ForumIAS

7 PM COMPILATION

May, 2026

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- Comprehensive coverage of a given current topic
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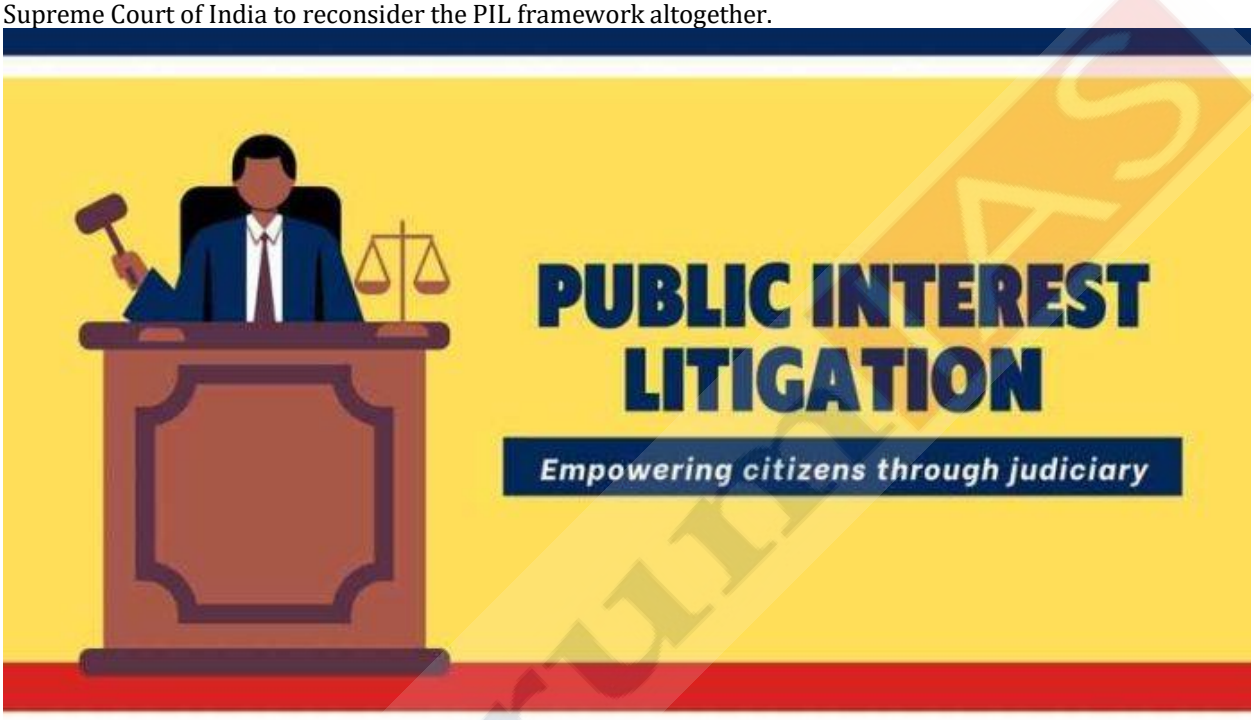
Public Interest Litigation (PIL) – Significance & Criticisms – Explained Pointwise

Public Interest Litigation (PIL) emerged in the 1970s as a transformative judicial innovation aimed at expanding access to justice for the poor and marginalized. This was facilitated by relaxing the strict rules of locus standi to allow representative actions, and by broadening judicial powers to take suo motu cognizance of public issues and convert them into litigation. However, over time, concerns have been raised regarding the misuse of this jurisdiction. Recently, in the Sabarimala reference case, the Union government urged the Supreme Court of India to reconsider the PIL framework altogether.



Source: Law Article

What is PIL?

PIL (Public Interest Litigation) refers to a legal mechanism that allows individuals or organizations to approach a court of law seeking justice for a matter of public interest, rather than for personal gain.

It is designed to protect the rights of marginalized or disadvantaged groups who may not have the resources or ability to file a lawsuit themselves.

PIL originated in the **United States** in the 1960s and was developed in India by the Supreme Court in the late 1970s and 1980s, notably under **Justices P.N. Bhagwati** and **V.R. Krishna Iyer**.

Key features of PIL:

To address issues affecting the public at large, such as environmental pollution, corruption, human rights violations, or prison reforms.

Any citizen, non-governmental organization (NGO), or social activist can file a PIL, not just an aggrieved party.

Unlike ordinary litigation, the strict rules of ***locus standi*** are relaxed, allowing anyone with public spirit to raise an issue.

The court can take **suo moto cognizance** of issues based on a letter, news report, or even a postcard.

PILs are typically filed under **Article 32** (in the Supreme Court) or **Article 226** (in High Courts).

What are some of the important cases taken up under PIL?

Hussainara Khatoon v. State of Bihar (1979)	This is widely considered the **first PIL in India**. A news report revealed that thousands of "undertrials" in Bihar had been in jail for periods longer than the maximum sentence they would have received if convicted. Supreme Court ordered the immediate release of over 40,000 prisoners. It established the **"Right to a Speedy Trial"** as a fundamental right under Article 21.
M.C. Mehta v. Union of India (1986–Present)	These cases gave birth to the **"Absolute Liability"** principle (making companies 100% liable for hazardous leaks) and the **"Polluter Pays"** principle. It forced thousands of polluting industries to either clean up or shut down.
T.N. Godavarman Thirumulpad v. Union of India (1996)	Often called **"the forest case"** of India. It is a landmark PIL which originated as a PIL to protect forest areas of Nilgiris & that fundamentally changed how India protects its environment, shifting the judiciary from a passive interpreter of law to an active manager of natural resources. The case introduced or strengthened several key concepts that govern Indian environmental law today such as **Net Present Value (NPV), CAMPA Funds** etc.
Vishaka v. State of Rajasthan (1997)	PIL highlighting the lack of protection for women in their workplaces. There was no specific law at the time to address the issue. The Court created the **"Vishaka Guidelines."** These guidelines were legally binding for years and eventually led to the enactment of the **Sexual Harassment of Women at Workplace Act, 2013.**
Parmanand Katara v. Union of India (1989)	A person died because hospitals refused to treat him, claiming they couldn't touch a "medico-legal case" (accident case) until a police report was filed. The Supreme Court ruled that **preserving life is paramount**. It held that every doctor, whether in a public or private hospital, has a professional and legal obligation to provide immediate medical aid to injured persons without waiting for police formalities.
NALSA v. Union of India (2014)	A PIL was filed to recognize the rights of transgender people. The Court officially recognized **transgender people as the "Third Gender."**

What is the significance of PIL?

Social Justice: India has vast populations of marginalized groups: Scheduled Castes, Scheduled Tribes, women, children, prisoners, and victims of human trafficking. PIL became the primary legal mechanism to secure justice for these groups. Cases on preventing manual scavenging, protecting the rights of sex workers, ensuring prison reforms, and stopping child labor were all initiated through PIL.

Expanding Article 21 (Right to Life): PIL played a very critical role in expanding the scope of Article 21. The right to a clean environment (M.C. Mehta case), right to livelihood (Olga Tellis case), right to free and compulsory education (Unnikrishnan case), right against custodial torture, right to speedy trial, right to shelter, and right to health are all products of PIL-driven jurisprudence.

Introduction of "Continuing Mandamus": This is a uniquely Indian innovation born out of PIL. Instead of issuing one judgment and closing the case, the court retains jurisdiction and monitors the implementation of its orders over months or even years. For complex issues (like cleaning the Yamuna River or converting Delhi's

buses to CNG), the court appoints committees, seeks regular compliance reports, and passes directions until the problem is fully solved. This ensures that the executive cannot simply ignore a court order.

Addressing Environmental Degradation: Given India's rapid industrialization and severe pollution problems, PIL has been the primary tool for environmental protection. Landmark cases like the **Taj Trapezium** case (protecting the Taj Mahal from acid rain), the **Delhi CNG** case, and the **Silent Valley** case were all PILs. The very establishment of the **National Green Tribunal (NGT)** was influenced by PIL jurisprudence.

Accountability of the State: It serves as a check on "Executive Overreach" or "Administrative Inertia." PIL allowed the judiciary to step in when the executive failed to perform its constitutional duties (**Judicial Activism**). The court takes a proactive role in governance to ensure justice. Thus, PIL transformed the Supreme Court into a "last resort" for citizens who felt ignored by the Executives & the Legislature.

Low-Cost Access to Justice: By relaxing procedural technicalities, the court ensures that the cost of litigation doesn't prevent justice from being served. The judiciary realized that in a developing nation, the "Rule of Law" is meaningless if it only serves those who can pay.

Filling Legislative Vacuums: When the government fails to create laws for urgent issues (like workplace harassment or air quality), the court provides "guidelines" that function as law until a formal Act is passed.

What are the major criticisms of PIL?

Judicial Overreach: PIL has led the judiciary to overstep its constitutional role of interpreting laws and instead start making or administering them. This violates the **Separation of Powers** doctrine. The judiciary is becoming a "super-legislature" and "super-executive" for e.g. Supreme Court's order banning the sale of alcohol on national and state highways, while well-intentioned for road safety, critics argued it ruined livelihoods of thousands of small shop owners.

Misuse for Private, Political, or Vexatious Motives: Many PILs are not for "public interest" at all, but for private gain dressed up in public garb for e.g. Rival politicians file PILs to harass opposition leaders, Business rivals file PILs to stall competitors' projects. The Supreme Court itself has called many PILs "publicity interest litigation," "private interest litigation," or "politically motivated litigation" or "Ambush PIL".

Overburdening of Courts: Hundreds of frivolous PILs have clogged the Supreme Court and High Courts. Instead of waiting for evidence, courts issue notices based on newspaper clippings, TV news reports, or letters. Judges spend weeks and months hearing such PILs instead of clearing the backlog of thousands of old criminal and civil cases involving real litigants.

Anti-Democratic Tendencies: Unlike Parliament or state assemblies, judges are not accountable to the people. Yet, PIL allows a single unelected judge to stall or change laws and policies affecting millions. While unelected judges are necessary for constitutional interpretation, using PIL to run day-to-day governance is a form of "judicial dictatorship."

Inconsistent Standards and Lack of Procedure: Unlike regular cases which have strict rules of evidence, cross-examination, and pleadings, PILs operate on a flexible, often ad-hoc basis. The same petition may be dismissed in one court and admitted in another. There is no codified "PIL Act" in India. Some judges take suo motu cognizance of a news report about a child falling into a borewell, but ignore a letter about thousands of malnutrition deaths. This arbitrariness is a major criticism.

Violation of Natural Justice: In traditional law, no order can be passed against a person without giving them a chance to be heard (***audi alteram partem***). PIL often bypasses this. Courts often issue interim orders (e.g., "stop all construction within 500m of this river") without hearing the affected parties—small builders, laborers, shopkeepers, or state agencies.

Difficulty in Implementation: A court can pass a landmark judgment, but it has no "sword or purse" to enforce it. Many PIL orders remain on paper because the government lacks the funds or the political will to implement them. This can lead to a loss of public faith in the judiciary when people see that court orders are routinely ignored.

Elitist and Urban-Centric Bias: Ironically, while PIL was meant for the poor rural masses, most PILs are filed in the Supreme Court or High Courts by elite urban lawyers, retired judges, or metropolitan NGOs.

What should be the way forward?

Stricter Scrutiny at the Admission Stage (Filtering Frivolous PILs):

Impose costs heavily on frivolous or vexatious PILs at the admission stage itself. The Supreme Court has occasionally done this, but it must become the norm, not the exception.

Distinguish clearly between – Genuine PIL and Private interest disguised as PIL or Publicity PIL.

Codify a "PIL Procedure": The **Parliament** or the **Supreme Court** (under Article 145) should frame clear, codified rules for PIL, including:

Who can file (definition of "public-spirited person").

What issues are maintainable (list of excluded matters: service disputes, contractual matters, political rivalries).

Time limits for disposal.

Requirement to exhaust alternative remedies (e.g., approaching the executive, National Human Rights Commission, or statutory bodies) before filing PIL.

Impose "Continuing Mandamus" Limits:

Courts should **set a time limit** for their own supervision (e.g., 6 months or 1 year) and then exit, leaving implementation to executive bodies.

Instead of monitoring directly, courts can refer complex technical matters to **expert statutory bodies** and only review their reports for constitutional compliance.

The **National Green Tribunal (NGT)** and **Human Rights Commissions** should be strengthened so courts can transfer environmental and human rights PILs to them, reducing the Supreme Court's load.

Enact a "Public Interest Litigation Act": Parliament should enact a **PIL Act** that defines – Who has standing (individuals, registered NGOs with a track record, legal aid authorities), What constitutes "public interest" (excludes private disputes, service matters, contractual breaches, political vendettas), Procedure for filing, hearing, and disposing of PILs, Costs and penalties for misuse. This would remove the arbitrariness and bring PIL within a predictable legal framework.

Bridging the Digital Divide: Expanding **e-Seva Kendras** to every *Gram Panchayat* to help rural citizens file petitions and track cases without needing to travel to a High Court. Translate the court orders and filing forms into regional languages to truly democratize judicial information & to overcome the criticism of urban-elitist biasness of PIL.

Judicial Self-Restraint: Instead of judges making technical decisions (like pollution levels or traffic flow), the judiciary should involve appointing independent, specialized committees and following their recommendations. Rather than passing new "guidelines," the court's role should shift toward monitoring whether existing laws are actually being implemented by the executive.

Strengthening NALSA: The National Legal Services Authority (NALSA) is being bolstered to provide free legal aid at the grassroots level. If local legal aid cells can solve a problem, the need for a massive PIL at the Supreme Court decreases.

UPSC GS-2: Polity
Read More: The Hindu

Gig Workers in India – Benefits & Challenges – Explained Pointwise

In a move to secure the rights of the growing platform-based labour force, the Karnataka government has officially operationalized a specialized grievance redressal mechanism for platform-based gig-workers. Th e mechanism, a first-of-its-kind in India, has been developed by the Karnataka Platform-based Gig Workers' Board in collaboration with the Department of e-Governance.

Source: The Core

Who are the Gig Workers?

According to the **Code on Social Security (2019)**, a gig worker is: "A person who works and earns through activities outside traditional employer-employee relationships."

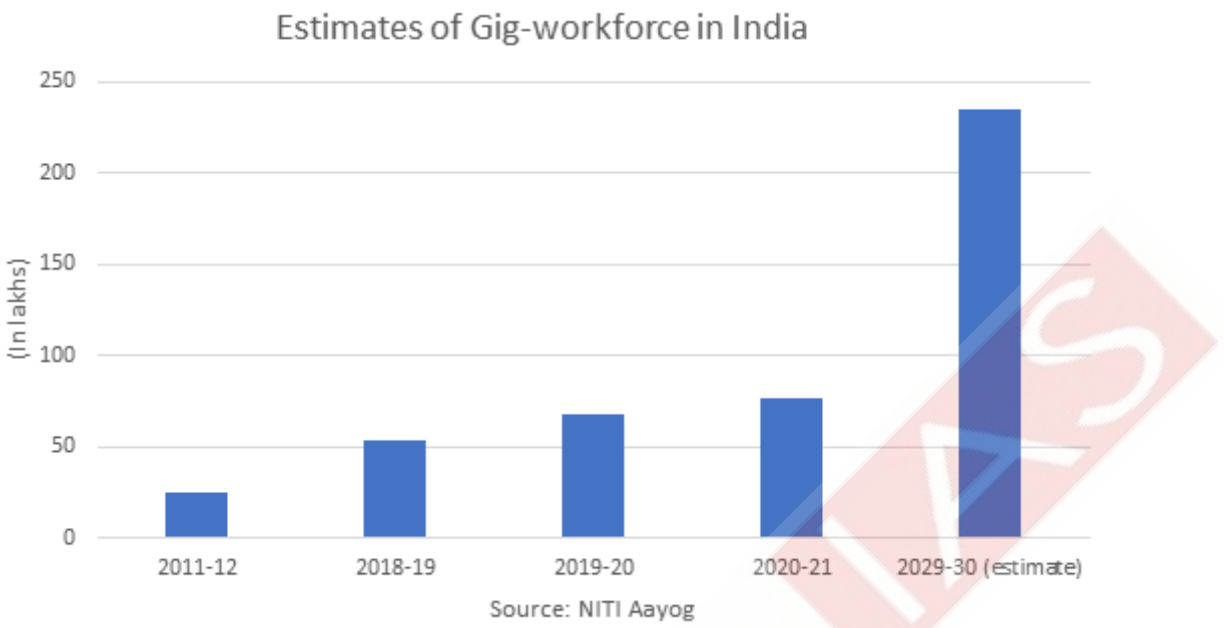
Gig work is largely task-based, facilitated through digital platforms. Workers, including freelancers and independent contractors, are paid per task rather than through full-time contracts. Common roles range from food delivery to online freelancing and digital services.

What is the present status of Gig Economy & Gig Workers in India?

As of now, India has around **7-8 million gig workers**, and this number is rapidly growing. NITI Aayog estimates that the numbers of gig workers could expand to 23.5 million by 2029-30.

The gig economy is expected to expand at a **Compound Annual Growth Rate (CAGR) of 12%**, reaching **23-25 million workers by 2030**. This would mean that gig workers would make up **4.1% of India's total workforce** by that time.

A report by **Boston Consulting Group (BCG)** suggests that the gig economy could potentially create **90 million non-farm jobs** and contribute an additional 1.25% to India's GDP, reflecting its potential as a significant economic driver.



Indicator	Value
2020-21	7.7 million gig workers (NITI Aayog)
2029-30 Projection	23.5 million workers
Skill Distribution	47% medium-skilled 22% high-skilled 31% low-skilled
Major Sectors	Ride-hailing, delivery, content creation, marketing, e-commerce logistics

What are the factors behind rapid growth of Gig Economy in India?

Digital Access	Over 936 million internet users and 650 million smartphone users (2025 estimate). Affordable devices and 4G/5G connectivity allow even rural workers to participate.
e-commerce & Startups	Platforms like **Zomato, Swiggy, Urban Company, Amazon, Flipkart** create demand for delivery, marketing, and logistics work.
Consumer Convenience	Urban lifestyles increase demand for **on-demand services**, boosting opportunities in delivery, customer support, and freelancing.
Labor Market Dynamics	Surplus of semi-skilled labor, weak social security, and high unemployment push workers toward gig jobs as a survival strategy.

Work Preferences	Younger generations value flexibility, remote work, and project-based tasks, making gig work highly attractive.

What are benefits of Gig Economy & Gig workers?

Opportunities for Workers: Gig work provides flexible hours, helping workers balance personal and professional life. **For example**, a woman delivering groceries via Swiggy can manage childcare, while a freelance designer on Upwork can pick projects based on availability.

Business Advantages: Companies access cost-effective, short-term labor. Amazon and Flipkart hire gig workers during peak seasons, allowing rapid workforce scaling and higher productivity.

Economic Impact: By 2030, the gig economy could create 90 million jobs, handle $250 billion in transactions, contribute 1.25% to GDP, and represent 4.1% of the workforce. Platforms like Zomato and Ola illustrate its role in boosting employment and economic activity.

Inclusivity & Technology: Gig work is reaching Tier-II and Tier-III cities, offering jobs to local youth. Ride-sharing and food delivery are expanding in cities like Mysuru, Coimbatore, and Lucknow. AI and predictive analytics help assign tasks efficiently, cut waiting times, and increase earnings.

Skill Development: Gig work encourages skill enhancement and digital literacy, as workers learn new tools, platforms, and professional practices to stay competitive.

What are the challenges faced by the Gig Workers?

Income Volatility: Unlike traditional salaries, gig income fluctuates based on demand, season, or even the time of day. This "feast-or-famine" cycle makes long-term financial planning (like getting a mortgage) extremely difficult.

Lack of Benefits: Most gig workers are classified as "independent contractors," meaning they do not receive health insurance, paid sick leave, maternity leave, or retirement contributions.

Operational Costs: Workers often bear the full burden of expenses, such as fuel, vehicle maintenance, insurance, and equipment, which can significantly eat into their "take-home" pay.

The "Black Box": Platforms use opaque algorithms to assign tasks, set pay rates, and track performance. Workers often feel they are working for a "boss they can't talk to."

Arbitrary Deactivation: A sudden drop in customer ratings or a technical glitch can lead to "deactivation" (essentially being fired) without a clear human appeal process or due process.

Surge and Target Pressure: Many platforms use "gamified" incentives, pushing workers to work longer hours or take higher risks (like 10-minute delivery guarantees) to meet targets or earn bonuses.

Occupational Hazards: Delivery and transport workers face high risks of road accidents, extreme weather exposure, and physical exhaustion.

Misclassification: There is a global legal battle over whether gig workers should be considered "employees." Until this is resolved, many remain in a "legal grey area" without the protection of minimum wage laws or collective bargaining rights.

What are the various initiatives taken by the government for Gig Workers?

Central Legislation	**Code on Wages, 2019:** Proposes a universal minimum wage for all sectors, including gig workers. **Code on Social Security, 2020:** Recognises gig workers as a separate category, but rules are yet to be framed. **Motor Vehicle Aggregator Guidelines, 2020:** Provides **term insurance of ₹15 lakh** and **health insurance of ₹10 lakh** for gig drivers. Limits working hours to **12 hours per day** with a **10-hour break** if logged in full-time.

	PM Jan Arogya Yojana (PM-JAY, 2025-26): Offers **₹5 lakh per family per year** health coverage for gig workers. **e-SHRAM Portal (2021):** National database for unorganized and gig workers; **30.58 crore workers registered** as of early 2025.
State-Level Initiatives	**Rajasthan (2023):** First state to enact platform-based gig worker law. Key features include: Mandatory registration of gig workers and aggregators. Creation of a **Welfare Board and Fund**, financed by a **1-2% transaction cess**. Provisions for **grievance redressal, payment transparency, and rights awareness**. **Karnataka:** **Karnataka Platform-Based Gig Workers (Social Security & Welfare) Act:** Based on Rajasthan's law but with stronger focus on **worker safety and welfare**. Includes **aggregator contributions** to the welfare fund as a percentage of gig worker earnings. **Integrated Public Grievance Redressal System Portal (IPGRS)**: Gig workers can officially lodge grievances, including regarding pay, working conditions, and platform-specific disputes. **Jharkhand & Bihar:** Recently passed similar laws ensuring registration and grievance redressal mechanisms for app-based workers.

What should be the way forward?

Implement existing legal framework better: Notify the detailed rules on eligibility, contribution rates, and benefit packages (health, accident, pension, maternity) under the social security fund for gig workers. Ensuring all gig workers are on e-Shram and linking this to actual scheme delivery, not just data collection, including PM-JAY coverage and existing pension schemes for unorganised workers.

Design a robust social security fund: Mandate 1-2% of platform annual turnover or payouts (capped as in the Codes) into a ring-fenced social security fund, with public disclosure and digital tracking of all contributions and disbursements. Provide portable, proportional benefits (health insurance, accident cover, disability support, and old-age income protection) that follow the worker across multiple platforms and cities.

Improve Work Conditions & Income Security: Guarantee minimum earnings floors or algorithmic "minimum standard orders" for pay, deductions, and insurance, drawing on models used in Australia and certain US jurisdictions.

Strengthen Worker Voice & Data Rights:

Giving gig worker representatives real voting power in national and state Social Security Boards and Welfare Boards, with transparent criteria for their selection.

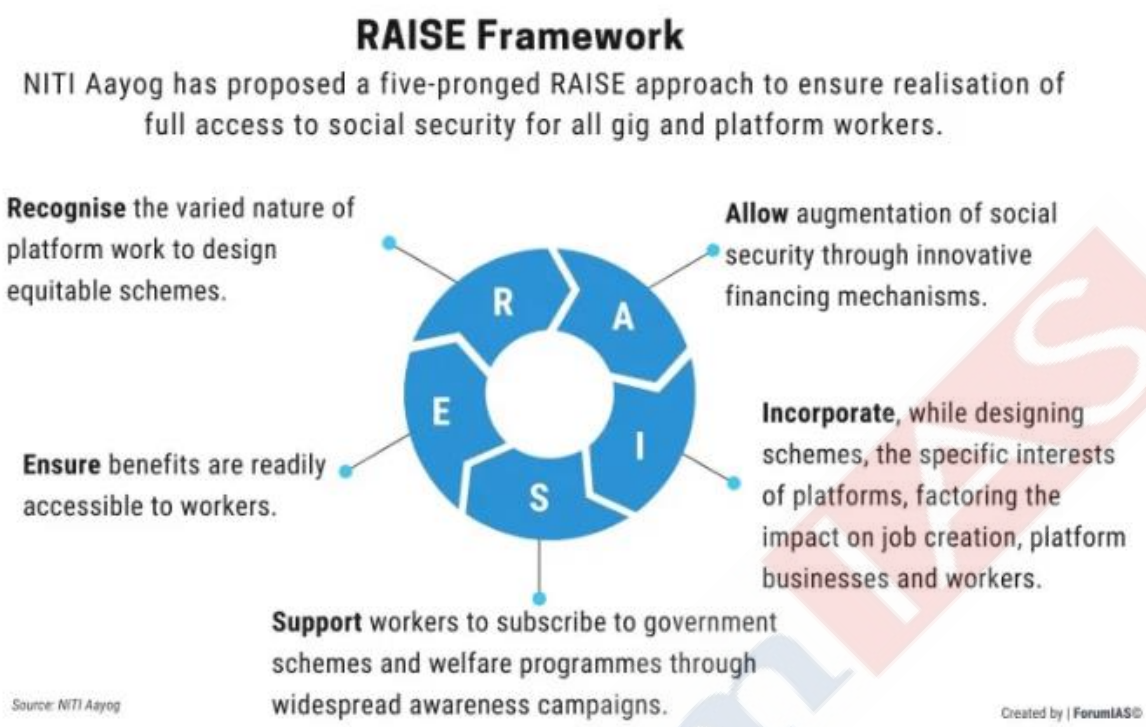
Mandating platform transparency on algorithms that set fares, incentives, and ratings, and granting workers rights to explanation and appeal against automated decisions, as proposed in draft state legislation.

Encourage Platform Responsibility & Innovation:

Offering tax or regulatory incentives for platforms that provide group insurance, skill-upgradation, and savings products over and above statutory minima, while penalising free-riding on the system.

Promoting digital benefit wallets linked to worker IDs so that every platform contribution (statutory and voluntary) accumulates in one portable account, improving financial inclusion and credit access for gig workers.

Implement NITI Aayog's RAISE Framework:



Read More: [The Hindu]
UPSC GS-3: Economics

Medical & Wellness Tourism in India – Explained Pointwise

India is emerging as a leading hub for Medical Value Travel (MVT) by integrating advanced medical infrastructure with traditional wellness systems such as AYUSH. Strong policy support, digital facilitation, and initiatives like **AYUSH Visa** and **Regional Medical Hubs** are strengthening the ecosystem. Rising global healthcare costs and demand for holistic care are driving international patients to India for affordable, high-quality treatment and preventive wellness solutions.

Source: Nimba

What is meant by Medical and Wellness Tourism?

Medical Tourism: It focuses on curative interventions such as complex surgeries, organ transplants, and advanced diagnostic care provided by specialised hospitals and healthcare institutions.

Wellness Tourism: It centres on preventive and holistic well-being through traditional systems such as Yoga, Ayurveda, Naturopathy and other AYUSH practices. It offers therapies that promote physical, mental and spiritual health.

How is India emerging as a global healing destination?

Across the world, rising healthcare costs, long waiting times, and the growing burden of lifestyle diseases are driving patients to seek treatment abroad. This global shift has led to the emergence of a multi-billion-dollar **Medical Value Travel (MVT) industry.**

The global Medical Value Travel market was valued at about **$115 billion in 2022**. It is projected to reach around **$286 billion by 2030**. The market is growing at a compound annual growth rate **(CAGR) of about 10.8%.**

India has emerged as one of the most significant destinations in this evolving global landscape. For centuries, India has been regarded as a sanctuary for those seeking healing, balance and recovery. Today, this ancient legacy has evolved into a dynamic Medical Value Travel ecosystem. It combines modern medical science with the timeless wisdom of traditional systems.

Industry estimates place the medical tourism market in India at about $8.7 billion in 2025, with projections of $16.2 billion by 2030.

Through the flagship **"Heal in India"** initiative, the Government is positioning the country as a premier destination for integrated and holistic healthcare.

According to the **Medical Tourism Index 2020–21**:

India ranks **10th** among the top 46 medical tourism destinations globally

12th among the world's top 20 wellness tourism markets.

5th among the top 10 wellness destinations in the Asia-Pacific region.

Leading Markets: According to 2025 figures, the top source countries for medical tourists include- Bangladesh (3,25,127 arrivals), followed by Iraq (30,989), Uzbekistan (13,699), Somalia (11,506), Turkmenistan (10,231), Oman (9738), and Kenya (9,357).

What are the reasons responsible for the growth of Medical and Wellness Tourism in India?

Robust Medical Resources	India's healthcare system is supported by one of the world's largest pools of trained medical professionals. India has **69,364 hospitals (43,486 private hospitals, and 25,778 public hospitals) with 1.2 million registered doctors**, achieving WHO recommended doctor population ratio. English serves as the primary language of medical education and clinical practice in India, enabling seamless communication with international patients. Over the past decade, India has significantly expanded its medical education capacity and healthcare infrastructure. This has strengthened the availability of skilled healthcare professionals across specialised disciplines.
Advanced Technology and Accreditation	India's healthcare system is supported by robust quality assurance mechanisms and internationally recognised accreditation standards. Hospitals and healthcare providers across the country obtain accreditation from the **National Accreditation Board for Hospitals and Healthcare Providers (NABH).** In addition, several Indian hospitals hold **Joint Commission International (JCI)** accreditation. It places the hospitals among healthcare institutions that meet globally accepted standards of clinical excellence.
Cost-Effective Medical Treatment	India's medical tourism appeal is significantly strengthened by its cost competitiveness. High-quality medical treatment in India is often available at substantially lower cost compared to many developed countries, while maintaining comparable clinical standards. This affordability is supported by **advanced medical technology and skilled professionals**. It enables international patients to access **specialised treatment without long waiting periods.**
Strengthening AYUSH-led Medical Value Travel	India possesses a unique advantage in wellness tourism through its centuries-old traditional systems of medicine collectively known as **AYUSH — Ayurveda, Yoga, Naturopathy, Unani, Siddha and Homeopathy.** **AYUSH Visa Facilitation**: To streamline access for international patients, the Government of India introduced a dedicated AYUSH Visa in 2023. It enables foreign nationals and their attendants to travel to India specifically for treatment under recognised AYUSH systems. **Insurance Coverage**: Insurance coverage for AYUSH therapies has also expanded significantly. Under the Health Insurance Regulations of IRDAI, insurers are permitted to cover treatments under AYUSH. Global outreach is also expanding through platforms like the WHO Global Traditional Medicine Summit, the Know India Programme, and AYUSH initiatives showcased during Maha Kumbh Mela 2025.
Regional Medical Hubs	A key proposal involves the establishment of **five Regional Medical Hubs** across the country in partnership with State Governments and the private sector. These Hubs are

	designed as **integrated healthcare complexes** that will house medical, educational, and research facilities under one umbrella.
Infrastructure for Wellness	In addition to strengthening modern healthcare infrastructure, the Government is also expanding the country's capacity in traditional systems of medicine: The establishment of **three new All India Institutes of Ayurveda** has been proposed to enhance education, research, and clinical services in Ayurveda. **WHO Global Traditional Medicine Centre in Jamnagar** is being upgraded to strengthen evidence-based research and global collaboration in traditional medicine systems.
Institutional Mechanism for Medical and Wellness Tourism	**National Medical & Wellness Tourism Promotion Board (NMWTB):** Constituted by the Ministry of Tourism in 2015, chaired by the Union Minister for Tourism. It promotes and facilitates medical and wellness tourism in India. **Multi-Stakeholder Platform**: The Board brings together ministries, state governments, hospitals, wellness centres, accreditation bodies, and industry stakeholders. Together, they strengthen the Medical Value Travel ecosystem. **State-Level Coordination**: States are encouraged to establish dedicated Medical and Wellness Tourism Promotion Boards or cells to support regional development and promotion.

What is the significance of growth of medical & wellness tourism in India?

Foreign Exchange Earnings: Attracts high-spending international patients, boosting foreign currency reserves.

Job Creation: Generates employment in healthcare, hospitality, transport, and wellness sectors (e.g., Ayurveda, yoga centers).

Ancillary Industry Growth: Spurs development of medical travel facilitators, translation services, insurance tie-ups, and post-operative care facilities.

Revenue for Healthcare Sector: Helps private hospitals utilize excess capacity and reinvest in advanced technology.

Retaining Talent (Reverse 'Brain Drain'): High-paying roles and world-class research opportunities in India's "Regional Medical Hubs" are encouraging top Indian doctors to stay in or return to India rather than moving to the US or UK.

Tier-2 Development: The expansion into cities like **Jaipur, Lucknow, and Chandigarh** means that world-class healthcare infrastructure is no longer concentrated only in the big metros, improving healthcare access for millions of locals in those regions.

Soft Power & Regional Leadership:

Positions India as a leader in **affordable, quality healthcare** within Asia and the Global South.

Strengthens diplomatic ties with neighboring countries (e.g., Afghanistan, Bangladesh, Myanmar) whose citizens rely on Indian hospitals.

What are the challenges faced by India Medical & Wellness Tourism sector in India?

Geopolitical Disruptions: Conflicts like the war in West Asia have caused a sharp decline in patients from key source markets such as Iraq, Yemen, and other Gulf nations. Travel disruptions, flight cancellations, and heightened uncertainty have led to a reported 30-40% drop in international patient footfall in some major Indian hubs.

Dependence on a Few Markets: A significant portion of medical tourists still comes from neighboring countries like Bangladesh, Iraq, and other nations in the Global South. Bangladesh remains the single largest contributor (over 50% of medical tourists). Any change in diplomatic relations or visa policies with neighbor nations can immediately impact hospital occupancy.

Visa & Logistical Hurdles: The current medical visa and e-visa durations (often 20-35 days) are too short for complex procedures like organ transplants or cancer therapy, which require weeks of follow-up care. This creates immense uncertainty for patients and their families.

Legal & Regulatory Complexities:

The legal framework poses risks for foreign patients. In the case of medical negligence or malpractice, pursuing a cross-border lawsuit is difficult and expensive due to different legal systems and language barriers.

Furthermore, there are significant data privacy concerns when sharing sensitive medical records across borders, as India's data protection standards may not be considered "adequate" by stringent frameworks like the EU's GDPR.

Insurance Synchronization: Many high-cost surgeries in India are still not seamlessly covered by global insurance providers, forcing international patients to pay out-of-pocket, which is a major deterrent compared to Singapore or Dubai.

Potential for Domestic Healthcare Disparity: There is a growing ethical concern that the lucrative medical tourism market could lead to a "two-tier" system. Hospitals may prioritize high-paying international patients for complex procedures and premium bed space, potentially crowding out or diverting resources from India's own population, which also faces a significant burden of disease.

What Should be the Way Forward?

Regional Medical Hubs: The government's announcement to establish **five Regional Medical Hubs** is a game-changer. These hubs will integrate modern medical facilities with AYUSH centres and dedicated facilitation units, moving beyond the current hospital-centric model to offer a complete ecosystem for international patients.

Specialized Clusters: Developing specific regions as "Centres of Excellence" for example, Kerala for Ayurveda, Tamil Nadu for Cardiac Care, and Uttarakhand for Yoga and Mental Wellness.

Skilled Manpower: A key differentiator will be service quality. The plan to train **1.5 lakh caregivers** in Yoga and Ayurveda will help create a pool of professionals who can offer genuine, standardized wellness experiences that blend with medical treatment. This must be complemented by training facilitators in global hospitality and language skills.

Insurance Portability: A major hurdle has been the lack of integration with global insurance networks. Future efforts require active collaboration with international insurers to include Indian hospitals in their coverage networks, removing a significant financial barrier for patients from the US or UK.

Shifting the Brand Narrative: India must market its **high-technology, fast, and reliable delivery** of complex procedures like transplants and oncology. The focus needs to shift from being the cheapest option to the most **trusted and technologically advanced** one, reinforcing the message of "competence, care, and compassion".

Medical Diplomacy: Incorporating healthcare into bilateral trade agreements with African and BIMSTEC nations to create "Green Channels" for patient referrals and doctor exchange programs.

Conclusion: India's medical and wellness tourism ecosystem is evolving into a globally trusted model of integrated healthcare. It combines modern medical infrastructure with traditional systems such as AYUSH. This enables both curative and preventive care. As global demand rises, India is poised to play a key role in shaping the future of global healthcare and wellness travel. For India to lead, it must move beyond relying on its natural strengths and start building the surrounding architecture of policy, trust, and seamless service that global patients require.

UPSC GS-3: Indian Economy

Read More: PIB

Model Code of Conduct – Explained Pointwise

Recently, Prime Minister Narendra Modi was accused of violating the **Model Code of Conduct (MCC)** when his address was broadcast live on national television. In his speech, he named opposition parties and urged women voters to punish them for defeating the **131st Constitution Amendment Bill** in the Lok Sabha. The broadcast raises important questions under both the Code and the Representation of the People Act, 1951.

Key Provisions of Model Code of Conduct

General Conduct	a. No party or candidate shall engage in any activity which may aggravate existing differences or create mutual hatred between different castes and religious or linguistic communities. b. No party or candidate shall engage in bribing of voters, intimidation of voters, impersonation of voters, canvassing within 100 meters of polling stations, holding public meetings during the period of 48 hours ending with the hour fixed for the close of the poll.
Meetings	The party or candidate shall inform the local police authorities of the venue and time any proposed meeting well in time so as to enable the police to make necessary arrangements for controlling traffic and maintaining peace and order.
Procession	A Party or candidate organizing a procession shall decide before hand the time and place of the starting of the procession, the route to be followed and the time and place at which the procession will terminate.
Polling Day	a. All Political parties and candidates shall co-operate with the officers on election duty to ensure peaceful and orderly polling. b. All Political parties and candidates shall refrain from serving or distributing liquor on polling day and during the forty eight hours preceding it.
Party in Power	a. Ministers shall not combine official visits with election work or use official machinery for the same. b. Public spaces and rest houses shall not be monopolized by the party in power and other parties shall also be allowed to use them.
Election Manifestos	a. Political parties shall avoid making promises that are likely to vitiate the purity of the election process or exert undue influence on voters. b. Manifestos shall reflect the rationale for promises and broadly indicate the ways and means to meet the financial requirements for it.

Created By Forum IAS

What is the Model Code of Conduct? What is the history of its evolution?

Model Code of Conduct: The Model Code of Conduct is a set of guidelines issued by the Election Commission of India for political parties and candidates to maintain decorum in their campaigning. It lays down a list of dos

and don'ts for leaders and parties ahead of elections. The Election Commission formalised it in 1968, revised it in 1974, and added Part VII on the **'Party in Power'** in 1979.

Duration of Model Code of Conduct: The MCC comes into force from the date the election schedule is announced until the date that results are out.

Legal Enforceability of MCC: MCC does not have any statutory backing. It has come to acquire strength in the past decade because of its strict enforcement by the EC. Certain provisions of the MCC may be enforced through invoking corresponding provisions in other statutes such as the IPC 1860, CrPC 1973, and RPA 1951.

Penalties for its violation: If the Election Commission finds a party or candidate in violation of the Model Code of Conduct, it can take measures from issuing a warning to ordering an FIR against the concerned party or candidate.

History of Evolution of Model Code of Conduct:

1960	The origin of the MCC lies in the Assembly elections of Kerala in 1960. The State administration prepared a 'Code of Conduct' for political actors.
1962	ECI circulated the Model Code of Conduct to all recognized political parties & State governments. It was followed in the Lok Sabha Elections in 1962.
1991	The EC decided to enforce the MCC more strictly after repeated flouting of the election norms.
2014	The EC issued guidelines prohibiting parties from making promises that exert an undue influence on voters. The EC also suggested that manifestos must also indicate the means to achieve promises.

What are the key provisions of MCC?

