



7 PM COMPILATION

3rd and 4th week September, 2026

Features of 7 PM compilation

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

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UPI Merchant Charges – Rationale & Impact – Explained Pointwise

The government has recently introduced a **0.4% Merchant Discount Rate (MDR)** on specified UPI payments to merchants above ₹2,000, while keeping person-to-person transactions and most small-value merchant payments free. The move seeks to strengthen the long-term sustainability of the UPI ecosystem, but also raises concerns regarding digital-payment adoption and financial inclusion.

What is the recent government decision regarding charges on UPI transactions?

- The Government of India and the National Payments Corporation of India (NPCI) decided to apply a new **Merchant Discount Rate (MDR) framework** for Unified Payments Interface (UPI) transactions, effective October 15, 2026.
- Earlier, in August, Parliament passed the Taxation and Other Laws (Amendment) Bill, 2026 during the Monsoon Session, amending Section 10A of the **Payment and Settlement Systems Act, 2007**. The amendment doesn't itself impose any fee, but it allows the government to notify a Merchant Discount Rate (MDR) on certain electronic payment modes going forward.
- Under the new MDR framework:
 - **0.4% MDR** will apply to specified **Person-to-Merchant (P2M) UPI transactions above ₹2,000**.
 - For transactions of **₹75,000 or more**, the MDR will be capped at **₹300 per transaction**.
 - **Person-to-Person (P2P) UPI transactions will remain completely free**, irrespective of the amount.
 - Merchant payments **up to ₹2,000 will remain free**.
 - Small merchants receiving up to **₹1 lakh per month through UPI QR codes** will continue to enjoy zero MDR. Over 96% of all merchant transactions fall into these free categories.
 - In sectors such as **railways, telecom, insurance, fuel and agricultural inputs**, transactions above ₹2,000 will attract a **flat ₹5 MDR**.
- The government has clarified that MDR is a **merchant-side charge, not a fee collected from consumers by the government**. Banks have been advised to prevent merchants from passing it on to customers.

What are the major reasons behind this decision?

1. **Ensure long-term sustainability of UPI:** UPI has expanded to a very large scale, creating continuing costs for payment infrastructure, operations and technological upgrades. A revenue stream is intended to make the ecosystem more financially sustainable.
2. **Support payment infrastructure:** MDR revenue will be distributed among ecosystem participants such as banks, payment service providers and UPI application providers, helping them maintain and expand payment infrastructure.
3. **Encourage wider expansion of UPI:** The government intends that the revenue model should support further expansion of UPI, particularly into rural and semi-urban areas. Moreover, a predictable revenue model can encourage banks and payment platforms to continue onboarding merchants and developing UPI-based services.
4. **Reduce dependence on government-funded incentives:** Until now, UPI transactions have largely been subject to zero MDR, limiting the direct revenue earned by banks and payment service providers from many UPI payments. The government therefore provided financial incentives to compensate ecosystem participants for promoting low-value UPI transactions. The new framework will create a direct revenue stream within the payment ecosystem, thereby reducing reliance on budgetary support.
5. **Fund cybersecurity and fraud prevention:** The rapid growth of UPI transactions has increased the need for stronger cybersecurity, fraud detection and prevention mechanisms. Revenue generated

through MDR can help payment ecosystem participants invest in real-time fraud monitoring, secure payment infrastructure, data protection, authentication systems and faster response mechanisms.

6. **Maintain affordability while creating revenue:** Rather than applying MDR universally, the government has limited it to specified P2M transactions above ₹2,000, while keeping P2P payments and most merchant transactions free. The government estimates that about 96% of P2M transactions will remain unaffected.
7. **International expansion:** A financially sustainable domestic ecosystem can also support India's efforts to expand UPI's interoperability and acceptance in other countries, strengthening India's digital-payment footprint.

What are the likely impacts of introducing merchant charges on UPI transactions?

Positive Impacts:

1. **Improved financial sustainability:** New MDR framework can create a more sustainable revenue stream for participants in the digital-payment ecosystem. It can help banks & payment service providers recover part of the costs associated with maintaining payment infrastructure, cybersecurity, fraud prevention and technological upgrades.
2. **Greater investment in infrastructure:** Revenue generated through merchant charges can provide payment ecosystem participants with additional resources to upgrade digital payment infrastructure. This can support improvements in transaction capacity, fraud detection, data protection and system resilience, enabling UPI to handle rising transaction volumes more efficiently and reliably.
3. **Greater competition among payment providers:** The introduction of MDR could create a more sustainable revenue model for banks, fintech companies and other payment service providers. This could encourage competition based on service quality, reliability and value-added features, rather than relying primarily on transaction volumes and market share.
4. **Reduced pressure on government finances:** A revenue-based MDR framework can reduce the UPI ecosystem's dependence on government-funded incentives to compensate banks and payment service providers for zero-MDR transactions.

Negative Impacts:

1. **Higher costs for some merchants:** The introduction of MDR will increase payment-processing costs for merchants undertaking specified higher-value UPI transactions. Although the charge is relatively small, it could affect businesses operating on thin profit margins, particularly in sectors with high transaction volumes.
2. **Possible pass-through to consumers:** Although the MDR is a merchant-side charge, some merchants may attempt to recover the additional cost from consumers by increasing prices or adding a separate payment fee.
3. **Possible shift towards cash or alternative modes:** Introducing merchant charges on certain higher-value UPI transactions could encourage some merchants to prefer cash or alternative digital payment methods to reduce transaction costs.

How are major instant payment systems around the world funded?

Instant Payment System	Country	How it is funded?

Pix	Brazil	Individuals generally use Pix free of charge, while merchants can be charged by their financial institutions for receiving payments. This creates a merchant-funded component while keeping retail users largely free.
FedNow	USA	FedNow is operated by the Federal Reserve as an infrastructure service for participating banks and credit unions. The Federal Reserve invested about \$545 million in developing the system, while participating institutions pay service fees to access it.
Faster Payments	UK	Operated through the UK's banking/payment infrastructure, with participating financial institutions bearing system and participation costs. The costs can ultimately be reflected in the broader commercial pricing of banking services.
PayNow	Singapore	Operated as part of Singapore's banking/payment infrastructure. Consumers generally receive a low-cost or free retail experience, while participating financial institutions bear infrastructure and participation costs.

What should be the way forward?

