT Delhi has opened an Abu Dhabi campus.

What are the key issues with India's higher education system?

- **Shortage of quality seats:** Talent exceeds the number of affordable quality seats. NEET alone draws over 20 lakh candidates for far fewer MBBS seats, so competition reflects scarcity of capacity rather than of talent.
- **Faculty vacancies:** Large vacancies at premier institutions raise teaching loads and weaken mentoring and research supervision. Expanding enrolment without faculty expands access but not quality.
- **Low research intensity:** GERD is only about 0.64% of GDP. Funding is concentrated in elite institutions, and most state universities and colleges have little research support.
- **Employability gap:** Rote-learning curricula leave graduates mismatched with market needs. One industry assessment (Mercer Mettl) found only 42.6% of graduates assessed were employable.
- **Unequal financial burden:** IIT students enjoy large implicit subsidies, but comparable students elsewhere do not. Loans alone create repayment pressure.
- **Brain drain:** Many high-performing students go abroad for study, taking academic talent and peer competition away from domestic institutions.

How does regulation stifle HEIs?

- **Compliance over integrity:** When external supervision substitutes for internal integrity, HEIs ask what minimum paperwork is needed rather than what is intrinsically right. Classrooms can meet every norm on paper while intellectual engagement stays dormant.
- **Optimising for the regulator:** Teachers document evidence for annual self-assessment reports instead of asking what makes a class worthwhile. Institutions focus on maximising ranking and accreditation scores, producing a “paper blizzard” of digital documents.
- **Overlapping and inconsistent rules:** Regulations from UGC, AICTE, NAAC and NCTE often conflict, and clarifications then create fresh irregularities. For example, UGC’s 2018 regulations require a 40-hour working week but only five hours daily availability on campus.
- **Overlapping oversight and delays:** Multiple bodies create red tape that delays curriculum updates, discourages multidisciplinary experimentation and slows responses to fields such as AI and green energy.
- **Trust deficit and risk aversion:** Assembly-line norms and surveillance-style monitoring push teachers towards “safe” conventional teaching, and innovation is stifled.
- **The IIT/IISc comparison:** The IISc, IITs, IIMs, NITs and IISERs largely operate outside the UGC-AICTE regime. They set their own curricula, recruitment processes and resource use, yet they are the best-performing institutions. This suggests intensive regulation is not what drives quality. Critics fear that bringing them under the VBSA could harm them too.
- **Federalism concerns:** Several states and universities say the Bill centralises power and limits state autonomy over their own universities, which educate most Indian students.

What measures can strengthen India’s higher education system?

- **Light-touch, outcome-based regulation:** Regulation should move from inputs and paperwork to learning outcomes, with a single window for compliance and no duplicate reporting. Autonomy should be tied to credible quality, not blanket inspection.
- **Safeguards in the VBSA framework:** The JPC should secure academic representation, stakeholder consultation and a meaningful state role. It should keep institutional autonomy intact for high-performing institutions.

- **Faculty capacity:** Fast-track recruitment, offer market-aligned pay and research start-up grants, and build campus infrastructure so top talent stays in India.
- **Decentralised research funding:** Extend ANRF grants, incubation labs and seed funding to state universities and affiliated colleges.
- **Skill integration:** Make internships and real-world projects mandatory, and co-create curricula with industry.
- **Student-centric financing:** Scale up PM-Vidyalaxmi and scholarships for weaker sections, and regulate fees in self-financing institutions to cap hidden costs.
- **Diversify university financing:** Encourage alumni philanthropy, endowments, industry-sponsored research, consultancy and technology transfer through tax and regulatory incentives.
- **Leverage technology:** Let leading institutions jointly offer digital courses in AI, semiconductors, biotechnology and clean energy. Combine them with local labs and mentoring so students need not relocate.

Conclusion: India's challenge is scale, quality and affordability. The new regulator will succeed only if it frees HEIs to be bolder rather than reducing quality to updating inspection portals, and if it is backed by faculty, research funding and student financing.

Read more- [TH](#)

UPSC Syllabus- GS 2– Issues related to Education

India's Rising Supercomputing Ecosystem – Explained Pointwise

India started building its own supercomputers with **PARAM 8000** in the early 1990s. Since 2015, the **National Supercomputing Mission (NSM)** has turned this into a national network. As of September 2026, India has 40 supercomputers with a combined speed of 68 petaflops (PF).

The topic is in the news because the Council of Scientific & Industrial Research (CSIR) is holding the **Emerging Science, Technology and Innovation Conclave (ESTIC-2026)** in New Delhi from 27 to 29 October 2026. Supercomputing is one of its themes.

What are supercomputers?

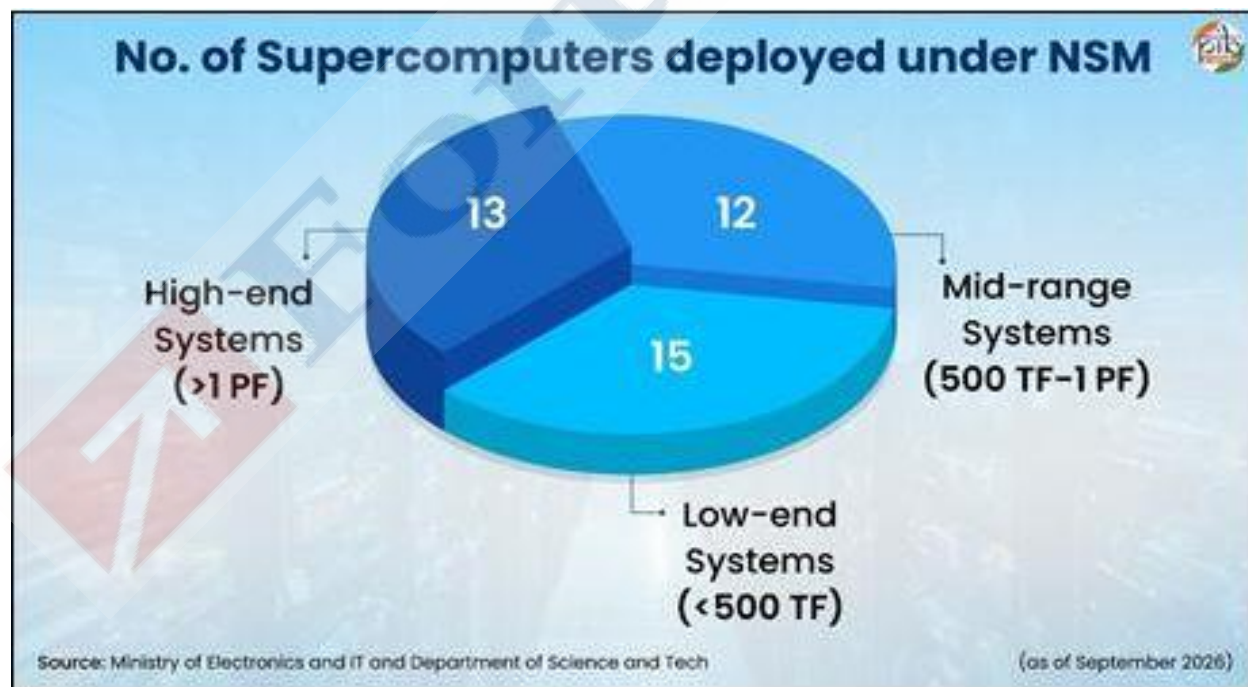
- **Definition:** Supercomputers are high-performance computing (HPC) systems designed to process complex calculations at exceptional speeds.
- **How they work:**
 - **Parallel processing:** They combine many processors or computing nodes that work on a single problem at the same time, so they are also called parallel computers.
 - **High-speed interconnects:** Fast connections between nodes let them exchange data during large-scale computations.
- **How their power is measured:** Performance is measured in FLOPS (Floating Point Operations Per Second), which counts the calculations done in one second.
 - **TeraFLOPS (TF):** One trillion calculations per second.
 - **PetaFLOPS (PF):** One quadrillion calculations per second.
 - **ExaFLOPS:** One quintillion calculations per second.

- **Global benchmark:** The world's fastest supercomputer reaches about 2.19 exaflops in 2026, or about 2.19 quintillion calculations per second.
- **Why India needs them:** India generates nearly 20% of the world's data. Artificial Intelligence (AI), weather forecasting and space research all need heavy computing capacity.

What is the National Supercomputing Mission (NSM)?

- **Launch:** NSM was launched in April 2015 with an outlay of about ₹4,500 crore.
- **Nodal bodies:** It is jointly steered by the Department of Science and Technology (DST) and the Ministry of Electronics and Information Technology (MeitY).
- **Implementing agencies:** The Centre for Development of Advanced Computing (C-DAC), Pune, and the Indian Institute of Science (IISc), Bengaluru, implement it.
- **Objectives:** It aims to build self-reliance in supercomputing and promote HPC for research and societal problem-solving. It also seeks a globally competitive supercomputing ecosystem in India, in line with Aatmanirbhar Bharat.
- **"Build approach":** It has three concurrent phases to create indigenous infrastructure:
 - **Assembly:** Putting together supercomputers in India.
 - **Manufacturing:** Producing the systems domestically.
 - **Design and manufacturing support:** Developing indigenous designs and the capability to build them.
- **Backbone network:** The National Knowledge Network (NKN) connects supercomputing facilities across academic and research institutions through a high-speed national network.

What is the current status of the Mission?



Source- PIB

- **Capacity:** India has deployed 40 supercomputers with a combined capacity of 68 PF as of September 2026.
- **Target:** NSM plans 50 supercomputers with cumulative capacity above 123 PF across academic and research institutions.
- **Evolution of the PARAM series:** PARAM 8000, developed by C-DAC and unveiled in 1991, ran at 1 gigaflop and marked India's entry into indigenous supercomputing. Later systems such as PARAM Yuva reached 54 teraflops.
- **Indigenous components:** The Mission has developed these components:
 - **Rudra servers:** Designed by C-DAC, with technology transferred to Indian Electronics Manufacturing Services (EMS) partners for manufacturing.
 - **PARAM Rudra supercomputers:** About 6,000 Rudra servers are deployed, with another 1,500 under manufacturing.
 - **High-speed interconnect:** Tested at 100 Gbps and 200 Gbps.
 - **Cooling technology:** Developed and demonstrated, and now in the deployment stage.
 - **HPC system software stack:** Developed and integrated with the systems.
 - **PARAM Shavak:** A "supercomputing-in-a-box" for students and researchers in engineering colleges and universities.
- **User base:** NSM infrastructure has supported over 16,000 researchers, including more than 2,900 PhD scholars, across over 400 institutions. It has run more than 1.5 crore compute jobs and contributed to over 1,990 research publications.
- **Link to the SDGs:** NSM contributes to 11 United Nations Sustainable Development Goals (SDGs).

What are the national applications of supercomputing under NSM?

- **Genomics and drug discovery platform:** Screens large sets of molecules to find drugs. It was used during COVID-19 to screen existing drugs and predict side effects such as heart risk.
- **Urban Environment Decision Support System:** Models weather and air pollution so cities can prepare for heavy rain and pollution.
- **Seismic imaging suite:** Maps subsurface structures for oil and gas exploration, with performance matching commercial tools.
- **Flood early warning system:** Forecasts floods up to two days in advance and is being used for the Mahanadi river basin.
- **Forest fire spread model:** Combines satellite remote sensing with computational models. It has been tested in the Sikkim Himalayas.
- **Materials science and computational chemistry:** Simulates atoms, molecules and alloys to study their behaviour.
- **Institutional users:** HPC applications support the India Meteorological Department (IMD), Central Water Commission (CWC), Central Pollution Control Board (CPCB) and the Ministry of AYUSH.

What is the significance of India's supercomputing ecosystem?

- **Scientific advancement:** HPC speeds up research in climate, space, healthcare and engineering by processing massive datasets and running complex simulations.
- **Technological self-reliance:** Indigenous servers, software, networking and cooling reduce dependence on imported technologies.

- **Strategic autonomy:** Supercomputers support strategic applications and give India sovereign capability in a critical technology.
- **Evidence-based governance:** Forecasting and simulation tools help agencies such as IMD, CWC and CPCB plan better and protect lives and infrastructure.
- **Manufacturing base and jobs:** Transferring server technology to Indian Electronics Manufacturing Services (EMS) partners builds domestic manufacturing capability.
- **Wider access to computing:** Training and portals (faculty programmes with AICTE, the SWAYAM HPC course, the HPC Shiksha portal) extend HPC skills beyond computer science departments.
- **Foundation for AI:** Growing demand for AI makes computing infrastructure a base for India's digital economy.

How is NSM linked to India's other technology missions?

IndiaAI Mission (AI compute)	<ul style="list-style-type: none"> ● Outlay: ₹10,372 crore over five years, implemented by the IndiaAI Independent Business Division under the Digital India Corporation. More than ₹4,500 crore is for compute. ● GPUs: Over 38,000 GPUs are available to startups and academia at affordable rates. ● Difference from NSM: NSM compute mainly meets public sector and research needs, while IndiaAI serves startups, MSMEs and academia building AI models. ● Shared dependence: GPUs are primarily made in one country, so both missions rely on imported accelerators.
India Semiconductor Mission (ISM)	<ul style="list-style-type: none"> ● ISM 1.0: Launched in December 2021 with ₹76,000 crore. Twelve manufacturing units are approved, and three (Micron, Kaynes and CG Semi) have started commercial production. ● ISM 2.0: Approved by the Cabinet in July 2026 with ₹1,27,500 crore, covering equipment, materials, chemicals, gases, chip design and packaging. ● Link to NSM: NSM builds the systems and servers, while ISM aims to supply the chips they run on.
National Quantum Mission (NQM)	<ul style="list-style-type: none"> ● Outlay: ₹6,003 crore for 2023-24 to 2030-31, run by the Department of Science and Technology. ● Domains: Quantum computing (50 to 1,000 qubits within eight years), quantum communication, sensing and metrology, and quantum materials and devices. ● Link to NSM: Quantum computing and supercomputing both serve advanced simulation and research, so the two

	missions can share skills and infrastructure. This link is my analysis, not an official statement
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What are the challenges?