General Conduct	No party or candidate shall engage in any activity which may aggravate existing differences or create mutual hatred or cause tension between different castes and religious or linguistic communities. All parties and candidates shall avoid scrupulously all activities which are 'corrupt practices' and 'offences' under the election law, such as bribing of voters, intimidation of voters, impersonation of voters, canvassing within 100 meters of polling stations, holding public meetings during the period of 48 hours ending with the hour fixed for the close of the poll, and the transport and conveyance of voters to and from polling station. Parties and candidates shall refrain from criticism of all aspects of private life, which are not connected with the public activities of the leaders or workers of other parties.
Meetings	The party or candidate shall inform the local police authorities of the venue and time any proposed meeting well in time so as to enable the police to make necessary arrangements for controlling traffic and maintaining peace and order. The party or candidate shall apply to the authority concerned well in advance to obtain permission or license for the use of loudspeakers or any other facility in connection with any proposed meeting.

Procession	A Party or candidate organizing a procession shall decide before hand the time and place of the starting of the procession, the route to be followed and the time and place at which the procession will terminate. The organizers shall take steps in advance to arrange for passage of the procession so that there is no block or hindrance to traffic. The carrying of effigies purporting to represent member of other political parties or their leaders, burning such effigies in public and such other forms demonstration shall not be countenanced by any political party or candidate.
Polling Day	All Political parties and candidates shall co-operate with the officers on election duty to ensure peaceful and orderly polling. All Political parties and candidates shall refrain from serving or distributing liquor on polling day and during the forty eight hours preceding it. All authorized party workers at polling booths should be given suitable badges or identity cards. Identity slips supplied by them to voters shall be on plain (white) paper and shall not contain any symbol, name of the candidate or the name of the party.
Polling Booth	The EC will appoint observers to whom any candidates may report problems regarding the conduct of the election.
Party in Power	Ministers shall not combine official visits with election work or use official machinery for the same. The party in power shall avoid advertising at the cost of the public exchequer or using official mass media for publicity on achievements to improve chances of victory in the elections. Ministers and other authorities shall not announce any financial grants, or promise any construction of roads, provision of drinking water. Public spaces and rest houses shall not be monopolized by the party in power and other parties shall also be allowed to use them.
Election Manifestos	The election manifesto shall not contain anything against the ideals and principles enshrined in the Constitution. Political parties shall avoid making promises that are likely to vitiate the purity of the election process or exert undue influence on voters. Manifestos shall reflect the rationale for promises and broadly indicate the ways and means to meet the financial requirements for it. Manifestos shall not be released during the prohibitory period (before 48 hours), as prescribed under Section 126 of the Representation of the People Act 1951, for single or multi-phase elections.

What is the significance of MCC?

Ensuring free and fair elections (Article 324): Model Code of Conduct aims to address the issues of electoral malpractices and ensure that elections are conducted in a free and fair manner.

Ensures a Level Playing Field: The MCC prevents the ruling party (at the Centre or state) from misusing its official position or resources to gain an undue advantage over opponents for e.g. **No announcement of new policies, schemes, or financial grants** once the code is in force, **Ban on using government machinery, vehicles, or personnel** for campaigning, **Bar on transferring officials** who are connected with election work.

Ensuring social harmony: Model Code of Conduct aims to preserve social harmony by proscribing the political parties and candidates in engaging in any activity which may aggravate existing differences, create mutual hatred and cause tension between different castes and communities, religious and linguistic groups.

Encouraging transparency and accountability: MCC encourages transparency and accountability on part of the political parties to reflect the rationale for their electoral promises and broadly indicate the ways and means to meet the financial requirements for it.

Creates Moral & Political Authority: Though **not legally enforceable** as a statute, the MCC has gained immense **moral and political force** over decades. Parties and candidates comply largely due to fear of ECI's punitive actions (e.g., barring a leader from campaigning, nullifying a victory, or deregistering a party).

What are the Challenges with the Model Code of Conduct?

Lack of Statutory Backing: The MCC is election commission's moral sanction to get political parties and candidates to fall in line. But the norms of the Model Code of Conduct are flouted due to lack of legal backing.

Ineffectiveness in Curbing Malpractices: The MCC has failed to prevent electoral malpractices such as hate speech, fake news, money power, booth capturing, voter intimidation and violence.

Challenges from evolving technologies: The MCC was designed for traditional media and rallies. MCC norms are also being increasingly challenged by new technologies like AI based deepfakes, and social media platforms that enable faster and wider dissemination of misinformation and propaganda.

Vague Clauses: Some MCC clauses, such as maintaining the 'purity of the election process', are subjective and can be misinterpreted. Phrases like "appealing to communal feelings" or "personal attacks" are subjective. What one person considers a policy critique, another may see as a violation, leading to claims of bias in how the ECI interprets the code.

Reliance on Political Cooperation: The MCC's effectiveness depends on the cooperation from political parties and governments. Parties and governments often indulge in the violation of MCC. **For ex-** Hate Speeches during election campaigning.

Lack of Enforcement capacity of Election commission: ECI suffers from the shortage of functionaries for the effective implementation of the MCC.

Interference with Governance: ECI is criticized for the early application of MCC as it imposes limitations on policy decisions, public spending, welfare schemes, transfers, and appointments. The blanket ban on new policy announcements and projects can stall critical, non-political administrative and development work.

Inconsistent & Delayed Enforcement: The ECI can be slow to act on complaints, especially against high-profile leaders, leading to allegations of bias and eroding public trust.

Lack of Awareness and Compliance: The provisions of the Model code of conduct is not widely known or understood by voters, candidates, parties, and government officials.

Exclusion of Party Expenditure: While there are strict legal limits on how much an individual **candidate** can spend on an election, there is currently **no cap on how much a political party** can spend. This creates a massive loophole where parties can spend hundreds of crores on high-tech rallies, digital ads, and private jets, technically staying within the "spirit" of the MCC while vastly outspending smaller rivals.

Read More- Electoral Reforms in India

What Should be the Way Forward?

Establishment of fast track tribunals: Establishing special election tribunals to resolve MCC cases within 6 months would ensure that the punishment actually happens while the election impact is still fresh.

Explore the option of providing statutory backing to MCC:

The recommendation of standing committee on electoral reforms of providing statutory backing to MCC must be considered and explored.

Instead of making the entire MCC a law (which could lead to long judicial delays), the **Law Commission** has suggested making specific, grave violations – like "Paid News," surrogate advertising, and communal hate speech – explicitly punishable as **"Corrupt Practices"** under the Representation of the People Act (RPA).

Changes in MCC to counter the misuse of new technologies: Changes in MCC must be brought and the capacity of ECI must be increased to deal with the misuse of social media like Whatsapp and Facebook which are used to influence opinions on the day of election.

Rationalizing MCC Application: To prevent disruption of development works and administrative processes – Create "essential services" exemption list; phase-wise withdrawal of MCC after polling.

Neutrality on part of ECI: ECI must be neutral in application of MCC across all the parties and candidates.

Deregistration Power: Currently, the ECI can register a party but lacks the clear power to **deregister** one. A proposed reform is to empower the ECI to suspend or deregister parties for repeated, systemic violations of the MCC.

Amending the "Silence Period": The 48-hour campaign silence period before polling (Section 126 of RP Act) is virtually ineffective online. The law must be explicitly amended to cover the internet, social media, and OTT platforms to prevent last-minute misinformation campaigns.

Mandatory AI Watermarking: All political parties must be mandated to use "digital signatures" or watermarks on their official content, making it easier to track "dark ads" or fake videos back to their source.

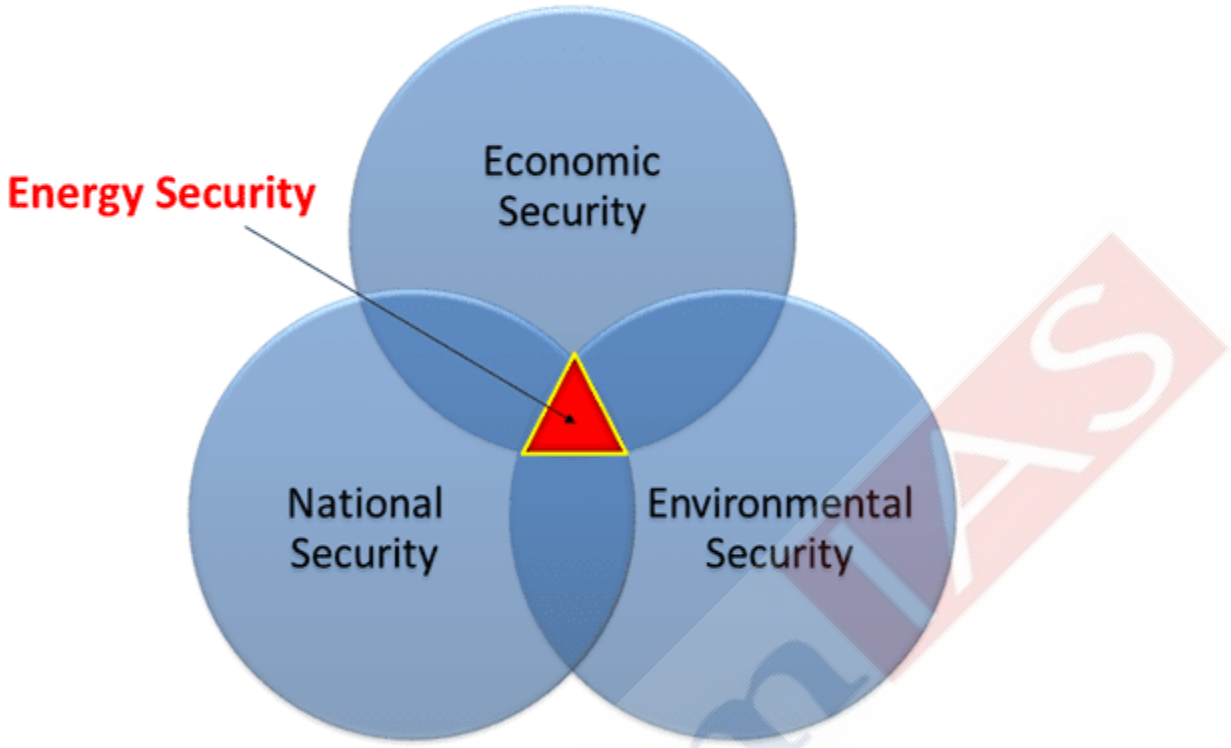
Capping Party Expenditure: A statutory cap on party-level expenditure is considered essential to maintain a "level playing field" and prevent the MCC from being overwhelmed by massive corporate-funded campaigns.

Read More: ECI, The Hindu
Syllabus: GS 2- Electoral reforms and issues related to RPA

India's Energy Security – Significance & Challenges – Explained Pointwise

The conflict in West Asia has demonstrated the speed with which geopolitical shocks have been transmitted to India's domestic economy. India is projected to see its economy growth slowdown from 7.4% in FY26 to 6.5% in FY27 with a projected increase in inflation from 2.3% to 4.4% due to disruptions observed in the energy supply chains. Despite rapid renewable capacity growth globally, geopolitical shocks expose India's dependence on fossil fuel imports from West Asia.

In this context, energy security can no longer be defined solely as the procurement of fuel at the lowest possible cost; it now hinges on resilience, diversification, and the safeguarding of macroeconomic stability.



Source: Arava Institute

Introduction:

Energy security:

Energy security refers to the uninterrupted availability of energy sources at an affordable price. It involves ensuring a reliable supply of energy to meet the growing demands of a nation, while managing risks such as geopolitical conflicts, supply chain disruptions, and environmental challenges.

Key aspects of energy security:

Availability: Enough energy resources (like oil, natural gas, coal, or renewables) are accessible.

Reliability: Energy supply is stable and not frequently interrupted (e.g., blackouts or fuel shortages).

Affordability: Energy prices remain reasonable and not overly volatile

Sustainability: Energy production and use do not harm the environment long-term (increasingly tied to clean energy).

Energy security is closely linked to the concept of **Energy transition**, which focuses on moving away from fossil fuels toward cleaner and more resilient energy systems.

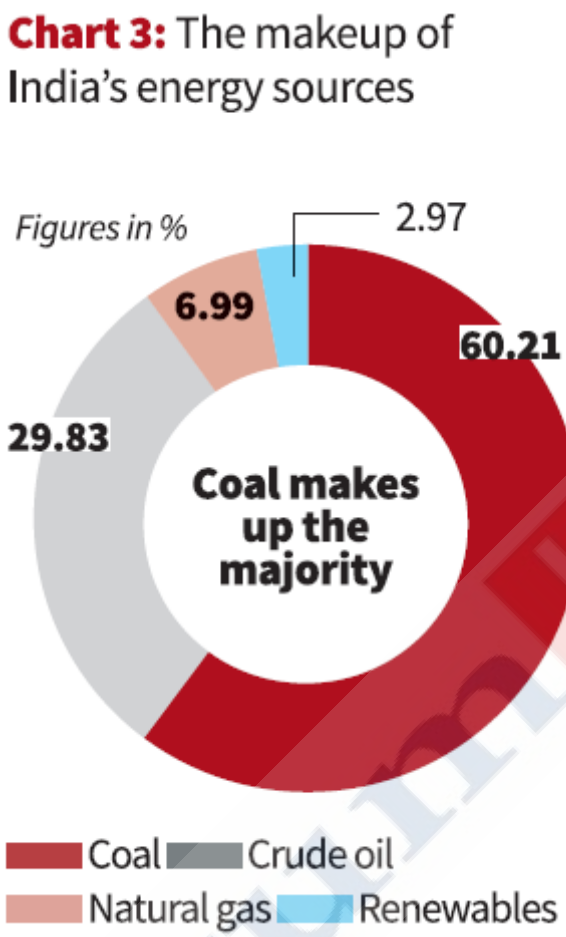
For India, energy security is crucial for sustaining economic growth, reducing dependency on imports, and achieving long-term sustainability.

India currently relies heavily on fossil fuels, primarily coal, for its energy needs, which poses environmental challenges and increases dependence on imports. Renewable energy (RE), including solar, wind, and hydropower, accounts for 44% of the installed capacity but contributes only 23% to energy generation.

Despite progress, the need for a diversified energy mix is critical to address rising demand and reduce carbon emissions.

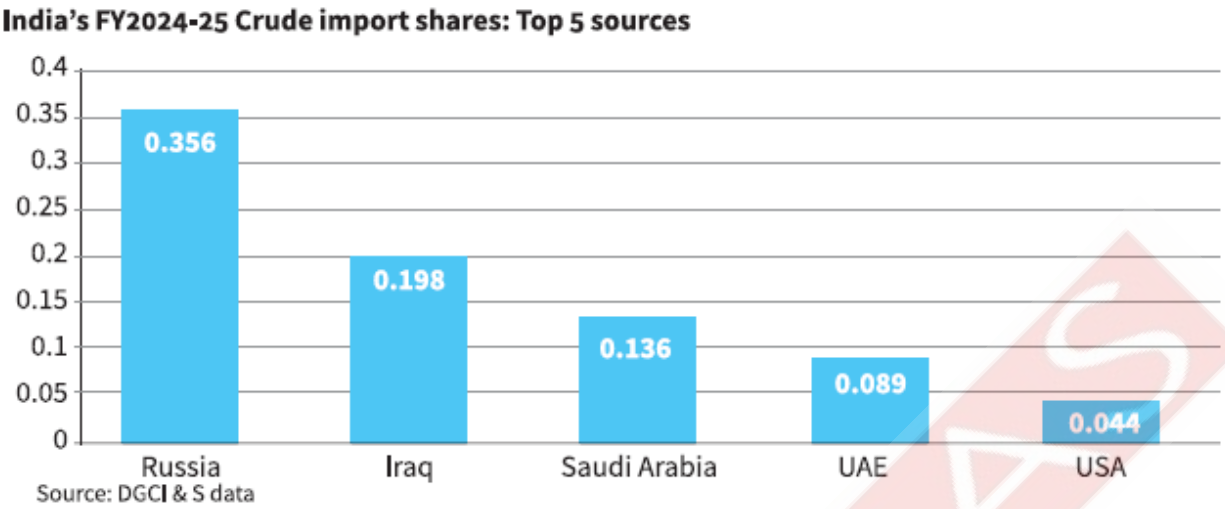
Current status of India's Energy Sector:

India's Energy Sources:

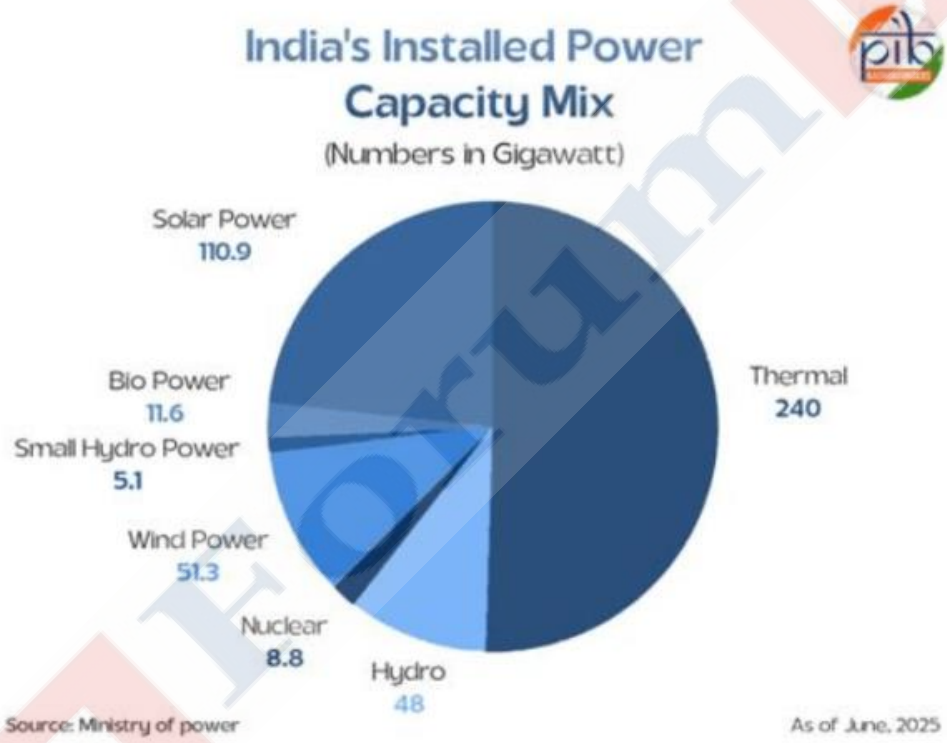


Source: The Hindu

Total **installed power capacity** reached **476 GW** by June 2025.
Thermal power accounts for **50.52%** of total installed capacity.
Per capita electricity consumption increased to **1,395 kWh** in 2023–24 from 957 kWh in 2013–14.
India achieved **100% village electrification** by April 2018.
Non-fossil fuel sources contribute **49% of total capacity** by June 2025.
India ranks **4th globally** in Renewable Energy Installed Capacity, **4th in Wind Power**, and **3rd in Solar Power capacity**.
Solar capacity increased to **110.9 GW**.
Installed **wind capacity** increased to **51.3 GW**.
Installed **nuclear capacity** grew to **8,780 MW**, across 25 reactors.
Hydro capacity increased to **48 GW**.
India's Crude Oil Import Sources:



Source: The Hindu



Source: Ministry of Power

What is the Significance of energy security for India?

Economic Stability & Growth:

India is one of the world's fastest-growing major economies. Sustaining a growth rate of 7-8% requires a proportional increase in energy consumption.

Reliable and affordable access to energy fuels industrial production, transportation, agriculture, and services, supporting GDP growth and job creation.

Energy security shields the economy from global supply shocks, volatile prices, and supply disruptions, ensuring sustained development.

National Security & Strategic Autonomy:

Reduces vulnerability to geopolitical risks, embargoes, and external supply disruptions by diversifying energy sources and suppliers.

Maintaining strategic reserves (petroleum, gas, critical minerals) enhances resilience during international crises or conflicts.

Technological Advancement & Competitiveness:

Stable energy supply encourages investment in advanced manufacturing, digital infrastructure, and innovation in sectors like AI, data centers, and green tech.

Promotes Make in India initiatives and supports export competitiveness.

Sustainable & Inclusive Development:

Ensures universal access to clean and affordable energy, vital for alleviating poverty, improving healthcare, and providing education in rural and remote areas.

Drives energy transition towards renewables and cleaner fuels, supporting environmental sustainability and meeting climate commitments.

Social Security & Quality of Life: Universal, reliable access to electricity and clean cooking fuels enhances health, reduces indoor pollution, and improves standards of living, particularly for vulnerable populations.

Rural Transformation: Reliable power enables mechanized farming and cold-storage chains, which are vital for doubling farmers' incomes.

What are the Challenges faced by India in ensuring its energy security?

Import Dependency: India imports nearly **90% of its crude oil** and more than **50% of its natural gas.** Crued oil, LNG, and LPG are all imported heavily from West Asia. Over 25% of the total import bill in FY24, puts pressure on rupee, inflates the trade deficit, making the country extremely sensitive to global price spikes, and compromises macroeconomic stability.

Economic Exposure: A modest $10 rise in global crude prices can widen India's current account deficit by up to 0.4% of GDP and add to inflationary pressures.

Declining Domestic Production: The situation is worsened by falling domestic output. Crude oil production dropped by **22.3%** over the last decade, and natural gas reserves have shrunk by **25%.**

Coal Paradox: India has the world's fourth-largest coal reserves, yet it still imports high-quality coking coal for its steel and power industries because domestic coal often has high ash content and lower calorific value.

Global Vulnerabilities:

Geopolitical conflicts, such as the Russia-Ukraine war and the USA-Iran war, and international sanctions cause sharp fluctuations in global oil prices, impacting India's oil import bill, fiscal balance, and foreign exchange reserves.

A staggering share of imports – **45% of crude oil, 60% of natural gas, and over 90% of LPG –** originates from the Middle East and must transit through the **Strait of Hormuz (Hormuz Chokepoint)**. Any disruption, as seen in recent conflicts, can have an immediate impact.

Financing Needs for Energy Transition: According to the International Energy Agency (IEA), India requires $160 billion per year to meet its energy transition goals by 2070 (India has a goal of **Net Zero by 2070**).

Rising Energy Demand: Driven by economic growth, population increase, urbanization, and industrialization, India's energy demand is projected to double by 2040. India's LPG imports also surged due to expanded household access due to schemes like PM Ujjwala Yojana – which increased the LPG connections from 62% of households in 2016 to nearly 100% by 2025.

Renewable Energy Intermittency: Renewable energy sources, like solar and wind, pose challenges due to their inherent variability, uncertainty, and concentration, require continuous balance to maintain grid stability.

Grid Instability: Solar and wind are intermittent. Without massive investments in **Battery Energy Storage Systems (BESS)**, the grid struggles to handle the surge of power during the day and the lack of it at night.

Inadequate Storage Infrastructure:

Strategic Petroleum Reserves: India's Strategic Petroleum Reserves (SPR) currently provide only about **9–10 days** of coverage, significantly lower than the 90-day global benchmark recommended for major economies.

LPG and LNG: These are critical vulnerabilities, with LPG reserves covering less than **two days** of consumption.
Critical Mineral Dependency: The energy transition creates fresh vulnerabilities for India. India's expansion into solar, batteries, EVs and storage may reduce oil use over time. However, India is currently **100% import-dependent** on critical minerals like **lithium, cobalt, and nickel**, which are essential for EV batteries and energy storage. Furthermore, **China controls 70-90% of the world's refining capacity** for these minerals, creating a new, highly concentrated supply chokepoint.

India's Plan for Energy Security:

Diversification of Energy Sources: India aims to diversify its energy portfolio by increasing the share of renewables like solar, wind, and hydropower, along with exploring other alternatives such as nuclear energy, biomass, and waste-to-energy. The goal is to achieve 50% of installed energy capacity from renewables before 2030.
Expansion of Nuclear Energy: India is expanding its nuclear energy capacity as a clean and efficient alternative. With 25% of the world's thorium deposits, India is exploring thorium-based nuclear reactors and small modular reactor technology to enhance operational flexibility and safety.
Boosting Hydropower and Cross-Border Energy Trade: Hydropower remains a key part of India's energy strategy, with plans to expand cross-border energy cooperation with neighboring countries like Nepal and Bhutan. By importing hydropower, India seeks to enhance its energy mix and ensure stable supply, particularly during peak demand periods.
Strengthening Transmission Networks: India is focused on enhancing transmission networks to efficiently absorb and distribute increased renewable capacity. This includes expanding inter-state transmission lines and developing energy corridors to connect renewable-rich states with energy-deficient regions.
Promoting Distributed Energy Generation: India is investing in distributed energy solutions such as rooftop solar, biogas, and small-scale wind projects. These decentralized energy systems can reduce transmission losses, support rural electrification, and increase energy resilience.

Various Government Initiatives for ensuring Energy Security:

Renewable Energy Expansion:
Target of 500 GW non-fossil fuel capacity by 2030: Includes solar, wind, hydro, and nuclear sources. As of 2025, installed non-fossil fuel capacity crossed 225 GW (solar 97.9 GW, wind 48.2 GW, hydro 46.9 GW, nuclear 8.2 GW). India ranks 4th globally in renewables.
Long-term Vision (2047): The draft National Electricity Policy (NEP) 2026 aims for **80% of installed capacity and nearly two-thirds of total generation** from non-fossil sources by 2047.
Solar Parks Scheme & PM-KUSUM: Boosts grid-connected and decentralized solar power, with 50 solar parks sanctioned and solar pumps for farmers.
National Green Hydrogen Mission: India aims to produce 5 million metric tonnes of Green Hydrogen by 2030. By February 2026, the first 8,000 tonnes of capacity were commissioned, with massive incentives for domestic electrolyzer manufacturing and use in refineries, transport, and fertiliser.
Ethanol Blending: India is on the verge of achieving **20% ethanol blending in petrol** (E20) by the end of 2026, significantly reducing the oil import bill.
National Bioenergy Mission & SATAT Scheme: Promotion of biogas, CBG, waste-to-energy plants to diversify energy sources and utilize agricultural waste.
Strategic Petroleum Reserves (SPR): India maintains reserves at Mangalore, Padur, and Vizag (5.33 million tonnes), with expansion plans at Bikaner, Mangalore (additional), Bina, Padur, and Chandikhol. These will buffer supply disruptions and build resilience. Private participation in SPR policy is encouraged.
Natural Gas Grid: The National Gas Grid has expanded to over 25,000 km, aiming to increase the share of natural gas in India's energy mix from 6% to 15% by 2030.
Grid Modernization: The **Draft National Electricity Policy 2026** focuses on making the grid "smart" to handle intermittent renewable energy.
Nuclear Power Expansion:

In April 2026, India reached a historic milestone with the **Prototype Fast Breeder Reactor (PFBR)** at Kalpakkam attaining criticality. This marks India's official entry into the second stage of its nuclear plan, which allows the country to eventually use its vast **Thorium reserves** for near-limitless power.

The 2025-26 Budget allocated ₹20,000 crore for SMRs (**Small Modular Reactors**) – smaller, safer reactors that can be deployed closer to industrial hubs.

The **SHANTI Act of 2025** opened the nuclear sector to private companies for the first time, aiming for 100 GW of nuclear capacity by 2047.

What should be the Way forward?

Further Diversify the Energy Sources & Mix:

India should reduce dependence on any single source or supplier by promoting alternative fuels and increasing sourcing from various global regions (e.g., Russia, Africa, U.S., Latin America).

India should continue to explore underutilized energy sources such as tidal, geothermal, and hydrogen fuel, which can provide sustainable alternatives. Expanding research and development in these areas can unlock new opportunities for energy security.

Build Storage Buffers: Fast-track Strategic Petroleum Reserves Phase II by 6.5 MMT, including new sites in Odisha and Karnataka, aiming for 90-day IEA benchmark from current 9-10 days..

Invest in Energy Storage Solutions: Improving energy storage technologies, like advanced batteries and pumped hydro storage, is crucial for balancing supply and demand, especially with the increasing share of renewables. Enhanced storage capacity can stabilize the grid and ensure a reliable power supply during fluctuations. Accelerating the rollout of **Battery Energy Storage Systems (BESS)** and **Pumped Hydro Storage** will ensure clean energy is available 24/7, not just when the sun shines.

Focus on Energy Efficiency and Conservation: Adopting energy-efficient technologies and practices across industries, buildings, and transportation can significantly reduce energy demand. Policies promoting energy conservation, retrofitting, and smart grids can optimize energy use and lower dependency on imports.

Smart Grid Transition: Implementing the **Draft National Electricity Policy 2026**, which mandates AI-driven grid management to predict demand spikes and manage the "intermittency" of green power.

Strengthen International Energy Cooperation:

India should strengthen its partnerships with global energy leaders to secure access to advanced technologies, invest in joint ventures, and develop cross-border energy projects.

Collaborating on research, sharing best practices, and participating in global energy markets can enhance India's energy resilience.

Leverage the **International Solar Alliance** (India's own initiative) for technology and financing.

Participate actively in BRICS energy frameworks and SCO energy cooperation.

Expand Infrastructure for Alternative Fuels: To reduce reliance on conventional fuels, India should invest in infrastructure for alternative fuels like compressed natural gas (CNG), liquefied natural gas (LNG), and biofuels. This includes setting up fueling stations, pipelines, and processing facilities to support the adoption of cleaner alternatives.

Expand Biofuels Potentials: Ethanol blending program reduces crude imports and transfers over ₹92,000 crore to farmers, foreign exchange savings.

Strengthen Nuclear energy Roadmap: Revive thorium roadmap, secure uranium partnerships, and localize Small Modular Reactor (SMR) technologies. Nuclear power offers zero-carbon energy.

Advance Utility Reforms: Strengthen governance in distribution companies by empowering boards, enhancing financial independence, and listing state-owned utilities on stock exchanges to attract private investment.

Securing Critical Minerals Supply Chains: Secure the supply of critical minerals through international collaboration, long-term stockpiles, and financial strengthening of entities like KABIL.

Strengthen Ecosystem: Adopt a "whole-of-government" approach with enhanced inter-ministerial coordination and a high-level committee on resilient supply chains for energy transition.

Conclusion:
Energy security is vital for India's economic growth and environmental sustainability. By diversifying its energy mix, enhancing infrastructure, and exploring new technologies, India can build a resilient energy system that meets growing demand while reducing carbon emissions. Continued investment in renewables, nuclear energy, and cross-border cooperation will be key to securing a sustainable energy future.

UPSC GS-3: Energy
Read More: The Hindu

India-Vietnam Relations – Explained Pointwise

The Vietnamese President is on an official visit to India, during which the two sides elevated their bilateral relations to the level of an "**Elevated Comprehensive Partnership**" and signed 13 agreements, including one on critical minerals. Both countries also decided to set a new bilateral trade target of **$25 billion by 2030** and enhance defence procurement cooperation between them.
Vietnam is a major pillar of India's '**Act East Policy**' and '**Vision MAHASAGAR**'. India also seeks to expand its ties with ASEAN through its relations with Vietnam. Moreover, both the countries have a common outlook in the field of Indo-Pacific.

Source: Bharat Shakti

Evolution of India-Vietnam relations:

Anti-Colonial Roots	The bond was forged between **Mahatma Gandhi** and **Ho Chi Minh**, who shared a mutual struggle against colonial rule. India was a crucial supporter of Vietnam during its war for independence from France. It served as the Chair of the **International Commission for Supervision and Control (ICSC)** formed by the 1954 **Geneva Accord**.

1970s	Full diplomatic relations were established in **1972**. India remained one of the few countries to support Vietnam during its **1979** conflict with China and its subsequent international isolation. India was also one of the few non-communist countries to condemn the U.S. action during the Vietnam War.
1990s	**Look East Policy (1992):** Following India's economic liberalization, Vietnam became a focal point of India's "Look East Policy," shifting the relationship from purely ideological to economic and strategic.
2000s-Now	**2007:** Establishment of a **Strategic Partnership**, expanding cooperation into defense and security. **2016:** Elevation to **Comprehensive Strategic Partnership** (CSP) during PM Modi's visit to Hanoi—a status Vietnam shares with only a few countries like Russia, China, and the US. **2026:** The relationship has reached a new peak with the elevation to an **Enhanced Comprehensive Strategic Partnership.**

What is the significance of India-Vietnam relationship?

Strategic & Security Significance:

Vietnam is the most critical pillar of India's **"Act East Policy."** A strong relationship with Vietnam allows India to maintain a strategic presence in the South China Sea, ensuring that the **Indo-Pacific** remains free and open. India is viewed as a "**trusted friend**" and a reliable source of defense modernization. By collaborating with India on **BrahMos missiles** and maritime surveillance, Vietnam diversifies its security dependencies and strengthens its "**Four No's**" defense policy *(no part in military alliances, no siding with one country against another, no foreign bases on its territory, and no use of force in international relations)*. This allows Vietnam to balance its complex relationship with China without becoming dependent on any single patron.

Economic Significance:

Supply Chain Resilience: In 2026, both nations signed a landmark MoU on **Rare Earths and Critical Minerals**. This is a direct move to reduce reliance on Chinese monopolies and secure the raw materials needed for high-tech industries like EVs and semiconductors.

Trade Complementarity: Vietnam imports Indian raw materials (iron, steel, cotton) and pharmaceuticals to fuel its manufacturing boom. **India** imports electronics, mobile components, and chemicals from Vietnam to support its digital infrastructure.

Digital Connectivity: The linking of India's **UPI** with Vietnam's payment systems in 2026 has revolutionized trade for small businesses and tourists alike.

Voice of the Global South: As two of the world's fastest-growing economies in 2026, they use their partnership to champion the interests of developing nations at the UN and ASEAN.

Gateway to ASEAN: Vietnam is one of ASEAN's most dynamic and influential members. A strong partnership with Vietnam serves as a key bridge for India to deepen its economic, strategic, and cultural engagement with the entire 10-nation bloc. Conversely, India provides Vietnam with a massive consumer market and a strategic partner in the Indian Ocean Region (IOR).

Defense and Security Cooperation: Defence & security cooperation is a key pillar in India-Vietnam Comprehensive Strategic partnership. Vietnam is India's most trusted defense partner in Southeast Asia. This cooperation helps India gain valuable operational experience in the region, test its military hardware, and build the capacity of a like-minded nation.

Civilizational Ties: The shared Buddhist heritage provides a layer of "soft power" that ensures public support for political and military alliances.

What are the challenges in India-Vietnam relationship?

Untapped Trade Potential: Bilateral trade remains well below its potential. The target of $15 billion has been repeatedly pushed back. Moreover, India faces a **trade deficit** with Vietnam, with Vietnamese exports (electronics, machinery) outpacing Indian exports.

Tariff & Non-Tariff Barriers: The ASEAN-India Trade in Goods Agreement (AITIGA) has uneven tariff coverage, with many products still in sensitive categories. Beyond tariffs, non-tariff barriers – including differences in technical standards, complex certification procedures, and regulatory frictions – significantly raise transaction costs.

Logistical Inefficiencies: Limited direct shipping links and weak maritime connectivity result in high logistics costs, making bilateral trade less competitive compared to trade with nations having better infrastructure.

Lack of Direct Links: The two countries are separated by the Bay of Bengal and lack direct land or efficient sea routes. While a **Trilateral Highway** connecting India, Myanmar, and Thailand is under development, its proposed eastward extension to Vietnam remains in the planning phase with no direct projects currently implemented.

Economic Dependency: Despite strategic friction, China remains Vietnam's largest trading partner and a major source of FDI. Vietnam must balance its security ties with India against the risk of economic retaliation from Beijing.

Vietnam's Balancing Act: Vietnam's foreign policy is built on "diversification" and avoiding over-dependence on any single power. While it has a **Comprehensive Strategic Partnership** with India, it has also recently upgraded its relationship with China to a "**Community with a Shared Future**."

Defense and Arms Supply Challenges: While India has supplied defense equipment, **competition from Russia, Israel, and the US** limits India's defense market share in Vietnam. India's own defense industrial capacity and export infrastructure are still maturing.

Limited People-to-People and Cultural Exchange: Despite ancient civilizational links (Cham culture, Buddhism), **contemporary awareness** of each other in both societies is limited. The Indian diaspora in Vietnam is small, reducing the people-to-people bridge compared to India's ties with, say, Singapore or the US.

What are the various initiatives undertaken to boost the India-Vietnam relationship?

Political Cooperation	**Elevated Partnership (2026)**: The relationship was formalized as an "Enhanced Comprehensive Strategic Partnership," marking a significant upgrade from the 2016 Comprehensive Strategic Partnership. **2+2 Ministerial Dialogue:** India and Vietnam have established a **Strategic Diplomacy-Defense Dialogue (2+2)** involving their Foreign and Defense Ministers. This elite diplomatic format is shared by India with only a handful of partners like the US and Japan.
Economic & Trade Cooperation	**Trade Target:** The bilateral trade target has been raised to **$25 billion by 2030.** **UPI-VietQR Interoperability:** In a landmark move for 2026, India's **NIPL** and Vietnam's **NAPAS** signed an agreement to link their payment systems. This allows for seamless cross-border QR code payments, benefiting tourists and small businesses. **IT and Software Services:** An MoU between the **Ministry of Electronics & IT (India)** and the **Ministry of Science and Technology (Vietnam)** focuses on deep-tech collaboration, specifically in **AI, cybersecurity,** and **semiconductor supply chains.** **Rare Earths Partnership:** MoU was signed between India and Vietnam's **ITRRE** for the joint exploration and processing of **rare earth elements**. Vietnam holds the world's second-largest reserves, and this partnership is designed to build a non-China-dependent supply chain.

Defense and Strategic Security Cooperation	**Shared Vision 2030**: Defence cooperation is guided by the "Joint Vision Statement on India-Viet Nam Defence Partnership towards 2030," focusing on capacity building, joint exercises, and industry collaboration. **BrahMos Missile Deal:** Negotiations for the sale of the **BrahMos supersonic cruise missile** (valued at approximately **$629 million**) have entered their final stages, signaling a shift from capacity building to active deterrence cooperation. **Naval Support:** India is moving forward with a **$500 million defense credit line**, which includes the construction of **14 high-speed patrol boats** and potential upgrades for Vietnamese Navy ships and submarines. **Indo-Pacific Oceans Initiative (IPOI):** Vietnam officially joined the **IPOI** in 2026, aligning with India's vision for maritime security and disaster management in the region.
Cultural Cooperation	**Preserving Heritage:** India is funding the **digitization and preservation of ancient Cham manuscripts** (of Indian origin) found in Vietnam, reinforcing the historical civilizational link. **Academic Chairs:** New **India Studies Chairs** have been established at the University of Da Nang and in Ho Chi Minh City by the ICCR. **Nalanda University Link:** An agreement between **Nalanda University** and Vietnam's **Ho Chi Minh National Academy of Politics** has been launched to train Vietnamese officials and researchers in public policy and governance.

What should be the way forward?

Institutionalizing the Relationship:

Hold **annual summit-level meetings** (not just on sidelines of multilateral forums) to sustain political momentum.

Establish a **Joint Strategic Vision Committee** at the foreign minister level with quarterly reviews.

Create a **Track 1.5 / Track 2 dialogue mechanism** involving think tanks, retired diplomats, and business leaders from both sides to generate fresh ideas.

Boost Economic Ties, Trade and Investment:

Set **realistic, time-bound trade targets** (e.g., $20 billion by 2028) with sector-specific roadmaps.

Reduce the **trade deficit** by promoting Indian pharmaceuticals, IT services, machinery, and agricultural products in Vietnam.

Encourage Indian companies — especially in **electronics, textiles, and manufacturing** — to set up supply chain operations in Vietnam as part of China+1 diversification strategies.

Establish a **Fast Track Investment Mechanism** for Indian businesses similar to what Japan and South Korea enjoy in Vietnam.

Deepening Defense and Security Cooperation:

Expedite BrahMos missile transfer — finalizing and delivering the BrahMos missile system to Vietnam would be a landmark signal of strategic trust and India's emergence as a credible defense exporter.

Expand joint naval exercises in the South China Sea to enhance interoperability and signal shared commitment to freedom of navigation.

Offer Made-in-India defense platforms — patrol vessels, radars, and ammunition — under favorable financing to reduce Vietnam's dependence on Russia (especially post-Ukraine war disruptions to Russian arms supplies).