1. **Maintain affordability:** UPI charges should be designed in a manner that preserves the affordability and convenience of digital payments, especially for low-value transactions and small merchants. The government should continue to keep essential, everyday payments free or minimally priced, while ensuring that any charges on higher-value transactions remain proportionate.
2. **Protect small merchants:** MDR framework should provide adequate exemptions or concessional rates for micro and small businesses. The government can also use transaction-value and turnover-based thresholds to ensure that larger businesses contribute more while small merchants remain protected.
3. **Monitor impact on cash usage:** The government and Reserve Bank of India should regularly assess whether merchant charges are encouraging businesses to shift from UPI towards cash or other payment modes. If evidence shows that charges are discouraging digital payments, the pricing structure could be reviewed, particularly for small businesses and low-margin sectors.
4. **Gradually develop a sustainable pricing model:** India should gradually move towards a financially sustainable pricing model for UPI without undermining its affordability and widespread adoption. Any charges should be proportionate to transaction value and the cost of providing the service. The government can periodically review MDR rates based on transaction volumes, ecosystem costs, and merchant profitability.
5. **Balance sustainability with financial inclusion:** The pricing framework should protect low-value transactions and small merchants, while ensuring that payment providers have adequate incentives to invest in a secure and reliable digital-payment ecosystem. This would help preserve UPI's role as an instrument of financial inclusion, digitalisation and accessible payments.

UPSC GS-3: Indian Economy
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India's Fisheries Sector – Significance & Challenges – Explained Pointwise



India ranks as the world's **2nd largest fish-producing nation**, accounting for approximately **8%** of global output. The fisheries sector constitutes a vital component of national food security, employment generation, and income enhancement, particularly across coastal and rural economies. Reflecting its growing structural significance, fisheries account for nearly **7.43%** of Agricultural Gross Value Added (GVA), the highest share among the agriculture and allied sectors. In this regard, let us understand the significance of the fisheries sector & the challenges that it is presently facing, as well as the various policy intervention provided to promote its growth.

What is meant by the fisheries sector?

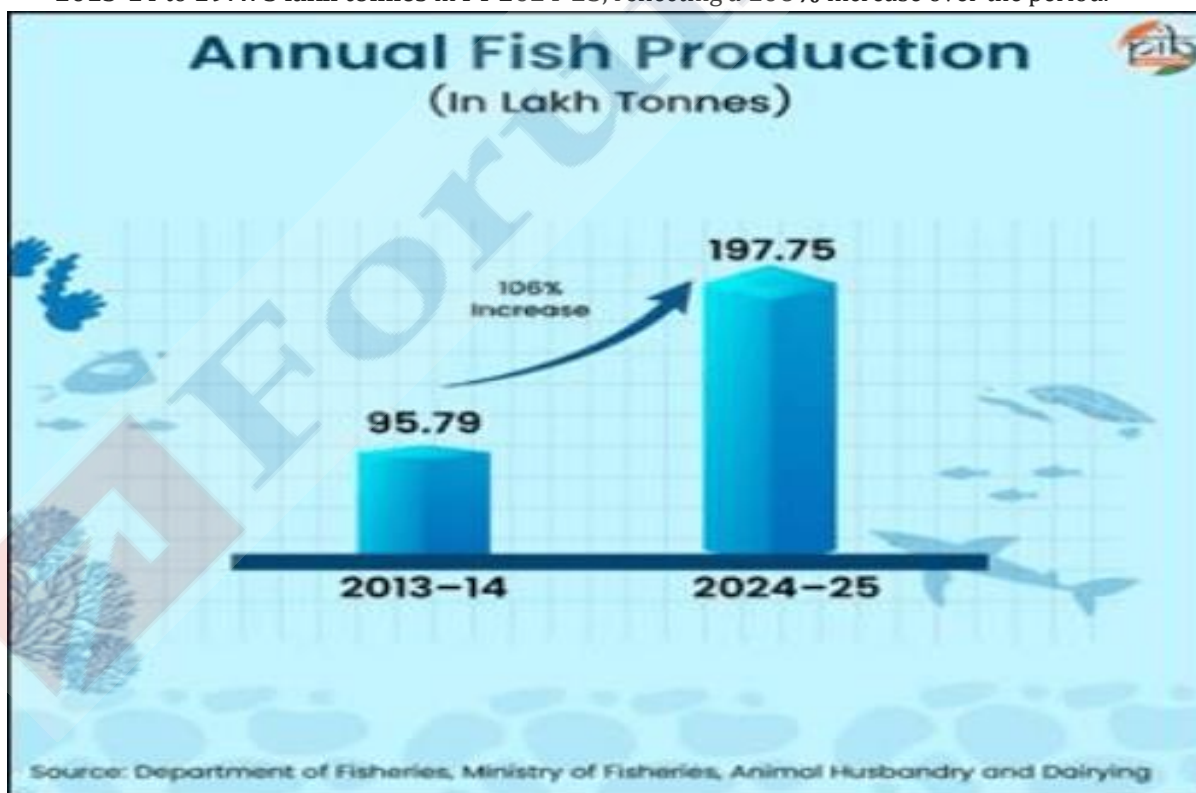
- The **fisheries sector** is a vital part of the global economy and food system. It involves the **harvesting, processing, distribution, and management of fish and other aquatic organisms** such as crustaceans (shrimp, crabs), mollusks (oysters, clams), and aquatic plants.
- Fisheries sector includes:

Marine Fisheries	Capture of fish from the seas and oceans: ○ Coastal Fisheries: Traditional and mechanized fishing within the territorial waters. ○ Deep-Sea Fishing: Operates in the Exclusive Economic Zone (EEZ) and high seas.
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	○ Mariculture: The farming of marine organisms in the open ocean or enclosed sections of the ocean.
Inland Fisheries	Largest contributor to India's total fish production (roughly 70%). ○ Capture Fisheries: Harvesting fish from open water bodies like rivers, canals, lakes, and reservoirs. ○ Aquaculture: Farming of fish and aquatic organisms under controlled conditions: ○ Freshwater Aquaculture: Farming in man-made ponds and tanks. ○ Brackishwater Aquaculture: Farming in water that has more salinity than freshwater but less than seawater.

What is the current status of the fisheries sector in India?