- **Gap with global leaders:** India's 68 PF across all 40 systems is only about 3% of the roughly 2,190 PF (2.19 exaflops) of the world's fastest machine.
- **Pace of the target:** The Mission aims for 50 systems and over 123 PF, but the current capacity is about 55% of that target.
- **Skewed capacity:** Only 13 of the 40 systems exceed 1 PF, and 15 are below 500 TF. Many institutions therefore still depend on modest systems.
- **Dependence on imported core components:** The release highlights servers, interconnects and cooling, but does not mention processors or accelerators (GPUs). These remain a likely area of dependence, which links the challenge to ISM and IndiaAI.
- **Energy needs:** Supercomputers consume a lot of power, so cooling and energy efficiency are major operational concerns.
- **Skills gap:** 16,000 researchers is a small user base for a country of India's size. Wider HPC literacy, especially outside elite institutions, is still needed.
- **Access and utilisation:** Systems sit in a limited set of institutions, so equitable access for smaller colleges, startups and industry needs managing.
- **Coordination across missions:** Parallel missions under different ministries risk duplicating compute capacity unless their roadmaps are aligned.

What should be the way forward?

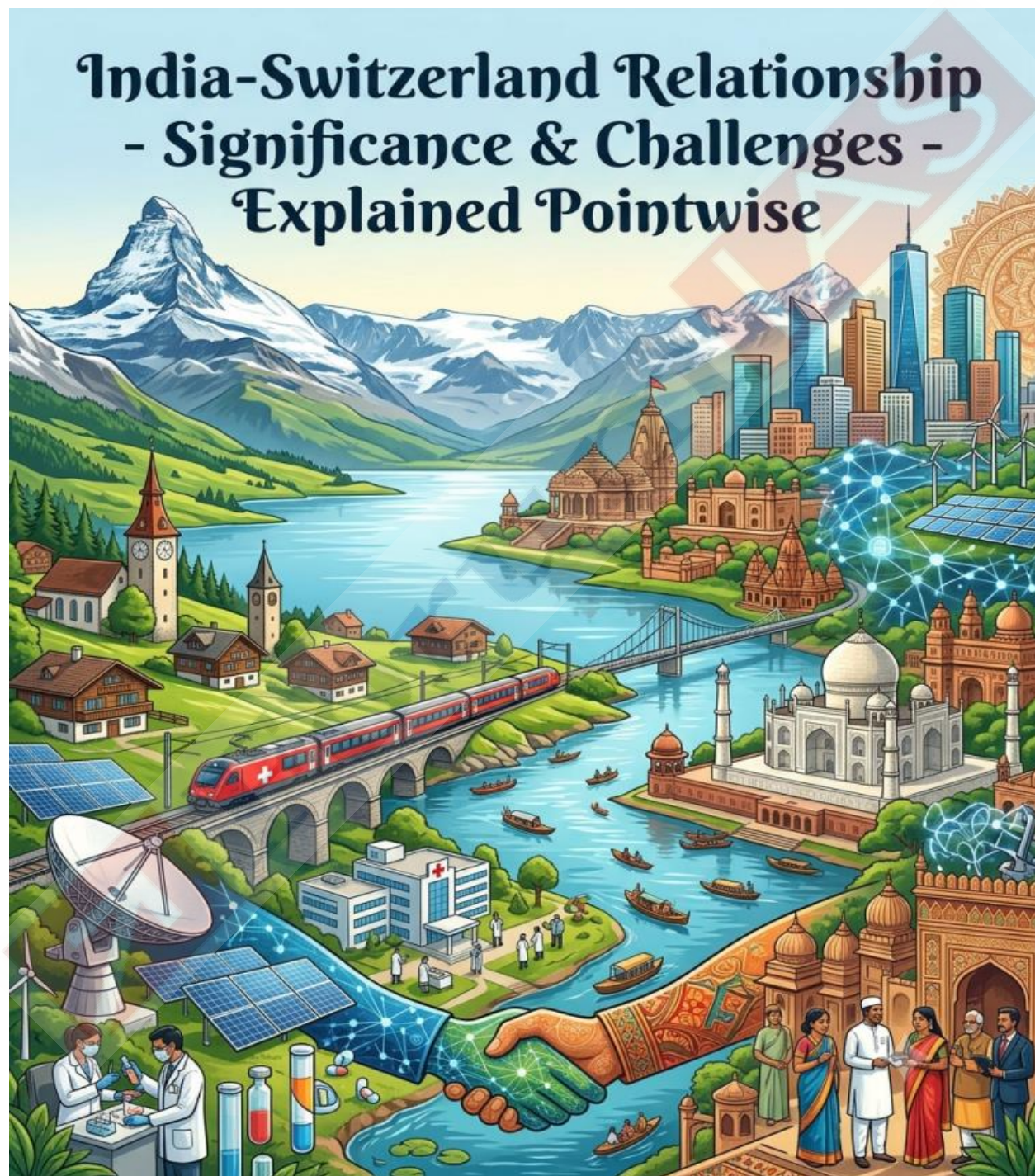
- **Expand capacity:** Complete the 50-system target and build faster, more energy-efficient systems.
- **Deepen indigenous capability:** Strengthen Indian hardware and software, including the design of core components, rather than only assembling.
- **Align the missions:** Coordinate NSM, IndiaAI, ISM and NQM through shared roadmaps, so that chips, systems and software are built as one stack.
- **Integrate AI and HPC:** Combine the two to address weather and climate, healthcare, agriculture, energy, drug discovery and engineering problems.
- **Widen access:** Open HPC resources to researchers, academia, industry and startups through the National Knowledge Network (NKN) and the HPC Shiksha portal.
- **Build skills:** Scale up workshops, hackathons, bootcamps and faculty training so the skilled user base grows.
- **Promote collaboration:** Bring together government, academia, industry, startups and research institutions to turn computing into practical solutions.
- **Prioritise efficiency and reliability:** Focus on energy-efficient, reliable systems and indigenous cooling.

Conclusion: India has moved from a single indigenous machine in 1991 to a Mission-led network of 40 systems built largely with homegrown technology. The next phase depends on faster systems, deeper self-reliance in core components and tighter alignment with the semiconductor, AI and quantum missions, so that high-performance computing becomes a practical tool for growth.

Read more- [PIB](#)

UPSC Syllabus- GS 3- Science & Technology

India-Switzerland Relationship – Significance & Challenges – Explained Pointwise



India and Switzerland have recently signed agreements on mobility aimed at facilitating longer-duration visas and promoting the exchange of young professionals. The two countries have also agreed to strengthen cooperation in the defence and nuclear energy sectors.

What is the significance of Switzerland for India & India for Switzerland?

For India:

1. **Trade & investment:** Switzerland is an important economic partner and a major source of foreign investment, technology and financial services. Greater Swiss investment can also promote technology transfer, manufacturing, employment generation and integration of Indian firms into global value chains.
2. **Technology & innovation:** Switzerland is a global leader in precision engineering, pharmaceuticals, biotechnology, advanced manufacturing and research, making technological cooperation important for India's industrial development.
3. **Financial hub:** Switzerland is a global financial centre with expertise in banking, wealth management, insurance and financial services. Its financial institutions and investment ecosystem can support capital flows, financial innovation and investment in India.
4. **Education & research:** Swiss universities and research institutions offer expertise in areas such as engineering, pharmaceuticals, biotechnology, climate science and advanced technologies. Academic exchanges, joint research programmes and partnerships can help India access advanced knowledge and strengthen its innovation ecosystem.
5. **EFTA partnership:** Switzerland is a key member of EFTA, making it important for India's implementation of the India-EFTA TEPA and attracting greater investment.

For Switzerland:

1. **Large and growing market:** India offers Switzerland access to a vast and rapidly expanding consumer market, supported by a growing middle class, rising incomes and increasing demand for high-quality goods and services. This creates significant opportunities for Swiss companies in sectors such as pharmaceuticals, machinery, financial services, luxury goods and precision engineering.
2. **Investment opportunities:** India's large consumer market, improving business environment and infrastructure expansion offer significant opportunities for Swiss companies, while the India-EFTA TEPA can further facilitate investment flows.
3. **Diversification:** Deeper engagement with India enables Switzerland to diversify its trade and investment partnerships beyond traditional European markets.
4. **Skilled workforce & talent:** India's large pool of skilled professionals, scientists, engineers and IT specialists provides Switzerland with access to high-quality human capital. Greater cooperation in education, research, innovation and professional mobility can help Swiss industries address skill shortages while fostering knowledge exchange and technological collaboration.
5. **Strategic European-Asian link:** India serves as an important bridge between Europe and the Indo-Pacific, offering Switzerland greater access to one of the world's fastest-growing major economies. Deeper engagement with India can help Switzerland diversify its economic partnerships & expand its presence in Asian markets.

What are the major challenges in India-Swiss relations?

1. **Trade imbalance:** India-Switzerland trade has historically been marked by an imbalance, with Switzerland enjoying a significant trade surplus, partly due to India's imports of Swiss gold, precious metals, machinery, pharmaceuticals and other high-value goods.
2. **Investment concerns:** Although Switzerland is an important source of foreign investment for India, Swiss investors may face concerns related to regulatory complexity, taxation, bureaucratic procedures and policy uncertainty. Differences in regulatory standards and compliance requirements can also increase the cost of doing business.
3. **Tax and financial transparency:** Differences and concerns related to taxation, cross-border financial flows and the disclosure of financial information have historically been sensitive areas in India-Switzerland relations. India has sought greater transparency regarding Indian assets held in Swiss financial institutions and stronger cooperation against tax evasion and illicit financial flows.
4. **Intellectual property rights (IPR):** Swiss companies, particularly in pharmaceuticals, chemicals and high-technology sectors, seek strong protection of patents and other intellectual property. India, while strengthening its IPR framework, also seeks to balance patent protection with affordable access to medicines, technology transfer and public interest.
5. **Limited diversification of economic ties:** India-Switzerland relations have traditionally been concentrated around trade, investment, banking and financial services. Cooperation in emerging areas such as digital technologies, artificial intelligence, green technology, advanced manufacturing and strategic technologies remains relatively underdeveloped.
6. **Implementation of TEPA commitments:** Effective implementation of the India-EFTA Trade and Economic Partnership Agreement (TEPA), particularly its investment and employment-related commitments, requires sustained coordination.

What are the key areas of cooperation between India & Switzerland?

1. **India-EFTA TEPA:** Switzerland, as an EFTA member, is central to the implementation of the India-EFTA Trade and Economic Partnership Agreement, which seeks to expand trade and investment ties.
2. **Corporate Integration:** Over 300 Swiss firms operate in India across precision engineering, pharmaceuticals, chemicals, and banking, while Indian IT giants and global capability centers (GCCs) support Swiss enterprises.
3. **Science, technology and innovation:** The **Indo-Swiss Joint Research Programme (ISJRP)** supports collaborative research in areas such as life sciences, engineering, social sciences and materials science. Indian institutions such as **IITs and IISc** collaborate with Swiss universities and research institutions on research projects. India's role as an Associate Member State at CERN in Geneva fosters high-energy particle physics research and technology co-development.
4. **Education and skill development:** Indo-Swiss Joint Research Programme (ISJRP) supports collaborative research between institutions of the two countries, while Swiss expertise in dual vocational education and training (VET) provides opportunities for strengthening India's skill-development ecosystem.
5. **Pharmaceuticals and healthcare:** India has a strong generic-drug and pharmaceutical manufacturing base, while Switzerland has globally competitive pharmaceutical research and innovation. Novartis and Roche, two major Swiss pharmaceutical companies, have a significant presence and operations in India, while Indian pharmaceutical companies such as Sun Pharma and Dr. Reddy's Laboratories have expanded their international presence, including in Switzerland.
6. **Tourism and people-to-people ties:** Switzerland attracts a large number of Indian tourists, while Indian culture, cuisine and cinema have created familiarity with India among Swiss citizens. Bollywood's association with Swiss locations, particularly through films, has further strengthened Switzerland's popularity among Indian tourists.

7. **Multilateral cooperation:** Both countries work together within the United Nations on sustainable development and international peace, while Switzerland's engagement with institutions such as the WTO provides avenues for coordination on rules-based international trade. They also cooperate on global initiatives relating to climate action and environmental sustainability.

What should be the way forward?