Establish a **bilateral defense industry working group** to co-develop or co-produce equipment suited to Vietnam's operational needs.

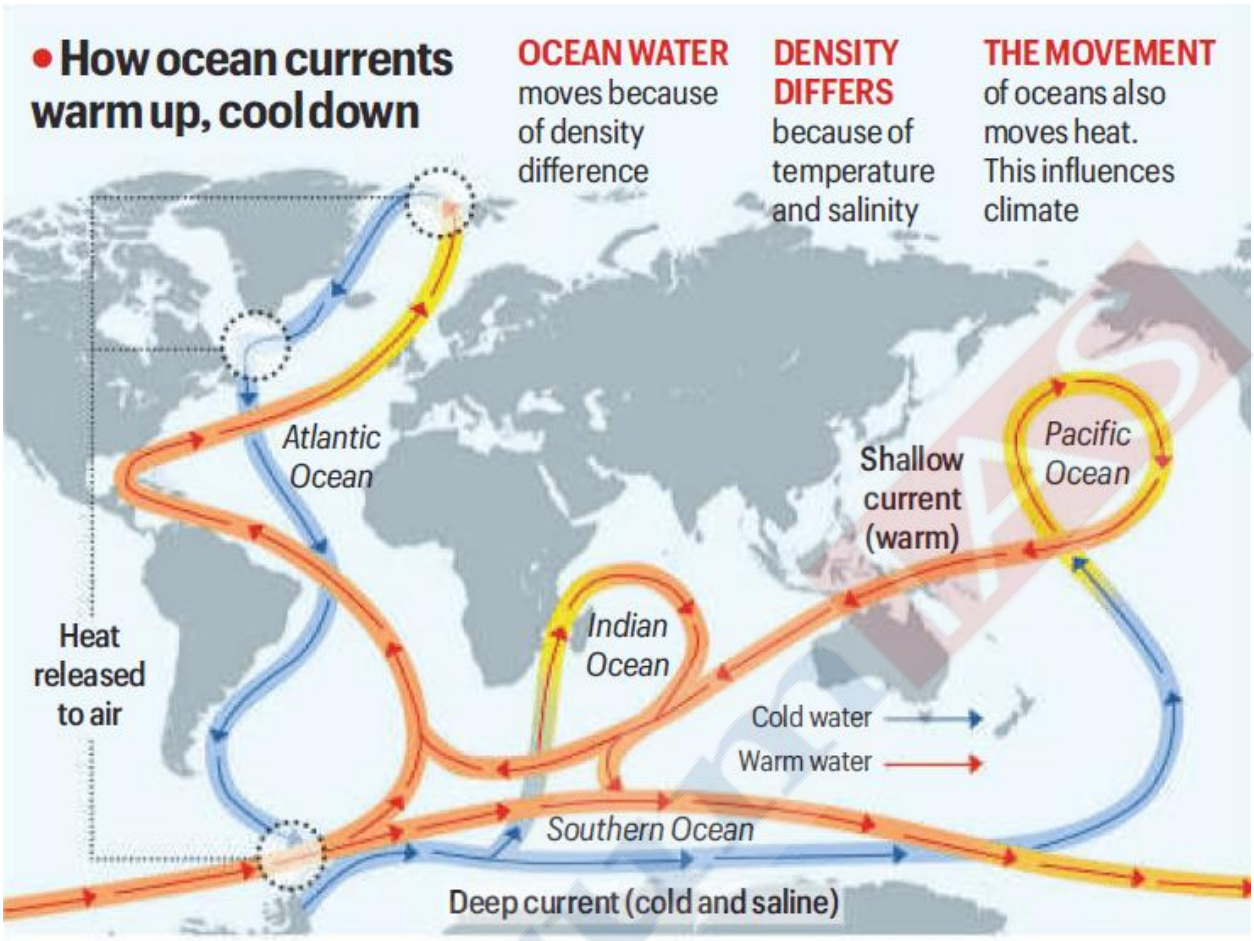
Enhancing Physical and Digital Connectivity:

Push for **direct shipping lines** between Indian ports (Chennai, Vishakhapatnam) and Vietnamese ports (Ho Chi Minh City, Da Nang).
Increase **direct flight connectivity** between major Indian and Vietnamese cities to boost tourism and business travel.
Collaborate on **digital public infrastructure** — India can export its UPI, Aadhaar-equivalent, and digital governance frameworks to Vietnam, which is rapidly digitizing.
Explore a **India-Vietnam digital corridor** for fintech, e-commerce, and startup ecosystems.
Strengthening Multilateral Alignment:
Coordinate positions at **ASEAN, East Asia Summit, UNCLOS tribunals, and the UN** more systematically.
India should reconsider or find **alternative pathways to RCEP** participation, or negotiate bilateral trade enhancements that compensate for its absence.
Work together on **reformed multilateralism** — UNSC reform, WTO modernization, and climate finance — where both have convergent interests.
Expanding People-to-People and Cultural Ties:
Significantly **increase scholarships** for Vietnamese students at Indian universities, especially in STEM, medicine, and business.
Promote **Buddhist cultural diplomacy,** joint restoration projects, pilgrimages, and cultural festivals can build lasting bonds.
Establish **Indian Cultural Centers** in Hanoi and Ho Chi Minh City and Vietnamese cultural centers in Delhi and Mumbai.
Support **Yoga, Ayurveda, and Indian soft power** more actively in Vietnam, where there is growing interest.

UPSC GS-2: International Relations
Read More: The Indian Express

Atlantic Meridional Overturning Circulation (AMOC) – Explained Pointwise

According to a new research, the Atlantic Meridional Overturning Circulation (AMOC), which regulates the climate across much of the globe, may slow by up to 59% by 2100, with potentially devastating consequences for weather systems as far away as the Indian subcontinent.



Source: Indian Express

What is AMOC?

Atlantic Meridional Overturning Circulation (AMOC) is a massive system of ocean currents that circulates water within the Atlantic ocean and is also part of the global thermohaline circulation, which connects the world's oceans with a single "conveyor belt" of continuous water exchange.

It is a component of Earth's ocean circulation system and plays an important role in the climate system. Earth's oceans behave a massive, invisible conveyor belt, – in the Atlantic ocean, this system is scientifically known as the AMOC.

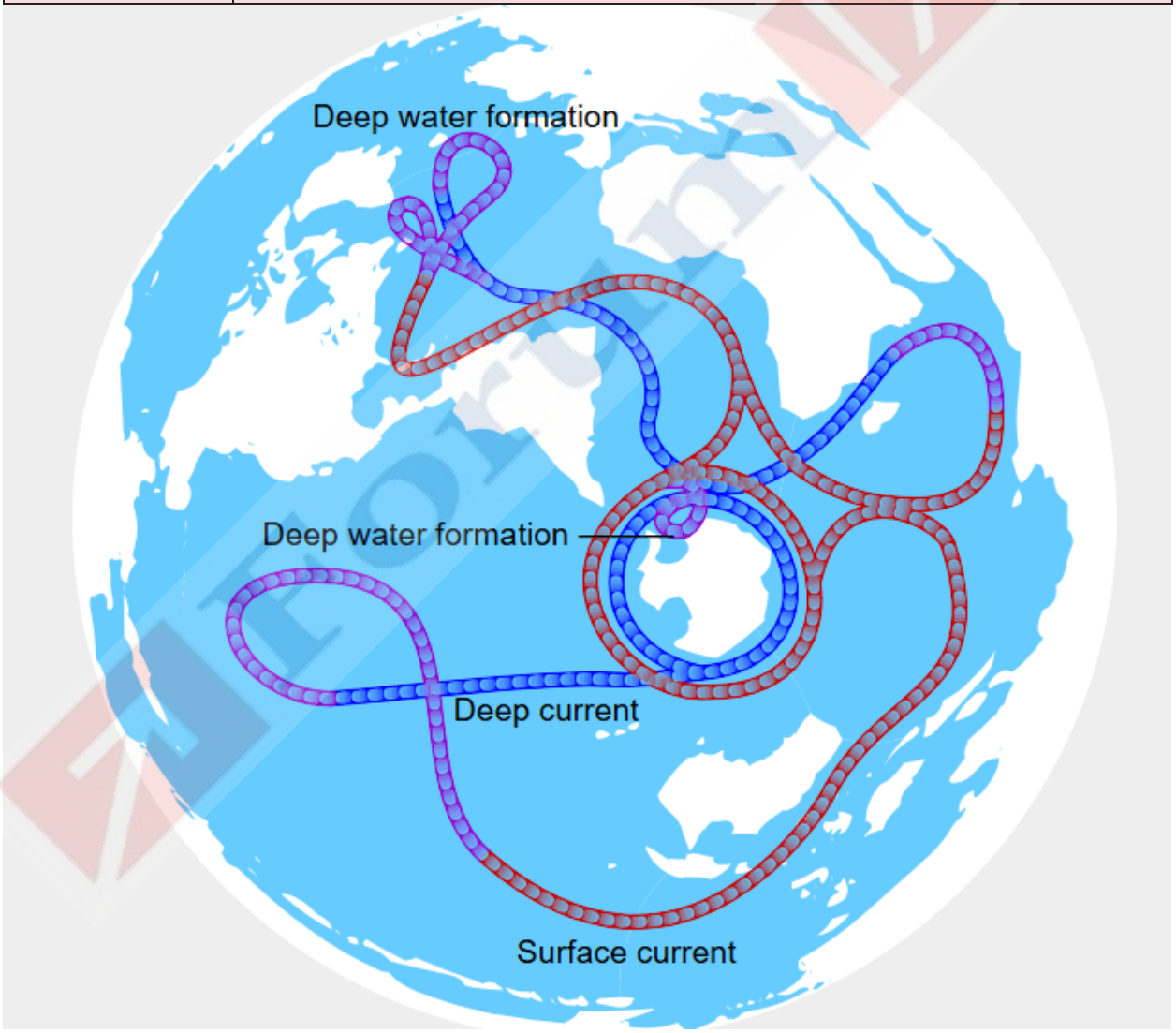
The AMOC is composed of a northward flow of warm, more saline water in the Atlantic's upper layers and a southward, return flow of cold, less salty, deep water.

AMOC is considered a **climate tipping point** — a system that, if pushed past a certain threshold, could irreversibly collapse into a new, sluggish state.

What is the mechanism of AMOC?

Formation of North Atlantic Deep Water (NADW)	The combination of intense cooling and brine rejection creates a dense, heavy, salty, cold water mass called **North Atlantic Deep Water (NADW).** This dense water sinks in the subpolar region near Greenland & Norway – the sinking of NADW is the driving force of the entire mechanism. As the water sinks, it creates a vacuum-like effect at the surface, pulling more warm water from the south to take its place.

Downwelling	The sinking water fills the deep basin of the North Atlantic. Because the sinking occurs constantly, it creates a "pile" of deep water.
Southward Flow	Gravity and pressure gradients push this deep water southward along the ocean floor, flowing like a slow, deep river all the way to the Southern Ocean.
Upwelling	Upwelling occurs mainly in the Southern Ocean (around Antarctica) and the Pacific and Indian Oceans, driven by winds and ocean turbulence. The rising water warms up, becomes less dense, and completes the loop.
Return Flow	The resurfaced waters are warmed and eventually return to the Atlantic, completing the circulation cycle. A single cubic meter of water takes about 1000 years to complete the journey.



Source: Wikipedia

What is the significance of the AMOC?

Climate regulation:

AMOC transports an enormous amount of heat northward (equivalent to the power of roughly one million nuclear power plants) – keeping Western Europe and the North Atlantic region significantly warmer than they would otherwise be. Without this heat transport, countries like the UK, Norway, and France would be 5 to 10° Celsius colder, resembling the climate of Canada or Siberia.

On the other hand, by pulling heat away from the tropics, the AMOC prevents the equatorial regions from becoming excessively hot, helping to maintain a more uniform global temperature.

Weather patterns:

The ITCZ: The AMOC influences the position of the **Intertropical Convergence Zone (ITCZ)**, a belt of low pressure near the equator & the planet's main rain belt.

Monsoons: If the AMOC shifts, these rain belts move. This could lead to devastating droughts in the Sahel region of Africa and parts of South America, potentially leading to widespread crop failure and food insecurity for billions of people.

Carbon sequestration & nutrient cycling:

The AMOC is a major "**carbon sink**". It helps draw CO_2 out of the atmosphere and into the deep ocean, making it a key part of the global carbon cycle.

When surface water sinks in the North Atlantic, it carries oxygen down to the deep ocean, allowing deep-sea life to survive.

It also drives upwelling of nutrient-rich deep water – this fuels the growth of phytoplankton, which forms the base of the entire marine food web.

Sea level: By "pulling" water away from the US East Coast, AMOC suppresses sea levels there. A weakening circulation would cause sea levels along the northeastern US to rise faster than the global average.

What are the reasons behind the slowing down & potential collapse of the AMOC?

Freshwater Influx from Melting Ice: AMOC depends on cold, **dense, salty water** sinking in the North Atlantic to drive circulation. As Greenland's ice sheet and Arctic glaciers melt at accelerating rates due to global warming, massive volumes of **fresh water** pour into the North Atlantic. Freshwater is lighter and less dense than saltwater, so it **disrupts the sinking mechanism** that powers AMOC like a pump. This is widely considered the primary threat.

Ocean & Atmospheric Warming:

Atmosphere Warming: In the past, warm surface water would release its heat to the cold Arctic air, becoming cold and dense. However, as Arctic air temperatures rise, the water doesn't cool down as effectively.

Ocean Warming: Warmer water is less dense and occupies more volume (thermal expansion). This added buoyancy makes it much harder for the water to begin its descent into the deep ocean. Essentially, the "engine" of AMOC loses its driving force.

Rising global temperatures reduce the **temperature contrast** between tropical and polar waters — a contrast that helps drive the circulation.

Arctic Sea Ice Loss: Sea ice formation naturally expels salt (**Brine Rejection**) into the surrounding ocean, increasing water density and aiding sinking. As Arctic warming causes dramatic **sea ice decline**, this salt-expulsion process weakens, further reducing the density of North Atlantic water and slowing the circulation.

Changes in Precipitation Patterns: Climate change is intensifying the global water cycle — making wet regions wetter. Increased **rainfall and river runoff** into the North Atlantic (particularly from rivers in North America and Europe) adds more freshwater to the ocean surface, compounding the dilution effect and further inhibiting the sinking of dense water.

Stratification of Ocean Layers: Climate change is making the ocean more "layered" (stratified). Normally, surface water and deep water mix. But now, a warm, fresh layer is sitting on top like a cap, while the cold, salty water stays trapped below. This stratification prevents the vertical exchange of water, meaning the "overturning" part of the Atlantic Meridional Overturning Circulation simply stops happening.

Positive Feedback Loops: The most alarming aspect is how these factors **reinforce each other**:

A weaker AMOC transports less warm water northward → less evaporation → fresher surface water → even weaker AMOC.
Reduced heat transport accelerates ice melt → more freshwater → further weakening.
If the current weakens, less salt is transported north, making the North Atlantic even fresher and further slowing the circulation.
These self-reinforcing loops mean that beyond a certain tipping point, the collapse could become self-sustaining and irreversible on human timescales

What can be the consequences of AMOC collapse?

Rapid Cooling of Europe & the North Atlantic: Europe currently enjoys a climate far warmer than its latitude would suggest, thanks to AMOC's heat transport. A collapse could trigger:
Temperature drops of **5–15°C in parts of Northwestern Europe** (UK, Ireland, Scandinavia, Iceland) within decades. Arctic sea ice would expand significantly southward, potentially reaching the British Isles and Denmark during winter months.
Paradoxically, this **regional cooling would occur within a globally warming world** — creating a stark climate anomaly.
Accelerated Sea Level Rise on the US East Coast: AMOC acts like a barrier, pulling Atlantic water away from the US coastline. Without it:
Sea levels along the **northeastern US coast could rise by an additional 30–80 cm** above the global average,
Cities like **New York, Boston, and Miami** face dramatically increased flood risk.
Storm surges from hurricanes would penetrate further inland and cause far greater damage.
Disruption of Global Monsoon Systems: AMOC is deeply connected to atmospheric circulation patterns worldwide. Its collapse would ripple far beyond the Atlantic:
The **West African and South Asian monsoons** could shift southward or weaken significantly.
The **Indian summer monsoon**, which is the backbone of the country's agriculture & economy, relies on specific global heat distributions. When the Atlantic conveyor slows down, less heat travels north. This shift pulls the planet's tropical rain belt southward, away from the Indian subcontinent. The result would be shorter wet seasons, longer dry spells, and an overall drying trend. This threatens rainfall that **billions of people** in India, West Africa, and Southeast Asia depend on for food and water.
The **Amazon rainforest**, already under stress from deforestation, could face severe drought, pushing it toward its own tipping point.
Sahel & African Drought: The tropical rain belt (the Inter-Tropical Convergence Zone) would shift southward with AMOC collapse:
The **Sahel region** of Africa — already one of the world's most climate-vulnerable areas — could experience prolonged, devastating droughts
Agricultural collapse across sub-Saharan Africa would threaten food security for hundreds of millions. This would likely trigger **mass migration** on an unprecedented scale, with major geopolitical consequences.
Marine Ecosystem Collapse: AMOC drives the upwelling of nutrient-rich deep water that sustains ocean food chains:
Collapse would cause a dramatic **decline in marine productivity** across the North Atlantic.
The circulation of nutrients that feeds phytoplankton (the base of the ocean food web) would cease, likely leading to a **total collapse of North Atlantic fisheries**.
Ocean deoxygenation in deep waters would create **dead zones**, further devastating marine biodiversity.
The ocean's capacity to absorb CO_2 would also be reduced, **accelerating atmospheric warming.**
More Extreme & Erratic Weather: The temperature gradients that AMOC helps maintain drive weather patterns across the Northern Hemisphere:
The **jet stream** would become more unstable and erratic, leading to more extreme and persistent weather events.
Europe and North America could see more devastating **winter storms, summer heatwaves, and flooding.**

Hurricanes forming in the Atlantic may shift their tracks, potentially striking areas not historically prone to them.

Acceleration of Global Warming: An AMOC collapse could turn the Southern Ocean from a carbon "sink" into a carbon **source.** The disruption of ocean layers could release massive amounts of stored CO_2 back into the atmosphere.

El-Nino: A sluggish AMOC traps heat in the southern hemisphere & leaves the Norther Pacific cooler. Thus, a weaker AMOC will make El-Nino events more unpredictable & extreme.

Triggering Other Tipping Points: Perhaps the most catastrophic dimension — AMOC collapse doesn't happen in isolation:

Cooling of the North Atlantic could **destabilize the West Antarctic Ice Sheet**, accelerating global sea level rise.

Drying of the Amazon could push it past **its own tipping point**, converting the world's largest rainforest into savanna and releasing enormous amounts of stored carbon.

Arctic permafrost thaw could **accelerate**, releasing methane and CO_2 that further drive warming.

UPSC GS-1: Geography

Read More: The Indian Express

Role of Governor in Government Formation – Explained Pointwise

In the recently held Tamil Nadu Assembly elections (2026), the Governor's role in government formation became a major constitutional and political issue because the verdict resulted in a hung Assembly. TVK emerged as the single largest party but initially lacked a clear majority in the Assembly. The Governor reportedly asked TVK to furnish support from at least 118 MLAs before government formation, leading to political controversy and debate regarding constitutional conventions. Constitutional experts emphasized that the proper method to determine majority is a floor test in the Assembly rather than subjective assessment by the Governor.

In this regard, it becomes important to understand the role plated by the Governor in the formation of the government in States.

What is the role & powers of Governor in Indian polity?

Constitutional & Ceremonial Role:

The Governor is the constitutional head of the State executives.

The executive power of the State is vested in the Governor (**Article 154**), and all executive actions of the State government are formally taken in their name (**Article 166**).

The Governor acts as a bridge between the Centre and the State.

He/she enjoys various executive, legislative, financial and discretionary powers.

Constitutional Provisions:

Article 153: Provides for a Governor for one or more than one states.

Article 154: The executive powers of the state are vested in the Governor and can be exercised directly or through subordinate officers in accordance with the Constitution.

Article 155: Provides for the appointment of the Governor by the President by warrant under his hand and seal.

Article 156: Provides the term of office of Governor- Appointed for a period of five years and holds office during the pleasure of the President. Pleasure of the President means that he can be removed anytime by the President, even before the expiry of five years.

Article 157: Qualifications – He should be a citizen of India and must have completed the age of 35 years.

Article 164(1): Provides that the Chief Minister of a State shall be appointed by the Governor, while other ministers shall be appointed by the Governor on the advice of the Chief Minister.

Discretionary Powers: Governor has two types of discretion in the execution of his work:

Constitutional Discretion	**Article 200 & 201 = Reservation of Bills:** The Governor can reserve certain bills for the consideration of the President. **Article 356 = President's Rule Report:** The Governor can send a report to the President declaring the failure of the constitutional machinery in the state. This action is taken in personal discretion without ministerial advice. **Article 239 (2) = Administrator of Adjacent Union Territory:** Where the Governor is also appointed as administrator of some Union Territory in respect of administration of such territories he will act independently of his Cabinet. **Article 167 = Seeking Information:** He seeks information from the Chief Minister with regard to the administrative and legislative matters of the state. **Special Tribal/Regional Responsibilities:** Determining royalties payable to Tribal District Councils (Assam, Meghalaya, Tripura, Mizoram).
Situational Discretion	**Appointment of Chief Minister**: When no single party has a clear majority, the Governor must use discretion to invite the leader most likely to command a majority in the House. **Dismissal of Council of Ministers**: If the Council of Ministers loses the confidence of the House or acts unconstitutionally, the Governor may dismiss them. **Dissolution of Assembly**: The Governor may dissolve the Legislative Assembly if a government loses a vote of confidence and no alternative government can be formed. **Asking for a Floor Test:** When the Governor has reasonable grounds to believe the government has lost its majority, they can direct the CM to prove it on the floor of the House.

What are the recommendations of various commissions regarding the Governor's role in the formation of government?

Sarkaria Commission (1988)	The Sarkaria Commission was the first to systematically address this issue. It recommended that the Governor, when inviting a party to form a government, should be guided by the following **'order of preference'**: **Pre-poll alliance:** First, invite the coalition of parties that was formed before the elections and commands the largest support. **Single largest party:** If no pre-poll alliance has a majority, invite the single largest party that stakes a claim to form the government with the support of others. **Post-poll coalition:** Next, consider a coalition formed after the election, with all partner parties joining the government. **Post-poll alliance:** As the last option, consider an alliance formed after the election, where some parties form the government and others (including independents) support it from outside. **Final arbiter:** In all these scenarios, the Governor's ultimate task is to select the leader who, in their judgment, is most likely to command a majority in the Assembly.
Punchhi Commission (2010)	The Punchhi Commission largely concurred with the Sarkaria Commission's order of preference but also made some significant additional recommendations:

	It reiterated the same **four-step order of preference** for government formation in a hung house, firmly supporting the principle that pre-poll alliances should be treated as a single political party. It also suggested that Governors must make decisions within a **fixed time frame (4 months)** and not sit on them indefinitely. **Codification:** It recommended that these guidelines be codified into the Constitution or through a "Code of Conduct" so that Governors cannot use personal whims.

What are the issues related to the Governor's role in the formation of government?

The Constitutional "Grey Area": The primary issue is the Constitution's silence on the exact procedure for a hung Assembly. While Article 164(1) gives the Governor the power to appoint the Chief Minister, it does not specify any criteria for when no party has a clear majority – leaving the Governor to exercise what is known as "situational discretion." This ambiguity creates a vacuum that has often been exploited for political maneuvering.

Disagreement Over the "Order of Preference":

Legally Non-Binding: While Sarkaria & Punchhi commissions have recommended a clear order of preference for whom the Governor should invite first, these are not legally binding. This has led to direct conflicts between the Governor and the political parties.

Subjective Interpretation: Governors often alternate between inviting the **Single Largest Party (SLP)** and a **Post-Poll Coalition**, depending on which aligns with the party in power at the Centre.

The "Agent of the Centre" Perception: The most persistent political issue is the widespread perception that Governors act not as impartial constitutional heads but as agents of the central government. The actions of Governors in hung Assembly situations are often viewed not as neutral constitutional decisions but as deliberate attempts to keep opposition parties out of power and favor a party aligned with the Centre.

Misuse of the "Time Frame" for Floor Tests: When a Governor invites a leader to form a government, they specify a period to prove a majority (the **Floor Test**). Giving an exceptionally long period (e.g., 15 days) is often viewed as providing a window for **"Horse-Trading"**.

"Subjective Satisfaction" vs. "Objective Proof": Governors sometimes reject claims of support based on their "subjective satisfaction" regarding the stability of a coalition. Instead of allowing the **Floor of the House** to be the judge (as mandated by the *S.R. Bommai* case), Governors sometimes act as "gatekeepers," deciding in the Raj Bhavan whether an alliance is "principled" or "opportunistic." The mandate should be tested in the Assembly, not in the Governor's office.

What should be the way forward?

Codification of the "Order of Preference": The recommendations of the **Sarkaria** and **Punchhi Commissions** should be formally codified into a "Code of Conduct" or added as a **New Schedule** to the Constitution.

Strengthening the "Floor Test" Doctrine: The **Supreme Court** has repeatedly stated that the floor of the House is the only place to prove a majority:

Mandatory Timelines: A standard "Floor Test" window (e.g., 48 to 72 hours) should be institutionalized to prevent the "buying of time" for horse-trading.

Physical Verification: Governors should be discouraged from demanding "physical parades" or "letters of support" at Raj Bhavan, instead, they should let the legislative process determine the majority.

Reform in Appointment and Tenure: A Governor who is constantly worried about being removed by the Centre cannot remain neutral:

Security of Tenure: As suggested by the **Punchhi Commission**, the phrase "during the pleasure of the President" should be replaced with a fixed 5-year term. Removal should only be possible through a process similar to impeachment by the State Legislature.

Appointment Panel: Instead of unilateral appointment by the Centre, a panel comprising the **Prime Minister, Speaker of Lok Sabha, and the Chief Minister of the concerned state** should select the Governor to ensure state-level consensus.

Regulating the Discretionary Powers: It is imperative that the Governors exercise their discretionary powers in a bona fide manner. The recent Justice Kurian Joseph Committee report on Union-State Relations, constituted by TN government, recommended incorporating a new schedule into the Constitution to codify the rules governing the Governor's use of discretionary powers.

UPSC GS-2: Indian Polity
Read More: The Hindu

Solid Waste Management in India – Explained Pointwise

The Solid Waste Management remains an Achilles heel for India. India's waste crisis is no longer a localised urban nuisance but a national ecological emergency. Our cities are choking on waste; plastic-clogged drains worsen monsoon flooding; landfills have become mountains of methane, fire & leachate; open burning of waste materials fouls the air; and rivers and coasts bear the burden of urban negligence. Proper steps need to be undertaken for safe disposal and treatment of solid waste in India.

The **Solid Waste Management Rules, 2026**, notified in supersession of the 2016 Rules and brought into effect from April 1, 2026, are driven by a legitimate and urgent environmental objective. They seek to improve source segregation, regulate bulk waste generators, promote scientific waste processing, reduce dependence on landfills, remediate legacy dumpsites, encourage a circular economy, and move towards digital monitoring. However, the Rules have also been criticized for disregarding the principles of federalism, local democracy, and subsidiarity.

What is a Solid Waste?

Solid Waste: Solid waste refers to any unwanted or discarded material. It is important to note that the definition of solid waste is not limited to wastes that are physically solid. Many solid wastes are liquid, semi-solid, or contained gaseous material. The solid waste includes a wide range of materials generated from various sources such as households, industries, commercial establishments, construction sites, and institutions.

Types of Solid Waste:

Municipal Solid Waste (MSW) – Household, commercial, market waste.
Biomedical Waste – Hospitals, clinics (requires special handling).
Electronic Waste (E-waste) – Phones, laptops, appliances.
Construction & Demolition (C&D) Waste – Debris, bricks, tiles.
Industrial Waste – By-products from factories, often hazardous.
Plastic Waste – Single-use plastics, packaging material.

Solid Waste Management: Solid Waste Management **(SWM)** refers to the systematic process of collecting, segregating, transporting, processing, recycling, and disposing of solid waste in an environmentally safe and sustainable manner.

Components of Solid Waste Management:

Waste Generation – Production of waste from households, industries, agriculture, hospitals, etc.
Segregation at Source – Separation of biodegradable, recyclable, hazardous, and inert waste.
Collection and Storage – Gathering waste from different sources and storing it safely.
Transportation – Moving waste to treatment or disposal facilities.
Processing & Treatment – Composting, recycling, biomethanation, and waste-to-energy conversion.
Final Disposal – Scientific landfilling or safe disposal of residual waste.

What is the status of Solid Waste generation in India?

Status of Solid Waste Generation in India:

According to a study published in 'Nature' – India is the **biggest plastic polluter** in the world – releasing 9.3mT of plastic waste annually – which is equivalent to around **20% of global plastic emission**.

According to CPCB report, **only ~50%** of total solid waste generated in the country is treated. The processing of solid waste in India has improved significantly, from **19%** in 2015-16 to **~50%** in 2020-21. In the corresponding period, the proportion of solid waste landfilled has fallen from **54%** to **18.4%**.

The total quantity of Solid waste generated in India per Day	~1,60,000 Metric Tonnes Per Day (TPD)
Waste Collection per day	~1,53,000 Metric Tonnes Per Day (TPD) Waste Collection efficiency is **~96%.**
Waste treatment per day	~80,000 Metric Tonnes Per Day (TPD) **Only 50%** of the total waste is treated.
Waste Landfilled per day	~30,000 Metric Tonnes Per Day (TPD) **18.4%** of the total waste generated ends in landfill.
Unaccounted Waste Generation	~50,000 Metric Tonnes Per Day (TPD) **31.2%** of the total waste generated remains unaccounted.

About 50-55% of the waste generated in Indian cities is biodegradable wet waste, about 35% is non-biodegradable wet waste and 10% is an inert component.

What are the Challenges Associated with Solid Waste Management in India?

1. Rising Waste Generation: Rapid economic growth has raised the consumption levels in the economy, which has in turn increased the waste generation. Further, the expansion of digital economy is leading to a multifold increase in e-waste generation. Rising plastic waste generation in eco-sensitive regions like Himalayas are choking the fragile ecosystems present there. ***For ex-*** *A Planning Commission Report had estimated that India will generate 165 million tonnes by 2030.*

2. Lack of proper Waste Management: India lacks proper waste management and disposal techniques.

Inadequate Infrastructure: Many urban and rural areas lack proper infrastructure for waste collection, segregation, transportation, processing, and disposal.

Collection & Treatment: While collection rates are improving, a significant portion of the generated waste remains uncollected.

Poor Processing: Only 50% of the waste produced is actually processed in India. ~30% of waste is not accounted and ~20% ends up in landfills, reflecting poor waste disposal method.

Incorrect and Inadequate Segregation Techniques: There is poor segregation of waste at source. Hazardous waste and e-waste is not sealed and labelled leading to improper disposal. ***For ex-*** *Valuable materials like aluminum and plastics end up in landfills instead of being recycled.*

Reuse/Recycling of waste: Reuse and recycling of waste is predominantly an informal economy, lacking access to advanced technology.

Financial Constraints: Local municipal bodies often face budget limitations hindering investments in modern waste management systems.

3. Littering and Illegal Dumping: Due to poor disposal methods, almost half of waste is placed in uncontrolled dumps and landfills. A substantial amount of untreated waste, approximately 24%, ends up in landfills, many of which are unscientific and overflowing. These landfills are the source of generation of methane gases, leachates, and landfill fires, adversely affecting the surrounding environment

4. Lack of land resources: The urban areas in India lack adequate land resources to set up waste processing plants. ***For ex-*** *Waste processing plants in Delhi need large land parcels, of about 30-40 acres each for treatment.*

5. Lack of public awareness: Lack of public awareness regarding proper waste management practices, contributes to littering and improper disposal habits.

6. Lack of regular waste collection services: The lack of regular waste collection services adds up to the building up of waste as well as littering. Illegal dumping in open areas and waterbodies increases the pressure on the municipal body, warranting more resources for clean-up.

7. Lack of proper data: Lack of data regarding the quantity & quality of waste generated & processed in India is a major roadblock in its management. The data regarding the rate of waste generation in India is under-estimated & of waste collection is over-estimated. **For e.g.** according to the official estimates, the plastic waste generation rate in India is 0.12 kg/capita/day, while according to the study published in 'Nature' , it is as high as 0.54 kg/capita/day. The agencies in India claim to collect 95% of the waste generated, however, these official statistics do not include rural areas, open burning of uncollected waste or the waste recycled by the informal sector.

8. Informal Sector: The informal sector, consisting of ragpickers and recyclers, plays a crucial role in managing and extracting value from waste, though often under hazardous conditions.

9. Waste Composition: A large percentage of Indian waste is organic, offering potential for composting and bio-methanation. However, the increasing proportion of non-biodegradable waste like plastics and e-waste presents management challenges.

10. Over-Centralization & One-Size-Fits-All Approach:

The waste management rules formulated in our country are based on the belief that centralization and over-regulation can cure administrative weaknesses, and that the Centre must design and command while the States merely execute. Thus, environmental governance in India not only runs contrary to the principle of subsidiarity but also embodies a technocentric vision that is insufficiently attentive to ground realities.

The Rules also follow a one-size-fits-all approach. A system suited to a resource-rich metropolis like Mumbai cannot be mechanically applied to a Himalayan pilgrimage town, an island settlement with scarce land, a coastal panchayat facing tidal flooding and marine litter, or a scattered tribal hamlet where low-density habitation makes waste collection and transportation costly.

What are the harmful impacts of poor Waste Management?

Health Issues	The improper waste management leads to several health issues such as: **Respiratory & Chronic Issues**: Open burning of waste leads to formation of harmful particles which can cause lung diseases. **Disease Breeding Grounds:** Poor collection of solid waste leads to garbage dumps which act as breeding ground for rats and mosquitoes etc. Mosquitoes act as carriers of diseases like malaria and dengue. **Microplastics in the Food Chain:** Poorly managed plastic waste eventually breaks down into microplastics. These are ingested by marine life and livestock, eventually making their way into human bloodstreams and organs.
Environmental Issues	Improper waste management techniques lead to various environmental problems such as: **Surface and Groundwater Contamination:** Unscientific dumping in landfill leads to formation of harmful chemicals which permeate into soil and groundwater. This renders groundwater unfit for drinking and cause multiple diseases **Air Pollution:** Open burning of trash—a common practice in areas with poor collection—releases hazardous chemicals like dioxins and particulate matter into the air. Additionally, decomposing organic waste in landfills produces methane (CH_4), a greenhouse gas roughly 28 times more potent than CO_2. Waste in landfills leads to formation of harmful gases leading to air pollution. ***For ex-*** *Around 90-98% of landfill gases are made up of methane and carbon dioxide, remaining 2-10% includes nitrogen, oxygen, ammonia, sulphides, hydrogen and various other gases.* **Soil Degradation**: Hazardous materials (like heavy metals from batteries) alter the soil's pH and chemistry, killing essential microorganisms and making the land infertile for years. **Marine Pollution**: A lot of land-based waste eventually ends up in sea leading to marine pollution.
Economic Impacts	Improper waste management usually has grave economic impacts such as: **Economic Loss:** Poor waste management is expensive. Governments end up spending more on **healthcare** and **emergency disaster relief** than they would have spent on an efficient disposal system. It also hurts tourism and lowers property values. **Urban Flooding:** In many cities, plastic waste clogs drainage systems. During heavy rain, this prevents water from flowing, leading to "artificial" floods that damage homes and infrastructure. **Resource Depletion:** Expansion of landfills occupy useful land, leading to wasteful utilization of an economic resource.
Impact on Wildlife	**Ingestion and Entanglement:** Over **100,000 marine mammals** die annually from plastic entanglement or ingestion. Land animals often choke on plastic or die from chemical poisoning after scavenging at dumpsites.

	Habitat Loss: Landfills and illegal dumping destroy natural habitats, forcing species to migrate or face local extinction.

What have been the Government interventions for Solid Waste Management?

Policy and Legal Framework for Waste Management in India	The Government of India (GoI) has formulated various Rules and Regulations. These rules are updated periodically and have been formulated under the **Environment Protection Act, 1986**. These include: a. **Solid Waste Management Rules** b. **e-Waste Management Rules** c. **Plastic Waste Management Rules**
Extended Producer Responsibility (EPR) Mechanism	EPR is a policy approach in waste management that makes producers responsible for the entire lifecycle of their products, including their collection, recycling, and disposal. In 2022, EPR initiatives utilizing market mechanisms were implemented for plastic packaging, e-waste, battery waste, and used oil.
Swachh Bharat Mission for Solid Waste Management	Central assistance is provided under Swachh Bharat Mission for solid waste management, including plastic waste management in urban and rural areas.
Compost Banao, Compost Apnao Campaign	It is a multi-media campaign launched by MoHUA on waste-to-compost under SBM-(U). The aim is to encourage people to convert their kitchen waste into compost to be used as fertilizer and to reduce the amount of waste getting to landfill sites.
Promotion of Waste to Energy	The Ministry of New and Renewable Energy (MNRE) launched Program on Energy from Urban, Industrial, Agricultural waste/residues and Municipal Solid Waste to promote setting up of Waste-to-Energy projects and to provide central financial assistance.
GOBAR-Dhan Scheme	This scheme promotes the conversion of cattle dung and organic farm waste into biogas and organic compost in rural areas.
National Action Plan for Municipal Solid Waste Management	This plan by the Central Pollution Control Board (CPCB) outlines strategies for waste minimization, utilization, recycling, processing, and environmentally sound disposal.
Mission LiFE	Mission LiFE (Lifestyle for Environment) is an India-led global mass movement to encourage individuals and communities to adopt sustainable, climate-friendly lifestyles and reduce mindless consumption.

	Mission LiFE actions are organized around themes such as energy conservation, water saving, waste reduction, sustainable food systems, reduced single-use plastics, healthy lifestyles, and e-waste management.

What should be the Way Forward?

1. Scientific Waste Management: The waste management planning should be based on sound scientific and engineering studies. They should consider waste composition, capital and long-term operating costs, transport distances, and the geographical location of waste processing and disposal facilities.

2. Smart Waste Management System: In the long term, technology like (Internet of Things) can be integrated into waste management. ***For ex-*** *RFID-enabled door-to-door waste collection monitoring can enhance collection efficiency and GPS based vehicle tracking can help in real time monitoring.*

3. Emphasis on Recycling, Resource recovery & Processing: Policies supporting recycling and recovery of resources from waste must be implemented stringently. Waste processing methods like composting, vermicomposting and bio-methanation should be adopted for treating organic waste. Establish efficient material recovery facilities (MRFs) and support the formalization of the recycling sector.

4. Scaling up Waste-to-Energy: Bio-methanation (anaerobic digestion) which uses microorganisms to convert the organic waste into methane, can be used as fuel. Bio-methanation plants should be scaled up. Also, Refuse-Derived Fuel (RDF) which consists of plastics, paper, and textile waste, having good calorific value, can be used to generate power in waste-to-energy projects.

5. Polluter Pays Principle:

Waste Management Rules which have incorporated '**Polluter Pays Principle**', need to be stringently implemented to penalize non-compliance.

Polluter pays principle casts absolute liability on the polluter for the harm caused to the environment & extends not only to compensate the victims of pollution but also the cost of restoring environmental degradation.

While the liability is clear under this principle, but the process of determining an equitable compensation is difficult as it must account for both tangible & intangible damages inflicted on environment & the affected communities. To overcome this, the Courts have modified the principle into **'Government Pays Principle'** under which it is the government which has to pay the compensation to the affected individuals & recover the same from the polluters, until the damage caused to the ecology is fully reversed.

6. Increasing Public Awareness: Self- help groups, residents' welfare associations, and community-based organizations should be encouraged to educate and acquaint people with beneficial waste management strategies, including separation, recycling modes, and drop off centers for recyclables, as well as composting.