- India has one of the world's largest inland reservoir networks, spanning approximately **31.5 lakh hectares**, offering significant potential for expanding inland fisheries.
- India's extensive coastline of over **11,099 km** and an Exclusive Economic Zone (EEZ) of approximately **24 lakh square kilometers** sustain the livelihoods of more than **50 lakh members** of the fishing community across 13 maritime States and Union Territories.
- Backed by sustained interventions, total fish output more than doubled from **95.79 lakh tonnes** in FY 2013-14 to **197.75 lakh tonnes** in FY 2024-25, reflecting a **106%** increase over the period.



Source: PIB

- Concurrently, seafood exports expanded significantly, reaching **₹62,408 crore** in FY 2024-25. Frozen shrimp remains the dominant export commodity, with the United States and China serving as key markets, highlighting the sector's expanding scale and growing global competitiveness.



Source: PIB

Marine Fish Stock Status of India:

ICAR-Central Marine Fisheries Research Institute (CMFRI) has assessed the status of India's commercially important marine fish stocks using scientific stock assessment methods. Some of the key findings are:

- 91.1% of the 135 commercially important fish stocks** assessed in 2022 were found to be **biologically sustainable**, indicating that current exploitation levels are generally within sustainable limits.
- Around **8.9% of the assessed stocks** were found to be **overfished or undergoing overfishing**, highlighting the need for targeted conservation and fishery management measures.
- CMFRI highlighted immense potential in seaweed farming, identifying **333 prospective seaweed farming sites** covering nearly 23,950 hectares. While India's current production is minor, the report noted it could provide substantial alternative revenue for coastal communities.

What is the significance of the fisheries sector and aquaculture?

- Food & Nutrition Security:** Fish is an affordable and accessible source of animal protein, vitamins, and omega-3 fatty acids, making it essential for combating malnutrition in rural and coastal communities. The sector is often vital to the dietary habits of vulnerable and marginalized populations.
- Economic Growth & Exports:** Fisheries are one of the fastest-growing allied agricultural sectors, contributing about \$6.24 billion (₹62,408 crore) in seafood exports in recent years. India is a leading exporter of shrimp globally. The sector also contributes roughly 1-2% to the national GDP and nearly 7.5% to the Agricultural Gross Value Added (GVA).
- Livelihoods & Employment:** Providing income for more than 28 million fishers, fish farmers, and allied workers, the industry is a massive driver of rural development. It supports vital supplementary

incomes for marginal farmers and provides active roles for women in processing, value-addition, and marketing. It strengthens rural and coastal economies and provides supplementary income to farmers.

4. **Resource Utilization & Potential:** India is blessed with vast resources, including over 8,000 km of coastline, vast estuaries, and millions of hectares of inland reservoirs and tanks. Modern aquaculture – such as brackish-water shrimp farming, cage culture, and advanced techniques like Recirculating Aquaculture Systems (RAS) – helps turn underutilized and even wastelands into highly productive assets.
5. **Empowering Women:** Aquaculture and fish processing are highly inclusive, providing significant employment and financial independence to women, who make up a large percentage of the post-harvest workforce (Women constitute **55-62% of the workforce**, especially dominant in post-harvest and processing operations (62%)).
6. **Biodiversity Protection:** Effective management of the sector – like implementing the sustainable practices outlined by institutes like CMFRI – ensures marine ecosystems remain balanced and resilient against climate change.
7. **Poverty Alleviation & Equity:** Fisheries sector provides supplementary income to small and marginal farmers. It offers livelihood options for landless and vulnerable communities through community-based or cage farming.
8. **Environmental & Ecosystem Benefits:** Fisheries sector:
 - Supports **aquatic biodiversity** when managed sustainably.
 - Promotes **carbon sequestration** and **coastal resilience** through mangrove-linked systems.
 - Reduces pressure on **wild fish stocks**, aiding **marine conservation**.

What issues are being faced by the fisheries sector and aquaculture?

1. **Overexploitation & Resource Sustainability:**
 - Although official data indicate that most of India's marine fish stocks are sustainable, the Food and Agriculture Organization (FAO) argues that India's marine fish production has reached a plateau, as most major fish stocks are already fully exploited. Scientific data indicates that **4.4%** of India's fish stocks are already overfished, with another **8.2%** under intense pressure. The situation is critical along the northwest coast, where **54.2% of fish stocks are overfished**.
 - Small-scale, mechanized trawling has caused significant seabed damage, and coastal states often **lack sufficient staff/patrol boats** to enforce the 5-nautical-mile no-trawling zone meant to protect inshore ecosystems.
2. **High Post-Harvest Losses:** Despite a 167% surge in inland aquaculture production to nearly 4 million tonnes, the sector suffers from high **Fish Loss and Waste (FLW)**. Marine fish losses have climbed to over **10%**, while dry fish losses are critically high at **37%**. These losses stem from inadequate cold-chain capacity, poor handling practices, and unhygienic landing sites.
3. **Lack of Export Market Diversification:** India's fisheries exports remain concentrated in a limited number of markets, particularly the **United States, China, Southeast Asia and the European Union**. Such concentration creates vulnerability because changes in tariffs, sanitary and phytosanitary (SPS) standards, consumer preferences, geopolitical tensions or economic slowdowns.
4. **Devastating Climate Change Impacts:**
 - Increased frequency of cyclones and unpredictable rainfall patterns disrupt fishing days and damage inland ponds.
 - Rising sea surface temperatures are causing species like sardines and mackerel to shift their distribution, moving deeper or further north, which makes them harder for traditional boats to reach.

Case Study:

In 2025, unseasonal rains and cyclones in Palghar, Maharashtra, destroyed dried fish stocks worth an estimated ₹100 crore, pushing over 1,00,000 fisherfolk to the brink. Despite being granted agricultural status, these fishing communities are often denied disaster relief packages available to farmers, leaving them with negligible compensation that fails to cover losses.

5. **Inshore Degradation and Destructive Fishing:** While deep-sea or overall fish stocks might occasionally show healthy numbers, **inshore coastal ecosystems are facing severe depletion**. The widespread use of non-selective bottom trawling destroys benthic habitats and results in massive amounts of “bycatch” (accidental capture of non-target, juvenile, or endangered species).
6. **Limited Value Addition:** India primarily exports raw frozen shrimp, missing out on the **30-40%** additional value that competitors like Vietnam capture through processing. This is due to inadequate cold-chain capacity, inconsistent farm supply, and weak integration between farmers, processors, and exporters.
7. **Slow Adoption of Advanced Technology:** While high-tech solutions like **Recirculating Aquaculture Systems (RAS)**, AI-driven feeding, and automated water-quality monitors exist, their high initial capital costs keep them out of reach for the vast majority of traditional farmers.
8. **High Input Costs:** Feed constitutes nearly **70% of production costs**. Rising prices of fishmeal and ingredients make it difficult for small farmers to maintain profitability.
9. **Global Competition:** India’s fisheries sector faces intense competition in international markets from major seafood-exporting countries such as **China, Vietnam, Thailand, Ecuador and Norway**. These countries often possess advanced processing technologies, better cold-chain infrastructure, stronger branding, and greater compliance with international quality standards.