1. **Deepen TEPA implementation:** India and Switzerland should ensure effective implementation of the India-EFTA Trade and Economic Partnership Agreement (TEPA) by reducing regulatory and non-tariff barriers, improving market access and facilitating customs procedures.
2. **Diversify economic cooperation:** Expand cooperation beyond traditional sectors such as finance and pharmaceuticals into AI, semiconductors, green technology, advanced manufacturing and digital technologies.
3. **Promote Swiss investment in India:** India should create a more predictable and investor-friendly environment for Swiss companies by simplifying regulatory procedures, ensuring policy stability, improving ease of doing business and strengthening investment facilitation mechanisms.
4. **Strengthen research partnerships:** India and Switzerland should expand joint research and innovation programmes by connecting Indian institutions such as IITs, IISc and CSIR laboratories with Swiss universities and research institutions. Greater collaboration in artificial intelligence, biotechnology, pharmaceuticals, clean energy, climate science, precision engineering and advanced materials can promote knowledge exchange and technological innovation.
5. **Strengthen financial cooperation:** India and Switzerland should deepen cooperation in fintech, digital payments, sustainable finance, wealth management and financial regulation. Switzerland's expertise in global financial services can complement India's rapidly expanding digital financial ecosystem.
6. **Strengthen multilateral coordination:** India and Switzerland should enhance coordination in multilateral forums such as the UN, WTO and other international institutions on issues of common interest. Cooperation can focus on sustainable development, climate change, international trade, global health and reform of multilateral institutions.
7. **Enhance people-to-people ties:** India and Switzerland should strengthen tourism, educational exchanges, academic mobility, cultural cooperation and professional exchanges. Facilitating student and researcher mobility, promoting direct tourism links and encouraging cultural exchanges can deepen mutual understanding and provide a stronger people-centric foundation for bilateral relations.

Conclusion: India and Switzerland should build on their economic complementarities by moving towards a broader, technology-driven and sustainability-oriented partnership, with TEPA serving as an important platform for deeper bilateral engagement.

Read More: [Indian Express](#)

UPSC GS-2: International Relations

Circular Economy – Significance & Challenges – Explained Pointwise



India's resource challenge has become increasingly acute in recent years. This raises an important question: whether the country's future resource needs will be met predominantly through greater extraction and import of virgin resources, or increasingly through recovering and reusing materials already embedded in the domestic economy by adopting a circular economy model.

What is a circular economy? How does it differ from the traditional linear economic model?

- A circular economy is an economic model that aims to minimise waste and maximise the reuse, repair, refurbishment and recycling of products and materials. It seeks to keep resources in use for as long as possible while reducing pressure on natural resources and the environment.

	Linear Economy	Circular Economy
Basic model	Take → Make → Dispose	Reduce → Reuse → Repair → Recycle
Resource Use	Relies heavily on continuous extraction of finite raw materials.	Minimizes raw extraction by prioritizing recycled and renewable inputs.
Value Retention	Product value drops to zero once used or discarded.	Value is preserved or recovered through repair, resale, and remanufacturing.

Waste Management	Waste is an unavoidable byproduct sent to landfills or incinerators.	Waste is eliminated by design; one process's output becomes another's input.
Environmental Impact	High carbon footprint, rapid resource depletion, severe ecosystem damage.	Lower emissions, reduced biodiversity loss, and active ecosystem regeneration.

What are the key principles of a circular economy?

1. **Design out waste and pollution:** Products should be designed to minimise waste, pollution and the use of hazardous materials throughout their lifecycle.
2. **Keep products and materials in use:** Products should remain useful for as long as possible through reuse, repair, refurbishment, remanufacturing and recycling.
3. **Regenerate natural systems:** Economic activities should restore rather than continuously degrade natural resources and ecosystems.
4. **Resource efficiency:** Maximum economic value should be obtained from minimum quantities of raw materials, energy and water.
5. **Extended product life:** Products should be durable, repairable and upgradeable to reduce premature disposal.
6. **Waste as a resource:** Waste from one process should become an input for another wherever technically and economically feasible.
7. **Renewable and sustainable inputs:** Greater reliance should be placed on renewable energy and sustainably sourced materials to reduce dependence on finite resources.

What is the significance of the circular economy for sustainable development in India?

1. **Conserves natural resources:** The circular economy promotes the reuse, repair, refurbishment and recycling of products and materials, thereby reducing the need for continuous extraction of virgin resources. By extending product lifecycles and recovering valuable materials from waste, it helps conserve minerals, water, forests and other natural resources.
2. **Reduces waste and pollution:** Circular economy minimises pollution by reducing the need for continuous extraction of raw materials and energy-intensive production. Thus, it contributes to cleaner production, better waste management and environmental sustainability.
3. **Supports climate goals:** A circular economy helps achieve climate goals by reducing resource extraction, energy consumption and waste generation, thereby lowering greenhouse-gas emissions. By promoting resource efficiency and sustainable consumption, the circular economy complements India's efforts towards low-carbon and climate-resilient development.
4. **Promotes sustainable industrialisation:** The circular economy promotes sustainable industrialisation by encouraging industries to adopt resource-efficient production, eco-friendly product design and cleaner technologies. It also encourages industries to design products with longer lifespans and recyclable components, thereby improving resource productivity and reducing environmental costs.
5. **Reduces import dependence:** A circular economy can reduce India's dependence on imported raw materials by promoting the recovery, reuse and recycling of valuable resources from discarded products and industrial waste. For e.g. recovering metals from electronic waste, batteries and end-of-life vehicles can reduce the need for fresh mineral extraction and imports.

6. **Promotes sustainable consumption:** A circular economy promotes responsible and sustainable consumption by encouraging people to reduce unnecessary consumption and adopt practices such as reuse, repair, sharing, refurbishment and recycling. This helps conserve resources, reduce environmental pressure and promote sustainable lifestyles.
7. **Supports inclusive growth:** The circular economy can promote inclusive growth by creating employment and livelihood opportunities across recycling, repair, refurbishment, remanufacturing and waste management. It can also help integrate informal waste workers into formal value chains, improving their incomes, working conditions and access to social security.
8. **Helps achieve SDGs:** The circular economy directly supports **SDG 12 (Responsible Consumption and Production)** by promoting efficient resource use, waste reduction, recycling and sustainable production. It also contributes to **SDG 13 (Climate Action)** by reducing emissions, **SDG 11 (Sustainable Cities and Communities)** through better waste management, and **SDG 8 (Decent Work and Economic Growth)** by creating green employment opportunities.

What are the major challenges in transitioning from a linear economy to a circular economy in India?

1. **Low awareness and behavioural change:** A major challenge is the persistence of the “use-and-dispose” mindset among consumers and businesses. Limited awareness about the benefits of repair, reuse, recycling and responsible consumption reduces demand for circular products and services.
2. **Inadequate waste-management infrastructure:** India faces gaps in waste segregation, collection, transportation, recycling and scientific disposal infrastructure. Poor segregation at source often contaminates recyclable materials, reducing their recovery value. Limited material recovery facilities, recycling capacity and organised waste-processing systems further hinder the efficient reuse of resources, making the transition to a circular economy difficult.
3. **High informal-sector dependence:** India's waste-management and recycling systems depend significantly on informal workers such as waste pickers, scrap collectors and small-scale recyclers. However, their activities are often fragmented, unregulated and poorly integrated with formal waste-management systems.
4. **Limited recycling and recovery technologies:** India faces gaps in advanced technologies for recycling, material recovery, remanufacturing and waste processing. Many waste streams, particularly e-waste, plastics and construction waste, require specialised technologies and skilled manpower for efficient recovery.
5. **High initial costs:** Transitioning to a circular economy often requires significant upfront investment in eco-friendly technologies, recycling infrastructure, resource-efficient machinery and redesigning products for reuse and repair. These costs can be particularly challenging for MSMEs, which may have limited access to finance and technology.
6. **Weak implementation and enforcement:** Although India has introduced measures such as Extended Producer Responsibility (EPR) and waste-management rules, gaps in monitoring, compliance and enforcement remain a challenge.
7. **Fragmented supply chains:** India's circular economy is constrained by fragmented supply chains, where manufacturers, consumers, recyclers, waste collectors and processors often operate in isolation. This makes the collection, segregation, tracking and recovery of materials difficult and reduces the efficiency of recycling and reuse.

What steps has the Government of India taken to promote a circular economy?

1. **Resource Efficiency and Circular Economy (RECE):** NITI Aayog has promoted a Resource Efficiency and Circular Economy approach through policy frameworks and sector-specific initiatives. It focuses on reducing virgin resource use and promoting reuse, repair, refurbishment and recycling.

2. **Extended Producer Responsibility (EPR):** EPR makes producers responsible for managing products and packaging after their useful life. EPR frameworks have been introduced for plastic packaging, e-waste, batteries and used tyres.
3. **Plastic Waste Management Rules:** The government has strengthened plastic waste management through measures such as source segregation, recycling and EPR for plastic packaging. Single-use plastic items identified as having low utility and high littering potential have also been prohibited.
4. **E-Waste Management Rules, 2022:** The rules promote formal recycling, EPR and environmentally sound management of electronic waste. Producers are assigned recycling targets and must meet specified EPR obligations.
5. **Battery Waste Management Rules, 2022:** These establish EPR for waste batteries and promote their collection, recycling and recovery of valuable materials.
6. **Vehicle Scrappage Policy:** Incentivizes the phasing out of unfit and polluting vehicles. It standardizes the creation of Registered Vehicle Scrapping Facilities (RVSFs) and Automated Testing Stations to recover high-purity steel, aluminum, and copper.
7. **Mission LiFE:** Introduced as a global initiative, Mission LiFE shifts the focus to demand-side circularity by nudging individuals and communities toward mindful consumption rather than mindless utilization. It promotes circular habits such as repair, reuse, reducing plastic reliance, and extending product lifespans at the household level.
8. **Swachh Bharat Mission – Urban 2.0:** Focuses on 100% source segregation of waste, setup of automated Material Recovery Facilities (MRFs), bio-remediation of legacy dumpsites, and processing of municipal solid waste.

What should be the way forward for India to achieve a more efficient and sustainable circular economy?

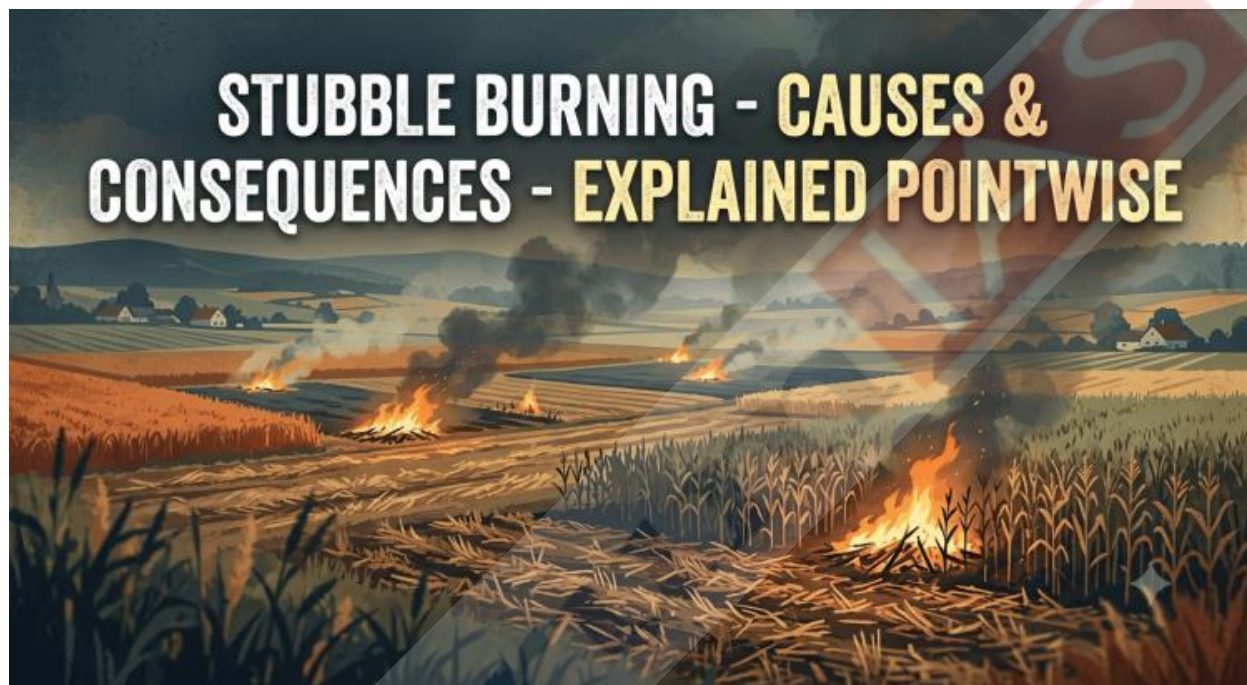
1. **Strengthen Extended Producer Responsibility (EPR):** Improve monitoring and enforcement of EPR to ensure producers take responsibility for the entire lifecycle of their products.
2. **Promote eco-design:** Encourage manufacturers to design products that are durable, repairable, reusable, upgradeable and recyclable, reducing waste at the source.
3. **Develop recycling infrastructure:** Invest in modern facilities for waste segregation, material recovery, recycling and resource extraction, particularly in smaller cities and rural areas.
4. **Formalize and Protect Informal Workers:** Integrate informal waste pickers and *kabadiwalas* into municipal material recovery systems through formal licensing, safety equipment, fair wage guarantees, and health benefits.
5. **Improve supply-chain integration:** Create stronger linkages between producers, consumers, recyclers and waste processors, supported by digital platforms for material tracking and traceability.
6. **Strengthen consumer awareness:** Promote sustainable consumption through “reduce, reuse, repair and recycle” campaigns and encourage responsible purchasing behaviour.
7. **Empower Recycling MSMEs:** Simplify compliance and expand targeted financial support (such as capital subsidies and technology transfer) for Micro, Small, and Medium Enterprises handling localized sorting, repair, and primary reprocessing.
8. **Institutionalize Right to Repair:** Expand “Right to Repair” regulations to mandate that manufacturers provide affordable spare parts, repair manuals, and software support to consumers, extending product lifespans and reinforcing a culture of maintenance.