7. Data collection: There is an urgent need to collect & provide reliable data about waste generation & its composition in the country for its effective management. We need to know how much of the waste is being generated, where & how it is being managed for finding an effective solution. We also need to have data regarding the infrastructure that has been built over the years for waste management & such infrastructure needs to be geotagged to help in proper disposal of waste.

8. Extended Producer Responsibility (EPR): To effectively operationalize the EPR, the producers, importers & and brand owners that have a legal obligation to collect the waste, can collectively form kiosks across the country to collect the waste from local bodies – so that all the waste that is covered under EPR can be deposited & effectively managed.

9. Circular Economy Model: The circular economy model underlines waste as a resource. India needs to move away from a linear to circular mode of waste management – with the twin objectives of minimizing waste & recovering energy & other resources.

10. Differentiated Environmental Governance:

Allow States to frame their own solid waste management rules for at least five years, subject to minimum national norms. States can try policies at manageable scale, contain failures, and allow successful models to diffuse horizontally or be adopted nationally.

Solid waste management rules must be recast around 5 principles – Minimum national standards, State flexibility, Empowered local bodies, Predictable finance, and citizen accountability.

Conclusion:

According to the SC of India, environmental protection is not only a regulatory obligation but also a constitutional imperative which aims to safeguard the fundamental rights of the individuals & preserve the ecological balance. Thus, it is the right time to hold the waste management system in the country accountable to the people whose health is impacted by the land, water & air pollution caused by unmanaged & mismanaged waste all across the country.

Read More: The Hindu
UPSC Syllabus: GS III, Conservation, Environment Pollution and Degradation.

National Testing Agency – Functioning & Challenges – Explained Pointwise

The **National Testing Agency (NTA)** has been caught in the middle of the storm surrounding the NEET controversy. In May 2026, the **NEET-UG examination** was cancelled nationwide after a "guess paper" circulated on WhatsApp was found to have a significant overlap with the actual question paper. This affected approximately 2.3 million students.

The Agency has once again come under scrutiny for its alleged weak operational capacity, porous cybersecurity framework, and poor crisis communication.

Source- NTA

What is the National Testing Agency? What is its envisaged role?

National Testing Agency: National Testing Agency (NTA) was established as a Society registered under the Indian Societies Registration Act, 1860. It has been established as a premier, specialist, autonomous and self-sustained testing organization to conduct entrance examinations for admission/fellowship in higher educational institutions.

Aim: NTA aims to conduct efficient, transparent and international standardized tests in order to assess the competency of candidates for admission and recruitment purposes.

Composition:

NTA is chaired by an eminent educationist appointed by the Ministry of Education.

The CEO of NTA is the Director General to be appointed by the Government.
The Director General is assisted by 9 verticals headed by academicians/ experts.
NTA consists of a Board of Governors comprising members from user institutions.

What was the intention behind the establishment of National Testing Agency (NTA)?

Professionalizing the Examination Process: Before the NTA, major exams like JEE Main and NEET were conducted by the **Central Board of Secondary Education (CBSE)**. However, the CBSE's primary expertise is in schooling and curriculum, not high-stakes competitive psychometrics. Thus, NTA was created as a specialist body whose sole mission is to research and execute entrance tests using modern assessment techniques.

Incorporation of Online Mode of examination: The NTA was designed to eliminate human error and leakage risks. Some of the examinations such as JEE Mains are conducted by NTA in the online mode at least twice a year. By pivoting to **Computer Based Tests (CBT)**, the agency intended to:
Standardize the testing environment across the country.
Provide faster, more accurate result processing.
Minimize the logistical challenges associated with paper-and-pencil tests (like physical transport of millions of OMR sheets).

Promoting Equity and Access: A major part of the NTA's mandate is to ensure that students from rural or underprivileged backgrounds are not disadvantaged by the shift to digital testing. The NTA established a network of centers (called Test Practice Centres (TPCs)) where students can practice CBT for free & also created online infrastructure such as a 'mobile app' to help students practice and take mock tests on their own computers or smartphones, ensuring that "tech-savviness" doesn't become a barrier to entry. It has helped in democratization of education.

Moving Toward "Scientific" Testing: The NTA aims to use data-driven insights to improve how students are evaluated. This includes:

Psychometric Analysis: Evaluating the difficulty level and discrimination index of every question.

Equipercentile Equating: A statistical method used to ensure that if an exam is held over multiple days, a student who got a "harder" set of questions isn't unfairly penalized compared to a student who got an "easier" set.

Adoption of global best practices: NTA was designed to adopt technology and best global practices to bring in high reliability, transparency, and standardized difficulty levels in the examinations. It has collaborated with international organizations like ETS (Educational Testing Services).

Implementation of Programme of Action (POA) 1992: Creation of National Testing Agency is to give effect to the Programme of Action (POA), 1992 which envisaged the concept of a common entrance exam on an all-India basis for admission to professional programs.

Research and Training: NTA was aimed at the establishment of a strong R&D culture as well as a pool of experts in different aspects of testing. It was also aimed to provide training and advisory services to the institutions in India.

What are the issues with functioning of NTA?

Frequent Paper Leaks and Integrity Breaches: The allegations of irregularities in the conduct of exams like NEET-UG, including suspected question paper leaks, distribution of wrong question papers, and technical glitches have posed serious questions on the integrity of the organization. A parliamentary panel found in late 2025 that at least **five of the 14 major exams** NTA conducted faced "major issues".

Over-Reliance on Outsourcing: The **Radhakrishnan Committee** (formed after the 2024 controversies) highlighted that the NTA is dangerously dependent on third-party vendors:

Contractual Staff: Much of the sensitive work – including question processing, translation, and exam center management – is handled by contractual personnel rather than permanent, accountable government officials.

Private Centers: Many exams are conducted in private computer labs and schools that lack standardized security protocols, leading to non-functional CCTV cameras and "managed" cheating.

High scores and Grace marks: The award of Grace marks to the candidates and unusual spike in the number of candidates securing full marks in the NEET exam (67 students securing full 720/720) has raised eyebrows on the procedure adopted by the National Testing agency.

Lack of Transparency and Accountability: There have been allegations regarding the lack of transparency and accountability on part of NTA to address the concerns of the students. NTA has often been criticized for being an opaque body, lacking transparency in its operations. **For ex-** Denial of demands for a CBI inquiry and a retest of the NEET exam on part of NTA.

Operational and Administrative Challenges: Even when papers aren't leaked, the NTA has struggled with the "scientific" execution of tests. Foe e.g. In 2026, the NTA had to revise its JEE Main answer key after correcting 19 errors in the Chemistry section alone. Students frequently complain about being allocated centers in far-flung cities, sometimes hundreds of kilometers away, despite providing local preferences.

Technical Failures: Beyond leaks, students frequently face **technical glitches, server crashes, and answer key errors**. Critics also highlight that despite pressure for digital reform, NEET remains a **pen-and-paper exam** conducted across 10,000+ centres, creating vast logistical vulnerabilities.

Reverting to pen-paper mode from the progressive online medium: The reversal to pen and paper mode from the online mode has increased the vulnerability of the examinations conducted by NTA to leaks. **For ex-** UGC-NET was an offline exam conducted by the CBSE till 2018, when it was taken over by the NTA and became an online exam. However, it was reverted to offline, pen-and-paper exam, which is potentially more vulnerable to paper leaks.

Delayed Implementation of Reforms: Most of the recommendations made by the **Radhakrishnan Panel** are yet to be fully realized:

The Digital Gap: The shift to a "hybrid" model (digital delivery of papers with OMR answering) has been slow to roll out across all regions.

Personnel Reform: The goal of replacing contractual staff with permanent personnel is still a "work in progress," with the agency currently targeting late 2026 for completion.

Read More- Exam Paper Leaks- Concerns and Way Forward- Explained Pointwise

What should be the Way Forward? (Including Radhakrishnan Panel Recommendations)

Structural Restructuring: The NTA must shift from being an administrative coordinator to a technology-first research body:

Permanent Workforce: Reducing reliance on private outsourcing. The goal is to man the NTA with internal experts in psychometrics and cybersecurity rather than temporary contractual staff.

Government-Only Centers: Major exams should be moved out of private schools/computer labs and conducted exclusively at government-controlled institutions, Kendriya Vidyalayas, or standardized "National Testing Centers."

Adopting a "Hybrid" Examination Mode: Since India lacks the infrastructure to test 2.5 million students simultaneously on computers (CBT), a **Hybrid Model** is the proposed middle ground:

Digital Delivery: Question papers are delivered to centers via an encrypted digital link just 30–60 minutes before the exam.

Physical Answering: Students still mark their answers on OMR sheets, but the physical transport of printed booklets—the most common point of paper leaks—is eliminated.

High-Speed Printing: Each center would be equipped with secure, high-speed printers to generate papers on-site.

Multi-Stage and Multi-Session Testing: To reduce the high-stakes pressure and the scale of potential leaks:

NEET-UG Two-Tier System: Moving toward a Preliminary and Mains format (similar to JEE or UPSC). This makes a "mass leak" much harder to execute and easier to contain.

Multiple Attempts: Allowing students to take the exam twice a year to reduce the "do-or-die" desperation that fuels the paper-leak market.

Deploy Full Biometric & AI Surveillance: While pilot tests have been conducted, a nationwide rollout of **Aadhaar-based facial recognition** and **AI-enabled CCTV monitoring** (which flags suspicious behavior in real-time) is essential to prevent impersonation and organized cheating.

Encrypted "Question Banks": Moving away from a single "master set" of questions to a system where each center (or even each student) receives a randomized set of questions pulled from a secure, encrypted cloud server.

Accountability and punishment of the guilty: The government should take steps to rehaul the NTA's systems and personnel. This will ensure that the technical glitches, cheating scams, paper leaks, and proxy candidates that have plagued the exams this year are not allowed to happen again.

Strict Enforcement of the 2024 Act: Rigorous implementation of the **Public Examinations (Prevention of Unfair Means) Act, 2024,** which mandates up to 10 years in prison and ₹1 crore fines for organized paper-leak syndicates.

Dismantling the centralised structure of National Testing Agency: The centralised structure of the NTA should be dismantled. This may well curb the Union government's centralising tendencies leading to examinations of enormous scale that are harder to manage in a far-flung regions of the country.

Taking help from the State government: For all-India examinations, the States should join the Central Govt in recovering the integrity of the beleaguered examination system. The state governments should also be shared some responsibilities for entrance examinations.

Read More: The Hindu
UPSC Syllabus- GS 2- Various regulatory and statutory Bodies

AI-Powered Financial Inclusion – Explained Pointwise

India's financial inclusion journey is witnessing a paradigm shift, propelled by the convergence of robust **Digital Public Infrastructure (DPI)** and **Artificial Intelligence (AI)**. What initially began as an effort to broaden access to basic banking services has now evolved into a technology-driven ecosystem aimed at delivering intelligent, inclusive, and real-time financial services at scale. By leveraging extensive digital footprints, advanced analytics, and consent-based data-sharing frameworks, AI is reshaping the design and delivery of financial services—improving efficiency, widening outreach, and enabling more personalized

financial solutions.

What is meant by Financial Inclusion?

Financial inclusion is the process of ensuring **access to financial services**, with timely, adequate and affordable credit primarily for vulnerable groups such as weaker sections and low-income groups.

In India, financial inclusion has moved beyond being just a policy goal and has become a digital reality. Over the last decade, interconnected digital platforms have made financial services more accessible, widespread, and technology-driven.

This transformation is anchored in foundational systems enabling identity verification, seamless payments, and direct benefit delivery. These systems ensure that financial services are **accessible, affordable, and efficient** across geographies. Together, they form the backbone of an integrated ecosystem that supports last-mile connectivity and future innovations.

What are the key foundational systems supporting financial inclusion in India?

JAM Trinity (Jan Dhan-Aadhaar-Mobile)	JAM is a foundational convergence of universal bank accounts, biometric identity, and mobile connectivity. Its motive is to provide every citizen with a unique financial identity and a direct link to the state, ensuring that geography is no longer a barrier to financial access.

Unified Payments Interface (UPI)	UPI is a real-time payment system that allows for instant money transfers between any two bank accounts via a mobile platform. It aims to democratize digital payments by offering a low-cost, interoperable, and secure experience for both small merchants and individual users. It accounts for nearly **81% of total retail payment volume** in India, becoming the primary digital rail for both person-to-person and person-to-merchant payments.
Direct Benefit Transfer (DBT)	Under DBT system, government subsidies and welfare benefits are directly transferred into the bank accounts of beneficiaries. Its primary goal is to enhance transparency and efficiency by removing intermediaries, thereby eliminating leakages and delays in the delivery of social welfare.

What are the various initiatives aimed at integrating AI into the financial sector?

BHASHINI	**Digital India BHASHINI Division (DIBD)** and the **RBI** has signed an MoU to collaborate on integrating **BHASHINI's language AI models** to enhance multilingual access to banking and financial services. The initiative aims at promoting financial inclusion across India's diverse linguistic landscape by providing multilingual access to banking services in all **22 scheduled Indian language,** thus removing literacy and language barriers. By providing **AI-powered solutions** for communication and service delivery, it ensures that all citizens, regardless of language, can **access essential services** and information effectively.
RBI Regulatory Sandbox	The RBI introduced the **Enabling Framework for Regulatory Sandbox (RS)**, to foster responsible innovation, enhance efficiency, and benefit consumers in the fintech sector. The objective of the RS is to foster responsible innovation in financial services, promote efficiency and bring benefit to consumers. It offers a **controlled environment** for **testing new products/services** under regulatory supervision before wider deployment.
MuleHunter.AI	The **Reserve Bank Innovation Hub (RBIH)**, **MuleHunter.AI** is an advanced AI-powered tool designed to identify and mitigate "mule" bank accounts used in cybercrimes. Unlike traditional rule-based systems, it uses **AI/ML-powered tool** to analyze transaction patterns in real-time, detecting anomalies that indicate money laundering or illegal betting.

Digital ShramSetu	**Mission Digital ShramSetu** announced in October 2025, is a proposed national initiative to create an AI-driven ecosystem that makes technology accessible, affordable, and impactful for India's **490 million informal workers.** The mission harnesses **AI, Blockchain, and Immersive Learning** to dismantle structural constraints such as financial insecurity, limited market access, and lack of formal skilling. By providing tools for social protection and real-time skill verification, the mission aims to turn the informal workforce into a primary driver for the **Viksit Bharat 2047** vision.
Unified Lending Interface (ULI)	ULI is a technology-based initiative to make frictionless credit available to every Indian and to further the Government's broader vision of digital empowerment, financial inclusion, and last-mile service delivery. ULI enables **digital access to multiple data sources**, including authentication services, land records, satellite service, and other financial and non-financial datasets, to support loan processing.

What is the significance of integrating AI into the financial sector?

Enhanced Efficiency and Cost Reduction: AI automates routine tasks such as data entry, transaction processing, and customer inquiries (via chatbots), reducing operational costs and freeing human workers for higher-value activities. AI-driven solutions can reduce the cost of business activities to nearly **1/10th** of traditional manual processes.

Improved Risk Management: Machine learning models analyze vast amounts of historical and real-time data to detect patterns indicative of fraud, credit defaults, or market volatility, enabling proactive risk mitigation. By leveraging the **Unified Lending Interface (ULI)**, AI models analyze "digital footprints" to assess risk.

Credit Scoring and Lending:
Digital advancements and AI are reshaping India's credit ecosystem by strengthening **credit assessment and expanding lending access**. Traditionally, access to formal credit was limited by the lack of verifiable financial histories, particularly for MSMEs, informal workers, and first-time borrowers.
AI-powered solutions move beyond conventional credit scoring models and leverage alternative data such as digital payment transactions, GST filings, bank statements, and utility payments to assess creditworthiness. By converting digital footprints into dynamic risk profiles, AI enables faster, more accurate, and cost-efficient underwriting decisions.

Advanced Fraud Detection and Security:
AI systems can identify anomalies in transaction behavior almost instantly, flagging potential fraud with greater accuracy than rule-based systems, and adapting to new threats over time.
AI identifies subtle patterns in transaction metadata that human analysts would miss, stopping "deepfake" fraud and sophisticated cyber-attacks before they settle.

Regulatory Compliance (RegTech): AI helps automate compliance monitoring, report generation, and transaction screening for anti-money laundering (AML) and know-your-customer (KYC) requirements, reducing human error and compliance costs.

What are the challenges associated with integration of AI in financial sector?

The "Black Box" & Opacity: Many AI systems lack transparency, making it difficult to explain decisions like loan rejections. In a country where financial literacy varies significantly, AI-driven loan rejections are often unexplainable. Frontline bank staff frequently cannot explain to a customer why an algorithm denied their credit, leading to trust deficits.

Data Privacy & Security: AI relies on vast amounts of sensitive financial data, increasing risks of breaches, unauthorized processing, and privacy violations. This is governed by the Digital Personal Data Protection (DPDP) Act, 2023.

Operational & Infrastructural Gaps: India has only ~3% of global data center capacity, a major hurdle for AI processing. Many smaller banks and NBFCs lack resources to build AI governance, creating an uneven playing field.

Algorithmic Bias: Because AI models are often trained on historical data, there is a significant risk of reinforcing social biases. For example, an AI might inadvertently penalize borrowers from specific pin codes or communities that were historically underserved, contradicting India's goal of inclusive finance.

Data Localization: Storing and processing massive financial datasets locally adds significant infrastructure costs for smaller fintechs and Cooperative Banks.

Socio-Economic Concerns: Low financial literacy (25-30%) could worsen the digital divide. Job displacement is a major concern, especially in public sector banks, requiring large-scale reskilling programs.

What should be the Way Forward?

Explainability as Default: Institutions must move away from "black box" models. Every AI-driven loan rejection or fraud flag must be traceable and explainable to both the regulator and the customer. Thus, prioritize **explainable AI (XAI)** tools (like SHAP or LIME). Disclose AI use in customer interactions and credit decisions, and provide clear grievance redressal mechanisms.

Algorithmic Audits: Regular third-party audits of AI models will become standard practice to detect and "unlearn" biases related to gender, geography, or socio-economic background.

Regulatory Sandboxes: More fintechs should utilize the RBI's regulatory sandbox to test "Agentic AI" (AI that can execute transactions) in a controlled environment before public release.

Workforce and Society: Launching massive, systematic reskilling initiatives for IT and banking professionals to manage the transition and mitigate job displacement, alongside nationwide programs to improve financial literacy so citizens can navigate an AI-driven financial world safely.

RBI's FREE-AI Framework: In response to the challenges involved, the RBI released the 'Free-AI Committee Report' in August 2025, proposing a framework for responsible and ethical AI use . Its key principles include:

Accountability: Financial entities are accountable for their AI models' actions, regardless of the autonomy granted to them .

Transparency & Explainability: AI-generated decisions must be traceable to comprehensible human logic .

Fairness & Non-Discrimination: AI models must act in an unbiased manner .

Human Oversight: Final decision-making must vest with humans, not AI models.

UPSC GS-3: Indian Economy
Read More: PIB

Medical Education in India and Associated Issues – Explained Pointwise

The medical education in India stands at a defining crossroads. Though, the country has witnessed an unprecedented expansion in its capacity to train future doctor over the past decade, however, this rapid expansion has also raised the question about the quality of doctors being produced in our country.

The cancellation of this year's NEET-UG, that has not only left over 22 lakh medical aspirants in lurch, but has

also triggered the calls for a structural reform.

Medical Education in India

What is the current status of Medical Education in India?

Growth in Institutions and Seats: From the academic years 2020-21 to 2025-26, MBBS seats increased by **48,563** and postgraduate seats by **29,080**. The number of medical colleges has grown to **819** in 2025-26, with a nearly 50/50 split between government and private/deemed universities.

Postgraduate Expansion: The postgraduate seats has been increased to ~85,000 nationwide. There is a concerted push to increase MD/MS seats to bridge the gap between undergraduate and specialist training.

Entry Examination: The **National Eligibility cum Entrance Test (NEET)** remains the standard for admissions. However, its administration has been marred by controversies, including paper leaks that led to the cancellation of the NEET-UG 2026 exam.

NExT Exam: The National Exit Test (NExT), intended to replace the final year MBBS exams, the FMGE, and the NEET-PG, remains in a state of "phased transition." The NExT exam has been **deferred** for high-stakes purposes until **2029**.

Approximately **20,000 to 25,000** Indian students go abroad every year to study MBBS. It is estimated that over **1.3 to 1.5 lakh** Indian students are currently enrolled in medical programs outside the country.

What are the shortcomings of medical education in India?

Integrity of the Examination System: The cancellation of **NEET-UG 2026** due to paper leaks has exposed vulnerabilities in the National Testing Agency (NTA). NEET was introduced for the much needed standardisation & transparency with regard to the selection of medical students. However, repeated paper leaks and litigation have led to widespread burnout & mental health crises among aspirants as well as an almost complete collapse of trust in the national entrance examination system.

Faculty Crisis:

High Vacancy Rates: There is a chronic shortage of qualified faculty, especially in rural and newer medical colleges. "Ghost faculty" — teachers on paper only, hired to clear inspections — is a well-documented problem. New AIIMS have reported vacancy rates around 40%, and many private colleges operate with minimal staff to cut costs.

Poor Quality of Teaching: Overburdened and underqualified faculty often resort to rote learning and outdated teaching methods. There is little emphasis on interactive, problem-based learning or mentorship.

Rote Learning and Outdated Pedagogy: The curriculum, despite recent reforms, is still heavily tilted towards memorization rather than understanding or application. The system rewards students for regurgitating facts from standard textbooks, not for critical thinking, clinical reasoning, or problem-solving. The high-stakes NEET exam reinforces this culture from the pre-medical stage itself.

Poorly Structured Clinical Training: Clinical training lies at the heart of medical education. But, such training in India is largely ineffective because it is focused on large tertiary care hospitals where students see a high volume of rare and end-stage diseases. They get minimal exposure to common outpatient illnesses, primary care, or community health settings.

Urban and Specialist Bias: The training produces doctors who are comfortable in urban, well-equipped hospitals. It fails to prepare them for rural postings where they must be generalists, handle tropical diseases, and work with minimal diagnostics.

Inadequate Focus on Public Health: The curriculum underemphasizes primary care, rural health, preventive medicine, and public health — despite India's massive burden of communicable and non-communicable diseases at the community level. Graduates lack skills in epidemiology, disease surveillance, health management, and implementing national health programs. Thus, there is a mismatch between India's public health needs and the medical education provided by institutions in the country.

Rampant Coaching Culture: The need for private coaching from the school level distorts priorities away from foundational learning towards shortcut techniques for exam success. The hyper-competitive environment, from NEET coaching to postgraduate entrance exams, often fosters a culture contrary to medical ethics.

Overburdened and Broken Postgraduate (PG) System: The PG system, intended to create specialists, is under immense strain in India. Postgraduate residents (especially junior residents) are treated as service providers who run the entire public hospital system with negligible learning time. They work 80-100 hour weeks, often without proper stipends or safety, leading to burnout and depression.

Maldistribution of Specialties: A vast majority of PG aspirants chase a few "glamourous" clinical specialties (e.g., Dermatology, Cardiology, Radiology). This leaves critical branches like Anesthesiology, Emergency Medicine, Geriatrics, and Psychiatry, as well as non-clinical ones like Pathology and Microbiology, with thousands of vacant seats.

Regulatory Gaps: The Medical Council of India (MCI) was dissolved in 2020 partly due to corruption and dysfunction, replaced by the National Medical Commission (NMC). While the NMC has powers, its actual inspection and enforcement are weak. Many private colleges routinely flout norms (e.g., patient load, faculty numbers, infrastructure) without severe consequences.

Commercialization of Education: Especially in the private sector, medical education has become a high-cost business. High tuition fees (often crores of rupees for a PG seat) can lead to a debt trap, pushing some doctors towards unethical practices to recoup their investment. This also limits access for meritorious but financially weaker students.

What are the adverse impacts of these shortcomings?

High Rates of Misdiagnosis and Medical Errors: A doctor trained primarily through rote learning, with inadequate clinical exposure, struggles to apply textbook knowledge to a real patient. This leads to a higher likelihood of missed or incorrect diagnoses, inappropriate prescriptions, and harmful medical procedures.

Rural Healthcare Crisis: Because the training is urban- and tertiary-hospital-centric, new doctors are neither skilled nor willing to work in rural areas. This results in the massive **79.9% specialist vacancy rate** in rural Community Health Centres (CHCs).

Unpreparedness for Epidemics: Weak training in public health, epidemiology, and community medicine means the healthcare system struggles to mount coordinated responses to outbreaks — as exposed repeatedly, including during COVID-19.

Persistent Disease Burden: Inadequate emphasis on preventive medicine and health promotion means doctors are ill-equipped to counsel patients on lifestyle, vaccination, screening, and disease prevention — perpetuating India's dual burden of communicable and non-communicable diseases.

Exploitation of Patients: Commercially motivated medical education produces commercially motivated doctors. Unnecessary surgeries, tests, and hospital admissions are partly a downstream consequence of a system that treats medicine as a business from the outset.

Rise of Violence Against Doctors: Poor quality care and communication failures fuel public frustration, contributing to the alarming rise of physical assaults on doctors and hospital staff in India.

Increased Brain Drain and Outflow of Capital: Many of India's best medical graduates emigrate to the US, UK, Australia, and Canada, seeking better training, pay, and working conditions. This represents a massive loss of investment and talent for the country. With ~25,000 students going abroad annually, billions of dollars in tuition fees flow into the economies of Russia, Georgia, and Central Asia rather than being invested in Indian infrastructure.

What steps have been taken by the Government?

Increase in Number of Medical Colleges & Seats:

The number of medical colleges has more than doubled, rising from **387 in 2014 to 819 today**. India now has the highest number of medical colleges in the world.

From the academic year 2020-21 to 2025-26, MBBS seats increased by **48,563** and postgraduate (PG) seats by **29,080.**

The government has approved the addition of another **10,023 medical seats** (5,023 UG and 5,000 PG) in government colleges from 2025-26 to 2028-29. This is part of a larger goal to create **75,000 new medical seats by 2029.**

22 new All India Institutes of Medical Sciences (AIIMS) have been approved under the **Pradhan Mantri Swasthya Suraksha Yojana (PMSSY)** to provide high-standard tertiary care and training.

Regulatory Overhaul: **Dissolution of MCI & Establishment of NMC (2020)** The Medical Council of India, long plagued by corruption and regulatory capture, was replaced by the **National Medical Commission (NMC)** through the NMC Act, 2020.

Examinations:

Entrance Exam: A single national entrance test (NEET-UG & NEET-PG) replaced multiple state and private entrance exams, reducing the influence of capitation-based admissions and improving merit-based selection.

Exit Exam: The NMC Act mandated the introduction of NEXT (National Exit Test), a two-part national exit examination. This ensures every graduate meets a minimum national standard before practicing independently, regardless of which college they attended.

Curriculum Reform: The **Competency-Based Medical Education (CBME) Curriculum Guidelines** have been notified to ensure graduates are better equipped with practical skills and knowledge relevant to India's healthcare needs. CBME shifted the focus from rote learning as it mandates **Early Clinical Exposure** from Year 1.

Regulatory Frameworks: Key regulations like the **Graduate Medical Education Regulations (GMER), 2023** and the **Maintenance of Standards of Medical Education Regulations (MSMER), 2023** have been issued to uphold integrity and quality.

New Faculty Regulations 2025: The **Medical Institution (Qualifications of Faculty) Regulations, 2025** have been issued to adopt a more inclusive approach.

Compulsory Rural Service: Several states have made a period of rural service mandatory after MBBS as a condition for PG admission or registration — attempting to address rural doctor shortages.

What should be the Way Forward?

Restoring the Sanctity of National Exams: Moving away from a single-day, pen-and-paper mass exam (like NEET-UG) to a multi-day, computer-based model. The immediate focus must be on "Leak-Proofing" the entry and exit points of the profession.

Comprehensive Regulatory Reforms: Strengthen NMC & ensure that NMC boards function with full autonomy, transparency, and accountability.

National Faculty Pool: A centralised pool of qualified faculty drawn from both public & private sectors can be created to deliver teaching across institutions, either physically or through digital platforms.

Address Regional Imbalances: A major concern is the skewed distribution of medical colleges. The government must actively incentivize the establishment of new institutions in underserved states like **Bihar, West Bengal, and Madhya Pradesh**, where the seat-to-population ratio is critically low.

Incentivize Rural & Underserved Postings:

Offer loan waivers, accelerated promotions, and PG admission preferences for faculty serving in rural or newly established medical colleges.

Elevating the living standards and salaries of rural medical officers to match or exceed their urban counterparts to make rural service a "choice," not a "punishment."

Reserve a percentage of medical seats for students from "Aspirational Districts" who are trained locally, as they are statistically more likely to stay and serve their own communities.

Ensure Affordability: To curb commercialization, fees for at least **50% of seats in private medical colleges** should be regulated at the state government rate.

Strengthen Clinical & Holistic Skills: The rigid, exam-centric learning model must be replaced with **competency-based assessments** that prioritize clinical reasoning and practical skills. The proposed **National Exit Test (NExT)** can serve as a standardized, high-quality assessment for all graduating students, ensuring a uniform level of competence nationwide.

Embrace Technology: It is imperative to integrate training on **Artificial Intelligence (AI) and digital health tools** right from the undergraduate level, preparing students for a tech-driven healthcare landscape.

Focus on Translational Research: Focus on research that solves real-world health problems & contribute meaningfully to patient care & policy, moving beyond the current practice of producing research solely for academic promotion .

Align Medical Education with India's Health Needs:

Train students in the actual top killers and disablers in India — tuberculosis, diabetes, hypertension, malnutrition, mental health, road traffic injuries.

Elevate Community Medicine from a poorly regarded subject to a central pillar of the curriculum.

Produce graduates who understand and can address health at the population level, not just the individual level.

Conclusion: The transformation of medical education in India is both an opportunity & a responsibility. The system must now transition from a focus on numbers to a focus on outcomes. Producing competent, compassionate, and future-ready doctors should remain the central goal. Achieving this will require visionary policymaking, institutional commitment, and a willingness to embrace change.

UPSC GS-2: Education
Read More: The Hindu

India-UAE Relations – Explained Pointwise

India and the United Arab Emirates share a long-standing relationship shaped by trade, cultural exchanges, and strong community connections across the Arabian Sea. Trade in pearls, dates, spices, textiles, and fisheries connected western India with the Gulf region for centuries.
Recently, PM Narendra Modi had a brief stopover in Abu Dhabi, days after UAE came under Iranian missile &

drone attacks. Criticizing the attack on the Emirates, PM Modi said that India stands shoulder to shoulder with the UAE.

Source: ForumIAS

Evolution of India-UAE Relations:

Historical & Maritime Foundations (Pre-1971)	• The bond predates the formation of the UAE. For centuries, the Malabar coast and the Arabian Peninsula were linked by maritime trade. • Indian seafarers exchanged spices, textiles, and precious stones for dates and pearls. • Until 1966, the **Gulf Rupee** (issued by the Reserve Bank of India) was the official currency in the region, illustrating the deep economic integration.

Diplomatic Launch & The "Oil-Labor" Era **(1971–2014)**	• India was among the first countries to recognize the **UAE federation** in **1971**, establishing **formal diplomatic relations** in **1972**. • The discovery of oil in the UAE drastically altered the trade dynamic. The UAE became a vital anchor for India's energy security, while India provided the vast blue-collar workforce required to build the UAE's modern infrastructure. This era saw a massive influx of Indian blue-collar workers. • By the early 1990s, as India opened up its economy through liberalization and Dubai positioned itself as a global logistics and re-export hub, bilateral trade began expanding beyond traditional commodities.
The Strategic Leap **(2015–Present)**	• The visit of PM Narendra Modi in 2015 (first by an Indian PM in over three decades) marked a "renaissance" in bilateral ties. • **Comprehensive Strategic Partnership (2017):** The relationship was formally elevated during MBZ's visit as the Chief Guest for India's Republic Day. • The signing of the **Comprehensive Economic Partnership Agreement (CEPA)** in 2022 transformed the economic landscape.

What are the various initiatives to boost India-UAE relations?

Energy Security	• **Strategic Petroleum Reserves (SPR) Expansion:** The Abu Dhabi National Oil Company (ADNOC) and Indian Strategic Petroleum Reserves Limited (ISPRL) have entered into structural pacts to store millions of barrels of Emirati crude in India's underground strategic reserves. This guarantees India emergency access to oil during geopolitical supply chain chokepoints. • **Long-Term LPG & LNG Sourcing:** Moving away from volatile spot-market purchases, Indian Oil Corporation (IOC) and ADNOC finalized robust, long-term supply agreements for Liquefied Petroleum Gas (LPG) and Liquefied Natural Gas (LNG) to ensure structural price stability for Indian consumers.
Economic	• **CEPA (Comprehensive Economic Partnership Agreement):** Implemented to eliminate or drastically reduce tariffs on over 90% of products, this agreement successfully pushed bilateral merchandise trade past **$100 billion** for the first time in the 2025–2026 fiscal year. Bolstered by this success, both nations have officially committed to an ambitious target of **$200 billion in bilateral trade by 2032.**

	• **Local Currency Settlement System (LCSS):** This operationalized mechanism allows Indian and Emirati businesses to bypass the US dollar entirely, settling trade invoices directly in Indian Rupees and UAE Dirhams. • **Digital Payment Linking (UPI & JANI/Jaywan):** India's Unified Payments Interface (UPI) has been interconnected with the UAE's instant payment platform. This integration allows seamless cross-border fund transfers and card swiping for travelers, dramatically reducing transaction costs for the massive Indian diaspora.

Security	• **Joint Military Exercises:**
	  ○ **Desert Cyclone (Army):** This is the flagship joint military exercise between the Indian Army and the UAE Land Forces. It focuses explicitly on **urban warfare, counter-insurgency, and desert combat operations.**
	  ○ **Zayed Talwar (Navy):** A bilateral naval exercise designed to enhance interoperability between the Indian Navy and the UAE Navy. It focuses on maritime search and rescue, anti-piracy operations, air defense tracking, and securing vital Sea Lines of Communication (SLOCs) in the Persian Gulf and Arabian Sea.
	  ○ **Desert Eagle (Air Force):** Periodic tactical fighter exercises where the Indian Air Force (IAF) and the UAE Air Force engage in simulated, high-intensity aerial combat maneuvers.
	• **Zero Tolerance on Extremism:** Both nations have created a joint working group on counter-terrorism. This has led to highly effective intelligence sharing regarding online radicalization, the movement of transnational terrorists, and the tracking of extremist recruitment networks across the Middle East and South Asia.

Technological	• **8-Exaflop Supercomputing Cluster:** A breakthrough technological initiative signed between India's C-DAC and the UAE's AI giant, G42, to co-develop an ultra-high-speed, sovereign supercomputing cluster to advance AI research, climate modeling, and data analytics. • **Integrated Space Ecosystem:** Moving beyond simple satellite launches, both nations have agreed on an initiative aimed at full-scale commercialization of the space sector. This includes building end-to-end infrastructure, launching joint space missions, and fostering cross-border aerospace startups. • **Project SHANTI (Civil Nuclear Cooperation):** Enabled by India's legislative advancements in advanced energy, both nations have established a roadmap to collaborate on advanced reactor systems, small modular reactors (SMRs), and mutual maintenance workflows for nuclear power plants.

Misc	• **I2U2 Food Security Corridor:** Funded by UAE, this initiative integrates Israeli water-saving technology with Indian agricultural land. High-tech **Food Parks** are being built across India to process and package crops directly for dedicated, cold-chain export corridors to the UAE, creating guaranteed demand for Indian farmers and food security for the Gulf. • **Global Off-shore Campuses:** Elevating cultural and academic soft power, elite Indian institutions have physically expanded into the UAE, highlighted by operational offshore campuses of the **Indian Institute of Technology (IIT) Delhi in Abu Dhabi** and the **Indian Institute of Management (IIM) Ahmedabad in Dubai.**

What is the Significance of India-UAE Relations?

Geopolitical Significance	• **Bridge to the Arab World:** The UAE, under its visionary leadership, is a pivotal state in the Gulf Cooperation Council (GCC) and the wider Islamic world. Strong ties with the UAE enhance India's standing and diplomacy across the Middle East. • **Balancing Act in a Multipolar Region:** Both nations share a preference for strategic autonomy. The partnership helps balance other regional powers and provides India a stable, influential partner amid complex regional dynamics (e.g., Iran-Saudi tensions). • **Counter-Balancing:** The partnership provides India with a stable anchor in West Asia, especially as a counterweight to shifting dynamics like the 2025 Saudi-Pakistan defense pact. • **Multilateral Forums:** The UAE is a key partner for India in mini-laterals like the **I2U2 Group** (India-Israel-UAE-USA) and within BRICS and the UN. This amplifies India's voice on global issues.
Economic & Trade Significance	• **Trade Powerhouse:** The UAE is India's **3rd largest trading partner** (after US and China) and **2nd largest export destination**. Bilateral trade reached **$100 billion** in FY 2024–25, aided by the landmark **Comprehensive Economic Partnership Agreement (CEPA)** signed in 2022. • **Investments:** UAE sovereign wealth funds are major investors in India across infrastructure, renewable energy, technology, and logistics. The UAE committed to a **$75 billion investment** in India's infrastructure, signaling a move from being just a trade partner to a long-term stakeholder.

	• **Gateway to West Asia & Africa:** The UAE's world-class logistics hubs (like Jebel Ali Port) serve as a critical **trade and connectivity corridor** for Indian goods to the Middle East, Africa, and Europe.
Energy Security	• **Energy Supplier**: The UAE is a **stable and reliable energy supplier** for India, meeting a significant portion of its crude oil and LNG needs. Last year, UAE was 4th largest source of crude oil, meeting nearly 11% of the requirement. UAE is the largest source of LPG, catering to ~40% of the requirement. • **Strategic Petroleum Reserves (SPR):** The Abu Dhabi National Oil Company (ADNOC) was the first foreign mega-corporation to invest in India's underground strategic oil reserves (such as the Mangaluru facility). • **Renewable Energy**: Growing collaboration in **renewable energy**, with UAE investing in India's massive solar energy sector.
Diaspora & Remittances	• The **3.5 million-strong Indian community** in the UAE (~35% of its population) is the **largest expatriate group** and the backbone of the UAE's workforce, contributing significantly to its economy and society. The diaspora has transitioned from predominantly blue-collar labor to high-earning white-collar professionals, tech entrepreneurs, and academics. • The UAE is the **largest single-source of remittances to India** (over **$15-18 billion annually**), vital for India's foreign exchange reserves and household incomes in states like Kerala, Tamil Nadu, and Uttar Pradesh. • The community acts as a **living bridge**, fostering deep people-to-people ties and cultural understanding.
Strategic & Security Cooperation	• **Counter-Terrorism & Intelligence:** Close cooperation on counter-terrorism, deradicalization, and intelligence sharing is crucial for regional stability and for addressing mutual security threats. • **Defense Ties:** Regular joint military exercises (air force 'Desert Eagle', naval exercises), port calls, and defense dialogues. The UAE is a key security partner in the volatile Gulf region. • **Maritime Security:** Collaboration to secure vital sea lanes in the Western Indian Ocean and the Gulf, which are lifelines for India's energy and trade flows.
Cultural & Soft Power	• The inauguration of the **BAPS Hindu Mandir in Abu Dhabi** is a historic symbol of religious tolerance and deep cultural respect, significantly boosting India's soft power.

What are the Challenges in India-UAE Relations?