What are the various government initiatives aimed at promoting the fisheries sector in India?

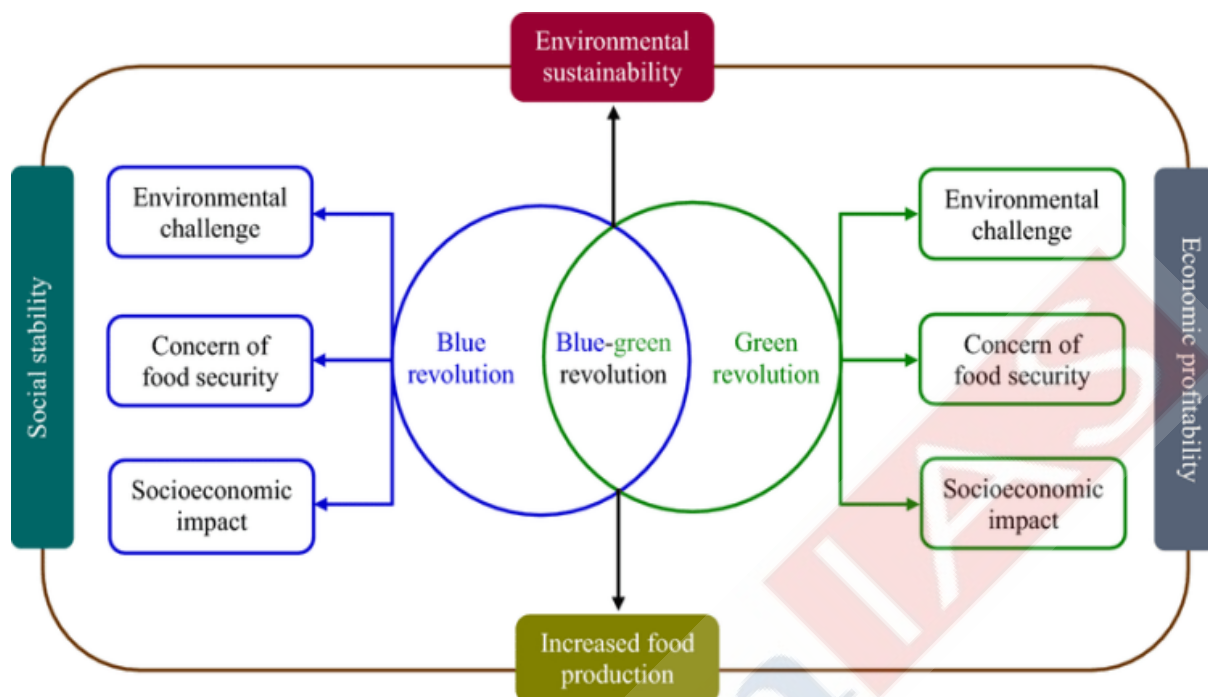
Blue Revolution	The Blue Revolution, launched in 2015, seeks to increase fish production and strengthen the fisheries value chain across inland and marine sectors by enhancing productivity, expanding infrastructure, and promoting modern practices. To build on these efforts and further advance post-harvest management, traceability, fisher welfare, and market linkages, the Government launched the Pradhan Mantri Matsya Sampada Yojana (PMMSY) in 2020 to accelerate the sector’s transformation.
Pradhan Mantri Matsya Sampada Yojana (PMMSY)	The PMMSY seeks to enhance fish production and productivity, upgrade quality standards, promote technological modernisation, strengthen post-harvest infrastructure, and improve fisheries governance. The scheme prioritises technology-driven aquaculture systems that improve productivity while optimising resource use. It promotes high-density, water-efficient models such as Recirculatory Aquaculture Systems (RAS) and Bio-floc technology, which enhance output, maintain quality, enable nutrient recycling, and support environmentally sustainable fish farming.

Pradhan Mantri Matsya Kisan Samridhi Sah-Yojana (PM-MKSSY)	The Pradhan Mantri Matsya Kisan Samridhi Sah-Yojana (PM-MKSSY) is a Central Sector sub-scheme implemented under the umbrella of the PMMSY. The scheme facilitates the structural transformation of the fisheries sector by advancing formalisation, expanding insurance coverage, strengthening access to institutional finance, and promoting quality assurance and traceability across the fisheries value chain. Pradhan Mantri Matsya Kisan Samridhi Sah-Yojana Focus Areas 01 Formalisation of unorganised fishers through digital identity under NFDP. 02 Improved access to institutional finance, including working capital. 03 One-time incentive for aquaculture insurance (one crop cycle). 04 Performance grants to improve A- efficiency of fisheries value-chain. B- Creation and maintenance of jobs. 05 Performance grants to promote A- Adoption, expansion of fish. B- fishery product quality and safety assurance systems. Source: Ministry of Fisheries, Animal Husbandry and Dairying
Kisan Credit Card for Fisheries	The Kisan Credit Card (KCC) scheme has become a pivotal instrument for advancing financial inclusion within India's agrarian economy. Structured to provide timely and affordable access to working capital, it enables farmers to finance the purchase of critical inputs and meet liquidity requirements for crop cultivation and allied activities. Since 2019, the scope of the scheme has been expanded to include animal husbandry, dairy, and fisheries. The Government has raised the lending limit under the KCC scheme for fisheries from Rs 2 lakh to Rs 5 lakh, thereby improving access to credit for fishers, farmers, processors, and other stakeholders.