Conclusion: India needs to move from a “**take-make-dispose**” model towards a “**reduce-reuse-repair-recycle-regenerate**” framework. A combination of policy enforcement, technological innovation, private-

sector participation and behavioural change can make circularity an integral part of India's sustainable growth strategy.

UPSC GS-2: Indian Economy
Read More: [The Statesman](#)

Stubble Burning – Causes & Consequences – Explained Pointwise



Stubble burning has emerged as a major environmental and public health concern in North India, particularly during the post-harvest season. Driven by time constraints, technological limitations and economic compulsions, the practice contributes to seasonal air pollution, highlighting the need for sustainable crop residue management.

What is stubble burning?

- Stubble burning refers to the practice of setting fire to the leftover crop residues, such as paddy stubble, after harvesting to clear fields quickly for the next cropping cycle.
- It is widely practised in Punjab, Haryana and Uttar Pradesh, particularly after paddy harvesting, and contributes to air pollution in northern India.

What are the major causes of stubble burning in India?

1. **Short window between crops:** Farmers in Punjab and Haryana have limited time between paddy harvesting and wheat sowing. To prepare fields quickly for the next crop, they often resort to stubble burning as a cheap and time-saving method.

2. **High cost of alternatives:** Machinery for crop-residue management, such as Happy Seeders and Super SMS systems, involves high purchase and operational costs, making it difficult for small and marginal farmers to adopt these alternatives.
3. **Labour shortage:** The migration of agricultural labourers to urban areas and rising labour costs make manual removal of crop residue difficult and expensive. Consequently, farmers often resort to stubble burning as a quick and low-cost method of clearing fields.
4. **Mechanised harvesting:** Combine harvesters cut and thresh crops quickly but leave large quantities of stubble and loose crop residue in the fields. Its removal requires additional machinery, time and expenditure, encouraging farmers to burn the residue as a quick and inexpensive method of field clearance.
5. **Monocropping pattern:** The widespread cultivation of paddy in Punjab, Haryana and western Uttar Pradesh generates large quantities of crop residue after harvesting, making its timely disposal a major challenge for farmers.
6. **Lack of economic incentives:** Crop residue management involves additional costs for machinery, labour, transportation and storage, while farmers often receive little immediate financial return from alternative uses of stubble. Consequently, burning remains a cheaper and quicker option for many farmers.
7. **Groundwater and policy factors:** Policies such as the Punjab Preservation of Subsoil Water Act, 2009, delayed paddy transplantation to conserve groundwater. However, this also delays harvesting, leaving farmers with a shorter window to prepare fields for wheat sowing. **For e.g.** farmers in Punjab and Haryana may resort to stubble burning to clear fields quickly before the next cropping season.

What are the environmental and health impacts of stubble burning?

Environmental Impacts:

1. **Air pollution:** Stubble burning releases large quantities of particulate matter (PM_{2.5} and PM₁₀), carbon monoxide and other pollutants, deteriorating air quality. **For e.g.** smoke from paddy-residue burning in Punjab and Haryana contributes to seasonal air pollution in Delhi-NCR, particularly during October-November.
2. **Greenhouse gas emissions:** Stubble burning releases greenhouse gases such as carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O), which contribute to global warming and climate change. **For e.g.** burning paddy residue in Punjab and Haryana releases these gases into the atmosphere, adding to India's agricultural emissions and worsening the climate impact of farming.
3. **Soil degradation:** Stubble burning destroys beneficial soil microorganisms, reduces organic matter and adversely affects soil structure and fertility. Repeated burning can weaken long-term soil health and increase dependence on chemical fertilisers.
4. **Loss of soil nutrients:** Stubble burning destroys organic matter and causes the loss of essential nutrients, particularly nitrogen and sulphur, reducing long-term soil fertility. **For e.g.** repeated burning of paddy residue in Punjab and Haryana can degrade soil health, increasing farmers' dependence on chemical fertilisers to maintain crop productivity.
5. **Biodiversity loss:** Stubble burning destroys the habitats of insects, earthworms and other small organisms, disrupting local food chains and reducing ecological balance.

Health Impacts:

1. **Respiratory diseases:** Stubble burning releases fine particulate matter (PM_{2.5}) that penetrates deep into the lungs, aggravating asthma, bronchitis and chronic obstructive pulmonary disease (COPD). During the paddy-harvesting season, deteriorating air quality in Delhi-NCR can worsen breathing difficulties, particularly among children, older people and those with pre-existing respiratory conditions.
2. **Cardiovascular problems:** Exposure to fine particulate matter (PM_{2.5}) released during stubble burning can enter the bloodstream and trigger inflammation, oxidative stress and increased blood pressure, raising the risk of heart attacks, strokes and other cardiovascular diseases.
3. **Eye and throat irritation:** Smoke from stubble burning contains particulate matter and irritant gases that cause burning eyes, watery eyes, sore throat and persistent coughing.
4. **Reduced quality of life:** Prolonged exposure to smoke from stubble burning causes discomfort, disrupts outdoor activities, reduces productivity and may lead to school closures during severe pollution episodes. It also increases healthcare expenses and disproportionately affects vulnerable communities.

What are the major challenges in controlling stubble burning?

1. **Difficulty in Penalizing Farmers:** While local authorities impose fines and log satellite-detected farm fires in revenue records, enforcing penalties on a large scale is politically sensitive and socially difficult, as small farmers often view burning as an economic compulsion rather than a choice.
2. **Inter-State Coordination:** Controlling air pollution across the Indo-Gangetic Plains requires effective coordination among Punjab, Haryana, Uttar Pradesh, Rajasthan, Delhi and the Central Government, which is often hindered by political and administrative challenges.
3. **High Cost of Machinery:** Crop residue management machines, such as Happy Seeders and Super Seeders, are expensive. Despite government subsidies (which is ranging from 50% to 80%), their cost remains a financial burden for small and marginal farmers.
4. **Pest and Germination Issues:** Farmers fear that paddy straw left on fields may increase pest attacks, such as pink stem borer, and affect uniform seed germination if sowing machinery is not used properly.

What steps has the Government taken to address stubble burning?

1. **Crop Residue Management (CRM) Scheme:** Provides financial assistance for purchasing crop-residue management machinery and establishing Custom Hiring Centres (CHCs), making equipment accessible to farmers.
2. **Subsidies on agricultural machinery:** Provides a 50% subsidy to individual farmers and up to 80% assistance to eligible farmer groups and organisations for establishing CHCs. Machines include Happy Seeders, Super Seeders and Smart Seeders.
3. **In-situ crop residue management:** Promotes incorporating or retaining stubble in the soil using suitable machinery, improving soil health and reducing the need for burning.
4. **Ex-situ crop residue utilisation:** Encourages the collection and use of paddy straw in biomass power plants, industrial boilers, biofuel production and other applications, creating economic value from agricultural waste.
5. **Satellite-based monitoring:** Uses satellite remote sensing to detect and monitor farm fires, helping authorities identify burning incidents and take timely action.
6. **Commission for Air Quality Management (CAQM):** Issues directions and coordinates action plans among Punjab, Haryana, Uttar Pradesh, Rajasthan and Delhi to prevent crop-residue burning and reduce regional air pollution.
7. **Bio-decomposer technology:** The government promotes microbial bio-decomposers that accelerate the decomposition of paddy straw in fields, converting crop residue into organic manure. **For e.g.** the

Pusa Bio-Decomposer developed by ICAR helps farmers manage stubble without burning, improving soil health and reducing air pollution.

8. **Awareness campaigns:** The government conducts awareness campaigns through agricultural departments, Krishi Vigyan Kendras (KVKs) and local authorities to educate farmers about the harmful effects of stubble burning and promote sustainable alternatives, such as mulching and crop-residue management machinery.
9. **Enforcement and penalties:** State governments impose environmental compensation on farmers who engage in stubble burning. Satellite-based monitoring helps identify farm fires, while local authorities monitor violations and enforce penalties to discourage the practice.

What should way forward to effectively address the problem of stubble burning?

1. **Promote affordable machinery:** Provide subsidised crop-residue management machines, such as Happy Seeders and Super Seeders, to small and marginal farmers.
2. **Strengthen Custom Hiring Centres:** Expand access to affordable machinery through cooperatives, Farmer Producer Organisations (FPOs) and village-level hiring centres.
3. **Provide financial incentives:** Offer direct incentives to farmers for adopting sustainable residue management practices instead of relying solely on penalties.
4. **Promote ex-situ utilisation:** Encourage the use of paddy straw in biomass power plants, compressed biogas (CBG) production, biofuels and industrial boilers.
5. **Diversify cropping patterns:** Encourage farmers to shift from water-intensive paddy cultivation towards less water-intensive crops through assured procurement, price support and suitable market linkages.
6. **Improve interstate coordination:** Ensure coordinated action among Punjab, Haryana, Uttar Pradesh, Rajasthan, Delhi and the Central Government to address regional air pollution.

Conclusion: Stubble burning is not merely an agricultural challenge but a serious environmental and public health concern. A shift from burning crop residue to utilising it as a resource is essential for achieving sustainable agriculture and cleaner air in India.

UPSC GS-3: Environment

Read More: [The Hindu](#)

Critical Minerals – Importance & Challenges – Explained Pointwise



The Central government is planning to come up with a new policy on stockpiling of critical minerals amid increasing concerns around supply chain disruptions, and to cut import dependency. Metals have played a very important role in the evolution of the human civilisation that led to the naming of important eras on the name of era defining metals like Bronze Age & Iron Age. Similarly, the minerals have also been central to the development of our economy & society for e.g. coal powered the 1st Industrial Revolution in 19th & 20th century, oil fueled the 2nd Industrial Revolution in second half of 20th century & now the critical minerals are believed to be driver of 21st century as their availability & accessibility will determine the pace & quality of growth for all major economies.

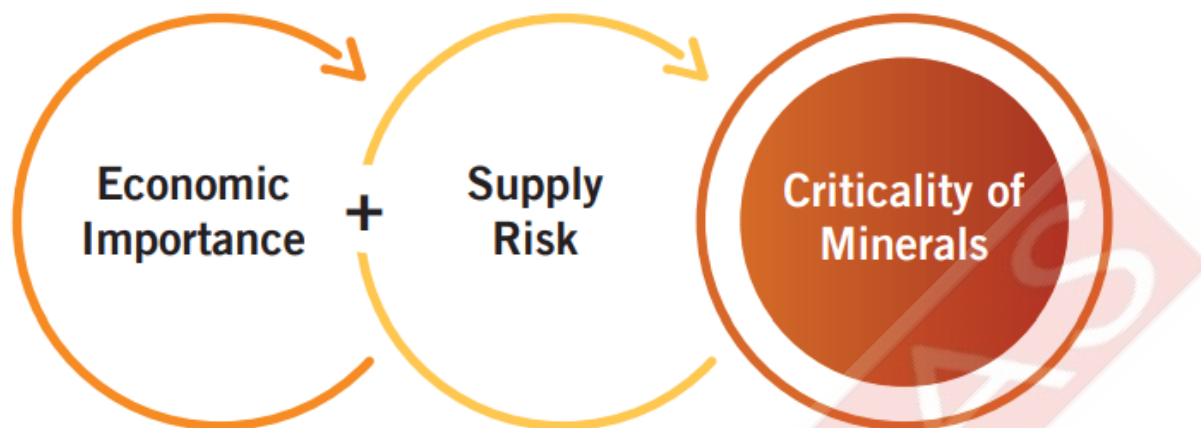
What are Critical Minerals?

What is the classification criterion & identified list of Critical Minerals in India?

Critical Minerals: Critical minerals are a category of non-fuel minerals and elements which satisfy 2 conditions:

1. **Economic development & National Security:** Essential for economic development and national security as they are vital for development of materials for defense, aerospace, nuclear, and space applications.
2. **Supply chain vulnerability:** There are associated risk of supply chain vulnerability and disruption with these minerals, due to their lack of availability, and concentration of existence, extraction or processing of these minerals in few geographical locations.

Factors Affecting Criticality:



Source: Ministry of Mines

Economic Importance (EI)	Supply Risk (SR)
1. Disruption Potential 2. Substitutability Index (SI) 3. GVA Multiplier Score 4. Cross-Cutting Index (CCI)	1. Governance-weighted Material Concentration 2. End-of-life Recycling Rates (EOL-RR) 3. Import Reliance (IR) and Self-Sufficiency (SS) 4. Substitutability Index (SR)

Critical Minerals identified in India: Government of India identified 30 minerals as Critical in July 2023 based on their strategic importance to clean energy & future technologies, high import dependence, domestic resource constraints & relevance for agricultural & industrial needs.

Antimony	Lithium	Strontium
Beryllium	Molybdenum	Tantalum
Bismuth	Niobium	Tellurium
Cobalt	Nickel	Tin
Copper	PGE	Titanium
Gallium	Phosphorous	Tungsten
Germanium	Potash	Vanadium

Graphite	REE	Zirconium
Hafnium	Rhenium	Selenium
Indium	Silicon	Cadmium

Critical minerals have strategic importance in sectors like defence, agriculture, energy, pharmaceutical, telecom. However, these minerals **face supply chain vulnerabilities**, due to their lack of availability and concentration in a few geographical locations. Hence, India has been focusing on securing the supplies of critical minerals.

What is the SIGNIFICANCE of Critical Minerals for India?