1. **Economic & Trade Frictions:**
    - **Trade Imbalance:** While trade volume is huge, the balance often tilts toward the UAE (due to oil & gold imports). India's exports to the UAE are heavily dominated by traditional sectors like gems, jewelry, textiles, and refined petroleum. Expanding India's share in high-value manufacturing, engineering goods, and technology services remains slow due to non-tariff barriers.
    - **Non-Tariff Barriers (NTBs):** Indian exporters, particularly in the agricultural and pharmaceutical sectors, frequently encounter strict sanitary and phytosanitary (SPS) measures. Despite the CEPA, issues like stringent product standards, certification hurdles, and customs procedures can act as de facto barriers for Indian exporters.
    - **Oil Dependency:** While the relationship is diversifying into renewables and nuclear (under the SHANTI Law), the bulk of trade is still anchored in hydrocarbons. This makes both economies vulnerable to global oil price shocks and the accelerating global shift toward green energy.
2. **Geopolitical Tightrope:**
    - **UAE-Pakistan Relations:** The UAE has historically close ties with Pakistan, including military cooperation and hosting of Pakistani diaspora. While the relationship with India has grown, the UAE continues to engage with Pakistan, which can be a source of sensitivity, especially during India-Pakistan crises (e.g. post-Pulwama or Operation Sindoor).
    - **Iran-UAE Tightrope:** Following intense geopolitical flare-ups in the region – such as the recent missile and drone strikes targeting the UAE – India has had to walk a narrow diplomatic tightrope. Indian Prime Minister explicitly condemned the strikes, standing "shoulder-to-shoulder" with Abu Dhabi. However, India must simultaneously manage its vital strategic relationship with Tehran, particularly regarding the operation of the Chabahar Port and transit access to Central Asia.
    - **China's Growing Role in the UAE:** China is the UAE's largest trading partner. The UAE is a key node in China's Belt & Road Initiative (BRI). Chinese ports, tech companies (Huawei, 5G), and military cooperation in the UAE create strategic competition for India, which sees the UAE as a partner for the India-Middle East-Europe Corridor (IMEC).
    - **Vulnerability of Maritime Chokepoints:** The modern maritime crisis underscores a shared vulnerability. A major portion of India's energy imports passes directly through the **Strait of Hormuz**. Any blockade or escalation by regional actors directly threatens India's domestic energy security and food corridor logistics with the UAE.
3. **Diaspora-related Issues:**
    - **Economic Vulnerability of Blue-Collar Workers:** Despite a massive shift toward high-skilled white-collar professionals, a significant portion of the diaspora remains in low-wage construction and domestic sectors. Issues related to harsh working conditions, delayed wage payments, and the strict *Kafala* (sponsorship) system require constant diplomatic intervention.
    - **Visa and Labor Reforms:** The UAE's evolving labor laws (like the **"Emiratization" Policy** *[increase the national workforce in the private sector]*) and visa regulations, while progressive, can create uncertainty for the large Indian workforce, especially blue-collar workers.

What should be the Way Forward?

1. **Deepen the Economic Integration**: The current CEPA is a foundation, not the ceiling. The focus must shift to **value-added sectors** and **financial integration.** Move beyond raw materials (oil, gems) and low-skill exports. Target co-production in:
    - **Pharmaceuticals & Medical Devices:** Create a joint regulatory fast-track for Indian generics and medical devices to access UAE ports for re-export to Africa and the Middle East.
    - **Aerospace & Defense:** Move from joint exercises to joint manufacturing (e.g., co-developing UAVs, cybersecurity hardware, or maintenance hubs for Indian military platforms in UAE).
    - **Semiconductors & Electronics:** Leverage UAE sovereign wealth and Indian talent to build chip design or assembly units under India's semiconductor mission.
2. **Manage Geopolitical Frictions Maturely**:
    - **On China:** Instead of demanding the UAE to choose sides, offer a superior "India-UAE model" (democracy + market + technology) versus the "China-UAE model" (autocracy + credit + infrastructure). Let the UAE benefit from both while tilting towards India on strategic issues (like IMEC).
    - **On Pakistan:** Institutionalize a "no-surprises" protocol. The UAE should inform India in advance of any high-level military or political engagement with Pakistan, and India should similarly share its concerns. This builds trust without requiring the UAE to break ties.
    - **On Iran:** Maintain a "separation of tracks." Both nations can cooperate on maritime security with the US while continuing trade with Iran. A joint India-UAE working group on sanctions compliance will help navigate US secondary sanctions.
3. **Institutionalize a 2+2 Ministerial Dialogue:** Like India has with the US and Australia, a regular dialogue between the Indian External Affairs & Defence Ministers and their UAE counterparts (Foreign & Defence) to coordinate on maritime, air, and cyber security.
4. **Operationalizing IMEEC and MAITRI:** Both nations must expedite the technical and customs integration of the **India-Middle East-Europe Economic Corridor (IMEEC)** and Project **MAITRI**. This includes harmonizing digital custom clearances and container-tracking systems to ensure that goods move seamlessly from Indian ports to Jebel Ali, and onward via rail.
5. **Scaling the Local Currency Settlement System (LCSS):** While the framework to trade in Indian Rupees and UAE Dirhams exists, its adoption must be scaled beyond major oil and gold conglomerates. Incentivizing small and medium enterprises (MSMEs) to use the LCSS will drastically reduce dollar-dependence and transaction costs.
6. **Joint Skill-Mapping and Certification:** As the UAE pushes its "Emiratization" policy and transitions toward a high-tech economy, India's National Skill Development Corporation (NSDC) should partner with UAE authorities to align Indian vocational training with modern Emirati job requirements. This will ensure that Indian workers transition from low-wage manual labor to high-value technical and service roles.
7. **Digital Upgradation of Worker Portals:** Integrating India's *e-Migrate* system directly with the UAE's Ministry of Human Resources and Emiratisation (MoHRE) digital platform will eliminate predatory middle-men, automate contract verification, and guarantee transparent wage payouts, effectively insulating vulnerable blue-collar workers.

UPSC GS-2: International Relations
Read More: The Indian Express

Energy Storage Systems – Significance & Challenges – Explained Pointwise

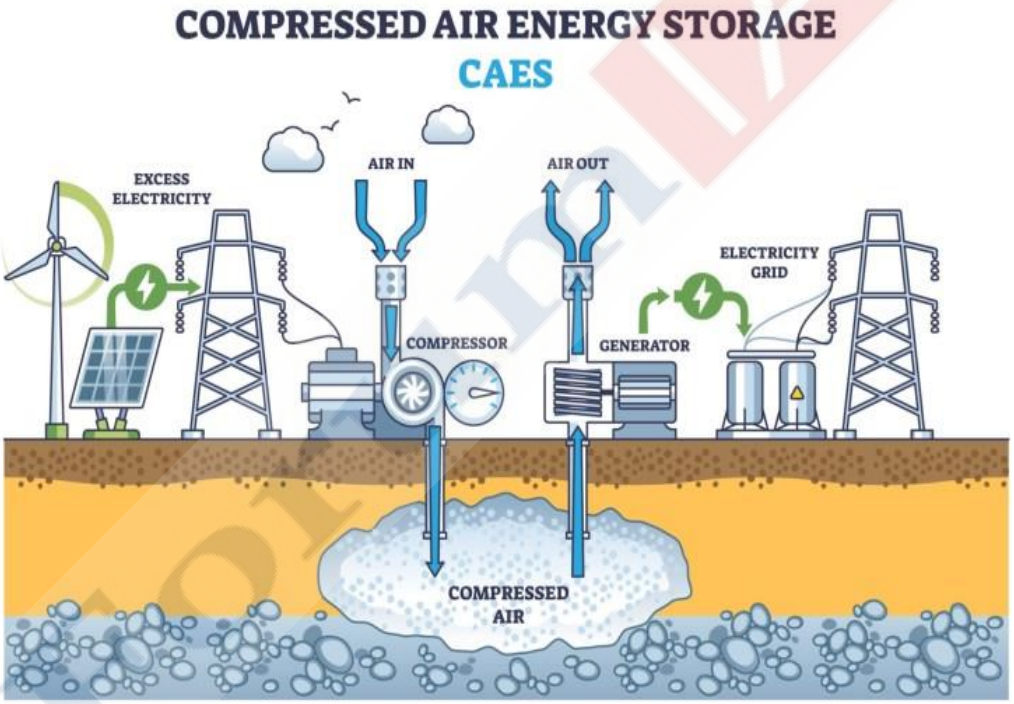
With the world shifting toward renewable energy like solar and wind, energy storage has become the missing puzzle piece for a clean energy future. India, which is rapidly expanding its renewable energy capacity, is facing a key challenge due to the vast gap between its actual operational capacity & its ambitious project pipeline.

What is energy storage?

- Energy storage refers to systems that can store excess renewable electricity during periods of high generation & discharge it when demand rises but power generation remains low.
- At its core, energy storage systems convert electricity from renewable sources such as solar & wind, when it is available, into forms that can be stored.
- Energy storage systems are required because of the core problem associated with the renewable energy: **Supply-Demand Mismatch**. Renewable energy sources like solar and wind are **intermittent** — they generate power only when the sun shines or the wind blows, not necessarily when people need electricity. Demand, on the other hand, follows human patterns (mornings, evenings, seasonal peaks) that rarely align with natural generation patterns.
- Energy storage is one of the most critical challenges in the **transition to clean energy**.

What are the different types of energy storage technologies?

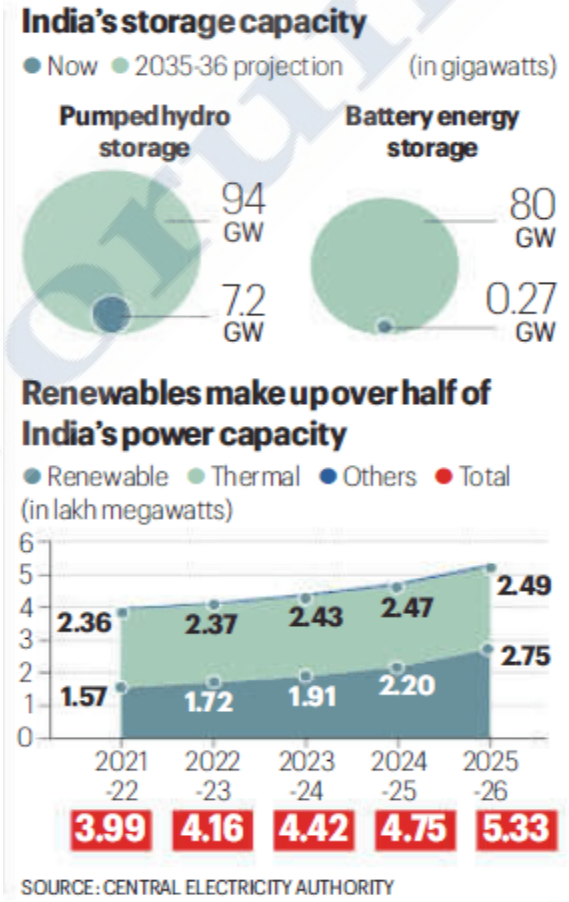
Pumped Hydro Storage (PHS)	Two reservoirs at different elevations. When energy is cheap/excess, water is pumped to the upper reservoir. When energy is needed, water is released back down through turbines to generate electricity.
Battery Energy Storage (BESS)	Stores electricity chemically & discharges it through chemical reactions when needed. Lithium-ion batteries, particularly **lithium iron phosphate (LHP) batteries**, are the dominant technology because of their falling costs, high efficiency & long operational life. This is currently the fastest-growing sector of energy storage.

Concentrating Solar-Thermal Storage Systems	This technology uses mirrors that capture & focus sunlight onto a receiver. As the receiver gets heated, materials such as molten salt are circulated inside the receiver to store the heat. The stored heat can later be used to produce steam. This steam is converted into mechanical energy in turbine, which powers a generator to produce electricity.
Compressed-Air Energy Storage Systems	Excess electricity powers a compressor to pump air into a sealed underground cavern (salt dome, aquifer, or depleted gas field). To retrieve energy, the compressed air is released, heated (natural gas is often used to reheat it), and expanded through a turbine.  Compressed air energy storage or CAES power production outline diagram.
Flywheel Energy Storage Systems	A large, heavy rotor (flywheel) is spun at very high speeds (up to 50,000+ RPM) in a near-frictionless vacuum. Energy is stored as rotational kinetic energy. To extract power, the flywheel's momentum drives a generator, slowing it down. Flywheels can discharge almost instantly, making them perfect for stabilizing short-term grid fluctuations.

Gravity Energy Storage Systems	GESS use electricity to lift heavy weights to higher elevations. When electricity is needed, the weights are lowered, converting gravitational energy back into electrical through generators.

What is the status of energy storage capacity globally & domestically?

- **China** continues to dominate, accounting for **~60%** of new installations in 2025, followed by the **United States** at **16%** .
- Globally, PHS & BESS are two most widely deployed electricity storage technologies. While batteries are growing fast, **pumped storage hydropower (PSH)** remains the largest source of grid-scale energy storage worldwide, with approximately **160 GW of operating capacity** and a massive pipeline of prospective projects.
- India has approximately **7 GW of operational Pumped Storage (PSP) capacity** & **under 1GW of BESS operational capacity**. The total planned capacity of **174 GW** is expected to support a national grid with **509 GW of solar** and **155 GW of wind** by 2036, this includes **80 GW of BESS & 94 GW of PHS**.



Source: Indian Express

What is the need for energy storage?

1. **Smoothing Out Variability:** Solar panels produce peak power at midday; wind turbines may generate most at night or in storms. Without storage, this surplus is wasted. Storage captures excess generation and dispatches it when needed.
2. **Grid Stability & Frequency Regulation:** Power grids require near-perfect real-time balance between supply and demand. Traditional fossil fuel plants can ramp up or down on demand. Renewables cannot. Storage acts as a buffer, absorbing or injecting power within milliseconds to keep frequency stable.
3. **Replacing "Peaker" Plants:** To handle sudden spikes in energy demand (like hot summer afternoons), utilities rely on **peaker plants**. These are typically natural gas plants that sit idle most of the year but can be turned on quickly. Because they only run occasionally, they are very expensive to operate and are often the dirtiest, most polluting plants on the grid. Battery storage can serve the same role more cheaply and cleanly.
4. **Enabling Higher Renewable Penetration:** Without storage, grids become unstable above ~30–40% renewable share. Storage is what makes 70–100% renewable grids physically possible — it's the bridge between generation and consumption.
5. **Reducing Curtailment (Wasted Energy):** When wind turbines or solar farms produce more electricity than the grid can safely handle, grid operators are forced to intentionally shut them off or disconnect them. This is called **curtailment** — wasting clean energy. Storage eliminates this waste.
6. **Energy Independence & Resilience:** Stored energy provides backup during outages, reduces reliance on fuel imports, and makes microgrids and remote communities self-sufficient.
7. **Transmission Congestion Relief:** Storage located near load centers can reduce the need for expensive long-distance transmission upgrades by serving local demand directly.

What are the challenges associated with energy storage?

1. **Massive Gap Between Capacity & Deployment**: India's storage ambitions on paper vastly outpace what's actually been built. India's limited domestic cell manufacturing base means that only 219 MWh of BESS capacity is operational from 12.8 GWh auctioned between 2022 and May 2025, largely reflecting execution gaps driven by high financing costs and aggressive underbidding.
2. **High Upfront Capital Costs (CapEx):** Building a grid-scale battery farm or a pumped hydro station costs billions of dollars. Unlike a gas turbine, which can be built in phases, a pumped hydro plant requires the entire dam, reservoir, and turbines to be built before it generates some revenue.
3. **Round-Trip Efficiency Losses**: No energy storage system is perfect; energy is always lost when converting it from one form to another and back again. This is known as **round-trip efficiency. Batteries** are highly efficient, retaining about 80% to 90% of the energy put into them. **Hydrogen Storage** is the least efficient. Generating hydrogen via electrolysis, compressing it, storing it, and later converting it back to electricity via a fuel cell or turbine results in a round-trip efficiency of only **30% to 45%**. This means more than half of the clean energy captured is lost as waste heat.
4. **Geopolitical Monopolies:** The mining and processing of essential battery materials—such as **lithium, cobalt, nickel, and manganese**—are concentrated in just a few countries. For instance, a vast majority of the world's cobalt is mined in the Democratic Republic of Congo, and China dominates the global refining capacity for almost all of these minerals.
5. **Degradation and Limited Lifespan**: Unlike a coal plant or a hydroelectric dam that can operate for 40 to 100 years with regular maintenance, chemical batteries wear out. Most grid-scale batteries only last about **10 to 15 years** before their capacity drops significantly and they need to be replaced. This

limited lifespan introduces a recurring long-term cost for grid operators who must constantly plan for battery replacement.

6. **Recycling Hurdles:** Spent lithium-ion batteries are very difficult and expensive to recycle due to their complex chemical mixtures. As millions of electric vehicles and grid batteries reach the end of their lives over the next decade, managing this wave of electronic waste is a massive looming challenge.

What are various government initiatives to promote battery storage?

1. **Advanced Chemistry Cell (ACC) PLI Scheme:** Overseen by the Ministry of Heavy Industries, this ₹18,100 crore Production-Linked Incentive scheme aims to establish 50 GWh of competitive domestic battery manufacturing.
2. **Viability Gap Funding (VGF) Scheme:** Provides financial support to make BESS projects commercially viable and accelerate early deployment. The government is aggressively deploying VGF to lower project costs for developers.
3. **Energy Storage Obligations (ESO):** Similar to Renewable Purchase Obligations, the government has legally mandated that power distribution companies (DISCOMs) must source a specific percentage of their electricity from storage-backed systems, scaling up to **4% of total energy consumption by 2030.**
4. **Transition from Plain Renewable Tenders:** Renewable Energy Implementing Agencies (like SECI, NTPC, and NHPC) have been directed to stop offering standard solar or wind contracts. Instead, they are pushing **"Round-the-Clock" (RTC)** and **"Firm and Dispatchable Renewable Energy" (FDRE)** tenders, forcing developers to integrate batteries to guarantee stable power delivery.
5. **Waiver of Inter-State Transmission System (ISTS) Charges:** To lower operational expenses, the government has waived inter-state transmission fees for electricity utilized by energy storage systems, making it cheaper to transport stored green energy across state lines.
6. **India Battery Storage Vision 2047:** Looking long-term, ministries are already formalizing a policy framework to introduce financial backing and interest subventions specifically for **Long-Duration Energy Storage (LDES)** technologies to manage seasonal energy shifts.

What should be the way forward?

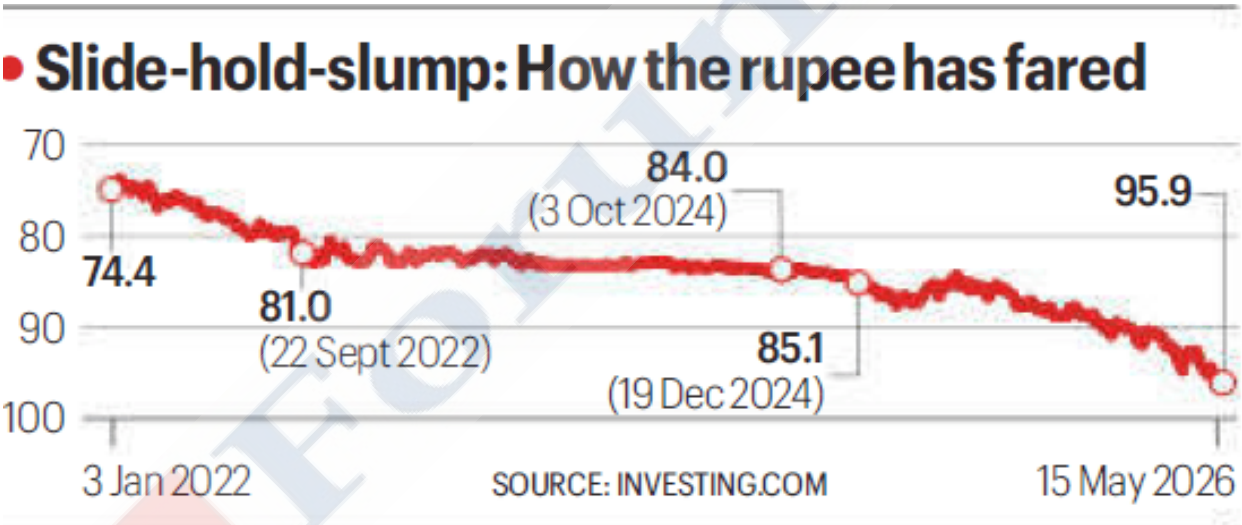
1. **Scale Domestic Manufacturing**:
   Relying entirely on imported battery cells (predominantly from China) poses a massive geopolitical and economic risk. India must build its own manufacturing ecosystem. The government's **Advanced Chemistry Cell Production-Linked Incentive (PLI) scheme** is a great start.
   However, since India has limited domestic lithium reserves, the country must heavily fund research and commercialization of alternative chemistries like **Sodium-ion** and **Zinc-air** batteries, which are well-suited for stationary grid storage.
2. **Leverage Massive Pumped Hydro Projects (PHS)**: While chemical batteries dominate short-duration needs (2–4 hours), India has immense natural topography suited for Pumped Hydroelectric Storage, which is ideal for long-duration storage. Unlike lithium-ion batteries, PHS projects have a lifespan of over 50 years and do not rely on scarce critical minerals.
3. **Decentralize Storage**: Large battery farms aren't the only solution; storage needs to be deployed at the consumer level. Farmers using solar water pumps and residential homes with rooftop solar should be incentivized to add small battery packs. This turns consumers into "prosumers" who can support the grid locally.
4. **Accelerate Grid Infrastructure**: Storage without grid readiness is futile. Investments under the Green Energy Corridor programme are expanding transmission infrastructure to connect renewable-rich regions with demand centres, reducing curtailment risks and improving system integration.

5. **Replacing Diesel Generators:** India has mandated a phased shift away from highly polluting diesel generator sets for backup power in commercial buildings. Incentivizing these buildings to switch to Battery Energy Storage Systems (BESS) will drastically cut urban air pollution.
6. **Build a Battery Recycling Ecosystem**: India must get ahead of the end-of-life problem before it becomes a crisis. A circular economy framework — including second-life battery applications (e.g., retired EV batteries repurposed for grid storage) and formal recycling infrastructure — will reduce material costs, environmental harm, and long-term import dependence.

UPSC GS-3: Energy Infrastructure
Read More: Indian Express

Weakening of Rupee – Causes & Consequences – Explained Pointwise

The Indian rupee has recently fallen past the 96-per-dollar mark, hitting a new record low. The rupee has declined by nearly 5.2% against the dollar since the Iran-US conflict began in late February. There is a strong possibility of it crossing the psychological level of 100 per dollar, which could further weaken investor sentiment.



Source: Indian Express

There are several factors responsible for the weakening of the Indian rupee, even as the currencies of many other emerging market economies are strengthening against the dollar. In this article, we will try to understand the major causes and consequences of the weakening of the rupee.

What are the factors responsible for weakening of the Rupee against Dollar?

1. **Domestic Factors:**
    a. **Widening Current Account Deficit (CAD):** The structural gap between India's imports and exports has expanded significantly. Beyond the massive energy bill, high international prices for other essential commodities have bloated India's overall import costs. A widening trade deficit creates a natural imbalance, leaving the country with an increased systemic demand for foreign currency.
    b. **Foreign Capital Outflows (FII & FPI Sell-offs):** With better returns available in the US and high valuations in Indian equity markets, FPIs and FIIs have become major net sellers. As foreign investors withdraw billions of dollars from Indian stocks and government securities (G-Secs) and send the money back to the US, they sell Rupees to buy Dollars, which puts further pressure on the Rupee to weaken.
    c. **Importers Are Buying Dollars in Advance**: Indian companies dependent on imported goods and raw materials have increasingly started securing dollars in advance to protect themselves against further currency depreciation. This precautionary demand for dollars has added additional pressure to the forex market during volatile sessions.
    d. **Limited Export Competitiveness**: While sectors like IT and pharma can benefit from a weaker rupee, the overall benefit is limited because many Indian exports rely on imported components, which have become more expensive.
    e. **Inflation & Growth Headwinds:** Even though, the long-term growth outlook remains strong, but, the slower near-term GDP growth & very low inflation level have acted as negative economic indicators, dampening investor confidence in Rupee's short term stability.
2. **External & Global Factors:**

a. **India-USA Trade Tensions & Tariffs:** USA is India's one of the top trading partners. However, the imposition of 50% tariff on Indian goods by the Trump administration has severely impacted the export competitiveness of Indian goods & has increased the market risk perception – making Indian rupee the worst performing currency in Asia for the year.
b. **Geopolitical Tensions**: Wars, conflicts (e.g. Russia-Ukraine, US-Iran War), or global crises trigger risk-off sentiment, pushing investors toward the dollar. Geopolitical conflicts in the Middle East and supply-chain anxieties around the Strait of Hormuz have pushed Brent crude oil prices past the $100–$110 per barrel mark.
c. **High Crude Oil Prices & Import Dependence:** India imports almost 80-85% of its crude oil, thus, it is highly vulnerable to global energy spikes. The rise in the crude oil prices & that of the important commodities imported by India like gold – lead to widening of India's trade deficit & weakening of INR.
d. **Strengthening of USA Dollar:** Despite the US Fed Reserve beginning its rate-cut cycle, the US Dollar has maintained persistent strength, reflecting its status as global reserve currency & a safe haven asset during a period of geopolitical uncertainty. During global market anxiety and geopolitical warfare, international investors flee emerging markets in search of safety which leads to strengthening of US dollar against major currencies & puts pressure on INR.

3. **Monetary Policy Factors:**
   a. **US Federal Reserve's Monetary Policy:** The US Federal Reserve's decision to increase interest rates makes USD-denominated assets more attractive to investors. This leads to capital outflows from emerging markets like India, further weakening the rupee.
   b. **RBI's Stance:** The RBI has chosen a **Neutral Policy Stance** & kept the repo rate unchanged for most part of the year 2025 – prioritizing domestic liquidity management & growth oven an aggressive defense of the Rupee.

What are consequences of weakening of the Rupee?

1. **Impact on Consumers:**
   a. **Inflationary Pressure (Imported Inflation):** As the INR weakens, the Oil Marketing Cos. have to pay more Rupees for the same barrel of oil. This increased cost is eventually passed on to the consumers through higher prices for petrol, diesel, and natural gas. This high fuel cost then triggers a cascading effect – contributing to broader consumer price inflation.
   b. **Rising Cost of Living:** The price of other key imports, such as electronics, gold, industrial chemicals, and fertilisers, also rise – intensifying the inflationary pressure & eroding the purchasing power & savings of the average household.
   c. **Foreign Travel & Education:** Foreign travel & education will become significantly expensive.
2. **Impact on Trade (Imports/Exports):**

The WINNERS	a. **Increased Competitiveness:** A weaker rupee makes the Indian goods & services cheaper for foreign buyers who pay in Dollars. This can boost the competitiveness of Indian exports in global market. b. **High Profitability for Exporters:** Indian exporters, particularly the IT Service Sector, benefit significantly. Weakening of the INR directly boosts their profit margin & revenue growth.

	c. **Boost to Domestic Investment:** Rise in export revenue can lead to increased domestic investment as exporters look to expand capacity to meet the higher demand.
The LOSERS	a. **Higher Import Bill:** Weakening of the Rupee against Dollar puts upward pressure on the net import bill. b. **Wider Trade Deficit:** The cost of essential imports outweighs the revenue gain from exports. A significant rise in import bill can lead to a widening of the Trade deficit. c. **Rising External Debt Burden:** India's foreign currency-denominated debt becomes more expensive to repay. For every dollar owed, more rupees are needed — increasing the **debt servicing cost.**

3. **Impact on Corporates (External Debt):**
    a. **Increase in Debt Servicing Cost:** The Indian Corporates who have taken ECBs denominated in USD & have not fully hedged their exposure, face a major risk. A weaker rupee means that a company has to pay more amount of INR for the USD-denominated debt.
    b. **Divergent Fortunes:** The corporate sector witnesses a divergence – while the export-oriented cos. see higher profits, the import-dependent cos. & highly indebted cos. face significant financial strain.
4. **Macroeconomic Impact:**
    a. **Worsening Trade Deficit & Pressure on Reserves:** The RBI often intervenes (spot intervention) in the forex market to prevent excessive depreciation of the Rupee. The RBI sells USD to absorb the excessive Rupee liquidity. However, it leads to reduction in the national reserve buffer.
    b. **Capital Flight:** Withdrawal of funds by FPI & FIIs is one the causes for the weakening of the INR. If the Rupee continues to weaken, it could signal greater macroeconomic instability which may increase the rate of capital flight from India – creating a self-perpetuating cycle of depreciation.
    c. **Higher Subsidy Burden:** Government spending on fuel and fertilizer subsidies rises sharply when import costs increase, worsening the **fiscal deficit.**
    d. **Delayed $5-Trillion Economy Goal**: A depreciating currency fundamentally shrinks the size of India's economy when measured in global dollar terms. For every ₹1 of depreciation knocks off an estimated 20 to 25 basis points (about $48 to $59 billion) from India's nominal GDP in USD terms. Projections warn that a sustained slip past ₹95–96/USD could push the timeline for India hitting the landmark $5-trillion milestone back toward FY30.

How India is responding to the weakening of the Rupee?

1. **Direct and Indirect Forex Interventions:** The RBI's first line of defense has been selling US dollars from India's foreign exchange reserves, which have declined to around $697 billion from over $720 billion before the recent crisis . The RBI has asked state-owned oil refiners (the largest buyers of dollars) to curb their spot market purchases and instead use a dedicated foreign currency credit line, effectively reducing immediate demand on the rupee.
2. **Curbing Speculation and Volatility:** To prevent excessive speculation from driving the rupee's fall, the RBI has also tightened regulations. This includes imposing a **mandatory daily limit of $100**

million on Authorised Dealers' Net Open Position (NOP) to limit excessive currency market positioning.

3. **Attracting Foreign Capital:** To increase the supply of dollars, authorities are looking to attract more foreign investment. This includes potentially reviving **special deposit schemes for Non-Resident Indians (NRIs).** Policymakers are working to make Indian G-Secs more lucrative for global institutional investors.
4. **Permitting Fuel Price Increase:** To improve its fiscal situation, India has allowed small increases in domestic fuel prices. By aligning fuel prices with the high global crude oil prices of $110–$120 per barrel, the government aims to reduce the losses faced by State-run Oil Marketing Companies (OMCs), which are struggling with costly crude oil imports and a weak Rupee.
5. **Shielding Consumers from Inflation:** To prevent a sharp spike in petrol and diesel prices, the government reduced the central excise duty by **₹10 per litre**. This move helps control inflation but comes at a fiscal cost, estimated at around 0.4-0.5% of GDP in foregone revenues.
6. **Taxing Non-Essential Imports**: Because crude oil imports cannot be easily cut, the Indian government is targeting the second-biggest drain on its foreign exchange: **precious metals**. The Centre recently hiked import duties on gold and silver categories.
7. **Public Appeal for Austerity:** In a significant move, Prime Minister Narendra Modi has made a public appeal to citizens to adopt "austerity measures" to conserve foreign exchange. He specifically urged people to **reduce gold purchases and avoid non-essential foreign travel** for a year.

What should be the way forward?

1. **Strengthen Domestic Macro-fundamentals:**
    - **Energy Security:** Aggressive domestic oil & gas exploration (Vedanta's $5 bn commitment), scaling ethanol blending (E20 target achieved), expanding renewable energy. India must prioritize domestic exploration blocks and completely optimize its Strategic Petroleum Reserves (SPR) to store oil when prices see temporary dips.
    - **Reduce Import Dependence:** Boost domestic production of electronics, chemicals, and capital goods to cut imports.
    - Contain **fiscal and current account deficits** through better tax mobilisation, rationalised subsidies, and export diversification so external financing needs remain credible.
2. **Manage External Vulnerability:**
    - **Expand Rupee Vostro Accounts:** India needs to accelerate its bilateral trade mechanism—paying for oil, gas, and commodities in Indian Rupees (INR) or localized currency swaps with major trade partners like Russia, the UAE, and alternative non-Western energy suppliers.
    - **Internationalizing the UPI-RuPay Stack:** Forging deeper cross-border payment links shrinks the need for US Dollars in retail, tourism, and remittance corridors.
    - **Forex Reserves:** Maintain **adequate forex reserves and flexible exchange rates** so the RBI can smooth volatility without defending unsustainable levels, reassuring markets about India's shock-absorbing capacity.
3. **Upgrade Export Competitiveness:** Upgrade export competitiveness with reforms in **logistics, trade facilitation, skilling, and industrial policy**, focusing on high-value manufacturing and services instead of low-margin commodities.
4. **Attract Stable Foreign Capital Inflows:** Attract stable **FDI and long-term portfolio flows** by improving contract enforcement, regulatory predictability, and financial-sector depth, reducing reliance on short-term "hot money".
5. **Safeguard Vulnerable Sectors & Households:**

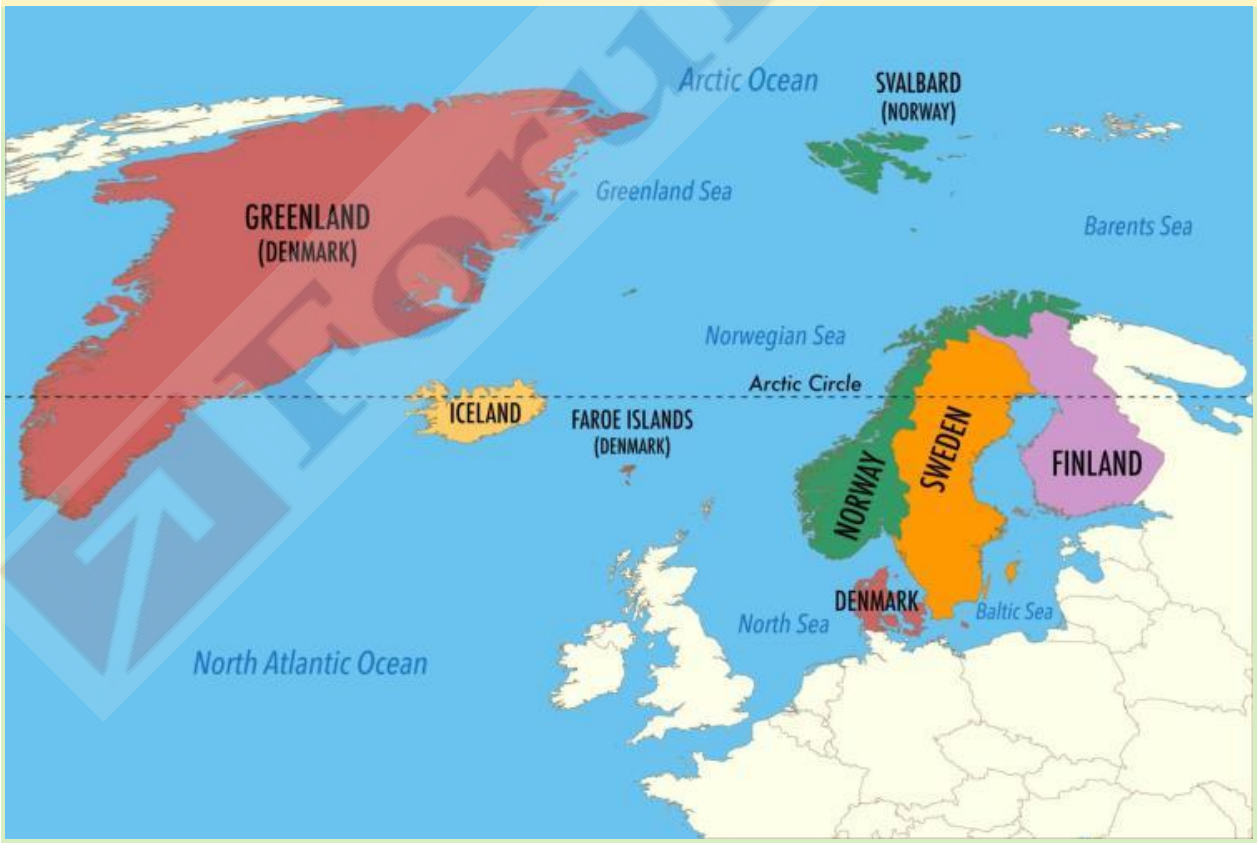
- Encourage firms with foreign-currency liabilities to **prudently hedge** and improve disclosure, limiting balance-sheet stress from sharp currency moves.
- Use **targeted support** (e.g., fuel tax calibration, transport and fertilizer support, food security buffers) to protect poorer households from imported-inflation spikes without large, open-ended subsidies.

6. **Long-term Solution:** Continue structural reforms (land, labour, financial inclusion, digital public infrastructure) that raise **productivity and long-term growth**, making India more attractive to capital and easing pressure on the rupee over time.

UPSC GS-3: Indian Economy
Read More: The Indian Express

India-Nordic Relations – Explained Pointwise

Recently, PM Narendra Modi attended the 3rd India-Nordic Summit at Oslo. The relationship between India and the **Nordic countries (Denmark, Finland, Iceland, Norway, and Sweden)** has undergone a profound transformation. What once was a quiet, development-assistance-oriented connection has evolved into a future-focused, high-tech, and **Green Strategic Partnership.**



Evolution of India-Nordic Countries Relations:

Post-Independence Period	● After India's independence, Nordic countries established cordial diplomatic ties with India based on shared values such as **democracy, peace, multilateralism, and welfare-oriented governance**. ● Nordic nations supported India's developmental efforts through technical assistance, education, healthcare, and humanitarian cooperation. ● Relations during the **Cold War** remained relatively modest, as Nordic countries were more integrated with Western Europe while India followed a **policy of non-alignment**.
Expansion of Economic and Development Cooperation (1990s)	● India's economic liberalization in 1991 opened new avenues for trade and investment with Nordic economies. ● Nordic companies increased their presence in India in sectors such as **telecommunications, engineering, shipping, renewable energy, and pharmaceuticals**. ● Cooperation expanded in **clean technologies, environmental protection, and sustainable development** due to shared interest in green growth.
Strategic and Innovation-Oriented Partnership (2000s)	● India began engaging Nordic countries as innovation-driven economies with expertise in **digital technology, smart cities, clean energy, maritime sectors, and advanced manufacturing**. ● Collaboration in **education, research, startups, and skill development** gained momentum.
Emergence of the India–Nordic Framework (2018 Onwards)	● A major turning point came with the first **India–Nordic Summit** in **2018** held in Stockholm, which institutionalized cooperation between India and the Nordic region. ● India and Nordic countries now cooperate on global challenges such as climate change, resilient supply chains, energy transition, and sustainable urbanization.

What are the various initiatives undertaken to strengthen the India–Nordic relationship?

1. **India-Nordic Summits:** The introduction of the plurilateral **India-Nordic Summit format** completely institutionalized the India-Nordic relationship, shifting the dialogue from bilateral pleasantries to a structured regional framework:
    - **1st India-Nordic Summit (Stockholm, 2018):** Focused on global security, economic growth, and innovation.
    - **2nd India-Nordic Summit (Copenhagen, 2022):** Emphasized post-pandemic economic recovery, climate action, and maritime cooperation.

- **3rd India-Nordic Summit (Oslo, May 2026):** Marked a historic peak, formally upgrading ties to a comprehensive **Green Technology and Innovation Strategic Partnership.**

2. **EFTA TEPA Agreement:** The signing and activation of the Trade and Economic Partnership Agreement (TEPA) with the European Free Trade Association (which includes Norway and Iceland) has opened a pipeline for a targeted **$100 billion investment into India**, aiming to generate one million direct jobs.
   India-EU FTA: Negotiations with EU-member Nordic states (Denmark, Sweden, Finland) are moving concurrently to further diversify supply chains and lower trade barriers.
3. **Green Strategic Partnership (Norway)**: India and Norway elevated their ties to this level, focusing on **carbon capture, utilization, and storage (CCUS)** , offshore wind, and green shipping. This includes establishing **"Green Shipping Corridors"** to decarbonize maritime routes.
4. **Circular Economy**: India and Finland are jointly hosting the **World Circular Economic Forum** in Gujarat, highlighting shared initiatives in waste management and bioeconomy.
5. **Next-Gen Telecom:** Finland and Sweden are heavily integrated into India's 5G/6G rollout. Joint research initiatives have been launched specifically targeting **6G technologies**, AI, and quantum computing.
6. **Defense & Space:** Sweden's advanced manufacturing and defense capabilities have aligned with India's "Make in India" defense push. Nordic defense firms are increasingly looking at India's defense industrial corridors, leveraging provisions like 100% FDI.
7. **Maritime Cooperation:** India & Nordic countries are collaborating on green shipping corridors, sustainable fisheries management, and smart port logistics.
8. **Arctic Research:** India has expanded its scientific footprint in the Arctic region (India's '**Himadri**' research station in Svalbard, Norway). Through institutionalized polar research collaborations, Indian and Nordic scientists are jointly studying climate change, glacier melting, and cryosphere dynamics.
9. **Multilateral Reform:** The Nordic countries have consistently vocalized their support for India's permanent membership in a reformed **UN Security Council (UNSC)** and its bid for the Nuclear Suppliers Group (NSG).
10. **Indo-Pacific & Connectivity:** Both regions are actively working to link Nordic economies to the Indo-Pacific through corridors like the **India-Middle East-Europe Economic Corridor (IMEC)**, ensuring secure and resilient supply chains.