Fisheries and Aquaculture Infrastructure Development Fund (FIDF)	FIDF was launched in 2018-19 to strengthen infrastructure across marine and inland fisheries and promote sustainable sectoral growth. The scheme offers a credit guarantee cover, helping fishers and entrepreneurs access much-needed credit with lower financial risk. It also provides an interest subvention of up to 3% per year.
National Policy on Marine Fisheries (NPMF), 2017	NPMF (2017) provides a comprehensive framework for sustainable development, management, and conservation of marine fisheries.
Marine Fisheries Census 2025	The National Marine Fisheries Census (MFC) 2025, launched in 2025 , represents a significant advancement toward fully digital, georeferenced data collection in India's fisheries sector.
Mission Amrit Sarovars	Under Mission Amrit Sarovar, the Government has facilitated the development of ~70,000 Amrit Sarovars , including 1,222 water bodies integrated with fisheries activities, thereby promoting fish culture, livelihood diversification, and the enhancement of aquatic ecosystems – thus, tapping the immense potential of inland fisheries in India.
Blue Economy and Deep-Sea Fishing Framework	The government introduced a dedicated enabling framework to sustainably harness fisheries from the Indian Exclusive Economic Zone (EEZ) and the High Seas. Special focus and financial resources are being funneled into the Andaman & Nicobar and Lakshadweep Islands to build modern marine hubs. Financial assistance is provided to traditional fishers to upgrade their vessels or transition from over-exploited near-shore waters into deep-sea resource fishing.

What should be the way forward?

1. **Blue-Green Revolution:** India's fisheries sector needs to move towards a **Blue-Green Revolution**, going beyond the present focus of the Blue Revolution. The Blue-Green Revolution represents a synthesis of the **Blue Revolution's** emphasis on productivity and the blue economy with **Green principles** of sustainability, climate resilience and resource efficiency.



Source: Research Gate

2. **Deep Sea Fishing and EEZ Utilization:** With near-shore waters facing overexploitation, attention is increasingly shifting towards deep-sea fishing. This requires investment in Blue Economy hubs in the Andaman & Nicobar and Lakshadweep Islands to support deep-sea fishing fleets. However, the FAO estimates that exploiting deep-sea resources would yield only a marginal increase in overall fish production.
3. **Prioritising Community-Led Models:** Fishermen Cooperative Societies and Fish Farmer Producer Organizations (FFPOs) should be given priority for deep-sea fishing operations. This empowers small-scale fishers by enabling them to access high-value resources like tuna.
4. **Good Aquaculture Practices (GAqP):** India should promote GAqP to improve the quality, safety and traceability of farmed fish and shrimp meant for export. Certification, traceability systems and regular testing can further build confidence among global buyers, reduce export rejections and enhance India's reputation as a reliable seafood supplier.
5. **Climate Resilience and Sustainability:**
 - **Species Diversification:** Moving beyond just shrimp and carp to high-value species like seaweed, tilapia, and sea bass which are more resilient to changing water temperatures.
 - **Integrated Multi-Trophic Aquaculture (IMTA):** Encouraging systems where the waste of one species (like fish) becomes the food for another (like seaweed or shellfish), creating a circular and eco-friendly farm model.
 - **Stricter Trawling Regulations:** Phasing out destructive bottom trawling in ecologically sensitive zones and introducing stricter enforcement of seasonal fishing bans using satellite monitoring.
6. **Move from Volume-Driven to Value-Driven Growth:** Shift export composition away from raw frozen shrimp (currently 70%+ of earnings) toward **processed, ready-to-eat, and higher-margin seafood products** – reducing vulnerability to tariff shocks like the recent US duty hikes.

7. **Diversify Export Markets:** Reduce overdependence on the US and China by actively developing markets in the **EU, Southeast Asia, Middle East, and Africa**, cushioning against demand shocks or trade policy shifts in any single market.

Conclusion: The fisheries sector is a critical contributor to India's economy, supporting the livelihoods of nearly 3 crore people, particularly among marginalised coastal and inland communities. If we are able to address the challenges faced by the sector then we will be able to move towards a more inclusive and resilient blue economy while contributing meaningfully to achieving **Sustainable Development Goal 14: Life Below Water** by sustainably managing fisheries and aquaculture.

UPSC GS-3: Agriculture

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Semiconductor Industry in India – Significance & Challenges – Explained Pointwise



Recently, Prime Minister Narendra Modi inaugurated the fifth edition of **SEMICON India 2026**. The event reflects India's transition from policy formulation towards actual semiconductor production and a broader domestic ecosystem.

India is emerging as a semiconductor hub, developing indigenous chips like **VIKRAM 3201**, **DHRUV64** to boost self-reliance. The market is growing from \$38 billion in 2023 and is expected to reach \$110 billion by FY30 & \$200bn by FY35.

This article examines the semiconductor industry in India, focusing on its significance, key challenges, government initiatives, and the way forward.

What are Semiconductors? What is their importance?

- **Semiconductors:** Semiconductors are materials whose electrical conductivity lies between that of conductors and insulators. Their conductivity can be controlled by factors such as temperature, impurities, electric fields and light. They can either be **pure elements**, like silicon or germanium or **compounds**, like gallium, arsenide, or cadmium selenide.

- **Important Properties of Semiconductors:**

- **Intermediate conductivity:** Their electrical conductivity is between conductors like copper and insulators like glass.
- **Negative temperature coefficient:** Unlike metals, their electrical resistance generally decreases as temperature increases, because more charge carriers become available.
- **Conductivity can be controlled:** Their conductivity can be deliberately modified by adding small quantities of impurities (a process called doping).
- **Sensitive to light:** Some semiconductors change their electrical behaviour when exposed to light, forming the basis of solar cells, photodiodes and light sensors.

Importance of Semiconductors:

1. **Foundation of modern electronics:** Semiconductor chips are the heart and brain of all modern electronics and communications technology products, contemporary automobiles, household gadgets such as refrigerators, and essential medical devices such as ECG machines.
2. **Propeller of emerging technologies:** The development of emerging technologies like AI, 5G, or driverless cars is dependent upon a fast and cheap semiconductor industry.
3. **Telecommunications:** Semiconductors are crucial for 5G/6G equipment, routers, satellites, optical communication and wireless devices, enabling high-speed communication.
4. **Economic importance:** The semiconductor industry supports high-value manufacturing, R&D, skilled employment, exports and technological innovation. Countries with strong semiconductor capabilities can participate more deeply in the global digital economy.
5. **Aiding the further development of electronic devices:** Semiconductors make the devices more compact, less expensive, and more powerful. **For e.g.** Semiconductor chips have enhanced the features of smartphones with powerful processing.
6. **Most traded products after petroleum:** Semiconductors are globally the most-traded products after petroleum and cars, with an annual turnover of \$500 billion.
7. **Transformative potential:** Semiconductors continue to enable the world's greatest breakthroughs and transformation in industries, ranging from aerospace and consumer electronics to energy and medicine.