1. **Push to India's Economic Development:** These Minerals give a push to India's economic development as industries such as **high-tech electronics, telecommunications, transport, and defense** rely heavily on these minerals. Their growth can lead to job creation, income generation, and innovation in these sectors. **For ex- India's push to become semiconductor manufacturing hub rests on the availability of these minerals.**
2. **Energy transition towards Net-Zero Emissions:** These minerals are the foundation of modern technologies like **solar panels, wind turbines and advanced batteries**, which will help in energy transition and would give a push to India's goal of **net-zero emission by 2070**.
3. **Competitive value chain establishment in India:** The discovery of critical mineral wealth and identification of areas of their potential use in advanced technologies will help in establishing competitive value chain in India. This would help in attracting **foreign direct investments** from countries like UK, USA as part of their **China+1 strategy**.
4. **National Security:** These minerals are **vital for defense, aerospace, nuclear, and space applications** due to their usage in development of high-quality and reliable materials capable of withstanding extreme conditions and performing complex functions. These would in turn help in bolstering India's national security.
5. **Reducing India's import Bill:** Currently most of the critical minerals are imported in India. The exploration and increased production of these minerals would help in **reducing India's import burden** and Current Account Deficit.

Sl. No.	Critical Mineral	Percentage (2020)	Major Import Sources (2020)
1.	Lithium	100%	Chile, Russia, China, Ireland, Belgium
2.	Cobalt	100%	China, Belgium, Netherlands, US, Japan
3.	Nickel	100%	Sweden, China, Indonesia, Japan, Philippines
4.	Vanadium	100%	Kuwait, Germany, South Africa, Brazil, Thailand
5.	Niobium	100%	Brazil, Australia, Canada, South Africa, Indonesia
6.	Germanium	100%	China, South Africa, Australia, France, US
7.	Rhenium	100%	Russia, UK, Netherlands, South Africa, China
8.	Beryllium	100%	Russia, UK, Netherlands, South Africa, China
9.	Tantalum	100%	Australia, Indonesia, South Africa, Malaysia, US
10.	Strontium	100%	China, US, Russia, Estonia, Slovenia
11.	Zirconium(zircon)	80%	Australia, Indonesia, South Africa, Malaysia, US
12.	Graphite(natural)	60%	China, Madagascar, Mozambique, Vietnam, Tanzania
13.	Manganese	50%	South Africa, Gabon, Australia, Brazil, China
14.	Chromium	2.5%	South Africa, Mozambique, Oman, Switzerland, Turkey
15.	Silicon	<1%	China, Malaysia, Norway, Bhutan, Netherlands

Table.1 The net import reliance for critical minerals of India (2020) (Source: A report on 'Unlocking Australia-India Critical Minerals Partnership Potential' by Australian Trade and Investment Commission, July 2021)

Source- Ministry of Mines

What are the CHALLENGES with Critical Minerals?

- Geopolitical and oligopolistic monopoly:** The concentration of critical minerals in few countries, has led to geopolitical monopoly with only a few countries dominating these mineral resources. This leads to **oligopolistic** (domination by a few large firms) markets. **For ex- Australia controls 55% of lithium reserves, and China has 60% of rare earths.**
- China's dominance in the processing and refining sector:** China is a central player in the global critical mineral supply chains, particularly in processing and refining. It accounts for:
 - 60% of worldwide production
 - 85% of critical mineral processing, 70% of cobalt processing
 - 90% of rare earth refining
 - 60% of lithium conversion capacity
 - China's dominance critical mineral sector leads to its political leverage over other countries. It alone can bring the global EV industry to a halt by restricting the supply of rare earths.
- Geopolitical Risks:** The **geographical concentration of these minerals** makes them vulnerable to geopolitical risks. Geopolitical tensions, conflicts, trade disputes, or sudden policy changes in those regions can impact their supply. **For ex- The civil war in Democratic Republic of the Congo,** has affected the global supply chain of cobalt, as 70% of the world's reserves of cobalt are located in DRC.

4. **Resource Nationalism:** The geographical concentration of these minerals has led to resource conflicts. This has increased resource nationalism, and trade fragmentation. **For ex- Rising resource nationalism in Africa.**
5. **Price Volatility:** Unlike oil, most critical materials are not widely traded on exchanges, and this limits opportunities to hedge against price volatility. Further, **insufficient data on consumption, production, and trade of minerals** causes uncertainty, price volatility and delays in investments.
6. **Rising Import Bill:** Between FY22 and FY23, there has been a **34% rise in imports of critical minerals**, totaling nearly Rs. 91,000 crore. India's heavy reliance on imports for these minerals, poses a risk to its industrial and energy security.
7. **Environmental Concerns:** Mining activities of these can lead to biodiversity loss, land use change, water depletion and pollution, waste contamination, and air pollution. **For ex- Lithium mining in the fragile landscapes of the Chilean Atacama desert is water-intensive.**
8. **Long Gestation Period for Alternatives:** Development of alternative sources and processing capabilities of critical minerals, like India's plans with Australia, can take more 15 years for fruition, delaying self-reliance.

Read More- [Critical Minerals Summit](#)

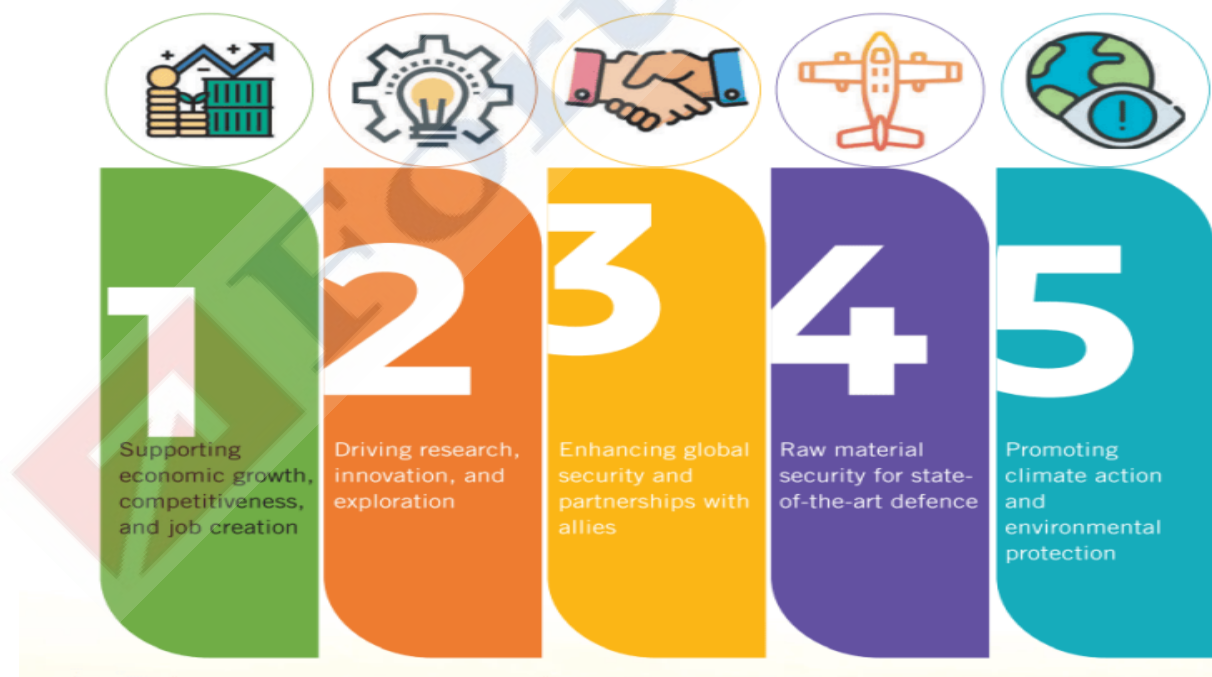
What INITIATIVES have been taken by the Government for Critical minerals in India?

Amendment to Mines & Minerals (Development & Regulation) Act, 1957	Through the MMDR Amendment Act, 2023, the Central Government is empowered to auction blocks of 30 critical minerals. The amendment permits private sector entry through auctions.
FDI liberalization	In 2019, India has allowed 100% foreign direct investment. Certain minerals which were previously classified as atomic have been reclassified, facilitating private-sector mining.
International Collaboration	India joined the Mineral Security Partnership , which is a US led initiative involving 13 countries and the EU. Khanij Bidesh India Ltd (KABIL) is assisting Argentina in lithium exploration and discussing lithium and cobalt blocks in Australia .
Institutional Initiatives	The Geological Survey of India has initiated over 250 projects to explore deep-seated critical minerals. India has launched startup challenges to develop advanced processing technologies.

Budgetary Support	<p>Customs Duty Removal: Customs duties on 25 critical minerals, such as lithium, nickel, copper, and cobalt, have been removed to enhance domestic manufacturing of advanced technologies like electric vehicles (EVs) and energy storage systems.</p> <p>Concessional Customs Duty Extension: The concessional customs duty of 5% on lithium-ion cells has been extended until March 2026.</p>
National Critical Mineral Mission (NCMM)	In the Budget 2024, Critical Mineral Mission has been announced to give a boost to India's critical minerals sector . Through this mission, India aims to boost the domestic output and recycling of critical minerals like copper and lithium.

Significance of Critical Mineral Mission:

1. Promotion of domestic production and recycling of critical minerals by increasing the capacities of India in terms of refining and processing.
2. Identification of minerals which are critical, which will help the country to plan for the acquisition and preservation of such mineral assets taking into account the long term need of the country.
3. Reduction of India's import dependency as India is 100% import dependent for certain elements.
4. Expedited exploration, overseas mineral acquisition, resource efficiency, recycling of minerals, and finding substitutes through suitable R&D.



Source- Ministry of Mines

What Should be the WAY FORWARD?

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1. **Implementation of the recommendations of expert committee on critical minerals:** Setting up of the **Centre of Excellence for Critical Minerals (CECM)** as a dedicated wing in the Ministry of Mines. This can be on the lines of **CSIRO which is an Australian government corporate entity**. The centre of excellence can collaborate with international agencies or Khanij Bidesh India Ltd (KABIL) for the strategic acquisition of foreign assets of these minerals.
2. **Push for expansion of Mineral Security Partnership (MSP):** Along with India, more countries in the Global South can be part of the alliance, especially critical mineral-rich African countries. The **MSP can become an international platform** that reports on the status and future of critical mineral markets.
3. **Encourage FDI in domestic mining:** Rising Foreign Direct Investment (FDI) will not just support businesses like battery and EV manufacturing. It will also bring the expertise of international mining firms to aid in exploring critical minerals for the country's benefit.
4. **Investment in beneficiation and processing facilities:** India should **invest in beneficiation and processing facilities in Africa** to promote local economies and sustainable relationships.
5. **Path to global leadership:** India can emulate **Indonesia's success in nickel** to become a global leader in these minerals, utilizing access to both domestic and international raw materials.
6. **Alignment of mineral incentives:** The Production-Linked Incentive (PLI) scheme for minerals **should align with global aspirations**, creating employment opportunities.

Conclusion: Critical minerals are the bedrock of the modern technological and sustainable future. Securing their supply is no longer just an economic concern but a fundamental matter of national security. If India is to become a serious player in manufacturing, then it can no longer depend upon mineral supply chains from overseas. As a country which is geologically rich, India has to develop its domestic capabilities to extract minerals – especially the critical minerals.

Read More: Indian Express, [The Indian Express](#)

UPSC Syllabus- GS Paper-3- Infrastructure: Energy, Ports, Roads, Airports, Railways etc.

Unlawful Activities (Prevention) Act (UAPA) – Significance & Challenges – Explained Pointwise

The Unlawful Activities (Prevention) Act (UAPA), 1967 is India's primary anti-terror and national security law. While it plays a crucial role in safeguarding national security and territorial integrity, its stringent provisions have raised concerns regarding civil liberties, personal freedom and the potential for misuse.

What is the Unlawful Activities (Prevention) Act (UAPA)? What are its key provisions?

- The Unlawful Activities (Prevention) Act (UAPA), 1967 is an anti-terrorism law enacted to prevent unlawful activities and protect the sovereignty, unity and integrity of India.
- It empowers the government to declare associations unlawful, designate individuals as terrorists, and take strict action against terrorist activities.

Evolution of UAPA:

- **1967 Origin:** Enacted to ban “**unlawful associations**” and prevent secessionist movements threatening India's integrity.

- **2004 Amendment:** Incorporated core anti-terror provisions into the UAPA following the repeal of the Prevention of Terrorism Act (POTA).
- **2008 & 2012 Amendments:** Expanded the definition of “**terrorist acts**” (including threats to economic security/counterfeiting) and strengthened investigative powers following the 2008 Mumbai attacks.
- **2019 Amendment:** Granted the government the power to designate **individuals** as terrorists (previously restricted to organizations) and empowered the National Investigation Agency (NIA) to seize property linked to terrorism without state police permission.

Key Provisions:

1. **Unlawful Activity (Section 13):** Refers to actions that support or incite the cession or secession of any part of India, or disclaim/question India's sovereignty and territorial integrity.
2. **Terrorist Act (Section 15):** Includes acts intended to threaten the unity, integrity, security, economic security (e.g. smuggling high-quality counterfeit currency), or sovereignty of India, or to strike terror in people.
3. **Declaration of Unlawful Associations:** Empowers the Central Government to declare an association unlawful if it engages in activities prejudicial to India's sovereignty, unity and integrity.
4. **Designation of Terrorists:** Under Section 35, the Central Government can designate organisations and individuals as terrorists.
5. **Punishment for Terrorist Activities:** Provides strict penalties for terrorist acts, including imprisonment and the death penalty in certain cases.
6. **Prohibition of Terrorist Organisations:** Provides for the listing of terrorist organisations and restrictions on their activities and support.
7. **Investigating Authority:** Cases can be investigated by state police (officers of DSP rank or above) or the **National Investigation Agency (NIA)**. Inspectors of the NIA are also authorized to investigate.
8. **Extended Investigation Period:** Allows the investigation period before filing a chargesheet to be extended up to 180 days, subject to statutory conditions and judicial approval.
9. **Strict Bail Conditions:** Section 43D(5) imposes stringent bail restrictions in specified cases where the court finds the accusation to be prima facie true.
10. **Seizure of Property (Sections 24A & 25):** Investigating officers can attach or seize properties believed to be “proceeds of terrorism”. Prior approval from the Director General of Police (DGP) or DG-NIA is required.
11. **Extraterritorial Jurisdiction:** The Act applies to all Indian citizens, whether inside or outside India, as well as foreign nationals committing offences targeting India or its assets.