What is the significance of India-Nordic Relationship?

1. **Strategic & Diplomatic Significance**: The Nordic countries, despite their small size, exert greater influence in global governance, multilateralism, and international institutions — areas where India, as a rising power, seeks wider partnerships. Both sides share commitments to a rules-based international order, democratic values, and multilateral frameworks like the UN.
2. **Economic & Trade**: Nordic countries are home to globally competitive companies in sectors like shipping (Denmark's Maersk), telecom (Nokia, Ericsson), energy, and life sciences. For India, Nordic firms are important sources of technology, investment, and innovation.
3. **Climate & Clean Energy**: The Nordics are world leaders in green technology — wind energy, hydropower, carbon capture, and sustainable urban planning. India, with its massive climate commitments under the Paris Agreement and its National Solar Mission, sees the Nordics as critical partners in its clean energy transition.
4. **Technology & Innovation**: Nordic nations consistently rank among the world's most innovative. Collaboration in digital infrastructure, fintech, AI, cybersecurity, and the startup ecosystem is growing. India's large and skilled tech workforce complements Nordic technological leadership.

5. **Arctic & Maritime**: Norway and Iceland give the relationship an Arctic dimension. As India develops its **Arctic Policy** (released in 2022), Nordic expertise in polar research, sustainable Arctic development, and maritime governance becomes increasingly relevant.
6. **People-to-People & Education**: There is a growing Indian diaspora in Nordic countries, and academic exchanges, research partnerships, and cultural ties are strengthening the foundation of the relationship.

What are the challenges in India-Nordic relationship?

1. **Trade Asymmetry and Barriers**: India's trade with Nordic nations collectively stood at $19 billion in 2024, which, while growing, remains well below the relationship's potential. The target to double bilateral trade by 2030 is ambitious but may be difficult to achieve given persistent trade barriers, particularly for Indian exports in textiles and pharmaceuticals.
2. **India's Relationship with Russia**: India's relationship with Russia is a key stumbling block. India's foreign policy is often misunderstood in Nordic countries. The Nordic countries, now deeply embedded in NATO and the EU's security architecture, are particularly sensitive to India's continued defence and energy engagements with Russia amid the Ukraine war.
3. **Human Rights and Democratic Values Friction**: EU and Nordic concerns over India's internet restrictions, freedom of expression, and human rights create periodic friction in diplomatic engagements. The Nordics, which consistently rank at the top of global democracy and press freedom indices, sometimes vocalize concerns about democratic backsliding that India views as interference in internal affairs.
4. **India Lagging Behind China as an Economic Partner**: While India is emerging as a key economic and technological partner for the Nordics, it still lags behind China in terms of overall economic engagement, making it harder to displace China-centric supply chains and business ties despite the political will on both sides.
5. **Arctic Complexity**: Since 2022, the Arctic region has faced rising tensions due to Russia's war in Ukraine and its growing military presence near Nordic countries. At the same time, China is expanding its role in the Arctic through the "**Polar Silk Road**" initiative to access new trade routes and natural resources. Balancing relations with both Russia and China makes Arctic cooperation between India and Nordic countries more challenging.
6. **Visa and Mobility Barriers**: Strict visa policies remain a challenge for Indian workers and professionals seeking to work in Nordic countries, even as Indian professionals are increasingly in demand in Nordic tech and healthcare sectors.
7. **Scale vs. Niche:** Nordic companies are typically smaller, highly specialized niche players (in fields like green hydrogen, carbon mineralization, or biotech). Scaling these technologies to fit the sheer volume of the Indian market often overwhelms Nordic corporate structures, which are unaccustomed to navigating the complex, multi-tiered Indian bureaucratic and regulatory landscape.

What should be the way forward?

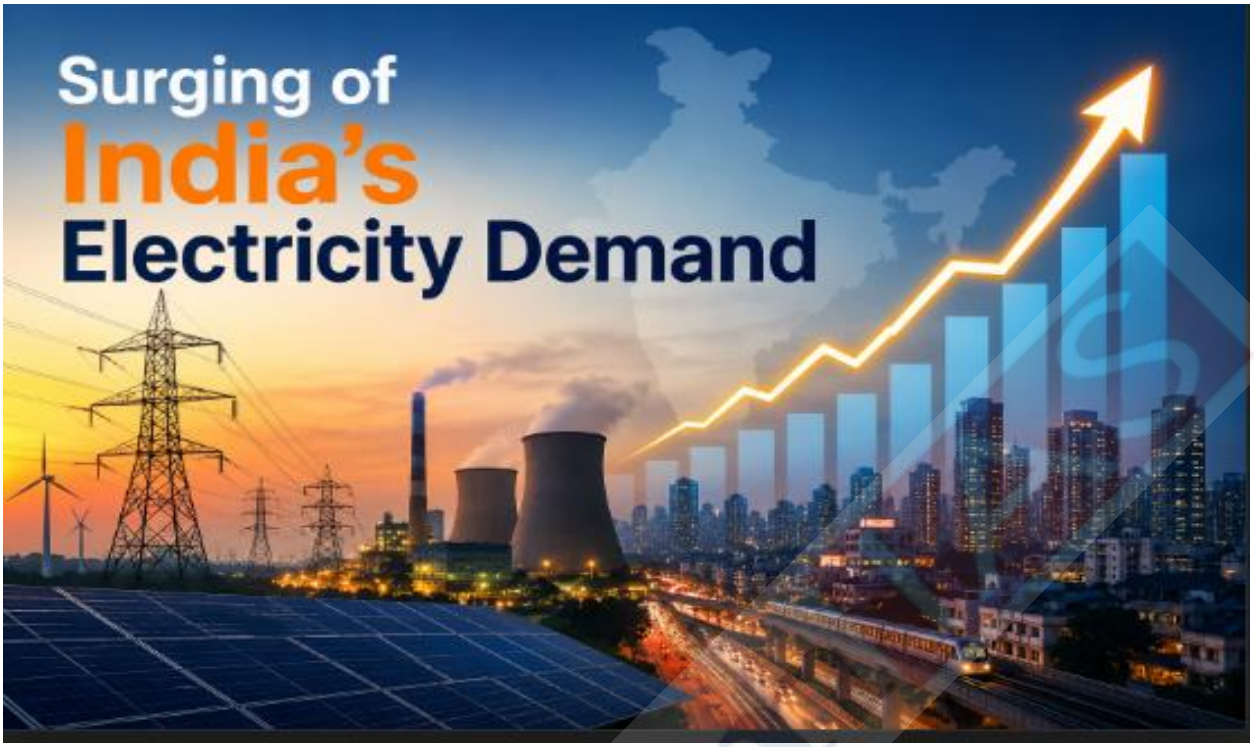
1. **Institutionalizing the Partnership**: Establish a **Permanent Secretariat** to ensure continuity between summits, monitor MoU implementation, drive agenda-setting year-round, and to take the relationship beyond the periodic summits.
2. **Leveraging the India-EFTA TEPA & India-EU FTA:** The Trade and Economic Partnership Agreement with Norway and Iceland must be operationalized effectively, with both sides actively reducing non-tariff barriers and facilitating investment flows toward the $100 billion target. Since Denmark, Finland, and Sweden are EU members, the India-EU FTA should be used to unlock deeper market access.

3. **Green Technology and Climate as the Anchor**: The elevation to a **Green Technology and Innovation Strategic Partnership** is the relationship's most promising pillar. To leverage it fully, India & Nordic countries should focus on initiatives like joint green hydrogen projects, technology transfer framework, carbon market cooperation, triangular development cooperation (Nordic countries and India can co-fund clean energy projects in the Global South).
4. **Managing India-Russia Relationship Diplomatically**: India should proactively communicate its strategic autonomy doctrine to Nordic partners, framing it as a stabilizing rather than destabilizing posture. Track-II dialogues between Indian and Nordic think tanks can help bridge the perception gap on India's Russia policy.
5. **Building a Structured Defence and Security Architecture**: India should actively engage Nordic countries — especially Sweden (Saab), Norway (naval technology), and Finland (surveillance) — in its Defence Industrial Corridors under the 100% FDI framework. Cybersecurity cooperation, where Nordic nations are world leaders, should be elevated to a dedicated bilateral track.
6. **Arctic Engagement**: India should build on its Arctic Policy (2022) and engage Nordic nations as primary partners in Arctic science, shipping route development, and environmental monitoring. Jointly countering China's Polar Silk Road ambitions through transparent, rules-based Arctic governance frameworks would align India and Nordic interests.
7. **Streamlined Visa Regimes:** A dedicated **Nordic-India Mobility Partnership**, similar to what India has with some EU states, would facilitate easier movement of students, professionals, and researchers. The Nordic nations should introduce streamlined, fast-track visa categories specifically for Indian STEM professionals, researchers, and academic exchange students involved in joint green-tech and digital projects.

UPSC GS-2: International Relations
Read More: The Hindu

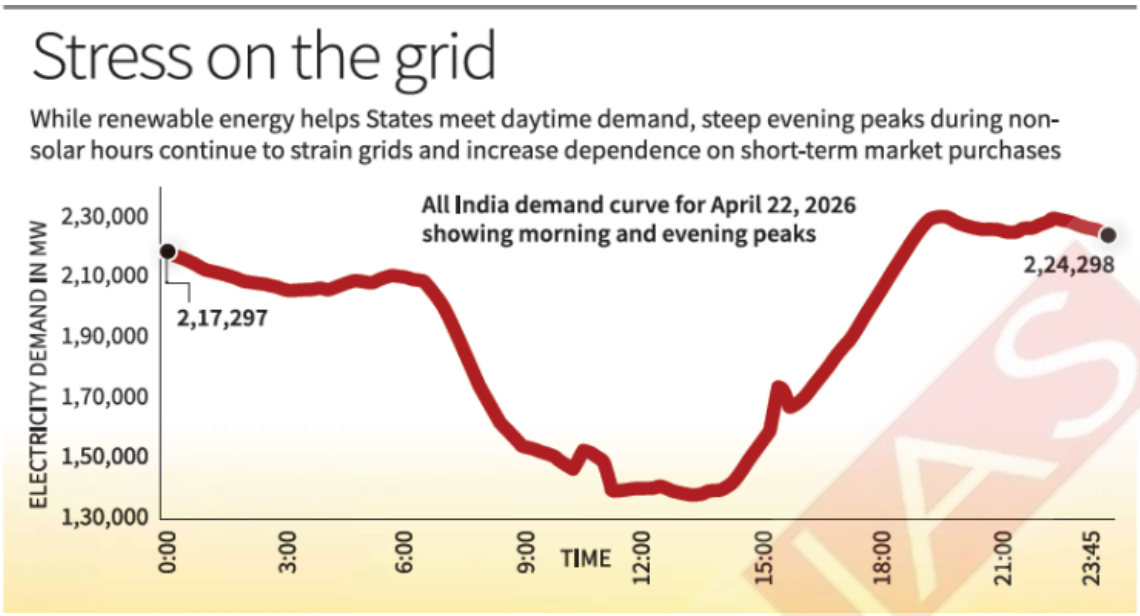
Surging of India's Electricity Demand – Explained Pointwise

India's electricity demand has reached a peak of 256 GW, touching an all-time high. This year, the peak demand surged much earlier than expected. Nearly one-third of this peak demand was met through renewable energy sources.



What is Peak Demand?

- **Peak Demand** (also called **Peak Load** or **Electricity Peak**) refers to the single highest moment of electricity usage on the electrical grid within a specific time period (typically a 15-minute interval).
- It represents the maximum amount of electricity consumers require simultaneously from the grid.
- Peak demand generally rises during:
    - Summer heatwaves due to heavy air-conditioner and cooler usage.
    - Industrial expansion and economic growth.
    - Increased urbanization and electrification.
- Entire power sector infrastructure (generation, transmission, distribution) needs to be planned to deal with the peak demand. If enough capacity is built to meet the peak demand, it will remain underutilized during off-peak hours, on the other hand, if enough capacity is not available to meet the peak demand, then the system will face issues like load shedding & grid instability.
- In last 5 years, the peak demand in India has risen by 37%. This surge has made it tougher for States to fulfill electricity requirements.



Source: The Hindu

How do States manage peak demand?

1. **Contractual Supply & Power Exchange Purchases**: Contractual supply comprises the long-term power purchase agreements (PPAs) that State DISCOMs sign with power supply over several years. Almost 85-90% of the demand in India is being met through contractual supply between the DISCOMs & generators. In times when contractual supply falls short due to spike in demand – DISCOMs turn to second mechanism – buying power from power exchanges. States buy short-term power from the **Indian Energy Exchange (IEX)** and **Power Exchange India Ltd (PXIL)** during peak hours.
2. **Demand-Side Management (DSM)**:
    - **Time-of-Day (ToD) Tariffs:** Higher electricity prices during peak hours (typically 6–10 PM) to discourage non-essential consumption.
    - **Energy Efficiency Programs:** Promotion of LED bulbs, star-rated appliances (BEE ratings), and efficient irrigation pumps (e.g. the KUSUM scheme for solar pumps).
    - **Load Limiting:** Industrial consumers are contracted with maximum demand limits; exceeding them attracts penalty charges.
3. **Load Shedding & Roster-Based Cuts**: Planned, rotational power cuts in specific zones or feeders when supply falls short. Agricultural feeders are often separated from domestic/industrial ones to allow targeted cuts without affecting critical consumers.
4. **Interconnection & Grid Balancing:**
    - The **National Grid (One Nation One Grid)** allows power-surplus states (e.g., Himachal Pradesh, Sikkim) to sell to deficit states.
    - **Regional Load Despatch Centres (RLDCs)** and **State Load Despatch Centres (SLDCs)** coordinate real-time balancing.
5. **Battery Energy Storage Systems (BESS)**: Increasingly deployed at grid scale (e.g., Andhra Pradesh, Rajasthan pilots) to store solar energy and discharge during evening peaks.

What are some challenges faced by the States due to rising demand?

1. **Expensive Emergency Power**: DISCOMs rely on long-term agreements for ~85-90% of their power, which is relatively cheap. When demand spikes, they are forced to buy extra power from short-term exchanges, where prices can skyrocket. Prices have repeatedly hit the **regulatory ceiling of ₹10 per kilowatt-hour** during recent peaks, making it incredibly costly to meet demand.
2. **Inadequacy of Distribution Network**: Even when power is available, the last-mile network often fails. The distribution infrastructure has not kept pace with generation growth. According to a recent assessment by CEA, nearly **13 lakh distribution transformers (DTs) fail annually** across India, leading to local blackouts. While states like Kerala have a failure rate of less than **2%**, some northern states see rates as high as **20%.** Overloading of transformers & feeders, ageing equipment, and inadequate maintenance continue to compromise the last-mile power delivery.
3. **States with Low Fiscal Space:** The challenge posed by demand surges becomes acute for financially stressed States because they are neither able to procure costly short-term power nor invest in distribution network upgrades. States like UP & Bihar continue to grapple with high losses, ageing distribution infrastructure, and overloaded transformers.
4. **Financial Stress on DISCOMs:** Many DISCOMs are already in a precarious financial state, with cumulative losses estimated around **₹1 lakh crore**. They are forced to sell power to agricultural and domestic users at highly subsidised rates, which are often below their own cost of supply. This makes it very difficult to recover the high costs of peak power purchases.
5. **Inadequate Transmission Capacity**: Inter-state transmission corridors are congested, preventing power-surplus states from selling to deficit ones efficiently. Intra-state networks in rapidly urbanising states (UP, Rajasthan, MP) lag behind load growth.

How does renewable energy help meet peak electricity demand?

1. **Solar Energy Contribution**: States with high solar energy generation capacity, such as Gujarat & Karnataka, are able to meet daytime peak comfortably as the solar power generation align reasonably well with daytime commercial & agricultural demand. But these States face steep evening peaks after sunset, for which they need to increasingly depend on energy storage technologies such as pumped hydro storage (PHS) & battery energy storage system (BESS).
2. **Wind Energy Contribution**: Wind generation in India is often **complementary to solar** — wind tends to blow more during evenings and monsoons when solar is weak. Coastal states like **Tamil Nadu, Gujarat, and Andhra Pradesh** benefit from strong evening sea breezes.

What needs to be done?

1. **Energy Storage Technologies**: Despite its growing contribution, RE cannot help in ensuring reliable round-the-clock power supply because of its intermittent nature & also because electricity demand & RE power generation do not always align – e.g. Solar power generation falls sharply after sunset, Wind generation is seasonal & highly dependent on monsoon conditions. This is where energy storage technologies become critical for India's power system:
    a. **Battery Storage (BESS):** The government has set ambitious targets, with plans to integrate around 47 GW of Battery Energy Storage Systems (BESS) by 2032**.**
    b. **Pumped Storage Hydro (PSH):** PHS is another key technology, with over 13,000 MW already under construction. Long-term transmission plans have been identified to support achieving 100 GW of PSP capacity; environmental clearances and funding need to be streamlined.
2. **Strengthen Distribution Networks**: Investment is needed to upgrade and modernize last-mile infrastructure to prevent local outages during peak periods. Government schemes like the **Revamped Distribution Sector Scheme (RDSS)** are designed to fund these upgrades, but they are linked to DISCOMs meeting specific performance targets, such as reducing AT&C losses.

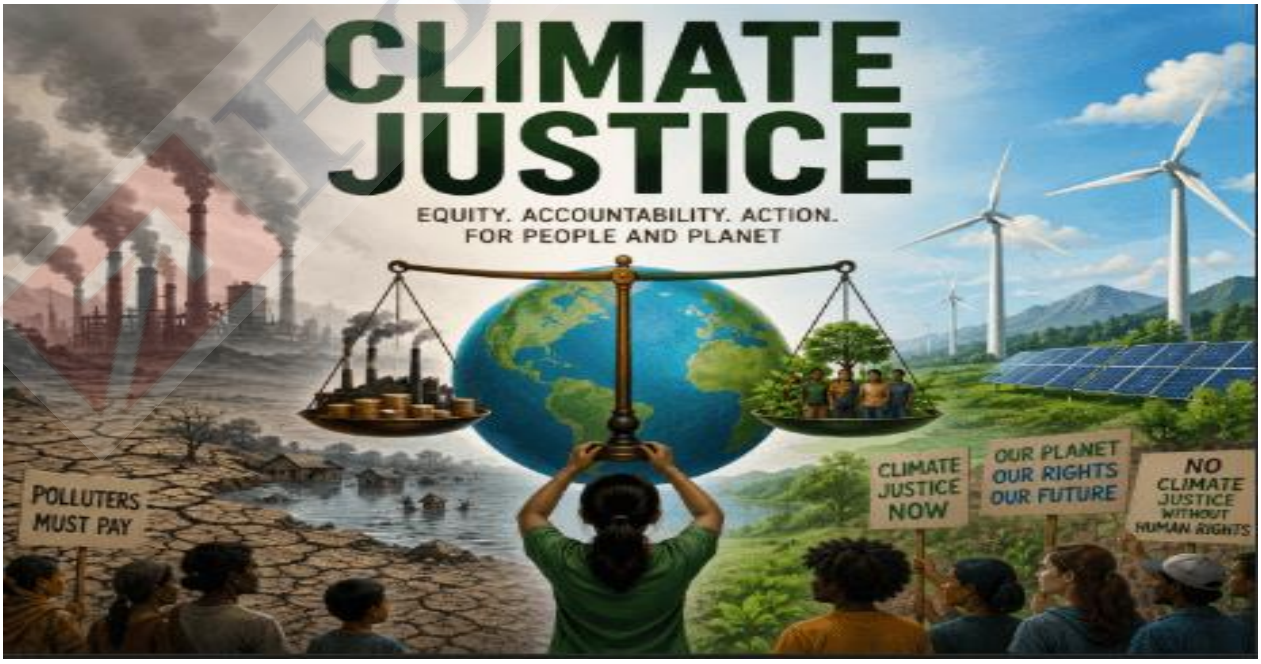
3. **Implement Tariff Reforms**: DISCOMs need to move towards **cost-reflective tariffs** to bridge the gap between their average cost of supply and revenue realized. The Draft National Electricity Policy (NEP) 2026 proposes automatic annual tariff revisions if state regulators fail to act, ensuring timely adjustments.
4. **Expand Time-of-Day (ToD) Tariffs**: ToD tariffs charge less for electricity during solar hours and more during peak evening hours. This incentivizes consumers to shift heavy appliance use (like running a water heater or dishwasher) to the daytime. States like Maharashtra, Gujarat, and Rajasthan have already introduced such tariffs.
5. **Leverage Smart Meters**: Smart meters are the technological enabler for ToD tariffs and other demand-response programs. They provide real-time data, allowing consumers to make informed choices and utilities to manage grid stress better. The RDSS has a major focus on implementing prepaid smart metering.

UPSC GS-3: Energy Infrastructure

Read More: The Hindu

Climate Justice: Meaning, Challenges and Way Forward – Explained Pointwise

Recently, the United Nations General Assembly (UNGA) formally adopted a Resolution on Climate Justice, which has been regarded as a historic milestone for climate accountability and climate justice. This resolution functions as the political and institutional mechanism to operationalize the landmark July 2025 Advisory Opinion from the **International Court of Justice (ICJ)**, shifting the conversation from climate action as a voluntary political choice to an explicit **legal duty under international law**. The resolution was passed with an overwhelming global majority, receiving 141 votes in favour, 8 against, while 28 countries – including India – abstained from voting.



What is the meaning of Climate Justice?

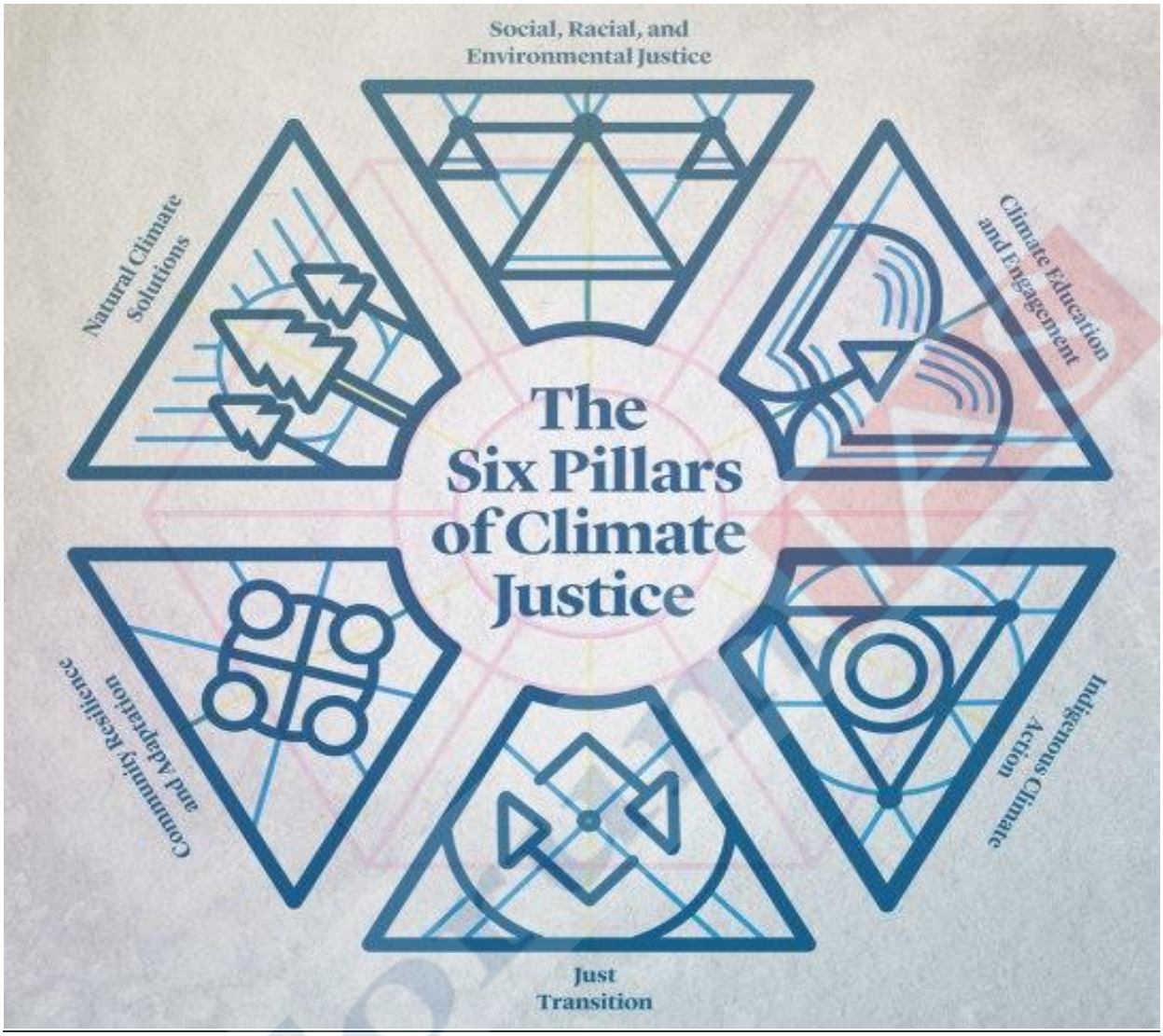
- Climate justice is a term used for **framing global warming as an ethical and political issue**, rather than one that is purely environmental or physical in nature.
- **'Climate Justice'** acknowledges climate change can have differing social, economic, public health, and other adverse impacts on underprivileged populations. The **impacts of climate change are not borne equally or fairly**, between rich and poor, women and men, and older and younger generations. From extreme weather to rising sea levels, the effects of climate change often have disproportionate effects on historically marginalized or underserved communities.
- Pursuing climate justice means addressing **social**, **gender**, **economic**, **intergenerational** and **environmental injustice**. All the dimensions of injustice are interconnected with each other and must be acknowledged in order to address them holistically e.g., some climate projects inadvertently create climate injustices when local communities are displaced for a conservation or renewable energy initiative. Advocates for climate justice are striving to have these inequities addressed through long-term mitigation and adaptation strategies.

What are the various dimensions of Climate Justice?

Climate Justice can be summarized under **Four types of Justice**:

1. **Procedural Climate Justice**: It is associated with **fair, accountable, and clear ways to make decisions about the effects of climate change** and how to deal with them. It is imperative to have fair procedures in place to make sure that goods are distributed fairly and in a way that is open and accountable. This can be ensured by due process, public participation, and representative justice. This can include **access to information**, **access to and meaningful participation in decision-making**, **lack of bias on the part of decision-makers**. It includes ideas like "transparency", "fair representation", "impartiality", and "objectivity".
2. **Distributive Climate Justice**: This aspect of justice deals with **how costs and benefits of climate change are shared**. There are three main aspects of distribution:
    a. Identifying the goods that are being distributed (e.g. food, clothing, water, power, wealth, or respect).
    b. Identifying the entities between which they are to be distributed (e.g. members of certain communities or stakeholders, certain generations, all of humankind).
    c. Identifying the most appropriate **mode of distribution** (e.g. status, need, merit, rights, or ascriptive and social identities).
3. **Recognitional Climate Justice**: It is focused on recognition of difference. It means **identifying vulnerable people** whose vulnerability may be worsened as a result of a process such as a low-carbon transition. Recognitional Climate Justice places emphasis on **understanding differences** alongside **protecting equal rights for all**, especially given uneven capacity to defend rights.
4. **Intergenerational Climate Justice**: It was recognized in the **Brundtland Report 'Our Common Future'** (1987) which conceived of sustainable development as being about the **ability of current generations to meet their needs without compromising the ability of future generations to meet their own needs**.

What are the main pillars of Climate Justice?



Source: Center for Climate Justice

The Center for Climate Justice (University of California) has identified **6 Pillars of Climate Justice**:

1. **Just Transition**: A just transition represents the transition of fossil fuel-based economies to equitable, regenerative, renewable energy-based systems.
2. **Social Racial and Environmental Justice**: It recognizes the disproportionate impacts of climate change on low-income and poor communities around the world, the people and places least responsible for the problem.
3. **Indigenous Climate Action**: Indigenous communities around the world are facing some of the most severe climate impacts. Indigenous communities are deeply reliant on their surrounding ecosystems for their lives and livelihoods. Indigenous peoples are leading efforts in climate change mitigation and adaptation across the globe **Climate Action should acknowledge their knowledge and role**.

4. **Community Resilience and Adaptation**: Community resilience and adaptation must be viewed from a perspective of social justice and equity. This would inspire models such as **food sovereignty**, **common property forest management**, and **energy democracy**. It would support local communities in **developing their own solutions** and allow them to benefit directly from local climate action.
5. **Natural Climate Solutions**: From a climate justice perspective, natural climate solutions take a systems approach and include regenerative farming, agroforestry, permaculture, urban gardens, and forest restoration.
6. **Climate Education and Engagement**: Widespread climate education and engagement is fundamental to addressing the root causes of climate change. A populace better educated about climate justice will fully understand why viewing climate change from a social justice and equity perspective is the best hope for solving the climate crisis.

What are the challenges in ensuring Climate Justice?

1. **Gradual Dilution of Common but Differentiated Responsibilities (CBDR)**: Article 3 of the UNFCCC recognizes the principle of CBDR based on differences between developed and developing countries in terms of their **current circumstances and historical contributions**. However, developed countries keep on pushing for higher commitments by developing countries e.g. Western nations pushed for 'phase-out' of coal at Glasgow 2021 (before agreeing for 'phase-down'). Coal is a cheap source and phasing-out of coal imposes big costs on developing countries.
2. **Economic and development trade-offs**: Poorer regions may prioritize immediate poverty alleviation and industrial growth over emissions reductions. Requiring them to adopt costly green technologies without external support can perpetuate economic inequality.
3. **Vulnerability and adaptation gaps**: The most climate-vulnerable communities (e.g., low-lying island states, Indigenous groups, agricultural dependents) often lack the resources, infrastructure, and political power to adapt. Adaptation funding consistently falls short of needs.
4. **Avoidance of Binding Targets**: The Nationally Determined Contributions (NDCs) under the Paris Agreement are voluntary in nature. They are not binding and legally enforceable. Kyoto Protocol had binding targets for developed countries but it has been non-functional. Developed countries, by avoiding binding targets, have reneged on their responsibility arising from their historical contributions.
5. **Shortfall in Climate Finance**: Despite their pledge, the developed countries have failed to provide US$ 100 billion per year for Climate Finance. Climate experts contend that US$ 100 billion per year is minuscule to address Climate Change. IPCC estimates that US$ 1.6–3.8 trillion is required annually to avoid warming exceeding 1.5°C.
6. **Definitional and Measurement Challenges**: There is no universal consensus on what climate justice requires — distributive fairness, procedural inclusion, recognition of harm, or restorative obligations? Attributing specific disasters or losses directly to climate change remains scientifically complex, complicating claims for compensation.

Read More: Climate Finance: Meaning, Need and Challenges – Explained, pointwise

Why did India abstain from voting on the resolution?

1. **Undermining the UNFCCC Process**: India's chief objection was that the resolution bypasses and **undermines the established UNFCCC** and the Paris Agreement. The Paris Agreement operates on a "bottom-up" structure where individual countries voluntarily set their own climate targets based on national capacity (known as Nationally Determined Contributions, or NDCs). India argued that the

UNGA resolution attempts to impose top-down, externally mandated benchmarks and specific mitigation pathways.

1. **Quasi-Binding Status**: By its very nature, an International Court of Justice (ICJ) Advisory Opinion is non-binding. However, India expressed serious concern that the UNGA resolution explicitly tries to elevate the ICJ's opinion into a **"binding or quasi-binding status."**
2. **Omission of 'Climate Finance'**: India has long maintained that developing nations cannot transition away from fossil fuels without significant financial assistance, technology transfers, and capacity building from developed nations. However, this resolution dictates strict obligations to cut emissions while entirely leaving out the means of implementation (money and technology) required to achieve them.
3. **Violation of CBDR Principle**: The foundational pillar of India's climate foreign policy is the principle of **Common But Differentiated Responsibilities (CBDR)**. India abstained because the resolution did not adequately reinforce that developed nations must shoulder the heaviest burden of global mitigation efforts.

India's abstention should not be seen as a vote against the concerns of the small island states. Indian initiatives such as SAGAR, and projects like International Solar Alliance, have been sensitive to the anxieties of countries most threatened by the rising seas.

How can Climate Justice be ensured?

1. **Operationalizing International Law & Accountability**: Now that UNGA Resolution and the International Court of Justice (ICJ) Advisory Opinion have established that climate inaction is a violation of international law, the next step is enforcement, which can be done by:
    a. **Climate Litigation:** Vulnerable nations and grassroots organizations must continue using domestic and international courts to sue major corporate polluters and negligent governments, establishing a legal precedent where environmental damage requires mandatory reparations.
    b. **Codifying Ecocide:** Formally recognizing "ecocide" (the widespread destruction of ecosystems) as an international crime under the Rome Statute would provide a powerful mechanism to hold individuals and corporate executives criminally liable for severe environmental neglect.
2. **Fulfilling and Expanding Climate Finance:** Developed nations must not only meet their historical $100 billion annual pledge but scale it up to meet the actual trillion-dollar needs of the Global South. This money should be provided as **grants, not loans**, so vulnerable nations aren't forced into further debt.
3. **Implementing a Globally "Just Transition"**: Shifting away from fossil fuels must be done in a way that protects workers, respects local communities, and prevents economic collapse. Transition pathways must be customized. Developed nations must phase out fossil fuels rapidly, while developing nations like India or African states are given the "policy space" and financial backing to transition gradually.
4. **Technology Transfer**: Technology transfer to developing nations must be accelerated, with intellectual property barriers reduced or waived for clean energy technologies. For e.g. similar to waivers created for life-saving medicines, certain patents on critical green technologies (like advanced solar cells, battery storage, and green hydrogen) should be waived or subsidized for developing nations.

5. **South-South Cooperation:** Expanding initiatives where emerging economies share regional expertise and scalable, cost-effective technologies with smaller, climate-vulnerable neighbors (similar to India's Infrastructure for Resilient Island States initiative).

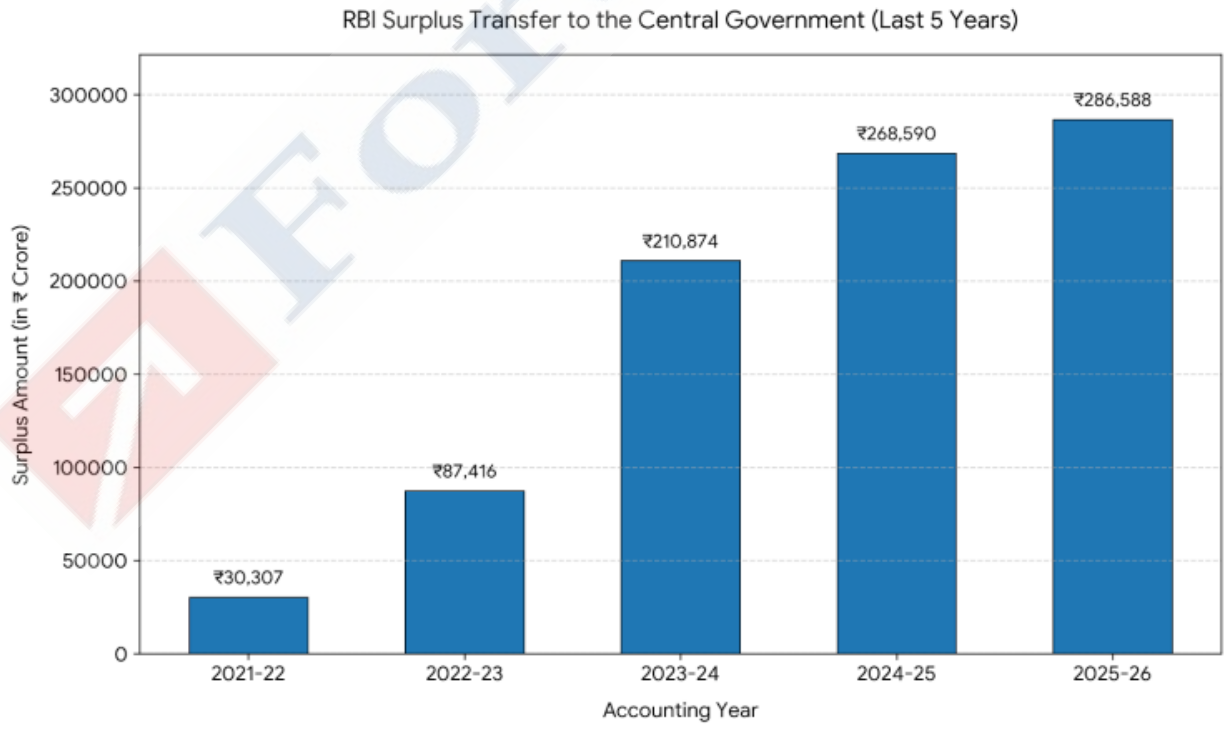
Conclusion:

Ensuring climate justice is anchored on a simple, foundational principle: **Common But Differentiated Responsibilities (CBDR)**. It is achieved when wealthy nations drastically cut their own emissions while financing the adaptation, survival, and clean energy transition of the rest of the world.

Read More: Indian Express
UPSC GS-3: Environment

RBI Surplus Transfer to Government – Explained Pointwise

Recently, the Central Board of the Reserve Bank of India (RBI) approved a **Rs. 2.86 lakh crore surplus** or dividend transfer to the Central Government for the accounting year 2025-26. The dividend payout is approximately **6.7% higher** than Rs 2.68 lakh crore transferred by RBI in 2024-25, marking the highest-ever surplus transfer by the central bank. At the same time, the RBI raised the **contingency risk buffer (CRB)** to Rs 10 lakh crore to create a safeguard in case geopolitical tensions escalate or crude oil prices worsen.



What is the source of RBI surplus? What is the mechanism for transfer of surplus by RBI?

The RBI has a unique operational nature, which stands apart from typical banks or financial entities.

Sources of Earnings of RBI	Expenditures of RBI
1. Profits derived from foreign currency assets like bonds, treasury bills and central bank deposits. 2. Earnings from local, rupee-based government securities. 3. Short-term based lending 4. Borrowing management for both central and state governments 5. Regulation of banks and non-banking financial bodies. 6. Commission from overseeing government transactions and specific underwriting endeavours.	1. Operating Expenses 2. Currency Printing 3. Staff remunerations 4. Transaction commissions for Banks 5. Dealer Compensations 6. Interest Paid on Deposits and Borrowings

- **Surplus:** Net income derived from the total income (sources of income) minus total expenditure (expenses). Out of the Surplus of RBI, risk provisioning is made for monetary and financial stability risks, and credit and operational Risks.
- **Transfer of Surplus:** RBI transfers its surplus to the government as per Section 47 of the Reserve Bank of India Act, 1934.
- The surplus calculation is based on the **Economic Capital Framework** (ECF) recommended by the Bimal Jalan committee. The committee, advised the RBI to maintain a Contingent Risk Buffer (CRB) between 5.5% and 6.5% of its balance sheet.

Read More- Economic Capital Framework

What are the reasons behind Increase in RBI surplus?

1. **Significant Foreign Exchange Trading Gains:** The single largest driver was the RBI's heavy intervention in the foreign exchange market. Amid persistent depreciation pressures on the Indian Rupee exacerbated by the West Asia conflict and global market volatility, the RBI engaged in large-scale sales of US dollars. Because these dollars were bought historically at much lower accumulation rates, selling them at current elevated rates allowed the central bank to book massive trading and revaluation gains.
2. **High Yields on Foreign Currency Assets**: Global interest rates across major advanced economies (like the US and Europe) remained elevated throughout the year. As a result, the RBI earned substantially higher returns and yields on its overseas investments, foreign currency assets, and sovereign securities held abroad.
3. **Increase in Gold Prices:** The RBI has progressively increased the share of gold in its foreign exchange reserves (rising to 16.7% in 2025–26). A massive rally in global gold prices—which surged by roughly

60% over the year—drastically inflated the value of the RBI's gold holdings, dramatically strengthening its accounting profitability and asset base.