What are the defining features of Semiconductor manufacturing?

Semiconductor manufacturing involves following stages:

Raw materials → Wafer manufacturing → Chip design → Fabrication → Packaging → Testing → Integration into electronic products

1. **Front-end manufacturing and back-end assembly:** Semiconductor manufacturing comprises the front-end fab manufacturing and the back-end assembly, including packaging and testing. However, the front-end fab manufacturing is a complex process, with only a handful of companies involved in large scale fab-manufacturing.
2. **Highly technology-intensive:** Manufacturing semiconductors requires advanced technologies such as photolithography, etching, deposition, ion implantation and chemical-mechanical polishing (CMP). Even tiny manufacturing errors can make a chip defective.
3. **Extremely high precision:** Modern chips contain billions of transistors on a very small area. Manufacturing therefore requires extremely precise control at microscopic and sometimes nanometre scales.

4. **Capital-intensive:** Setting up a semiconductor fabrication plant (**fab**) requires enormous investment in specialised equipment, cleanrooms and supporting infrastructure. Advanced fabs can require billions of dollars in capital.
5. **Requires ultra-clean environments:** Even microscopic particles can damage semiconductor wafers. Fabs therefore operate in highly controlled cleanrooms with strict control over dust, temperature, humidity and vibrations.
6. **Highly concentrated global supply chain:** Globally, the entire semiconductor value chain has seeped in the interdependence between a handful of countries like the **USA, Taiwan, Japan, China, and some European nations**. Within this chain, there's an extraordinary degree of specialisation that makes it vulnerable to shocks. **For e.g.** 100% of the world's most advanced (below 10 nanometres) semiconductor manufacturing facilities are located in just two countries, **Taiwan** and **South Korea**.
7. **Revenue sharing b/w few companies:** The top 3 companies in each stage of the semiconductor supply chain take in about 80-90% of the revenue.

Semiconductor manufacturing status in India:

1. **Semiconductor R&D footprint in India:** India has an existing base for design and verification for the semiconductor industry. Most of the global semiconductor companies having an R&D footprint in India.
2. **Fabrication facilities limited to strategic semiconductor development:** India has two fabs – **SITAR**, a unit of the Defence Research and Development Organisation (DRDO) in Bengaluru, and a **semiconductor laboratory** in Chandigarh. These build silicon chips for strategic purposes like defence and space, and not for commercial use.
3. **High import dependence:** **100%** of our semiconductor chips, memory, and display cards are imported into the country. In 2020, India spent \$15bn on electronic imports, with **37%** coming from China.
4. **Rapid expansion of ATMP/OSAT (Packing & Testing) facilities:** India has made faster progress in Assembly, Testing, Marking and Packaging (ATMP)/Outsourced Semiconductor Assembly and Test (OSAT).
5. **Strong position in chip design:** India already has a significant advantage in semiconductor design and engineering talent. Government data indicates that India hosts about **20%** of the global semiconductor chip-design workforce and around **7%** of global semiconductor-domain GCCs.
6. **Progress under ISM 1.0:** As of December 2025, 10 projects worth Rs. 1.60 lakh crore have been approved across 6 states, covering silicon fabs, silicon carbide fabs, advanced packaging, and ATMP facilities.



Source- PIB

Why is there a global race to diversify semiconductor supply chains?

1. **Over concentration of manufacturing units:** Semiconductor chip manufacturing is concentrated in a few countries. **For e.g.** Taiwan produces over 60% of the world's semiconductors, and along with South Korea makes 100% of the most advanced chips (below 10 nanometers). A disruption in one major producing region can affect industries worldwide.
2. **Supply chain disruption due to epidemic:** The semiconductor industry experienced significant supply shortages during the pandemic due to disruptions in China's production. The pandemic demonstrated how semiconductor shortages can disrupt automobiles, electronics, telecommunications and other downstream industries. Because chips are an upstream input used across numerous industries, a shortage can have economy-wide effects.
3. **Geopolitical conflicts:** The ongoing Russia-Ukraine conflict has resulted in shortages of raw materials for domestic industries. **For e.g.** Ukraine plays a critical role as a key supplier of neon, which is an essential input in semiconductor manufacturing.
4. **Emerging geopolitical contestations:** Growing US-China strategic competition, export controls, trade restrictions and technology disputes have made dependence on a limited number of suppliers a strategic concern. Governments therefore want greater control over critical semiconductor capabilities. **For e.g.** US has restricted its firms and its allies from assisting the Chinese production of 16 nanometers or smaller chips.
5. **Economic and national-security importance:** Semiconductors are essential not only for consumer electronics but also for AI, telecommunications, automobiles, defence, satellites and critical infrastructure. Consequently, reliable access to chips has increasingly become an element of economic and technological security.
6. **Rise of AI and advanced computing:** The rapid expansion of AI, data centres and high-performance computing is increasing the strategic importance of advanced chips. This has encouraged countries to secure domestic or trusted access to semiconductor manufacturing and related technologies.

7. **Pursuit of technological sovereignty:** Countries increasingly want to reduce excessive dependence on foreign suppliers for technologies considered strategically important. This has led to policies supporting domestic fabs, chip design, advanced packaging, semiconductor equipment and materials.

Therefore, many countries are looking to diversify their supply chain. India seeks to take advantage of countries eyeing for diversification of supply chains.

What is the significance of development of indigenous semiconductor industry in India?