What are the main objectives of the UAPA?

1. **Protect National Integrity:** Safeguard the sovereignty, unity and territorial integrity of India.
2. **Prevent Unlawful Activities:** Prevent activities that threaten India's sovereignty, security and constitutional order.
3. **Combat Terrorism:** Prevent and punish terrorist acts and related activities.
4. **Disrupt Terrorist Organisations:** Identify, prohibit and restrict terrorist organisations and their operations.
5. **Prevent Terror Financing:** Curb the funding and financial support of terrorist activities.

6. **Strengthen National Security:** Empower law enforcement agencies to investigate and prosecute offences related to terrorism and unlawful activities.
7. **Deter Anti-National Activities:** Establish legal deterrents against activities that threaten national security and public order.

What is the significance of the UAPA in ensuring national security?

1. **Combating terrorism:** UAPA enables the investigation and prosecution of terrorist activities. It provides the legal framework for prosecuting offences linked to terrorist attacks and organised terror networks.
2. **Disrupting terrorist organisations:** It allows the government to designate terrorist organisations and prohibit their activities. For e.g. Lashkar-e-Taiba (LeT) and Jaish-e-Mohammed (JeM) are among the organisations listed under the Act.
3. **Targeting individual terrorists:** The 2019 amendment empowered the government to designate individuals as terrorists under Section 35, helping address threats posed by individuals operating independently of formal organisations.
4. **Curbing terror financing:** It enables action against funds, proceeds and property linked to terrorist activities, thereby weakening the financial networks that sustain terrorism.
5. **Addressing cross-border terrorism:** It provides a legal basis to prosecute offences involving terrorist networks operating across national borders, subject to the applicable jurisdiction and evidence.
6. **Strengthening investigative capacity:** Section 43D(5) permits the investigation period for certain offences to be extended to 180 days, subject to statutory conditions and judicial approval, allowing additional time for complex terror investigations.
7. **Addressing regional security threats:** UAPA helps law enforcement agencies tackle insurgency and extremist networks. For e.g. In 2022, Jammu and Kashmir recorded 371 UAPA cases, while Manipur recorded 167, reflecting the law's use in regions facing significant security challenges.
8. **Countering Economic Warfare:** The Act explicitly covers acts that threaten the economic security of India, such as large-scale smuggling of High-Quality Counterfeit Indian Currency Notes (FICN) aimed at destabilizing the monetary system.
9. **Pan-India Operations:** Paired with the National Investigation Agency (NIA) Act, the UAPA empowers central agencies to investigate cross-state and international terror cases without needing state-by-state police permissions. For e.g. **2008 Ahmedabad Blasts & Indian Mujahideen Modules** – UAPA provisions enabled investigative agencies to map inter-state cells operating across Gujarat, Maharashtra, and Uttar Pradesh.

What are the major challenges and criticisms associated with the UAPA?

1. **Stringent bail provisions:** Section 43D(5) of the UAPA imposes strict conditions on granting bail, as courts must be satisfied that the accusations are prima facie untrue to grant bail. This makes bail difficult and may lead to prolonged pre-trial detention, raising concerns about personal liberty under Article 21.
2. **Low conviction rates:** The low conviction rate under UAPA raises concerns about the effectiveness of investigations and prosecution. According to NCRB-based figures cited by the Supreme Court in 2026, conviction rates remained around 1.5%-4% nationally between 2019 and 2023. This raises concerns about prolonged trials and the possibility of accused persons remaining incarcerated for years without a final verdict.
3. **Broad and ambiguous definitions:** Certain provisions of the UAPA use broad terms such as “unlawful activity” and “terrorist act,” which may create uncertainty about the boundary between legitimate

dissent and activities that threaten national security. This can give investigating agencies considerable discretion and raise concerns about arbitrary application.

4. **Potential misuse:** The broad provisions and stringent nature of the UAPA have raised concerns that the law may be used against individuals engaged in peaceful protests, dissent or activism, even when the alleged conduct may not clearly amount to terrorism. For e.g. **Bhima Koregaon-Elgar Parishad case** –The prolonged incarceration of accused persons before the conclusion of trial has raised concerns about due process and the right to a speedy trial.
5. **Violation of personal liberty:** The stringent provisions of UAPA, particularly prolonged pre-trial detention and restrictive bail conditions, can undermine the right to personal liberty guaranteed under Article 21 of the Constitution. Accused persons may remain imprisoned for years without conviction, raising concerns about due process and the principle that bail should not be denied indefinitely when trials are unduly delayed.
6. **Impact on freedom of expression:** The broad provisions of the UAPA may create a chilling effect on freedom of speech and expression guaranteed under Article 19(1)(a) of the Constitution. The possibility of arrest and prolonged pre-trial detention may discourage journalists, activists and citizens from expressing dissent or criticising government policies, even when their activities do not involve violence or terrorism.

What are the major Supreme Court judgments related to the UAPA?

National Investigation Agency v. Zahoor Ahmad (2019)	The Supreme Court held that, while considering bail under Section 43D(5), courts should assess whether the prosecution's accusations are prima facie true, without conducting a detailed trial-like examination of the evidence. This made bail more difficult in UAPA cases.
Union of India v. K.A. Najeer (2021)	The Court held that stringent statutory restrictions on bail do not prevent constitutional courts from granting bail where prolonged incarceration and an unduly delayed trial violate fundamental rights under Article 21.
Vernon Gonsalves v. State of Maharashtra (2023)	The Court granted bail to Vernon Gonsalves and Arun Ferreira in the Bhima Koregaon case. It observed that mere possession of literature, even if it promotes extremist ideology, does not by itself constitute a terrorist offence.
Bikramjit Singh v. State of Punjab (2020)	The Court held that the right to default bail (if a chargesheet is not filed within the stipulated period, such as 90 or 180 days) is a fundamental right . If the prosecution fails to complete the investigation within the designated timeframe or fails to seek a valid extension from a competent court, default bail cannot be denied.

What measures should be taken to prevent the misuse of the UAPA?

1. **Ensure Judicial Oversight:** Strengthen independent judicial scrutiny of arrests, bail restrictions and prolonged detention under the UAPA to prevent arbitrary action. Courts should ensure that the evidence satisfies the statutory requirements and that accused persons' fundamental rights under Article 21 are protected.

2. **Define Offences Clearly:** The government should clarify broadly worded provisions of the UAPA to distinguish genuine terrorist activities from peaceful protests, political dissent and legitimate criticism of government policies. Clearer definitions can reduce arbitrary interpretation, prevent misuse and ensure that the law targets activities that pose a genuine threat to national security while protecting fundamental rights.
3. **Ensure Time-Bound Trials:** Strict adherence to time limits for completing investigations and conducting day-to-day trials must be mandated to safeguard the Right to Life and Personal Liberty under Article 21. The government should strengthen special courts, fill judicial vacancies, improve prosecution capacity and ensure regular monitoring of pending cases to expedite trials.
4. **Promote Accountability:** Establish clear accountability mechanisms for investigating agencies and officials to prevent arbitrary arrests and the misuse of UAPA. Independent review of cases, transparent investigation procedures and action against deliberate violations can help ensure that the law is implemented fairly.
5. **Protect Freedom of Expression:** Ensure that peaceful dissent, criticism of government policies, journalism and academic debate are not criminalised under the UAPA without sufficient evidence of a legally recognised offence. This would safeguard Article 19(1)(a) of the Constitution while enabling authorities to take firm action against genuine threats to national security.
6. **Strengthen Evidence-Based Investigations:** Investigating agencies should rely on credible, verifiable and corroborated evidence before invoking UAPA provisions. Mere association with an accused person, possession of literature or expression of dissent should not automatically be treated as evidence of terrorist involvement.
7. **Provide Remedies for Wrongful Prosecution:** Establish effective legal remedies for individuals who are wrongfully prosecuted under the UAPA, including access to legal aid, compensation where legally justified, and accountability for proven abuse of authority. This would help protect personal liberty, uphold the principle of natural justice and strengthen public confidence in the criminal justice system.

UPSC GS-3: Internal Security; GS-2: Indian Polity

Read More: [The Hindu](#)

GM Crops in India – Arguments in Favour & Against – Explained Pointwise

According to an industry-commissioned study, a quarter or more of India's cotton cultivation area comprises genetically modified (GM) hybrids incorporating "unapproved" herbicide-tolerant (HT) and Bt traits. On the one hand, the findings indicate farmers' acceptance of HT technology; on the other, they raise concerns about the bypassing of the government's biosafety assessment and regulatory approval mechanisms. This makes it important to discuss about the GM crops – the arguments in favour as well against their introduction especially in India and what should be the way forward.

What are GM crops?

- GM crops are plants that have had their DNA altered using genetic engineering techniques to introduce specific, desirable traits that do not occur naturally in the species. This process involves inserting one or more genes from a different species into the plant's genome to confer certain advantageous traits that aren't naturally present in the species. For e.g.
 - **Bt cotton:** Genetically modified to resist certain insect pests, particularly bollworms.
 - **Bt brinjal:** Developed for resistance against the brinjal fruit and shoot borer.

- **Golden Rice:** Developed to produce beta-carotene, a precursor of Vitamin A.
- Unlike what plant breeders did traditionally in cross breeding by combining genes from same or closely related plant species, GM technology does not restrict trait selection. Genes from any living organism, be it plants, or animals, is used to arrive at the desired traits.
- GM crops are developed to improve crop yield, enhance nutritional value, reduce the use of chemical pesticides, and increase resistance to environmental stressors like drought or frost. However, the use of GMOs also raises concerns related to potential health risks, environmental impact, and ethical considerations.

About the GM crops permitted in India and in other countries:

GM crops in India:

- **Bt Cotton:** In India, the major transgenic crop that has been commercialized is Bt cotton. Bt cotton is genetically modified cotton that expresses a toxin derived from the bacterium *Bacillus thuringiensis*, which provides resistance against destructive pests such as the bollworm. Bt cotton remains the only GM crop approved for cultivation in India till date. The area under Bt. Cotton cultivation has increased from **less than 1%** in 2002-03 to almost **94%** in 2019-20.
- **GM mustard:** In addition, India is also considering the commercial release of genetically modified mustard known as Dhara Mustard Hybrid (DMH -11). This GM mustard has genes from a soil bacterium that enhance hybridization, potentially leading to a yield increase of 25-30%. As of now, this crop has received approval from the GEAC but is yet to receive final clearance from the Ministry of Environment.

Other transgenic crops which are under developmental phases in India:

- **GE Banana:** The National Agri-Food Biotechnology Institute (NABI) in Mohali is developing fungus-resistant varieties and exploring the fortification of bananas with iron. They are also working on increasing the amount of provitamin A in the fruit.
- **GE Potato:** The Central Potato Research Institute (CPRI) in Shimla has received permission to conduct research on the GE potato hybrid KJ66, derived from the wild Mexican potato, aimed at combating the late blight pathogen **Phytophthora infestans**.
- **GE Maize:** Rallis India Limited has received conditional approval from GEAC to conduct trials on GE maize, aimed at improving its resistance to the moth **Spodoptera frugiperda** and tolerance to the herbicide glyphosate.
- **GE Rubber:** The Rubber Research Institute in Kottayam has been granted permission for trials of two GE rubber lines expressing an 'osmotin' gene, which is expected to confer resilience to the plants under a range of adverse conditions.

Transgenic crops in other countries:

- **Soybean:** In the United States, one of the first and most widespread transgenic crops is the Roundup Ready soybean. These soybeans are engineered to be resistant to glyphosate, the active ingredient in the herbicide Roundup.

- **Bt Maize:** Another common transgenic crop is Bt maize (or corn), which like Bt cotton, contains a gene from the **Bacillus thuringiensis** bacterium. This allows the maize to produce a protein that is toxic to certain types of pests, notably the European corn borer.
- **Golden rice:** In some parts of Asia, a genetically modified version of rice known as Golden Rice has been developed. This rice is modified to produce **beta-carotene**, a precursor of vitamin A, in the edible parts of the rice plant. This is intended to combat vitamin A deficiency, a significant public health problem in many developing countries.
- **Sugarcane:** A GM sugarcane variety developed by Brazil which is resistant to the sugarcane borer. It incorporates a gene from the bacterium *Bacillus thuringiensis* (Bt), which enables the plant to produce a protein toxic to specific insect pests.

How India is regulating transgenic crops?

India has a well-established regulatory framework in place to control and supervise the introduction and cultivation of GM crops. This is governed by various rules, regulations, and guidelines set by different ministries and departments.