4. **Robust Expansion of the Balance Sheet**: The RBI's overall balance sheet expanded by **20.61%**, crossing the ₹91 lakh crore mark. This growth was propelled by liquidity management operations, including the central bank buying domestic government securities (bonds) to inject liquidity into the banking system, which in turn increased its interest-earning asset portfolio.

What is the significance of the record RBI Surplus transfer to the Government?

1. **Absorbing the "Geopolitical War Shock"**: The ongoing US-Iran conflict has pushed up global energy, commodity, and fertilizer prices. Because India imports over 80% of its crude oil, these spiking prices severely inflate the government's import bill and threaten to balloon its subsidy obligations. This massive inflow of **non-tax revenue** essentially acts as an economic shield. It directly provides the cash buffer needed to cover higher-than-expected outlays for **food, fertilizer, and petroleum subsidies** without forcing the government to cut spending elsewhere.
2. **Increased Capital Expenditure (CAPEX):** The surplus transfer provides much needed fiscal stimulus to the government to increase its allocations to roads, railways, and defence projects.
3. **Managing Fiscal Deficit:** This substantial non-tax revenue helps the government in its efforts to contain the **fiscal deficit**. However, it may not be enough to fully meet the ambitious target of **4.3% of GDP** for FY27, with estimates suggesting the deficit could slip to around **4.7%**.
4. **Offsetting Revenue Losses**: It serves as a buffer against potential shortfalls from other sources, such as lower tax collections and reduced dividends from public sector companies like oil marketing companies, which are also impacted by the global crisis.
5. **Signaling Central Bank Autonomy and Resilience**: The RBI managed to transfer a record dividend while simultaneously injecting a massive **₹1.09 lakh crore into its own Contingent Risk Buffer (CRB)**—nearly triple what it provisioned last year. This sends a powerful signal to international rating agencies and global investors that the RBI can aggressively support the sovereign balance sheet while retaining immense financial firepower to defend the rupee and intervene in volatile markets.

What Should be the Way Forward?

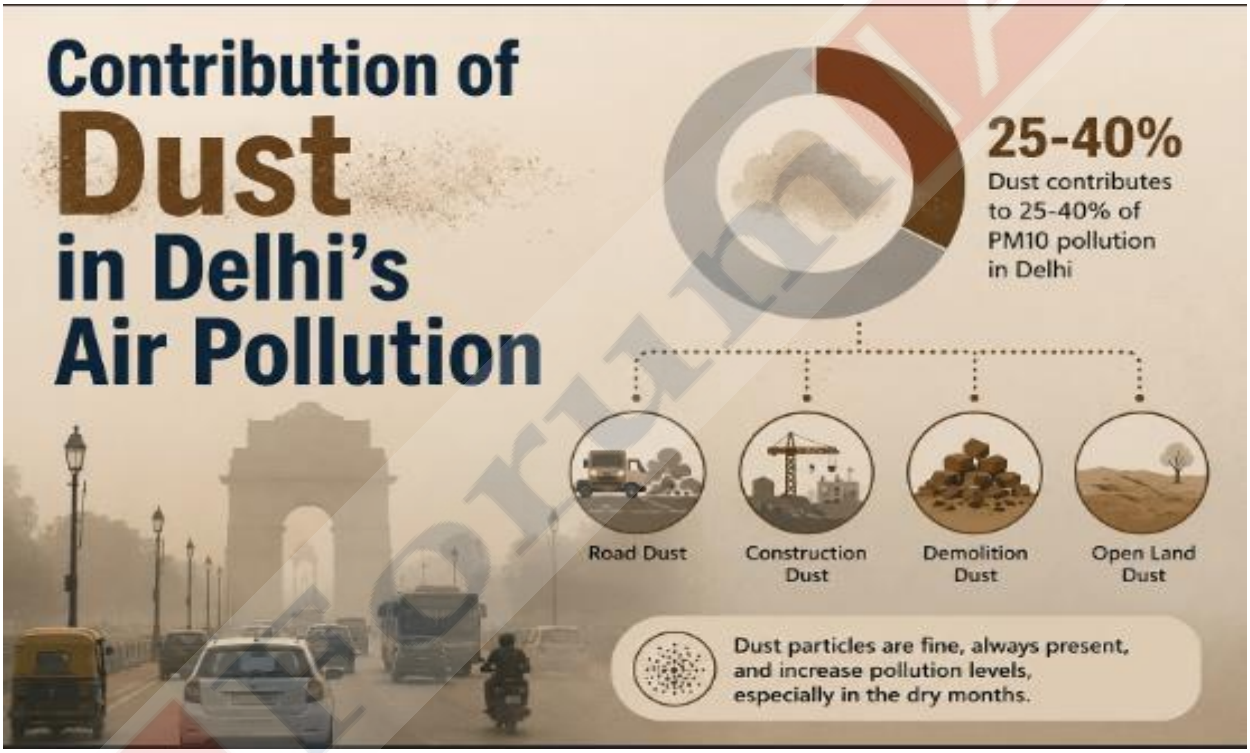
1. **Absorbing Global Energy and Commodity Shocks**: The immediate priority must be managing the fallout from the ongoing conflict in West Asia and the resulting surge in crude oil prices. The government should deploy a significant portion of this surplus to absorb the inevitable spikes in the **food, fertilizer, and petroleum subsidy bills**.
2. **Maintaining Infrastructure Targets:** The Union Budget set a massive public capex target of **₹12.2 lakh crore** (up from ₹11.2 lakh crore). The surplus must be funneled into key asset-creating sectors like transportation, green energy, urban development, and public logistics.
3. **Fiscal Deficit Consolidation:** The extra revenue should be strictly managed to hit the **4.3% fiscal deficit target** for the financial year.
4. **Increasing Govt tax-GDP Ratio:** The government must not constantly depend upon transfers from the central bank or dividend from public-sector enterprises. Proper fiscal management must be undertaken to increase the government's tax-to-GDP ratio.
5. **Avoid RBI-Reliant Fiscal Planning:** Refrain from budgeting for optimistic RBI surplus figures. Treat any transfer above a conservative baseline as a windfall for deficit reduction. This breaks the cycle of dependence and forces more disciplined fiscal management from the outset.
6. **Adhere Strictly to the ECF:** RBI should continue to determine the surplus transfer based on the rules of the Economic Capital Framework (ECF), which prioritizes building a strong risk buffer. The ECF

provides an objective, rule-based methodology. Following it closely shields the RBI from political pressure to maximize dividends.

Read More: The Indian Express
UPSC Syllabus- GS 3: Indian Economy

Contribution of Dust in Delhi's Air Pollution – Explained Pointwise

A January 2026 report by a panel of top experts constituted by the Commission for Air Quality Management (CAQM) identified road dust as a major pollution source in Delhi because it acts as both – a primary emission & a persistent source.



What is meant by road dust?

- **Road dust** refers to the fine, solid particles that accumulate on road surfaces and are kicked up into the air by passing vehicles, wind, or traffic.
- It is a major contributor to **particulate matter (PM)** air pollution, particularly in urban areas and near unpaved roads.
- Road dust broadly include airborne dust from roads & shoulders, vehicle movement, dry soil, and road wear. Poor road surfaces, potholes, broken edges, unpaved stretches, road-tyre-brake wear, and debris falling from the transport of construction & demolition material all contribute to the dust load.

What is Road Dust Made Of?

1. **Mechanical Wear:** Tiny particles worn off from vehicle brake pads, clutches, tires, and the road surface itself (asphalt or concrete).
2. **Crustal Material:** Natural dirt, soil, and rock dust blown onto the road from nearby fields or unpaved shoulders.
3. **Vehicle Emissions:** Leftover soot and exhaust particles that settled onto the ground and get re-suspended.
4. **Seasonal Debris:** Winter road salt, sand used for traction, and dried organic matter like leaves.

Why is road dust difficult to control, and why does it persist?

1. **The Re-suspension Loop:** When a vehicle drives over a road, its tires create a vacuum and turbulent airflow that lifts settled dust back into the air. Once lifted, it stays airborne for hours before settling again, only for the next car to repeat the cycle.
2. **"Non-Point Source" Pollutant Source**: Road dust is scientifically a very different kind of pollutant source as compared to construction & demolition (C&D) dust. It is a line source (spread along a corridor), unlike C&D dust, which is a point source. The non-point source nature of road dust makes it difficult to control as it requires routine removal & surface management.
3. **Arid Geography and Climate of Delhi**:
    - Delhi sits on the edge of the semi-arid Thar Desert and experiences extreme weather. The scorching summer heat bakes the soil, stripping it of all moisture. Without moisture to hold the dirt together, it easily turns into loose, powdery dust.
    - Strong winds regularly carry massive amounts of natural crustal dust from Rajasthan and neighboring dry states straight into the NCR, constantly replenishing the city's dust supply. Degradation of Aravalli range has weakened a natural dust barrier around Delhi, allowing more wind-blown dust to enter the city.
4. **Intense Construction Activity**: Delhi-NCR is a perpetual construction zone. Massive infrastructure projects (Metro expansions, flyovers, high-rises) alongside endless digging by civic agencies for internet cables, water pipes, and sewage lines leave behind heaps of loose soil.
5. **Operational Gaps in Clean-Up**: While the Delhi government heavily prioritizes a "dust-free roads" initiative – logistical gaps persist. Investigation data shows that Delhi's mechanical sweeping fleet is significantly under-scaled (80% shortage) for its thousands of kilometers of motorable roads, with active machines often concentrated heavily on a few select VIP or industrial hotspot routes, leaving large portions of peripheral roads unaddressed.

• DELHI'S ROADS CARRY A HIDDEN LOAD

145 KG Approx. amount of loose dust a 1-km road stretch in Delhi can hold

KEY POINTS FROM VARIOUS STUDIES

2016 IIT KANPUR:

- Road dust PM10 emissions in Delhi estimated at 79,626 kg/day
- Road dust PM2.5 emissions estimated at 22,165 kg/day
- North, north-east, and parts of north-west Delhi strong hotspots for road-dust resuspension-induced PM10
- These same areas overlap with low mechanical sweeping zones such as Narela, Shahdara North and Civil Lines
- Areas with relatively higher sweeping coverage, Shahdara South, Rohini and Keshavpuram, had much lower levels of road dust, as per the spatial mapping

2023 IIT KANPUR, IIT DELHI, TERI REPORT:

- Road silt load in Delhi ranged from 2 to 12.5 g/m². Reducing it below 2 g/m² recommended, with regular vacuum sweeping

2023 IIT DELHI:

- Average Delhi road silt load was around 14.47 g/m²
- This means a 1-km × 10-metre road stretch can hold ~144.7 kg road dust

2020 IIT MADRAS:

- Delhi road silt load near construction sites reaching about 40 g/m², considered high for urban roads in India

Aravalli degradation has weakened a natural dust barrier around Delhi.

Why dust pollution is a cause of worry?

1. **Air Pollution (PM10 & PM2.5):** When vehicles drive over dry roads, they create turbulence that lifts these fine particles into the air. For cities like Delhi, **road dust resuspension** is a major source of harmful particulate matter, second only to exhaust emissions in some cases.
2. **Respiratory Damage:** Inhaling fine dust causes immediate irritation to the airways, leading to coughing, wheezing, and shortness of breath. Over time, it severely aggravates chronic conditions like **asthma, bronchitis, and Chronic Obstructive Pulmonary Disease (COPD)**.
3. **Toxic Chemical Payload:** Dust is not just soil. Urban and industrial dust carries a toxic cocktail of heavy metals (like lead and copper from brake pads), microplastics, pesticides, and polycyclic aromatic hydrocarbons (PAHs) from vehicle exhaust, increasing the long-term risk of cancer. Nationwide, exposure to road dust is linked to more than 10,207 premature deaths annually.
4. **Suffocating Plant Life:** When heavy dust settles on leaves, it blocks sunlight and clogs stomata (the pores plants use to breathe). This disrupts **photosynthesis**, stunting plant growth and reducing agricultural crop yields.
5. **Water Contamination:** Toxic dust is washed by rain into lakes, rivers, and oceans. This introduces heavy metals and excess nutrients into aquatic ecosystems, leading to water pollution and harming marine life.

What is the Delhi government doing to control dust pollution?

1. **Mechanical Road Sweepers (MRSMs):** A growing fleet of vacuum-based sweeping trucks operates across key transit corridors to physically lift silt load off the streets.
2. **Mist-Spray Systems & Anti-Smog Guns:** Over 340 permanent mist-spray systems are installed on central verges to continuously dampen airborne dust. Furthermore, the city has deployed zero-emission, **EV-mounted anti-smog guns** that move through heavy-traffic and high-pollution corridors.
3. **Monitoring Construction & Demolition (C&D) Waste**: All construction projects covering more than 500 square meters must register on a centralized portal. The government uses artificial intelligence, geo-tagging, and remote video monitoring to track dust emissions from these sites in real time.
4. **Filterless Purifiers (STR-101):** The city has installed filterless, self-cleaning air purification units on electricity poles along heavy-traffic central verges. These systems suck in polluted air, isolate dust, smoke, and PM2.5 particles, and release cleaner air.
5. **Roadside Dust Catchers:** Devices like the **PAWAN III** are placed on roadside dividers to trap vehicular and dust emissions directly at the bumper level before they spread into the atmosphere.

What more needs to be done?

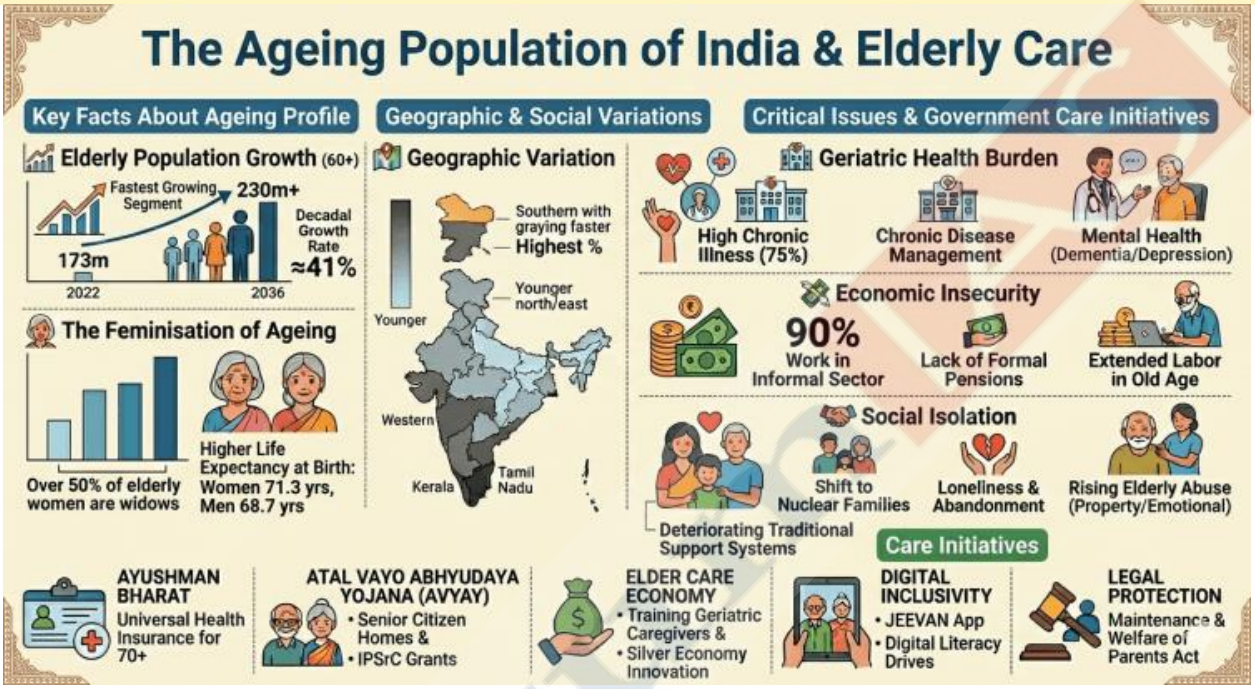
1. **Scale and Optimize Mechanical Sweeping**: Sprinkling water or sweeping with manual brooms just moves dust around. The city needs a massive upgrade to its **Mechanical Road Sweeping Machine (MRSM)** infrastructure. Sweeping routes must be mapped using GIS data to focus on high-silt commercial and industrial zones (like Anand Vihar or Narela), rather than prioritizing low-pollution VIP zones.
2. **Mandatory "Greening" of Open Pockets and Central Verges**: Paving alone won't work if open soil is constantly blown onto the tarmac. Every inch of unpaved road shoulder (*kutcha* edge) must be covered with interlocking concrete blocks or grass. Instead of cosmetic flowers, dividers and roadsides need dense, multi-layered canopy plants and grass. Planting dense, drought-resistant shrubs along road margins can trap dust and stabilize soil, preventing it from becoming airborne.
3. **Eliminating Potholes:** Broken pavement and potholes accumulate silt. When heavy vehicles drive over them, they crush this trapped silt into extremely fine, toxic PM2.5 particles. Maintaining smooth, pothole-free roads is a direct way to reduce dust suspension. Potholes and cracks must be repaired within 72 hours of identification to prevent them from grinding into fine dust.
4. **Transition to Regional, Multi-Agency Governance**: Dust does not respect political borders. A significant amount of dust is blown into Delhi from the arid plains of Rajasthan and unpaved roads in neighboring NCR cities like Gurugram, Noida, and Faridabad. **CAQM** needs to enforce a synchronized, legally binding dust-management protocol across the entire NCR. If Delhi sweeps its roads but neighboring cities don't, the wind will simply blow the dust back in.
5. **Dust suppressants**: While water evaporates quickly, the government could test longer-lasting, eco-friendly chemical suppressants (like calcium magnesium acetate) on high-traffic corridors, though these must be carefully vetted to avoid groundwater contamination.

UPSC GS-3: Environment
Read More: Indian Express

The Ageing Population of India & Elderly Care – Explained Pointwise

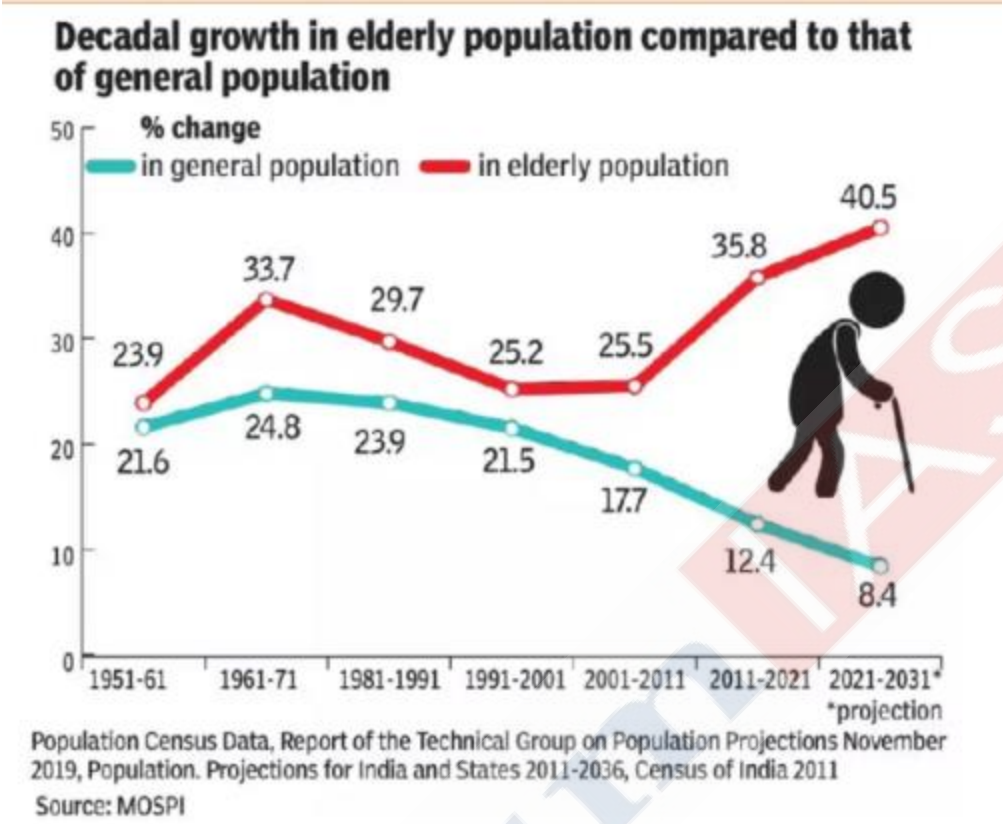
India is undergoing a profound demographic transition. While the country has long celebrated its "demographic dividend" of a young workforce, its population is graying at an unprecedented pace. According to the latest SRS

data, India's birth rate fell from 21 in 2014 to 18.3 in 2024; while death rate marginally went down from 6.7 to 6.4 – which shows that the country is well on its way from population 'explosion' to one of ageing population. Recently, Kerala – India's most rapidly ageing state – announced the formation of a department for the welfare of elderly people.



What is the Status of Elderly Population in India?

- According to the Government of India and the United Nations, India currently has **more than 150 million** elderly people (about **10%** of total population), making it the **second-largest elderly population globally**.
- The number of elderlies (persons above 60 years) is set to increase from 100 million in 2011 to **230 million** in 2036 (about **15%** of the population). By 2050, the elderly population is expected to constitute nearly **one-fifth** of the total population, that is around 350 million.
- The population aged 80 years and above is expected to expand by a massive **279%** between 2022 and 2050, triggering an urgent demand for long-term palliative care.
- **Old Age-Dependence Ratio:**
    - The old age-dependence ratio denotes the number of persons aged 60-plus per 100 persons in the age group of 15-59 years.
    - According to the Ministry of Statistics and Programme Implementation's (MOSPI) 'Elderly in India 2021' report, the old-age dependency ratio is increasing in India. The old age-dependence ratio has increased from 10.9% in 1961 to 14.2% in 2011, to 15.7% in 2021 and is projected to increase to 20.1% in 2031 respectively.



Source- MOSPI

- **Inter-State Variation:**
    - The demographic transition happening in India is not even across the States. According to the RBI report, **Kerala & TN** will be "**ageing States**" by 2036 because their elderly populations will exceed 22% & 20% respectively.
    - On the other hand, the **working age populations** of **Bihar, UP, Jharkhand** will continue to rise beyond 2031, **Karnataka & Maharashtra** occupy the middle ground – balancing growth with the onset of ageing pressure.

What is the need for taking care of the Elderly Population in India?

1. **Unlocking the "Silver Dividend"**: Healthy, well-supported seniors possess a lifetime of institutional knowledge, professional skills, and cultural wisdom. By keeping them healthy and integrated into society, India can leverage their potential for mentorship, community leadership, and part-time economic contributions—turning a perceived challenge into a national asset.
2. **Generational Link:** The elderly citizens provide a vital generational link for the upcoming generation, such as providing support and stability to families and society at large. **For ex-** Grandparents in joint families provide a crucial link for transferring values and morals to the younger generation.
3. **Social Harmony:** The deep cultural impressions and social experiences of the elderly population in India provide the necessary buffer against intolerance, violence and hate crimes.

4. **Relieving Pressure on the Working-Age Workforce:** Without formal elder care infrastructure (like day-care centers, trained caregivers, and assisted living), the burden of full-time care falls on working-age children. This often forces women out of the workforce or reduces overall economic productivity as families struggle to balance work and caregiving.
5. **Moral and ethical responsibility:** It is the moral and ethical responsibility of the society to care for its people beyond their prime. This helps in reciprocating their lifetime of physical, social, emotional, and economic investment in the society.
6. **Constitutional Mandate: Article 41** of the Constitution of India directs the State to secure the right to work, education, and public assistance in cases of old age, sickness, and disablement. Taking care of seniors is a fulfillment of this constitutional directive.

What are the Challenges Faced by Elderly Population in India?

Social Challenges	1. **Social Neglect:** Elderlies are increasingly being neglected by the younger generation due to various social reasons such as western education, globalisation, nuclear family structure. 2. **Abuse of the elderly population:** Elderlies in India face various forms of abuse such as physical, sexual, psychological or financial. They suffer from emotional harm that emerges from verbal or emotional abuse. 3. **Inter-section of Caste and Elderly:** The lower caste elderly have to keep on working for livelihood even at old age due to financial issues. While for the upper caste elderlies, good jobs become less available and they hesitate to take menial jobs which creates a feeling of 'worthlessness' amongst them. 4. **Feminisation of ageing:** Ageing in India is increasingly female-centric. **Over 54% of elderly women are widows**, making them highly vulnerable to economic dependency, lack of property rights, and social isolation. The life of elderly widows is riddled with stringent moral codes of the society. Social bias against elderly women results in unjust allocation of resources, neglect, abuse, exploitation, gender-based violence, lack of access to basic services and prevention of ownership of assets.
Economic and Financial Challenges	1. **Lack of Social Security Protection:** Approximately **90% of India's workforce is in the informal sector** (agriculture, daily wage labor, domestic work). Consequently, an overwhelming majority of seniors do not have access to formal, employer-matched pensions or retirement benefits. 2. **Inadequate Government Safety Nets:** India spends only about 1% of its gross domestic product on pensions. While government pension schemes like the Indira Gandhi National Old Age Pension Scheme (IGNOAPS) exist, the monthly payouts are heavily critiqued as being too low to cover basic nutritional and survival needs. 3. **Lack of housing and other basic amenities:** The housing available to a majority of the senior citizens are sometimes inappropriate and unsuitable to their requirement.

Health Issues and Challenges	1. **High Burden of Chronic Diseases:** Data from the Longitudinal Ageing Study in India (LASI) reveals that nearly **75% of senior citizens suffer from at least one chronic illness** (such as diabetes, hypertension, cardiovascular diseases, or severe arthritis). Multi-morbidity (suffering from two or more chronic conditions simultaneously) affects over half of the elderly population. 2. **Crippling Out-of-Pocket Expenditure:** India has a remarkably low penetration of health insurance tailored for senior citizens. High premium rates and exclusions for pre-existing conditions mean that families must pay for treatments entirely out-of-pocket, frequently driving vulnerable families into poverty. 3. **Mental Health and Cognitive Decline:** Issues like depression, severe anxiety, and cognitive impairments (such as Alzheimer's and dementia) affect roughly 20% to 25% of the elderly. Mental health stigma, combined with a severe shortage of trained geriatric psychologists, leaves these conditions largely undiagnosed and untreated. 4. **Rural-Urban Healthcare Divide:** While 71% of India's elderly reside in rural villages, specialized tertiary healthcare facilities and doctors are heavily concentrated in urban centers, making access a geographic nightmare for frail seniors.

What are the Government initiatives for elderly care in India?

Atal Vayo Abhyuday Yojana (AVYAY)	It is an umbrella scheme that consolidates various efforts under a single, strategic framework aimed at improving the quality of life for senior citizens. The scheme has five key components that address different needs: 1. **Integrated Programme for Senior Citizens (IPSrC):** To provide institutional care. 2. **Rashtriya Vayoshri Yojana (RVY):** To provide Physical Aids and Assisted-living Devices for Senior citizens belonging to the BPL category. 3. **Seniorcare Ageing Growth Engine (SAGE):** Aims to create Silver Economy. 4. **Senior Citizen Opportunities for Productive Engagement (SCOPE):** Portal that aims to utilize the experience, time and energy of the elderly population which can be used by the business enterprises looking for stable employees with experience. 5. **State Action Plan for Senior Citizens (SAPSrC):** Empowers states to develop and implement their own action plans for elderly welfare.

National Policy for Older Persons 2011	The policy aims to encourage individuals to make provisions for their own and their spouse during old age, to bring non-governmental organizations for caring for older persons and to provide healthcare facilities to the elderly.
The Maintenance and Welfare of Parents and Senior Citizens Act, 2007	The Act provides a legal framework for the care of the elderly. It makes it a legal obligation for children and heirs to provide maintenance to their parents/senior citizens, a provision that is increasingly important as family structures change. The Act also provides for the establishment of old age homes and the protection of life and property of seniors.
National Social Assistance Programme (NSAP)	This is a social security program that provides a monthly pension to seniors living below the poverty line. Under the **Indira Gandhi National Old Age Pension Scheme (IGNOAPS)**, eligible individuals between 60-79 years receive **₹200 per month**, while those aged 80 and above receive **₹500 per month**.
Pradhan Mantri Vaya Vandana Yojana	The scheme aims to provide social security during old age. It also protects elderly persons aged 60 and above against a future fall in their interest income due to uncertain market conditions.
Senior care Ageing Growth Engine (SAGE) Initiative and SAGE portal	This initiative aims to create a **"Silver Economy"** by identifying, evaluating, and supporting start-ups that develop innovative, age-friendly products and solutions to help seniors lead more independent lives.
Ayushman Bharat (AB-PMJAY) Expansion	Every senior citizen in India **aged 70 years and above is eligible for a ₹5 lakh annual free health insurance cover**, entirely irrespective of their socio-economic or income status. For families already covered under PMJAY, seniors over 70 get an exclusive, unshared ₹5 lakh top-up.
National Programme for the Health Care of the Elderly (NPHCE)	This program provides dedicated healthcare delivery systems for seniors down to the grassroots level. It sets up 10-bed geriatric wards in district hospitals, runs weekly clinics at Primary Health Centers (PHCs), and establishes specialized **National Centres of Ageing (NCAs)** at premier medical colleges like AIIMS New Delhi for tertiary research and palliative care.

Elderline (14567)	A national, toll-free helpline number specifically operationalized to support senior citizens. It offers immediate real-time support across India for grief counseling, guidance against elder abuse, clarity on pension schemes, and emergency rescue operations for abandoned citizens.

What should be the Way Forward?

1. **Formalization of caregiving economy:**
    - According to a NITI Aayog report, healthcare offered at home can replace up to 65% of unnecessary hospital visits and reduce hospital costs by 20%.
    - Well-trained caregivers possessing empathetic outlook towards elderly need to be provided formal and better work place conditions.
    - Recognition of "home" as a place for providing care and as a "place of work" for caregivers will be the first step towards elderly care.
2. **Reforming the National Pension System:** The current monthly payouts under the Indira Gandhi National Old Age Pension Scheme (IGNOAPS) need to be systematically revised and pegged to inflation indices to ensure they cover basic living and nutritional costs.
3. **Strengthen Geriatric Healthcare Infrastructure**: India must **establish geriatric departments in all medical colleges** and increase the number of specialist physicians. States like Tamil Nadu have already recommended creating geriatric units in every medical college as a model to follow.
4. **Replication of Switzerland's TIME BANK initiative:** Under this initiative, the younger generation start to save 'time' by taking care of senior citizens. Later, they can use the saved 'time' when they get old, sick, or in need of someone to take care of them. This initiative must be applied to Indian setup.
5. **Incentivizing the "Silver Economy":** The government should offer tax incentives, subsidies, and grants to startups and private enterprises developing senior-friendly technologies, assistive devices, universal design infrastructure, and specialized senior living communities.
6. **Public-Private Partnerships (PPP):** Private healthcare providers should be incentivized to establish specialized geriatric wings and day-care centers in semi-urban and rural areas, backed by state viability gap funding.
7. **Address the Feminisation of Ageing**: Since over 50% of elderly women are widows facing social exclusion, targeted policy must ensure **property rights, survivor pensions, access to healthcare, and legal protections** for elderly women — especially in rural areas where vulnerability is highest.
8. **Rationalisation of subsidies:** The RBI report recommends the ageing States to rationalize their subsidies to afford rising pension costs & youthful States to invest heavily in human capital.

Conclusion: India has a small window of opportunity to act. Unlike many developed nations that aged after becoming wealthy, India is ageing while still building its public health and social protection systems. Thus, India needs to shift from a **reactive, welfare-based model** to a **proactive, rights-based, and opportunity-driven approach** — one that invests in geriatric healthcare, financial inclusion, technology, age-friendly infrastructure, and social empowerment

Read More: The Hindu
UPSC Syllabus- GS 2- Govt policies for vulnerable section

Critical Infrastructure – Significance & Threats – Explained Pointwise

Critical infrastructure and essential services are often taken for granted. Over the past few decades, these services have expanded significantly due to digital transformation driven by automation, the Internet of Things (IoT), and AI. However, the same connectivity that enhances efficiency has also widened the spectrum of risks and vulnerabilities.

What is meant by critical infrastructure?

- **Critical infrastructure** refers to the physical and cyber systems, assets, and networks that are so vital to a nation that their incapacitation or destruction would have a debilitating effect on physical security, economic security, public health, or safety.
- **The key characteristics** that define something as critical infrastructure are that it is interconnected with other systems (so failures cascade), it serves large populations, it is difficult to quickly replace or repair, and its failure would cause widespread harm.
- The **National Critical Information Infrastructure Protection Centre (NCIIPC)** (the nodal national agency created in 2014 under the National Technical Research Organisation (NTRO)) has officially identified **six core sectors** as critical to India:
    1. **Power & Energy**
    2. **Banking, Financial Services & Insurance (BFSI)**
    3. **Telecommunications**
    4. **Transportation**
    5. **Healthcare**
    6. **Government & Strategic Public Enterprises**

What is the significance of critical infrastructure?

Economic Significance	• **Facilitates High Growth:** India targets 8-10% GDP growth to become a developed nation (Viksit Bharat). This is impossible without reliable power, modern transport (railways, highways, ports), and high-speed digital connectivity. • **Enables "Make in India" & Supply Chains:** Global companies shifting supply chains away from China need reliable infrastructure. A power cut or a failed logistics route in a manufacturing hub like Tamil Nadu or Gujarat directly loses contracts and investments for India. • **Drives Digital Economy:** With UPI processing billions of transactions monthly, India's fintech infrastructure is critical. A 2-hour outage of the banking network (which is designated as critical) would freeze e-commerce, salaries, and emergency aid transfers.
National Security Significance	• **Military Readiness:** All military bases, nuclear command centers, and border surveillance systems depend on a resilient power and communications grid. Disabling these via a cyber or physical attack would cripple India's defensive and offensive capabilities before a single shot is fired. • **Protecting Strategic Assets:** India's nuclear power plants (e.g., Kudankulam), space assets (ISRO), and defense R&D centers are prime terror targets. Their protection is directly linked to strategic stability in South Asia.
Social Significance	• **Public Health & Safety:** Hospitals require uninterrupted power for ICUs. Water treatment plants need power to pump clean water. A multi-day blackout in a city like Delhi or Mumbai could lead to dehydration, heatstroke, sewage overflows, and a public health crisis. • **Disaster Management:** India is prone to cyclones, floods, and earthquakes. Communication towers, early warning systems, and emergency services (police, fire, ambulances) are all critical. If these fail during a disaster, the death toll multiplies. • **Food Security:** India's Public Distribution System (PDS) and food supply chains rely on cold storage (refrigeration) and rail transport. Disrupting these leads to spoilage of grains and vegetables, directly impacting hunger and inflation for the poor.

What are the various threats and challenges faced by critical infrastructure?

Cyberthreats	• **State-Sponsored Cyber Warfare**: Critical infrastructure is a prime target for advanced persistent threat (APT) groups, with over **1.5 million cyberattacks** attributed to just seven such groups. Intelligence reports highlight that a vast majority of targeted attacks on Indian networks originate from the **China-**

	Pakistan axis & targeting India's power grids, telecom networks, and defense systems for leverage during geopolitical standoffs. ● **Ransomware**: The energy sector is particularly vulnerable, with **67% of global energy, oil/gas, and utilities organizations** hit by ransomware in 2024. High-profile incidents—like the crippling attack on AIIMS Delhi and massive data breaches at healthcare insurers—demonstrate that hackers are actively targeting the operational lifelines of public safety, demanding massive payouts to release frozen operational systems.
Physical & Hybrid Threats	● **Terrorism attacks:** Cross-border terrorism remains a persistent threat, especially in Jammu & Kashmir. Pipelines, railway networks, power stations, and dams have historically been targets of terrorist groups. ● **Left-Wing Extremism (Naxalism):** Maoist groups (Naxalites) have repeatedly targeted railway lines, power infrastructure, and communication towers in central and eastern India. This disrupts development in already vulnerable tribal and rural regions. ● **Geopolitical Conflict**: Energy infrastructure, such as the **Jamnagar Refinery** and **Mundra Port**, is located close to the international border with Pakistan, making them strategic targets. The 2025 **Operation Sindoor** saw security agencies intercept over 600 drones and missiles, **40% of which targeted Gujarat and Rajasthan**, indicating a clear and present danger. ● **Drone Warfare**: Recent global conflicts have shown how drones can precisely target oil depots, refineries, and gas fields, causing economic shockwaves. India is actively working to counter this threat, which traditional air defenses are not fully equipped to handle.
Technical & Systemic Challenges	● **Legacy Systems:** Many of India's physical infrastructures (like older power sub-stations, water pumping stations, and railways) run on outdated **Operational Technology (OT)**. These legacy systems were originally designed to be isolated from the internet. When they are retrofitted with modern internet-of-things (IoT) sensors to integrate with smart grids, they become highly vulnerable because they lack built-in, modern encryption and authentication protocols. ● **Hardware Vulnerabilities**: India relies heavily on imported electronic hardware, microchips, and telecommunications equipment. This creates a severe **supply chain risk**, where foreign adversaries can embed malicious firmware at the manufacturing stage. If triggered remotely, these backdoors could compromise entire telecom or energy grids. ● **Regulatory and Governance Gaps**: India currently lacks an overarching **Critical Infrastructure Protection Act** and a single nodal agency to oversee all aspects of security.

Environmental, Climate change & Natural disaster related Challenges	• **Extreme Weather Events:** Climate change poses a direct physical threat to India's infrastructure. Cyclones on the eastern and western coasts routinely tear down telecom towers and flood power stations. Intense heatwaves strain the electrical grid to its absolute limits, while flash floods and landslides in northern regions can physically wipe out transport corridors and hydro-dams. • **Earthquakes**: Large parts of northern and northeastern India lie in high seismic zones, putting dams, bridges, and urban infrastructure at risk.

What are the various government initiatives aimed at protecting critical infrastructure?

1. **Institutional Frameworks**:
    - **NCIIPC (National Critical Information Infrastructure Protection Centre):** Created under Section 70A of the IT Act, this is the nodal national agency responsible for safeguarding the designated 6 critical sectors (Power, BFSI, Telecom, Transport, Strategic/Defense, and Government). It issues real-time threat intelligence and coordinates national security protocols.
    - **CERT-In (Indian Computer Emergency Response Team):** Operating as the premier incident response agency, CERT-In handles broader cybersecurity threats and coordinates rapid response and forensics whenever a network breach or ransomware attempt is flagged.
    - **I4C (Indian Cyber Crime Coordination Centre):** Established under the Ministry of Home Affairs (MHA), this center enhances coordination between law enforcement agencies to intercept cross-border cybercrimes targeting critical digital assets.
    - **National Disaster Management Authority (NDMA)**: Apex body for disaster management under the Disaster Management Act, 2005. Develops national policies and plans for protecting infrastructure against natural disasters.
    - **CISF:** The Central Industrial Security Force provides dedicated physical security for over 350 vital industrial and public installations, including nuclear plants, airports, and space stations.
2. **Digital Personal Data Protection (DPDP) Act:** The DPDP Act introduces heavy statutory financial penalties (up to **₹250 crore per incident**) for any enterprise or government body failing to implement adequate security safeguards, legally forcing critical entities to heavily prioritize security investments.
3. **Silicon Sovereignty & Hardware Security:** To mitigate supply chain weaponization (such as hidden backdoors in imported hardware), India enforces strict screening and security testing for power grid components and telecom gear. The push for indigenous semiconductor manufacturing via the **India Semiconductor Mission (ISM)** aims to decouple critical national infrastructure from volatile foreign supply chains.
4. **Cyber Swachhta Kendra (Botnet Cleaning Centre):** Run by CERT-In, this initiative tracks and neutralizes botnet infections across the country, preventing attackers from using networks of compromised local devices to launch crippling Distributed Denial of Service (DDoS) attacks against national servers.
5. **CSPAI (Certified Security Professional in Artificial Intelligence):** Launched by the government to bridge the critical technical skill deficit, this specialized training track equips elite defensive engineers with the skills required to protect critical infrastructure from AI-generated threats, data poisoning, and automated network intrusions.