1. **Tackling supply shocks:** The pandemic and the subsequent lockdowns impacted the supply of chips to India. **For e.g.** Automobile manufacturers like Mahindra & Mahindra and Tata group were compelled to reduce their production due to the shortage.
2. **Meeting the rising demand:** Experts estimate that around 50 crore people will join the internet in the next decade, which will increase the demand of more phones and laptops. Similarly, the post-pandemic world is showing a greater inclination towards work from home culture. This warrants an enhanced demand for servers, internet connectivity, and cloud usage. Hence, indigenous semiconductor industry is needed to meet the rising demands. There is a huge domestic market for semiconductors which could exceed \$60 billion by 2026.
3. **Reduce import dependence:** A domestic ecosystem can reduce India's dependence on imported chips and other critical semiconductor components, particularly as domestic demand for electronics, EVs, AI and data centres expands.
4. **Boost high-value employment:** The semiconductor industry requires specialised engineers, technicians, researchers and manufacturing professionals. It can therefore create high-skilled, high-productivity employment and strengthen India's technical talent base.
5. **Revenue boost:** Indigenous capacity would attract local taxes and boost the export potential. Further, India would be required to import fewer semiconductor chips, which would decrease the import bill. **For e.g.** India imports almost all semiconductors to meet its demand, which is estimated to reach around \$100 billion by 2025.
6. **Enhanced Security:** Chips made locally will be designated as "trusted sources" and can be used in products ranging from CCTV cameras to 5G equipment. This would improve the national cybersecurity profile.
7. **Geopolitical Benefits:** Countries having a sufficient supply of chips would be in a better position to mold the future course of geopolitics, driven by data and the digital revolution. Further self-sufficiency will decrease reliance on Chinese chip imports, especially during hard times like the Galwan Valley border clash.
8. **Promote R&D and innovation:** Building fabs and advanced packaging facilities can encourage research in materials science, electronics, nanotechnology, chip architecture and semiconductor equipment, while creating stronger links between universities, startups and industry.
9. **Generate economic multiplier effects:** Semiconductor manufacturing can stimulate related industries such as specialty chemicals, gases, precision machinery, electronics, logistics, testing and advanced materials, creating a wider industrial ecosystem.

What have been the government efforts towards development of semiconductor industry in India?

National Policy on Electronics, 2019	It envisions positioning India as a global hub for Electronics System Design and Manufacturing (ESDM) sector . It aims to encourage the development of core components (including chipsets) and create an enabling environment for the industry to compete globally.
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Semicon India Programme (2022)	The government has approved the Semicon India programme with a total outlay of INR 76,000 crore for the development of semiconductor and display manufacturing ecosystem in the country. Semicon 1.0: Launched with an initial outlay of ₹76,000 crore to build a domestic semiconductor and display manufacturing ecosystem. It provided fiscal support for setting up fabs, compound semiconductor/silicon carbide facilities, and OSAT/ATMP (packaging and testing) units. Semicon 2.0: In July 2026, the Union Cabinet approved Semicon 2.0 with an outlay of ₹1,27,500 crore. It seeks to build on Semicon India and expand capabilities in areas such as chip design, semiconductor equipment and materials, Indian semiconductor IP and supply-chain resilience.
Modified Scheme for setting up of Semiconductor Fabs in India	It aims to attract large investments for setting up semiconductor wafer fabrication facilities in the country. The Scheme extends a fiscal support of 50% of the project cost on an equal footing basis for setting up of Silicon complementary metal-oxide semiconductor (CMOS) based Semiconductor fabrication in India.
Modified Electronics Manufacturing Clusters (EMC 2.0) Scheme	Under this, the government will provide support for the setting up of Electronics Manufacturing Clusters (EMCs) and Common Facility Centres (CFCs).
Foreign Direct Investment	The Government of India has allowed 100% (FDI) under the automatic route in the Electronics Systems Design & Manufacturing sector.
Production Linked Incentive Scheme (PLI)	Under this, the government will provide an incentive of 4% to 6% on goods manufactured in India and covered under target segments to eligible companies for a period of five years.
Design Linked Incentive (DLI)	The DLI Scheme provides financial incentives and design infrastructure support for ICs, chipsets, System-on-Chips (SoCs), systems and IP cores. This helps India leverage its existing strength in semiconductor design and move towards higher-value activities.
India Semiconductor Mission	The India Semiconductor Mission was established as the institutional framework for implementing India's semiconductor strategy, facilitating investment, evaluating projects and developing the semiconductor ecosystem.

	As of 2026, it has approved 13 semiconductor projects with cumulative investments exceeding ₹1.64 lakh crore, spread across Gujarat, Assam, Uttar Pradesh, Odisha, Punjab, and Andhra Pradesh. The Union Budget 2026-27 launched India Semiconductor Mission 2.0 with Rs. 1,000 crore to boost domestic chip capabilities through local equipment and material production, full-stack IP design, and industry-led R&D and skilling.
Skill Development	The government has set targets to train 1,00,000 semiconductor technicians and engineers and attract 200 chip design startups, aiming to address a projected one-million-person talent gap in the global semiconductor and AI sector.
International technology partnerships	India has entered into semiconductor-related cooperation with major technology partners, including the US, European Union, Japan and Singapore , to strengthen technology transfer, investment and supply-chain resilience.

What are the challenges in the semiconductor industry in India?

1. **Very high capital requirements:** Setting up a semiconductor fabrication plant requires billions of dollars of investment in cleanrooms, specialised machinery and supporting infrastructure. As per a government estimate, it would cost roughly 5 –7 billion to set up a chip fabrication unit in India.
2. **Dependence on imported equipment and technology:** Advanced semiconductor manufacturing requires highly specialised equipment, materials and intellectual property. India remains dependent on global suppliers for several of these critical inputs, limiting complete technological self-reliance.
3. **Shortage of specialised skilled manpower:** While India has a large pool of engineers and a strong chip-design workforce, there is a relative shortage of professionals with hands-on expertise in fab operations, semiconductor process engineering, equipment maintenance, materials science and advanced packaging.
4. **Bureaucratic inefficiencies:** The process of establishing an indigenous semiconductor facility requires clearances and approvals from multiple government departments. Further, there exists a considerable degree of bureaucratic delays at each stage that discourages the establishment of manufacturing units.
5. **Infrastructure requirements:** Fabs require uninterrupted power, large quantities of ultrapure water, specialised gases, chemicals, cleanrooms and reliable logistics. Establishing this ecosystem at scale is complex and expensive.
6. **Technological Constraint:** The indigenous manufacturing of semiconductors requires the use of high-end technologies. These technologies are licensed from patent holders at a very high price.
7. **Structural Flaws:** FDI in electronics is less than 1% of the total FDI inflow because of the dearth of skilled labor, delays in land acquisition, and the uncertain tax regime.
8. **Competition from established semiconductor hubs:** India faces competition from established manufacturing ecosystems in **Taiwan, South Korea, Japan, the United States, China and Singapore**,

which possess decades of accumulated technological expertise, supplier networks and manufacturing experience.

What should be the focus area for Indian Semiconductor Industry?