1. **Genetic Engineering Appraisal Committee (GEAC):** The committee reviews proposals related to the release of GM organisms and products into the environment, including experimental field trials.
2. **Environment Protection Act:** The GEAC or people authorized by it have the power to take punitive actions under the Environment Protection Act.
3. **Role of the [Indian Council of Agriculture Research \(ICAR\)](#):** The ICAR plays a crucial role in supervising the development of new GM varieties and hybrids. For e.g. the approval for GM mustard allows for the environmental release of two genetically engineered mustard varieties are under the supervision of the ICAR.
4. **Assessment of Risks:** The regulatory framework also requires the evaluation of potential risks to human health, animal health, and biodiversity. This involves rigorous testing under laboratory and field conditions to ensure the safety and efficacy of GM crops.
5. **Public Consultation:** In some cases, public consultation is also part of the process before a final decision is made about the commercialization of a GM crop. This allows stakeholders, including the public, to voice their concerns and opinions.

Read more: [Genetic Engineering Appraisal Committee approves commercial cultivation of genetically modified mustard yet again](#)

What are the arguments supporting the introduction of GM crops in India?

1. **Higher agricultural productivity:** GM crops can increase agricultural productivity by reducing crop losses caused by pests and diseases. For e.g. **Bt cotton** provides resistance against bollworms, helping protect yields and improve production efficiency. This can contribute to greater agricultural output and food security.
2. **Addressing food security:** One of the main arguments supporting the introduction of GM crops in India is the potential to enhance food security. With India's population continually growing, transgenic crops offer a promising solution to increase agricultural yield and meet the escalating food demand. Moreover, crops can even be engineered to be **more nutritious**, providing critical vitamins to populations that struggle to get specific nutrients needed for healthy living. Thus, GM crops can be used to address the problem of **Hidden Hunger** (Nutritional deficiency).

3. **Improved crop characteristics:** GM crops can be engineered to have desired traits such as drought resistance, pest resistance, and improved nutritional content. These modifications can lead to healthier, more resilient crops that are better suited to varying climatic conditions and can contribute to higher yields.
4. **Higher farmers' income:** Transgenic crops can provide economic advantages to farmers. The use of crops genetically engineered to resist pests, for instance, can reduce the need for expensive pesticides. The GEAC's recent approval of GM mustard is a prime example of this, with the potential to boost yield and subsequently increase farmers' income. For e.g. Brinjal growers in Haryana have rooted for **Bt brinjal** as it reduces the cost of production by cutting down on the use of pesticides.
5. **Curbing Edible Oil Imports & Agricultural Trade Deficit:** India imports nearly 60% of its edible oil requirements (spending over \$15-20 billion annually), primarily palm, soybean, and sunflower oil. Proponents point to indigenous varieties like **DMH-11 (GM Mustard)**, which uses a barnase/barstar gene system to create hybrids that yield 25-30% more seed than traditional mustard. Higher yields would significantly boost domestic oilseed production and reduce reliance on imports.
6. **Potential environmental benefits:** By reducing the need for chemical pesticides and herbicides, transgenic crops may also help decrease environmental pollution. Furthermore, certain GM crops may require less water, contributing to more sustainable water use.
7. **Climate change adaptation:** Indian agriculture is vulnerable to climate volatility, monsoon delays, and rising temperatures. GM technology allows scientists to engineer crops resistant to abiotic stresses such as severe drought, salinity, flooding, and extreme heat such as **climate-resilient GM rubber** trials or **drought-tolerant maize**.
8. **Enhanced crop diversity:** Transgenic technology can facilitate the development of new crop varieties, enhancing agricultural biodiversity. This could offer farmers a greater choice of crops to cultivate, potentially leading to more diverse farming systems.
9. **Global competitiveness:** GM crops can improve productivity, reduce pest-related losses and enhance crop quality, helping Indian agricultural products remain competitive in international markets. They can also strengthen India's position in the global agricultural biotechnology sector.

What are the arguments against the introduction of GM crops in India?

1. **Health concerns:** Some groups argue that the consumption of genetically modified crops could potentially lead to health issues. There are concerns about allergenicity, antibiotic resistance, and the overall safety of consuming foods derived from GMOs.
2. **Impact on biodiversity:** Critics also argue that the introduction of transgenic crops could negatively impact biodiversity. There are concerns that the proliferation of GM crops could lead to the genetic contamination of wild relatives of the modified crops. The increased use of herbicide-resistant crops could harm non-target organisms and beneficial insects. GM technology could also allow the transfer of genes from one crop to another, creating "**super weeds**", which might be immune to common control methods.
3. **High cultivation costs:** GM seeds may be expensive due to technology fees and limited availability from approved suppliers. Additional costs associated with seed replacement and crop management may increase farmers' financial burden.
4. **Potential socio-economic implications:** There are also socio-economic considerations. For instance, small farmers might face difficulties if they cannot afford the often higher-priced GM seeds, potentially exacerbating economic inequalities in rural communities.
5. **Dependence on multinational companies (MNCs):** Many GM seeds are patented by multinational corporations. Farmers using these seeds would be dependent on these companies for their supply, potentially leading to monopolistic practices and loss of control over their own agricultural practices.

From an economic standpoint, this poses a risk to the long-term food security by creating dependence on a single or limited number of suppliers. If the supplier company failed, then the crop it provides would not be available to the people who depend on that crop.

6. **Secondary Pest Vulnerability:** Opponents highlight the long-term track record of **Bt Cotton** in India. Over time, pests like the **Pink Bollworm** evolved resistance to the Bt toxin, forcing farmers to buy more expensive insecticides and higher-dose seed traits, contributing to rising agricultural debt.
7. **Questionable outcomes:** Various claims around stress tolerance, nutrition and yields have turned out to be false, including in India with its Bt cotton experience. Cotton yield has stagnated around 460 kgs per hectare in the recent past, despite most cotton being GM. The most impressive yield growth was achieved between 2000 and 2006 (from 278 kg to 521 kg/ ha) when GM cotton adoption was marginal. There has been no such yield increase thereafter.
8. **Increased use of chemicals:** On the other hand, increased illegal use of **glyphosate** is bringing its own problems. Though GM Cotton was supposed to be more resistant to pests, chemical usage (including pesticides) in India's cotton cultivation has actually increased. For e.g. cotton farmers in North India often face the challenge of **pink bollworm infestation & white fly attack**. It is noteworthy that 24 countries that are ahead of India in terms of cotton yields do not grow GM cotton.
9. **Impact on exports:** Countries with strict regulations on GM foods may impose import restrictions or labelling requirements on genetically modified agricultural products. This could reduce market access for Indian farmers and exporters, particularly in markets where non-GM products command a premium.
10. **Weaknesses in regulatory capacity:** India's limited capacity for independent biosafety testing, post-release monitoring and effective enforcement raises concerns about the safe management of GM crops. Delays in regulatory decisions and concerns over transparency may also undermine public trust in the approval process.
11. **Ethical and cultural concerns:** The genetic modification of crops raises ethical questions like human intervention in nature, potential damage to environment, negative impact on traditional farming practices, excessive corporate dominance, potential harm to human health etc. These can be especially potent in countries like India with rich cultural and religious traditions tied to natural processes.

What should be the Way Forward?

1. **Enhanced research and development:** To address concerns related to transgenic crops, further research and development should be undertaken. This should focus on comprehensive risk assessment, long-term impact studies, and the development of techniques to prevent cross-contamination.
2. **Rigorous regulatory framework:** The regulatory framework for the approval and monitoring of transgenic crops in India needs to be rigorous. This can help ensure that only those GM crops that are safe for human health and the environment are permitted. Govt should again take up the proposed **Biotechnology Regulatory Authority of India Bill** to ensure a sturdy regulatory architecture in India. This encourages entry of competitors that could check monopolistic conditions in the GMO market.
3. **Capacity building in biotechnology:** India needs to enhance its capacity in the field of biotechnology. This involves training scientists in advanced techniques, and creating world-class laboratories that can undertake cutting-edge research in this field.
4. **Public awareness and engagement:** Transparent, evidence-based information on GM crops should be shared with the public to address concerns and misconceptions. This could involve engaging with communities through public consultations before the introduction of GM crops.

5. **Protecting farmers' interests:** Policies should be in place to protect farmers from potential exploitation by multinational companies selling GM seeds. This includes ensuring farmers have access to a variety of seeds, including non-GM options.
6. **Monitoring environmental impact:** After the introduction, transgenic crops should be continuously monitored to assess their impact on biodiversity and ecosystems. In particular, the potential for gene flow to non-target species should be rigorously evaluated.
7. **Promote alternative approaches:** India should strengthen conventional breeding, marker-assisted selection, integrated pest management (IPM) and agroecological practices to improve crop productivity and resilience. These approaches can complement biotechnology while reducing chemical pesticide use and conserving agricultural biodiversity.
8. **International collaboration:** India can benefit from international collaboration in this field, learning from the experiences of other countries that have successfully adopted transgenic crops, and working together to address shared challenges.

CONCLUSION: By resisting genetic engineering technologies, India risks falling behind the rest of the world where scientists are deploying gene editing tools to improve yields, disease resistance and shelf life of crops. However, any decision on introduction of GM technologies must be taken on the basis of scientific evidence. A participatory approach should be adopted in order to bring together all stakeholders to develop regulatory protocols. This would ensure trust in the entire process.

Sources: [Indian Express](#), [Wikipedia](#)

Syllabus: GS Paper 3: Science and Technology: Awareness in the field of biotechnology, Agriculture

Preventive Detention – Significance & Concerns – Explained Pointwise

In recent instances, police detentions of protesters to prevent or disperse demonstrations have raised concerns about the balance between maintaining public order and protecting democratic freedoms. While the State has a duty to ensure peace and security, such actions must respect the fundamental rights to freedom of speech, peaceful assembly and personal liberty.

This highlights the need to examine the legal safeguards governing detention and prevent their arbitrary use against peaceful protesters.

What is preventive detention? How does it differ from punitive detention?

- Preventive detention refers to the detention of a person by the authorities without a criminal trial, with the objective of preventing them from committing a potential offence or engaging in activities considered prejudicial to public order, national security or other legally specified interests.
- Unlike standard arrests, it is not a punishment for a crime already committed, but a precautionary measure taken by executive authorities to prevent potential harm.

Preventive Detention	Punitive Detention
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To prevent a potential offence.	To punish an offence already committed.
Preventive in nature.	Punitive in nature.
No criminal trial is required before detention.	Generally follows a criminal trial and conviction.
Objective: To protect public order, national security or other legally specified interests.	Objective: To penalise the offender and deter crime.
Constitutional Provisions: Article 22(3)-(7).	Constitutional Provisions: Article 20, Article 21 and applicable criminal procedure safeguards.

What are the constitutional provisions governing preventive detention in India?

- **Article 22 – Protection against arrest and detention:** Article 22 deals with safeguards against arrest and detention, including special provisions relating to preventive detention.
 - **Article 22(1):** An arrested person must be informed of the grounds of arrest and has the right to consult and be defended by a legal practitioner of their choice.
 - **Article 22(2):** An arrested person must be produced before the nearest magistrate within 24 hours of arrest, excluding travel time, and cannot be detained beyond that period without the magistrate's authority.
 - **Article 22(3):** The safeguards under clauses (1) and (2) do not apply to enemy aliens or persons detained under preventive detention laws.
 - **Article 22(4):** Preventive detention beyond 3 months generally requires the recommendation of an **Advisory Board** constituted in accordance with the Constitution, subject to the clause's exceptions and parliamentary law.
 - **Article 22(5):** The detaining authority must communicate the grounds of detention as soon as may be and provide the earliest opportunity to make a representation against the detention.
 - **Article 22(6):** Facts that the authority considers against the public interest to disclose need not be revealed.
 - **Article 22(7):** Parliament may prescribe circumstances and classes of cases for detention beyond three months without an Advisory Board opinion, as well as the maximum detention period and Advisory Board procedure, within constitutional limits.
- **Seventh Schedule – Legislative Powers:** The Constitution distributes legislative powers relating to preventive detention between Parliament and the States:
 - **Union List, Entry 9:** Parliament can legislate on preventive detention for reasons connected with **defence, foreign affairs or the security of India**.
 - **Concurrent List, Entry 3:** Both Parliament and State Legislatures can legislate on preventive detention for reasons connected with the **security of a State, maintenance of public order, or maintenance of essential supplies and services**.

What have the courts said about preventive detention?

A.K. Gopalan v. State of Madras (1950)	<ul style="list-style-type: none"> • The Court upheld most of the Preventive Detention Act, 1950, taking a narrow view of personal liberty. • This approach was later displaced by the broader interpretation in Maneka Gandhi.
Dr. Ram Manohar Lohia v. State of Bihar (1966)	<ul style="list-style-type: none"> • Distinguished law and order from public order. • Every breach of law and order does not justify preventive detention – the disturbance must reach the level specified by the relevant law.
Khudiram Das v. State of West Bengal (1975)	<ul style="list-style-type: none"> • Held that the authority's subjective satisfaction is subject to judicial review, particularly where there is non-application of mind, mala fide action or reliance on irrelevant material.
Maneka Gandhi v. Union of India (1978)	<ul style="list-style-type: none"> • Strengthened personal liberty jurisprudence by holding that a procedure depriving a person of liberty must be fair, just and reasonable, and must satisfy applicable fundamental-rights requirements.
A.K. Roy v. Union of India (1982)	<ul style="list-style-type: none"> • Examined the constitutional validity of the National Security Act, 1980, and clarified important procedural protections relating to preventive detention.
Rekha v. State of Tamil Nadu (2011)	<ul style="list-style-type: none"> • Emphasised that preventive detention must be used within narrow limits. • If ordinary criminal law is sufficient to deal with the situation, preventive detention should not be used as a substitute.

What is the significance of preventive detention in maintaining public order and national security?