6. **National Cyclone Risk Mitigation Project (NCRMP):** Implemented in eight coastal states, this project has built **multi-purpose cyclone shelters, evacuation roads, and saline embankments** and has facilitated underground cabling for power.

What should be the way forward?

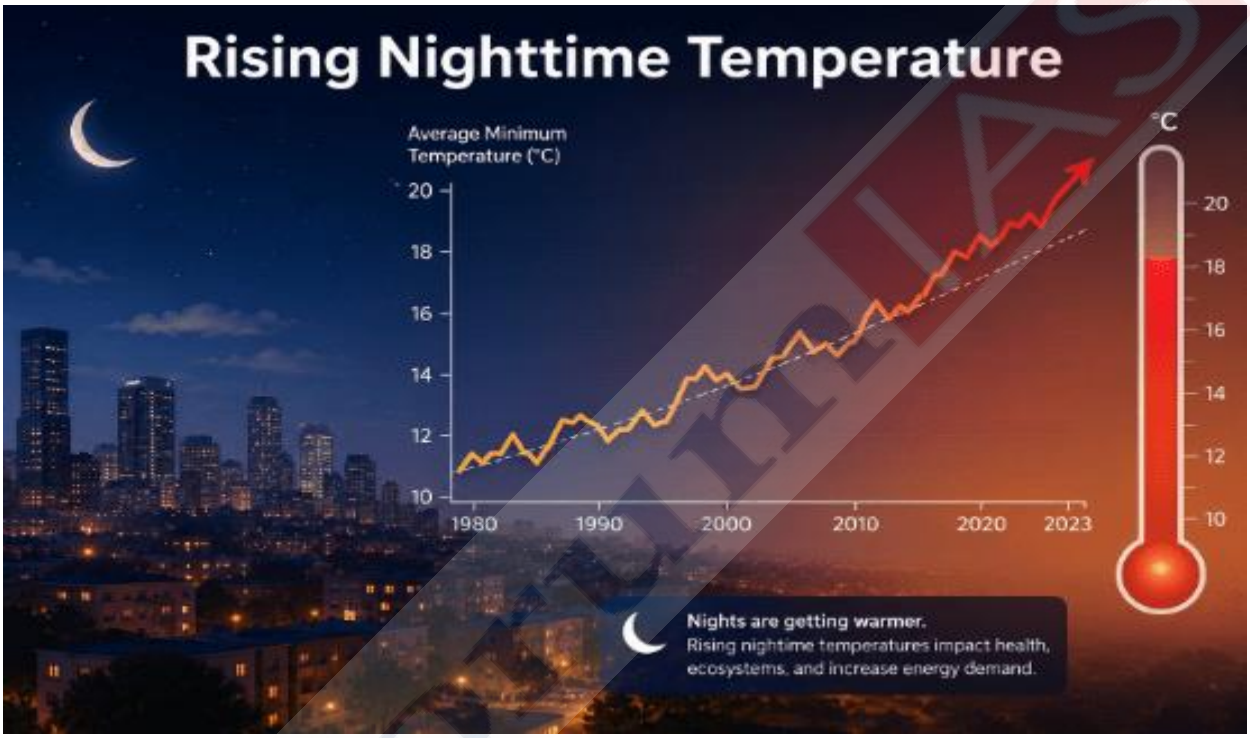
1. **Enact a Comprehensive Legal Framework:** India currently lacks an overarching **Critical Infrastructure Protection Act.** The Act should:
    - **Codify a Unified Definition:** Establish a clear, legally binding classification of "critical infrastructure" across all sectors to eliminate ambiguity.
    - **Mandate "Digital Twins":** Require every physical asset to be supported by a functional digital twin for real-time structural health monitoring and predictive maintenance .
    - **Establish Criminal Liability:** Impose clear accountability on designers, contractors, and operators for failures resulting from gross negligence, addressing the current diffusion of responsibility.
2. **Establish a Unified Governance Mechanism:** Create a **Supply Chain Technical Office (SCTO)** under the National Cyber Security Coordinator to provide technical expertise and move hardware security from subjective assessments to **quantifiable risk calculations.**
3. **Mandate Resilience Cost-Benefit Analysis (RCBA):** Use the RCBA tool developed by the **Coalition for Disaster Resilient Infrastructure (CDRI)** to demonstrate the economic returns of resilience investments. For example, flood protection on a road in Assam returned **eight rupees for every rupee spent.**
4. **Achieve Full Hardware & Silicon Sovereignty**: To mitigate the risk of embedded foreign spyware, India must aggressively accelerate its trusted source procurement policies. Through the India Semiconductor Mission, India must mandate that all microchips, routers, and supervisory systems used in strategic sectors (Defense, Telecom, Power) are either manufactured domestically or rigorously vetted through deep, cryptographic hardware audits.
5. **Create Sector-Specific CERTs**: While the NCIIPC provides macro-level oversight, India needs hyper-specialized, deeply embedded sector-specific response teams (e.g., **Fin-CERT** for finance, **Power-CERT** for energy, and **Trans-CERT** for logistics). Sector-specific engineers understand the unique operational nuances of their respective fields far better than general cybersecurity practitioners.
6. **Climate and Physical Resilience**: As extreme weather events become more frequent, India must legally mandate climate stress-testing for all physical infrastructure projects. New bridges, highways, data centers, and power lines must be engineered using predictive climate modeling to ensure they can withstand 50-year flood levels, severe heatwaves, and category-5 cyclones.
7. **Create a Dedicated "Cyber Defense Corps"**: To bridge the acute cyber-talent deficit, the government should establish a dedicated technical wing within the armed or paramilitary forces. Grooming and retaining elite ethical hackers, AI engineers, and industrial security experts within public service is vital to maintaining India's digital sovereignty.

Conclusion: As India moves toward becoming a major global economy & digitally empowered nation, the safety of critical infrastructure cannot be treated merely as a technical issue. It is a matter of sovereignty, resilience & economic security. The need of the hour is stricter policy enforcement, rigorous certification, preference for trusted indigenous technologies & continuous vigilance across government & industry.

Read More: The Hindu
UPSC GS-3: Infrastructure

Rising Nighttime Temperature – Reasons & Consequences – Explained Pointwise

India is witnessing a steady rise in nighttime temperatures due to climate change, rapid urbanisation, and changing land-use patterns. Unlike daytime heat, rising night temperatures prevent the atmosphere from cooling adequately after sunset, leading to prolonged heat stress for humans, agriculture, and ecosystems. This trend has become more pronounced in recent years, especially in urban areas affected by the urban heat island effect. Increasing nighttime temperatures not only worsen heatwaves but also impact public health, energy demand, crop productivity, and overall climate resilience in India.



What is meant by nighttime temperature?

- Nighttime temperature refers to the atmospheric temperature recorded during the night, usually after sunset and before sunrise. It generally represents the minimum temperature experienced in a day.
- Global mean temperatures have risen by more than 1.3°C since 1850, with nighttime temperatures increasing even more rapidly than daytime temperatures.
- Rising nighttime lows are often a clearer signal of global warming than rising daytime highs, as warmer nights can increase heat stress on humans and crops.

What are the reasons behind rising nighttime temperature?

1. **Changes in the Planetary Boundary Layer**: The planetary boundary layer is the lowest part of the atmosphere – the air directly influenced by the Earth's surface. This layer changes shape between day and night, which accelerates nighttime warming:
    - **The Daytime Layer:** During the day, solar heating causes the air to mix vigorously, expanding this boundary layer up to several kilometers high. The heat is distributed through a massive volume of air.

- **The Nighttime Layer:** At night, the ground cools and the boundary layer shrinks, becoming very thin and stable – often just a few hundred meters thick.
- When that trapped heat is compressed into a much shallower nighttime layer, the same amount of warming energy causes a **greater temperature increase** than during the day.

2. **Greenhouse Gas Emissions**: CO_2, methane, and other greenhouse gases trap heat in the atmosphere around the clock. While the sun drives daytime warming, these gases prevent heat from escaping at night — making nights warm faster than days.
3. **Increased Atmospheric Moisture (Water Vapor)**: As the planet warms, evaporation increases, and the atmosphere can hold more moisture (about 7% more moisture for every **1°C** of warming). Humid air holds onto heat far better than dry air. When nighttime humidity is high, it prevents the air temperature from dropping significantly, resulting in persistently hot nights.
4. **The Urban Heat Island Effect**: Cities are significantly hotter than surrounding rural areas at night due to:
   - **Concrete and asphalt:** Absorb heat during the day and release it slowly at night.
   - **Dark surfaces:** Low albedo (reflectivity) means more solar energy is absorbed.
   - **Lack of vegetation:** Fewer trees means less evaporative cooling
   - **Waste Heat:** Air conditioners, vehicles, and industrial machinery run around the clock in cities, pumping literal "waste heat" directly into the nighttime environment.
5. **Deforestation**: Trees provide shade and release moisture through transpiration, cooling the air at night. Clearing forests removes this natural cooling mechanism, leading to warmer nights in affected regions.
6. **Cloud Cover Changes**: Clouds trap heat beneath them at night (similar to greenhouse gases). Changes in cloud patterns due to climate change are contributing to warmer nights in many regions.
7. **Land Use Changes**: Converting forests and wetlands into farmland or urban areas reduces natural cooling. Irrigated farmland can increase humidity, which in turn traps more heat at night.

What are the impacts of rising nighttime temperatures?

1. **Impact on Human Health:** During heatwaves, high nighttime temperatures are actually more dangerous than daytime peaks. If the temperature doesn't drop enough at night, the human body can't cool down and recover from the daytime heat stress. For vulnerable groups (such as the elderly, infants, outdoor workers, and people with heart or kidney disease) this lack of nighttime relief drastically increases the risk of heatstroke and cardiovascular failure.
2. **Impact on Agriculture:**
   - Many crops and plants require a period of cooler nighttime temperatures to rest and regulate their metabolism.
   - High nighttime temperatures have been directly linked to lower yields in major global staples like rice, corn, and wheat. For example, research shows that for **every 1°C increase** in nighttime minimum temperatures, rice yields can **drop by roughly 10%**.
   - Like humans, dairy cows, pigs, and poultry rely on cool nights to shed daytime heat. Persistent nighttime heat causes severe heat stress in animals, leading to lower milk production, reduced fertility, and higher mortality rates.
3. **Economic Costs**:
   - Demand for air conditioning surges through the night, straining power grids and increasing electricity costs. This relentless demand deprives power grids and transformers of the cool night hours they need to cool down mechanically, leading to a higher frequency of brownouts, blackouts, and equipment failures.

- Buildings, roads, and bridges experience more thermal stress as they get less nighttime cooling, accelerating wear and tear.
- Urban infrastructure designed for historical temperature ranges becomes increasingly inadequate.

4. **Intensified Wildfires**: As nights warm, the relative humidity stays low, preventing the nighttime moisture recovery that used to naturally dampen fires. Wildfires now remain aggressively active through the night, making them much more unpredictable and dangerous to combat.
5. **Ecosystem Imbalance**: Many nocturnal animals, insects, and pollinators are adapted to specific nighttime temperature ranges. Warmer nights alter their hunting patterns, reproductive cycles, and geographical ranges, throwing entire local food webs out of sync.
6. **Aggravated Air Pollution**: Rising nighttime temperatures can trap pollutants close to the ground. When the night stays warm, it alters the stability of the lower atmosphere, preventing the dispersion of ground-level ozone and particulate matter (PM 2.5). This creates stagnant, toxic air in the urban areas.

What needs to be done?

1. **Emission Reduction**: To permanently slow down the rise of nighttime temperatures, global society must rapidly transition away from fossil fuels and toward renewable energy, halting the accumulation of carbon dioxide and methane that traps infrared heat at night.
2. **Redesign Cities to Combat the Heat Island Effect**:
   - **Cool Pavements and Roofs:** Replacing traditional dark asphalt and roofing with highly reflective materials (cool roofs and cool pavements) prevents surfaces from absorbing solar radiation during the day.
   - **Massive Urban Greening:** Planting trees, creating pocket parks, and installing green roofs. Plants naturally cool the air through evapotranspiration and provide shade that prevents the ground from heating up in the first place.
   - **Wind Corridors:** Designing city layouts with building heights and spacings that encourage natural wind flow. This helps flush trapped heat out of urban centers after sunset.
3. **Revising Heatwave Definitions:** Weather bureaus must issue heat warnings based on minimum nighttime temperatures, not just daytime peaks. A day that hits 38°C followed by a 28°C night is far more dangerous than one followed by a 20°C night.
4. **Smart Grid Management:** Power companies must fortify the electrical grid to handle 24/7 peak demand, incorporating large-scale battery storage to handle the relentless overnight air conditioning load without blackouts.
5. **Agriculture Adaptations:**
   - Develop and promote heat-tolerant crop varieties that can withstand warmer nights.
   - Use night-time irrigation techniques to cool soil and crops during warm nights.
   - Shift planting schedules to align with changing temperature patterns.
   - Install automated misting systems and fans in barns that trigger specifically at night to help dairy cows and livestock shed daytime heat stress.
6. **Cooling Shelters & Infrastructure:** Cities need to provide **24-hour cooling shelters** for those without AC at home, as well as **cool bus stops** and public **water kiosks** where people can access relief at any hour.

UPSC GS-1: Geography
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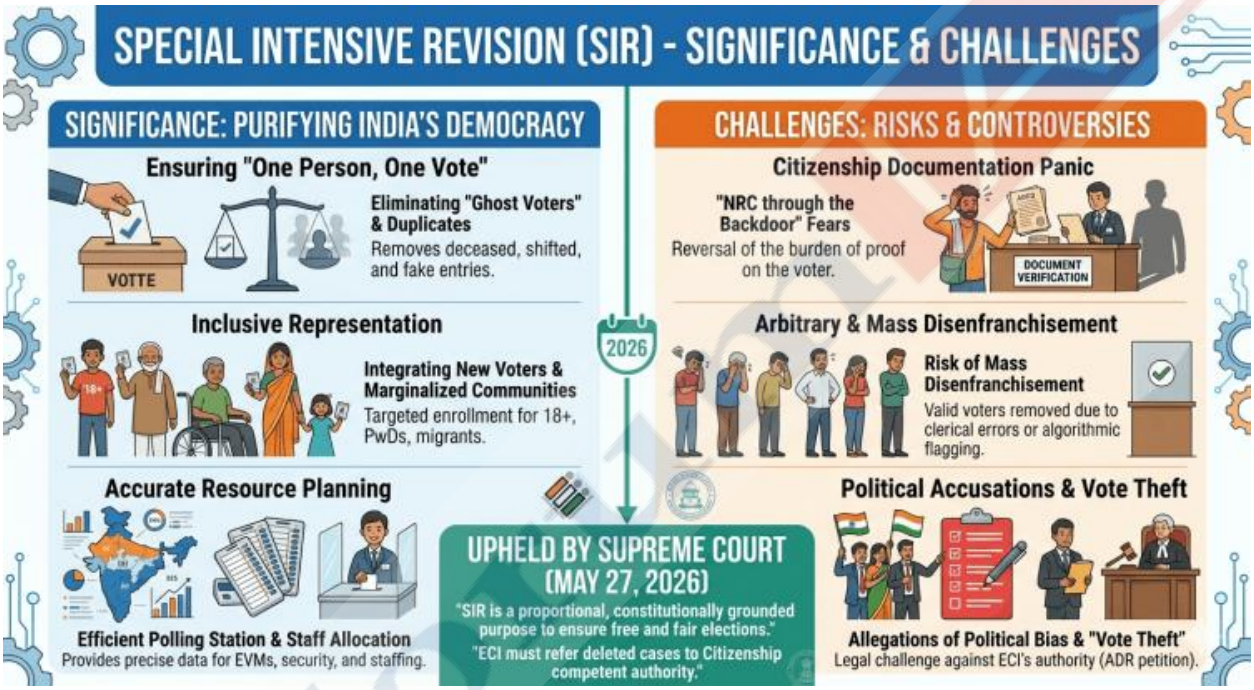
Special Intensive Revision (SIR) of Electoral Rolls – Significance & Challenges – Explained Pointwise

Recently, the Supreme Court completely upheld the legal and constitutional validity of the Election Commission of India's (ECI) Special Intensive Revision (SIR) exercise & also upheld the procedure followed by the EC. ECI, using its discretionary powers under **Section 21(3)** of **Representation of People Act, 1950**, conducted the Special Intensive Revision (SIR) of electoral rolls for the entire country, starting first from Bihar. It was first such exercise in more than 2 decades (last took place in 2004). However, the exercise has also triggered several controversies with opposition political parties questioning the exercise. Thus, it is important to understand Why & by what process ECI carry out revision of electoral rolls & its significance along with the limitations that it has.



What is Special Intensive Revision?

- A **Special Intensive Revision (SIR)** is a focused, time-bound exercise conducted by the Election Commission of India (ECI) to update and verify the accuracy of electoral rolls.
- Electoral revisions are of 3 types:
    - **Summary Revision:** Annual revision of electoral rolls for routine maintenance + No door-to-door verification.
    - **Intensive Revision:** Major overhaul of electoral rolls + Includes door-to-door verification.
    - **Special Revision:** Undertaken in exceptional cases such as missed areas, large-scale errors, legal or political exigencies etc.
- Unlike routine summary revisions, which are annual and involve only minor updates, an intensive revision involves full, fresh preparation of electoral rolls through **house-to-house verification** by Booth Level Officers (BLOs) to ensure that:
    - All eligible citizens are included in the electoral rolls.
    - Ineligible or duplicate entries are removed.
    - The voter list is accurate, inclusive, and transparent.

- For the latest SIR, ECI has adopted a hybrid approach – combining the characteristics of **intensive revision** as well as **summary revision**. It has also introduced a new step – the requirement of documentary proof at the enumeration stage itself – which is a departure from past practice. The '**special**' in this intensive revision in effect signals its methodological flexibility.
- Intensive revisions have been undertaken earlier **13 times** in **1952-56, 1957, 1961, 1965, 1966, 1983-84, 1987-89, 1992, 1993, 1995, 2002, 2003 & 2004.**

What are the Key Features of SIR?

- **Constitutional Mandate:** The exercise is backed by **Article 324** of the Indian Constitution, which grants the ECI total superintendence and control over elections.
- **Statutory Power:** It is formally conducted under **Section 21(3) of the Representation of the People Act, 1950**, allowing the Commission discretionary powers to comprehensively overhaul and refine rolls when ordinary revisions fall short.
- **Hybrid Approach:** The SIR combines features of both intensive and summary revisions. It includes door-to-door field verification (like intensive revision) and also uses existing rolls for distributing enumeration forms (like summary revision).
- **Documentary Proof:** For the first time, even existing electors (enrolled after 2003) must provide documentary proof of date and/or place of birth during enumeration.
- **Approved Documentation:** Electors are required to furnish strict proof of residence and identity. Following a pivotal Supreme Court ruling, widely accepted documents like **Aadhaar, Voter ID, and ration cards** are seamlessly utilized to prevent genuine eligible citizens from facing procedural exclusion.
- **House-to-House Enumeration:** Booth Level Officers (BLOs) visit every house in the assigned polling booth area and distribute pre-filled "Enumeration Forms" to existing electors and new eligible persons.
- **Duplicate & Invalid Entry Removal:** SIR systematically removes entries of deceased persons, those who have relocated, and duplicates — ensuring every registered voter entry is verified, genuine, and currently valid.
- **Special Focus on Vulnerable Groups:** There is special emphasis on migrants, youth, and excluded electorates to ensure no eligible voter is left out.
- **Draft Publication & Grievance Redressal:** A draft roll is published, objections are entertained, and a grievance redressal mechanism is applied before finalizing the rolls.
- **Final Roll & Freeze:** The final roll is constituted and frozen ahead of elections, with additions and deletions after that restricted to special cases only.

Why do we need the revision of electoral rolls?

1. **Foundation of Free and Fair Elections**: As the Supreme Court observed, "Free and fair elections do not rest merely upon the mechanics of polling. They fundamentally depend upon the integrity, accuracy and credibility of the electoral rolls, which form the foundation of the democratic process."
2. **Ensuring Electoral Roll Purity and Accuracy:** SIR is the most effective method for identifying and deleting names of deceased persons, duplicate entries, and individuals who have permanently shifted residence from the electoral roll. This prevents fraudulent voting and ensures that only eligible citizens vote. It provides an opportunity to correct errors in names, addresses, age, and other details, leading to a more accurate and reliable voter list.

3. **Preventing Inclusion of Ineligible/Foreign Persons**: The inclusion of foreign illegal immigrants has been cited as one of the key reasons necessitating an intensive revision of electoral rolls, to ensure that only genuine Indian citizens participate in elections.
4. **Identifies Unenrolled Voters:** Through house-to-house enumeration, BLOs can identify eligible citizens who have turned 18, or who were previously missed, and assist them in registering. This is crucial for expanding the democratic franchise and ensuring universal adult suffrage.
5. **Addresses Demographic Shifts:** Given India's rapid urbanization and internal migration, SIR helps in updating the rolls to reflect demographic changes, ensuring that migrant populations are correctly enrolled in their new places of residence.
6. **Strengthening Public Trust in Elections:** A transparent and rigorously updated electoral roll builds confidence among voters, political parties, and the general public in the fairness and legitimacy of the election process. When the voter list is perceived as pure, it enhances trust in election results.
7. **Addressing Concerns from Political Parties:** Political parties often raise concerns about the integrity of electoral rolls, especially regarding the inclusion of illegal voters or exclusion of genuine ones. SIR is the ECI's most robust tool to address such concerns and ensure a level playing field.
8. **Legal and Constitutional Mandate:** The ECI's power to conduct such revisions is enshrined in the Constitution and the Representation of the People Act, 1950. Conducting SIR fulfills the ECI's constitutional mandate to ensure free and fair elections.

What are the challenges and controversies associated with SIR?

1. **Risk of Disenfranchisement of Genuine Voters:** This is by far the biggest challenge and source of controversy. SIRs often demand specific, sometimes old, documents to prove citizenship, date of birth, and ordinary residence (e.g., pre-1987 documents, parental birth certificates). Many vulnerable groups, including:
    a. **Marginalized Communities:** Such as Scheduled Castes (SCs), Scheduled Tribes (STs), and minorities (e.g., Muslims), who may historically lack formal birth records or land deeds.
    b. **Migrant Workers:** Who frequently move for work and may not have stable residence proof or be present at their native village during the verification period.
    c. **Poor and Illiterate Individuals:** Who may not understand the process or have the resources to obtain complex documents.
    d. **Women:** Especially those who have migrated after marriage, who may face difficulties in producing parental documents or documents from their place of birth.
2. **Burden of Proof Shifted to Citizen:** Instead of the state being primarily responsible for ensuring all eligible voters are on the roll, the onus often shifts to the individual to prove their eligibility, which can be an overwhelming task for many.
3. **Scale of Deletions:** The sheer volume of names purged has caused intense friction. For instance, during the initial phases of the rollout, millions of voters were removed from the rolls across states like Bihar and West Bengal.
4. **Timing of the Exercise**: Opposition parties alleged that the timing of the SIR — close to important electoral events — creates unnecessary confusion and administrative overload, potentially disadvantaging certain voter groups.
5. **Logistical and Administrative Burden:**
    a. **Massive Scale:** India's electorate is enormous. Conducting house-to-house surveys for millions of households is a monumental logistical task, requiring a vast number of Booth Level Officers (BLOs) and supervisory staff.

b. **Short Timelines:** SIRs are often conducted within relatively short, strict deadlines (e.g. 30 days for enumeration), which can be impractical, especially in large, densely populated, or remote areas, or during adverse weather conditions (like monsoon season in Bihar). This hurried process can lead to errors and omissions.

6. **Scope of ECI's Powers:** The debate often centers on whether the ECI, in the name of "purifying" rolls, oversteps its mandate by essentially conducting a de facto citizenship verification, which is primarily the domain of the Ministry of Home Affairs (MHA) under the Citizenship Act.
7. **Public Perception and Trust Deficit:** When the process is seen as exclusionary or politically motivated, it can erode public trust in the ECI's impartiality and the fairness of the electoral system itself.
8. **The "NRC through the Backdoor" Fear:** A major political flashpoint—particularly in states like West Bengal and Assam—is the fear that SIR is a covert step toward implementing a National Register of Citizens (NRC). Critics and opposition parties note that the intense scrutiny caused widespread panic among migrant workers and marginalized communities.
9. **Uneven Implementation Across Constituencies**: Critics point to uneven implementation across constituencies, with procedural shortcomings varying significantly from region to region, raising concerns about fairness and consistency of the exercise.

What are the issues raised by ADR and other petitioners in their challenge to the SIR before the Supreme Court?

1. **Lack of Statutory Backing**: The main objection was that the SIR effectively turned the Election Commission into a body deciding citizenship issues without clear legal authority. Petitioners argued that the ECI does not have the power to carry out large-scale citizenship checks in the name of cleaning up electoral rolls.
2. **Violation of Constitutional Rights**: The petitioners argued that the SIR exercise violated fundamental rights guaranteed under the Constitution, including:
    - **Articles 14, 19, and 21:** They claimed the process was arbitrary, lacked transparency, and violated the right to life and personal liberty by failing to follow principles of natural justice.
    - **Articles 325 and 326:** They argued that the manner of the revision threatened the universality of adult suffrage.
3. **Ultra Vires of Section 21(3) RP Act**: The ECI based its notification on Section 21(3) of the Representation of the People Act, 1950, which allows "special revisions" of electoral rolls. However, the this provision was originally meant only for limited or exceptional corrections in specific constituencies. Using it for a large-scale, fresh revision of voter rolls across an entire state or the country went beyond the law's original purpose.
4. **Reversal of the Burden of Proof**: The petitioners argued that the SIR reversed a well-settled legal presumption established by the Supreme Court in **Lal Babu Hussein vs. Electoral Registration Officer (1995)**, which dictates that a person whose name is already on the voter list is presumed to be an Indian citizen unless the State proves otherwise. The SIR required voters whose names were not in the 2002/2003 "legacy rolls" to **prove their citizenship** by furnishing specific documents.
5. **Discriminatory Documentation Barriers**: The stringent document requirements heavily penalized economically weaker sections, illiterate populations, and internal migrant laborers. Because these groups are less likely to possess pristine ancestral legacy records.

What did the Supreme Court rule?

1. **ECI Has the Power to Conduct SIR**: The Court ruled that the ECI did not overstep its bounds. It held that the exercise is entirely justified under **Article 324 of the Constitution** (which gives the ECI

absolute control over elections) read with **Section 21(3) of the Representation of the People Act, 1950**.

2. **Scale of SIR**: SC rejected the argument that "special revisions" can only be done in isolated constituencies, ruling that the ECI can scale the exercise statewide or nationwide if systemic inaccuracies (like massive migration or duplication) require it.
3. **Citizenship Claim**:
    - The Court ruled that under Section 16 of the RP Act, the ECI is undoubtedly empowered to check citizenship for the **limited purpose** of deciding who gets included or excluded from a voter list.
    - The Court clarified that deleting someone's name on citizenship grounds **does not** mean the ECI has legally declared them a non-citizen. It simply means the ECI was "unable to be satisfied" for electoral purposes. Final adjudication rests with competent authorities under the **Citizenship Act.**
4. **Document Requirements & Inclusions**: The Court rejected claims that the ECI's strict document checklist was arbitrary. It ruled that any massive verification drive requires a structured, reliable framework. However, the Court noted that the process was made constitutionally compliant because of safeguards added during the hearings—most notably, the **inclusion of the Aadhaar card** as a valid document to ease the burden on ordinary citizens.
5. **Grievance Redressal & Safeguards**: The Court noted that decisions taken during the SIR are **subject to judicial review**. It also ordered the ECI to refer all persons deleted on citizenship grounds to the competent authority within four weeks, with orders for restoration of voting rights if they are found to be citizens.
6. **Procedural Integrity**: The Supreme Court ruled that the measures adopted in electoral roll revision "bear a reasonable nexus to the objectives sought to be achieved, are not manifestly excessive and are accompanied by sufficient procedural safeguards to prevent arbitrary exclusion."

Read More: The Hindu
UPSC GS-2: Representation of People's Act

India-Myanmar Relations – Significance & Challenges – Explained Pointwise

Myanmar President U Min Aung Hlaing is currently on an official visit to India. It is his first foreign visit after assuming the presidency and reflects Myanmar's efforts to enhance regional diplomatic engagement. During the visit, discussions are expected to focus on border security, connectivity projects, trade, economic cooperation, and cultural ties.

The India-Myanmar relationship is one of India's most strategically important but geopolitically complex partnerships. The relationship is currently dominated by India's competing needs for **border security** and its commitment to the **Act East Policy**, all while navigating the unstable political environment created by the 2021 military coup.

Map of major regions in Myanmar and India's northeastern states.

Historical Background of India-Myanmar Relationship:

India and Myanmar have a long history of cultural, religious, and trade links that date back to ancient times. As the land of Lord Buddha, India is a country of pilgrimage for the people of Myanmar.

Spread of Buddhism	Theravada Buddhism traveled from India to Myanmar through both land and maritime routes. Emperor Ashoka's missionaries (Sona and Uttara) are traditionally credited with bringing the faith to **Suvarnabhumi** (the Golden Land, encompassing parts of Lower Burma).

British Era	Both India and Myanmar were part of British India during colonial rule until 1935. **The Anglo-Burmese Wars:** Through three successive wars (1824–26, 1852, and 1885), the British East India Company and the British Raj systematically annexed Burmese territories. The **Treaty of Yandabo (1826)** concluded the First Anglo-Burmese War, forcing Burma to cede Assam, Manipur, Arakan, and Tenasserim, fundamentally restructuring the borderlands. **The Indian Diaspora & Demographics:** Under British rule, large numbers of Indians—including civil servants, merchants, laborers, and moneylenders (such as the Chettiars)—migrated to Burma.
Post Independence	After independence, India and Myanmar established diplomatic relations and maintained close ties. India and Myanmar signed a **Treaty of Friendship** in **1951**. Prime Minister Nehru and Prime Minister U Nu stood together as founding members of the **Non-Aligned Movement (NAM)** at the Bandung Conference in 1955. Ties hit a historic low during the **8888 Uprising (1988)**. India strongly condemned the military's brutal crackdown on pro-democracy protestors and openly championed Daw Aung San Suu Kyi, even granting her the Jawaharlal Nehru Award for International Understanding in 1992.
2002	The Indian Consulate in Mandalay was reopened, and the Consulate of Myanmar was set up in Kolkata.
2014	Myanmar became part of India's "**Neighbourhood First**" **policy** and its "**Act East" policy**.

What is the Significance of Myanmar for India?

1. **Geo-strategic:** Myanmar is India's gateway to South-East Asia and development of North-Eastern India. Myanmar is an important pillar of India's "Neighborhood First" policy and "Act East" Policy. **For e.g.** Development of India-Myanmar-Thailand (IMT) trilateral highway, Kaladan Multi-Modal Transit Transport (KMMTT) corridor relies on Myanmar.
2. **Counter-Insurgency Operations:** For decades, insurgent groups operating in India's Northeast (such as the NSCN, ULFA, and various Manipuri outfits) have utilized the dense, forested terrain of Myanmar's Sagaing Region and Chin State to set up safe havens. India relies heavily on the cooperation of the Myanmar military (*Tatmadaw*) to conduct coordinated border operations (like *Operation Sunrise*) to dismantle these camps.
3. **Border Management and Stability:** The border region is deeply interconnected by shared ethnicity, causing internal conflicts in Myanmar (such as the post-2021 civil strife) to directly spill over into India. Managing the influx of refugees, smuggling, and cross-border ethnic tensions requires continuous institutional engagement with Myanmar.

4. **Balancing China's Influence:** China has deep economic and strategic footprints in Myanmar, notably through the **China-Myanmar Economic Corridor (CMEC)**. This includes pipelines and a deep-sea port at **Kyaukphyu**, which gives Beijing direct access to the Indian Ocean—effectively bypassing the Malacca Strait. India's proactive diplomatic, economic, and defense engagement with Myanmar is crucial to prevent New Delhi from being strategically encircled along its eastern maritime flank.
5. **Energy Security:** Myanmar possesses significant offshore natural gas reserves (such as the Shwe gas project). Indian public sector undertakings (like ONGC Videsh and GAIL) have invested heavily in these fields, helping diversify India's energy import basket.
6. **Reduction of illegal migration in India:** A stable Myanmar is necessary to reduce the illegal Rohingya and Chin migration in India.
7. **Cultural Soft Power:** The shared heritage of Theravada Buddhism creates an enduring cultural bond. India utilizes "Buddhist Circuit" tourism and the restoration of historical sites in Myanmar (such as the Ananda Temple in Bagan) to strengthen bilateral people-to-people ties.

What are the Major Areas of Cooperation Between India and Myanmar:

1. **Bilateral Trade Dynamics:** Trade between the two countries reaches roughly **$2.1 billion annually**. India's imports from Myanmar are heavily dominated by agricultural commodities (beans, pulses, and timber products account for nearly 90%), while India primarily exports pharmaceuticals, semi-finished steel, and heavy machinery. Indian companies such as Essar, GAIL, and ONGC Videsh Ltd. have invested in Myanmar's energy sector.
2. **Infrastructure and Connectivity:** India-Myanmar relations has been bolstered by the key connectivity projects. India has invested deeply in the infrastructure projects in Myanmar:
    - India and Myanmar inaugurated the 250-kilometer **Tamu-Kalewa-Kalemyo highway**, popularly called the Indo-Myanmar Friendship Road, in 2001.
    - India is building the **Kaladan Multi-Modal Transit Transport** to link Kolkata to Sittwe in Myanmar and then from Myanmar's Kaladan river to India's North-East.

    - India, Myanmar, and Thailand are building the **Asian Trilateral Highway**, which will connect India to ASEAN.

3. **Free Movement Regime (FMR):** The border is governed by an FMR, which allows people residing within 16 km on either side to cross without a visa. This facilitates local tribal links (especially the Kuki-Chin-Mizo communities) but is a major security challenge, especially during conflicts.
4. **Defence cooperation:**
    - India and Myanmar conduct a joint military exercise, called **India – Myanmar Bilateral Military Exercise (IMBEX)**.
    - **Operation Sunrise** between India-Myanmar armies jointly target the militant groups that operate in the border states.
5. **Multilateral partnership:** Myanmar is also a key component of India's strategy to bridge South and South-East Asia through ASEAN, BIMSTEC, and Mekong Ganga Cooperation (MGC).
6. **The Rakhine State Development Programme:** India provides targeted financial grants to build prefabricated houses, schools, and local infrastructure in conflict-prone areas to encourage socio-economic stability.
7. **Education and research:** India has developed Myanmar Institute of Information and Technology and Advanced Center for Agricultural Research and Education (ACARE) for conducting research on pulses and oilseeds.
8. **Humanitarian Aid and Disaster Relief:** India has provided humanitarian aid and disaster relief in natural calamities in Myanmar like Cyclone Mora (2017), Komen (2015), earthquake in Shan State (2010) and COVID-19.

What are the Challenges in India-Myanmar Relations?

1. **Political Unrest in Myanmar:**
    - **Military Coup in 2021:** Aung San Suu Kyi's National League for Democracy (NLD) landslide victory in the 2020 elections sparked concern among the military. The military (Tatmadaw) alleged electoral fraud and staged a coup in February 2021. Aung San Suu Kyi and other leaders were detained, sparking widespread protests and a violent military crackdown.

- **Anti-Junta Armed Struggle:** Various Ethnic Armed Organizations (EAOs) and People's Defence Forces (PDFs) intensified their resistance against the military regime, resulting in escalating conflicts across the country.

2. **India's Policy Paradox with respect to Myanmar Coup:** India faces a dilemma in the form of its commitment to democracy vs. its internal security concerns. On one hand, India has been engaging with the military junta to control insurgent groups operating along the India Myanmar border. On the other hand, India also favours the establishment of federal democracy in Myanmar.
3. **Massive Influx of Refugees in India:** The ongoing armed struggle between the military Junta and the People's Defence forces in the Chin region, Sagaing region have led to massive influx of refugees in India, especially in Mizoram and Manipur. This influx of refugees in India has emerged as a major bone of contention between India and Myanmar, as these have been linked to violent ethnic clashes, drug trafficking and smuggling.
4. **Misuse of Free movement regime:** The Free Movement Regime between India and Myanmar is being exploited by militants and cross-border criminals for the illegal transportation of weapons, contraband goods, and counterfeit Indian currency.
5. **Safe Havens for Indian Insurgents:** Indian insurgent groups (such as ULFA, NSCN, and Manipuri outfits) continue to exploit ungoverned spaces in Myanmar's Sagaing Region to maintain training camps, launch cross-border attacks, and slip back into sanctuary.
6. **The "Golden Triangle" Nexus:** Proximity to the notorious Golden Triangle makes the porous border a major transit corridor for high-grade narcotics, illegal arms smuggling, and synthetic drugs.

7. **Massive Footprint of China**: Through the **China-Myanmar Economic Corridor (CMEC)**, Beijing provides the cash-strapped junta with massive investments, veto protection at the UN, and strategic infrastructure like the Kyaukphyu deep-sea port. China's access to the Bay of Bengal directly bypasses

the Malacca Strait bottleneck, posing a long-term maritime challenge to India's security umbrella in the Indian Ocean. India finds it incredibly difficult to match China's financial muscle and rapid project execution speeds.

8. **Delays in regional connectivity Projects:** The inordinate delays in the implementation of the connectivity projects like the Kaladan Multimodal Connectivity project have widened the trust deficit between India and Myanmar.
9. **Cyber Scam Centers:** A major emerging threat is the rapid proliferation of sophisticated cyber scam syndicates and human trafficking networks operating out of lawless border zones in Myanmar, trapping thousands of foreign nationals—including hundreds of Indian citizens—in forced cyber slavery.

What should be the Way Forward?

1. **Support for democracy and human rights:** The United Nations Special Rapporteur has reported an increase in India's arms supply to the military since the coup. Arming the Tatmadaw (Myanmar Military) undermines India's position on restoring democracy. India should continue to advocate for the restoration of democracy and respect for human rights in Myanmar like the release of political prisoners and ending the military junta's crackdown on dissent.
2. **Engagement with all stakeholders:** India should use its influence to open channels of dialogue with and between the junta and the opposition, including armed ethnic groups.
3. **Use of Regional Organisations for enhanced cooperation:** India should collaborate closely with the ASEAN nations for a peace plan for Myanmar.
4. **Enhanced Economic Engagement:** India should continue to engage with Myanmar economically to promote sustainable development for the benefit of the people of Myanmar. The delayed connectivity projects like the Kaladan and Asian Trilateral Highways must be expedited at the earliest.
5. **Closer Security Cooperation:** India must closely collaborate with Myanmar in intelligence sharing and coordinated efforts to combat insurgencies and drug trafficking.
6. **Grassroots Development Grants:** Focus developmental funding on high-impact local programs, such as providing medical supplies, constructing mobile health clinics, and funding local primary education infrastructure through initiatives like the Rakhine State Development Programme.
7. **Leverage Spiritual Diplomacy:** Deepen ties through the common ground of Theravada Buddhism. Streamlining and subsidizing travel on the **"Buddhist Circuit"** for Myanmar nationals wishing to visit Bodh Gaya and Sarnath acts as an enduring bridge for people-to-people relations.
8. **Targeting Cyber Scam Syndicates:** India must prioritize high-level intelligence sharing and joint police operations with regional authorities to locate, dismantle, and rescue Indian nationals trapped in forced labor within cyber scam factories operating out of Myanmar's lawless pockets.

Conclusion: India-Myanmar relations remain vital for India's eastern strategy, Northeast integration, regional stability, and for managing China's expanding influence—necessitating patient engagement, rapid implementation of projects, and balanced diplomatic outreach.

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