1. **Prevents potential threats:** Preventive detention enables authorities to intervene before anticipated activities threaten national security or public order, provided statutory requirements are met. It helps prevent potential harm rather than merely punishing offences after they occur.
2. **Combats terrorism:** Preventive detention enables authorities to detain individuals, subject to legal safeguards, when there are sufficient grounds to believe that their activities may threaten national security. It can help prevent terrorist attacks and disrupt activities such as recruitment, financing and logistical support for terrorism.

3. **Securing Critical infrastructure & Defense:** Enactments like the **National Security Act (NSA)** and the **Unlawful Activities (Prevention) Act (UAPA)** grant authorities powers to detain actors attempting to disrupt defense installations, foreign relations, or territorial integrity.
4. **Controls communal violence:** Preventive detention can help authorities prevent anticipated acts of communal violence by detaining individuals when there are legally sufficient grounds to believe their activities may threaten public order.
5. **Economic Security:** Statutes such as **COFEPOSA** (Conservation of Foreign Exchange and Prevention of Smuggling Activities Act) utilize preventive detention to deter organized economic offenses, money laundering, and illegal racketeering that weaken the national economy.
6. **Protects essential supplies:** Preventive detention can help prevent activities such as hoarding and smuggling that threaten the availability of essential commodities.
7. **Addresses emerging threats:** Preventive detention enables authorities to act against anticipated threats before they materialise into serious harm, provided the legal grounds are satisfied. For e.g. the **National Security Act, 1980** may be invoked to prevent activities prejudicial to national security or public order when its statutory requirements are met.
8. **Supports public safety:** Preventive detention can help authorities prevent anticipated acts of violence that pose a serious threat to public safety and public order. Authorities may detain an individual under a valid preventive detention law when statutory conditions are met and credible material indicates a threat of imminent communal violence.

What are the major concerns associated with the misuse of preventive detention laws in India?

1. **Violation of Fundamental Rights:** Arbitrary use of preventive detention can violate Article 21 (right to life and personal liberty) and undermine the safeguards under Article 22 of the Constitution, as individuals may be detained without a regular criminal trial.
2. **Circumvention of Criminal Justice:** Authorities may misuse preventive detention as a shortcut to avoid ordinary criminal proceedings, including the need to prove allegations in a fair trial. This undermines the presumption of innocence and the right to due process.
3. **Excessive Executive Discretion:** Preventive detention laws grant executive authorities significant powers to detain individuals based on their assessment of potential threats. This may lead to arbitrary decisions or detention based on inadequate evidence, undermining personal liberty.
4. **Prolonged Detention Without Trial:** Preventive detention allows individuals to be detained without a criminal trial, sometimes for extended periods. This can undermine the right to personal liberty under Article 21 and cause serious hardship to detainees and their families. For e.g. under the National Security Act (NSA), 1980, detention can extend up to 12 months, subject to statutory conditions and safeguards, without a criminal trial.
5. **Weak Procedural Safeguards:** Delays in communicating the grounds of detention, failure to consider a detainee's representation promptly, or inadequate disclosure of relevant information can undermine the constitutional safeguards provided under Article 22.
6. **Political Misuse:** Preventive detention laws may be misused to target political opponents, activists or dissenters, thereby discouraging legitimate criticism of the government and weakening democratic freedoms. For e.g. during the Emergency (1975–1977), the **Maintenance of Internal Security Act (MISA), 1971** was used to detain opposition leaders and political activists without trial, raising serious concerns about the misuse of executive powers.
7. **Impact on Vulnerable Sections:** Poor and marginalised individuals often lack access to quality legal assistance and resources to challenge preventive detention orders, making them more vulnerable to prolonged or arbitrary detention.

8. **Erosion of Public Trust:** Arbitrary use of preventive detention can weaken public confidence in law-enforcement agencies and the justice system, as citizens may perceive the authorities as acting beyond their legal powers.

What measures should be taken to prevent the misuse of preventive detention laws in India?

1. **Ensure Strict Judicial Review:** Courts should scrutinise preventive detention orders to ensure they comply with constitutional safeguards, are based on relevant material and are free from mala fide intentions.
2. **Strengthen Procedural Safeguards:** Authorities must strictly comply with Article 22(5) of the Constitution by promptly communicating the grounds of detention and providing detainees an effective opportunity to make a representation against the detention. This will help prevent arbitrary detention and protect individual liberty.
3. **Limit Executive Discretion:** The government should establish clear and objective criteria for ordering preventive detention to prevent arbitrary decisions. Detention orders must be based on relevant evidence, recorded reasons and strict compliance with constitutional safeguards.
4. **Avoid Substitution for Criminal Law:** Preventive detention should be used only in exceptional circumstances to prevent anticipated threats, and not as a substitute for ordinary criminal proceedings. Authorities should rely on investigation, arrest and trial under criminal law whenever these are sufficient to address the alleged offence.
5. **Ensure Accountability & Transparency:** Authorities should record clear, specific reasons for detention and maintain proper documentation to enable effective judicial scrutiny. Officials responsible for mala fide or unlawful detention should face appropriate legal or disciplinary action, thereby reducing arbitrary use of power and strengthening public trust.
6. **Strengthen Advisory Boards:** Advisory Boards should function independently and impartially to review the grounds of preventive detention and assess whether sufficient legal justification exists for continued detention. Timely reviews and reasoned assessments can help prevent arbitrary detention and protect individual liberty.

Conclusion: Preventive detention must remain an exceptional measure. Strong judicial oversight, accountable executive action and strict adherence to constitutional safeguards are essential to balance national security with individual liberty and the rule of law.

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Women Livelihood – Significance & Challenges – Explained Pointwise

Women's livelihood is a key driver of economic empowerment, gender equality and inclusive growth. The reported lapse of the Centre's flagship urban livelihood scheme, DAY-NULM, without a successor raises concerns about the continuity of institutional support for women's economic and social empowerment, highlighting the need for a comprehensive approach to women's livelihoods in India.

What is the significance of women's livelihood opportunities in promoting economic empowerment and inclusive growth in India?

1. **Economic Empowerment:** Women's livelihood opportunities provide financial independence, reduce dependence on family members and enhance their control over income and assets. For e.g. women

associated with Self-Help Groups (SHGs) can access credit and establish small businesses, strengthening their economic autonomy.

2. **Poverty Reduction:** Women's livelihood opportunities increase household income, improve access to basic necessities and help families escape the cycle of poverty. For e.g. women engaged in Self-Help Groups (SHGs) can generate income through small businesses and allied activities.
3. **Unlocking Demographic Dividend:** Women constitute nearly half of India's population. Increasing Female Labour Force Participation (FLFP) unlocks a massive reserve of labor, skills, and entrepreneurial talent.
4. **Gender Equality:** Women's livelihood opportunities reduce economic disparities between men and women by promoting equal access to employment, income and productive resources. This strengthens women's financial independence and promotes gender equality in society.
5. **Improved Social Status:** Livelihood opportunities enhance women's decision-making power within households and increase their participation in social and community affairs. For e.g. women associated with Self-Help Groups (SHGs) often gain greater confidence, financial independence and recognition in society.
6. **Inclusive Economic Growth:** Women's livelihood opportunities expand the productive workforce, increase household incomes and ensure that the benefits of economic growth reach a wider section of society. For e.g. women-led Self-Help Groups (SHGs) under DAY-NRLM promote rural entrepreneurship and generate employment.
7. **Human Capital Development:** Female income directly correlates with improved child nutrition, health outcomes, higher school enrolment rates, and lower drop-out rates, interrupting the intergenerational cycle of poverty. Studies consistently show that women invest up to 90% of their earnings back into their families and communities, compared to 30-40% for men.
8. **Sustainable Development:** Women's livelihood opportunities promote sustainable development by advancing gender equality, reducing poverty and ensuring inclusive economic growth. They contribute to achieving **SDG 5 (Gender Equality)** and **SDG 8 (Decent Work and Economic Growth)**.

What are the major challenges faced by women in securing sustainable livelihoods in India?

1. **Patriarchal Mindset of Society:** Traditional gender norms often consider men as primary breadwinners and women as caregivers, restricting women's employment choices, mobility and economic independence. This mindset discourages women from pursuing livelihood opportunities and limits their participation in decision-making.
2. **Low Labour Force Participation:** Social norms, household responsibilities and limited employment opportunities restrict women's participation in India's labour market. This limits their financial independence and prevents the economy from fully utilising its human resource potential.
3. **Unpaid Care Work:** Women bear a disproportionate burden of household chores, childcare and elderly care, limiting their time and ability to pursue paid employment and sustainable livelihood opportunities. This reinforces economic dependence and gender inequality.
4. **Gender Wage Gap:** Women often receive lower wages than men due to occupational segregation, discrimination and unequal access to better-paying jobs. This reduces their financial independence and discourages their participation in the workforce.
5. **Limited Access to Resources:** Women often face difficulties in accessing land ownership, institutional credit, modern technology and productive assets. This limits their ability to establish enterprises, improve agricultural productivity and secure sustainable livelihoods.

6. **Lack of Skill Development:** Limited access to vocational training, digital literacy and market-oriented skills reduces women's employability and restricts their access to better-paying jobs and sustainable livelihood opportunities.
7. **Safety and Mobility Constraints:** Concerns about sexual harassment, unsafe public transport and workplace security, along with social restrictions on women's mobility, limit their access to employment opportunities, particularly in urban and industrial areas.
8. **Regional and Social Inequalities:** Women from disadvantaged castes, tribal communities and economically weaker households face multiple barriers, including limited access to education, skill development, credit and employment opportunities. Regional disparities in infrastructure and job availability further restrict their livelihood prospects.

What initiatives have been taken by the government and civil society to promote livelihood opportunities for women in India?

Government initiatives:

Deendayal Antyodaya National Livelihoods Mission (DAY-NRLM)	Yojana Rural Mission	Organises rural women into Self-Help Groups (SHGs) and promotes access to credit, skill development and self-employment.
National Livelihoods Mission (DAY-NULM)	Urban Mission	Supports urban poor women through SHGs, skill development, access to credit and self-employment opportunities.
Pradhan MUDRA (PMMY)	Mantri Yojana	Facilitates collateral-free institutional loans to eligible micro-enterprises, including women-led businesses.
Stand-Up Scheme	India	Facilitates bank loans for greenfield enterprises promoted by women and SC/ST entrepreneurs, subject to scheme eligibility conditions.
Lakshpati Initiative	Didi	Aims to enable women in SHGs to earn sustainable annual household livelihoods of at least ₹1 lakh through diversified economic activities.
Namo Drone Scheme	Drone Didi	Trains women SHG members in drone piloting and maintenance for agricultural applications (crop monitoring, fertilizer spraying).
Swavalambini Scheme		Facilitates young women through ideation, financial access, and 21 weeks of dedicated business mentorship.

Civil society initiatives:

Self-Employed Women's Association (SEWA)	Organises women in the informal economy and supports skill development, microfinance, social security and direct market linkages.
Kudumbashree Mission, Kerala	Promotes women's neighbourhood groups, micro-enterprises, collective farming and producer companies to improve income and economic independence.
PRADAN (Professional Assistance for Development Action)	Strengthens rural women's livelihoods via sustainable agriculture, livestock rearing, and natural resource management.
Mann Deshi Foundation	Operates India's first microfinance bank managed by and for rural women, accompanied by Business Schools for female entrepreneurs.
Sheroes & Digital Platforms	Enables urban and semi-urban women to access remote work opportunities, peer support networks, and career coaching.
Barefoot College (Tilonia)	Trains rural, non-literate women (" Solar Mamas ") to become solar engineers, building clean energy livelihoods in off-grid areas.

What measures should be taken to ensure sustainable and dignified livelihood opportunities for women in India?

1. **Skill Development:** Provide women with market-oriented vocational training, digital literacy and technical skills aligned with industry requirements. This will enhance their employability, promote entrepreneurship and enable them to access better-paying and sustainable livelihood opportunities.
2. **Improve Access to Credit:** Expand access to affordable institutional credit, microfinance and financial literacy programmes for women entrepreneurs and Self-Help Groups (SHGs). Simplifying loan procedures and strengthening schemes such as MUDRA can help women establish businesses, generate employment and achieve financial independence.
3. **Ensure Equal Wages:** Strictly enforce equal pay for equal work and strengthen mechanisms to address gender-based wage discrimination. Effective implementation of the Code on Wages, 2019, along with regular wage audits and grievance-redressal mechanisms, can promote fair remuneration and economic justice for women.
4. **Promote Women Entrepreneurship:** Women entrepreneurs should be provided with affordable credit, skill development, modern technology and better market access. Strengthening initiatives such

as the MUDRA Yojana can encourage women-led enterprises, generate employment and promote economic independence.

5. **Strengthen SHGs:** Strengthening SHGs through easier access to credit, skill development, digital literacy and market linkages can promote women's entrepreneurship and generate sustainable livelihoods. Initiatives such as DAY-NRLM and the Lakhpati Didi initiative can further enhance women's income and economic independence.
6. **Improve Access to Productive Resources:** Ensure women's ownership of land, property and other productive assets, along with access to institutional credit, modern technology, irrigation and agricultural training. This will enhance their productivity, economic independence and livelihood security, particularly in rural areas.
7. **Address Patriarchal Mindsets:** Promote gender-sensitive education, community awareness campaigns and equal sharing of domestic responsibilities to challenge traditional gender stereotypes. This can encourage families to support women's employment, entrepreneurship and economic independence.

Conclusion: Ensuring sustainable and dignified livelihoods requires moving beyond employment generation towards decent work, equal opportunities, social security and economic independence. Empowering women economically is essential for inclusive growth and the realisation of **Viksit Bharat**.

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