R&D-intensive activities	R&D-intensive activities like electronic design automation (EDA) , core intellectual property (IP) , and chip design . The US is the leader in this segment. India can get part of the business by supporting its existing chip-design experts and funding technology and innovation centres , including top engineering colleges.
FABS facilities for advanced chips	India should focus on setting up of semiconductor fabrication (FABS) facilities for making of advanced chips.
Focus on medium and low-end chips	Due to the pandemic related supply disruptions and tensions between the US and China , the US, Japan, and many other countries have announced plans for setting up local Fabs . This might lead to a surplus capacity for high-end Fabs in the near future. Hence, India should focus on making medium and low-end chips.
Assembly, testing and packaging (ATP) segment	This segment captures 10% of the value . China is the current leader. With low-cost skilled technical manpower, India is a natural choice to take some part of the business.
Full-Stack IP Design	ISM 2.0 emphasises indigenous IP creation – reducing royalty payments and establishing technological sovereignty.
Local Equipment & Materials	ISM 2.0 focuses on producing semiconductor equipment and materials domestically, a critical supply chain gap

What Should be the Way Forward?

- 1. Build an end-to-end ecosystem:** India should develop capabilities across the entire value chain (chip design, semiconductor-grade materials, equipment, wafer fabrication, packaging, testing and electronics manufacturing) rather than focusing only on fabs.
- 2. Strengthen semiconductor R&D:** Greater public and private investment should be directed towards semiconductor process technology, materials, equipment, chip architecture and indigenous intellectual property (IP). Stronger industry-academia-research-institution linkages can accelerate commercialisation.
- 3. Develop specialised human capital:** India should create specialised programmes in semiconductor fabrication, process engineering, equipment maintenance, materials science, chip design and advanced packaging. Industry-oriented training and apprenticeships can complement conventional engineering education.
- 4. Ensure reliable infrastructure:** Semiconductor clusters need 24×7 high-quality electricity, ultrapure water, waste-treatment facilities, cleanrooms, high-speed logistics and robust digital infrastructure. Dedicated semiconductor industrial clusters can help provide these facilities.

5. **Provision of adequate funding:** Adequate funding must be provided to augment the research and development potential of technical institutes. **For e.g.** IIT Madras developed a microprocessor named 'Moushik' with funding support from the Ministry of Electronics and Information Technology.
6. **Expeditious execution of Sovereign Patent Fund (SPF):** The Sovereign Patent Fund (SPF) under National Policy on electronics should be established expeditiously. It is a wholly or partly Government-backed entity that aims to bolster domestic businesses through the acquisition and licensing of patented technology.
7. **Support of businesses:** The government should also support businesses in the acquisition of semiconductor manufacturing units in other countries. This is easier than setting up a domestic facility and can be done swiftly for ensuring a continuous supply of chips. Hand-holding startups of entrepreneurial engineers can also produce large payoffs.
8. **Initial Focus on back-end of manufacturing:** Semiconductor foundries are the world's most expensive factories, accounting for 65% of industry capital expenditure but only 25% of the value addition. Therefore, to lower the risks of investment, India should especially look at back-end of manufacturing such as assembly, packaging and testing. Once it stabilises and an ecosystem develops, front-end of manufacturing will follow.
9. **Integrate with global value chains:** India should pursue "China+1" and supply-chain diversification opportunities while avoiding an unrealistic goal of complete self-sufficiency. The objective should be to become a trusted, competitive and resilient node in global semiconductor value chains.

Conclusion: The 21st century will be an era of Digital revolution signifying an increased use of mobile phones and computer devices. This enhanced usage can be met only with a robust availability of semiconductor chips that sustains their functioning. Therefore India needs to focus on the indigenous development of semiconductors in order to realize its digital potential and emerge as a strong power in the present era.

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UPSC Syllabus- GS 3- Indian Economy

Graham Act – Rationale & Implications – Explained Pointwise

The **Lindsey O. Graham Sanctioning Russia and Iran Act, 2026**, recently signed into law by the United States, seeks to intensify economic pressure on Russia by targeting its energy revenues, defence sector and sanctions-evasion networks. The Act is significant for India given its dependence on Russian crude and the possibility of higher U.S. tariffs on major buyers of Russian energy. Therefore, it is important to examine the rationale behind the Act, its wider geopolitical and economic implications, particularly for India.

What is the Lindsey O. Graham Sanctioning Russia and Iran Act, 2026? What are its major provisions?

- The **Lindsey O. Graham Sanctioning Russia and Iran Act of 2026** is a U.S. law aimed primarily at increasing economic pressure on **Russia over the Ukraine war**, while also extending and strengthening certain sanctions against **Iran**.
- The Act establishes a comprehensive sanctions framework targeting the political, financial, energy, and commercial networks sustaining Russia's war in Ukraine.
- While the legislation does not name individual nations directly, the criteria place major buyers like **India and China** squarely within its regulatory scope.

Major Provisions of the Act:

1. **Sanctions against Russian officials and entities:** The Act provides for sanctions against Russian officials, oligarchs, their family members and other persons supporting the Russian government.

2. **Targeting Russia's "Shadow Fleet":** Sanctions can be imposed on vessels and foreign persons involved in helping Russia evade existing sanctions, particularly through the transportation of Russian oil.
3. **Up to 100% tariffs on major buyers of Russian energy:** The President is empowered to impose tariffs of up to 100% on imports from the five largest purchasers of Russian crude oil or natural gas.
4. **Conditional treatment of natural-gas imports:** Countries whose Russian natural-gas imports constitute less than 15% of Russia's total natural-gas exports and which are taking significant steps to reduce those imports can qualify for an exemption.
5. **Tariffs on Russian-origin goods:** The legislation authorizes tariffs of up to 500% on Russian-origin goods, subject to specified exceptions.

Why has the United States introduced the Graham Act?

1. **To pressure Russia over the Ukraine war:** The primary objective is to increase the economic cost for Russia of continuing its war in Ukraine by targeting its energy and defence sectors and entities involved in sanctions evasion.
2. **To reduce Russia's energy revenues:** Russia's oil and gas exports provide an important source of government revenue. The Act therefore targets Russia's energy trade and gives the U.S. President authority to impose tariffs on major purchasers of Russian energy.
3. **To discourage third countries from purchasing Russian energy:** By allowing tariffs of up to 100% on imports from major buyers of Russian oil or gas, the legislation seeks to make continued purchases of Russian energy more costly for third countries. This provision potentially affects major buyers such as **India and China**.
4. **To target sanctions-evasion networks:** The Graham Act seeks to target Russia's "shadow fleet" and other networks that help circumvent Western sanctions. By imposing sanctions on shadow fleets, the U.S. aims to close loopholes, restrict Russia's energy revenues and strengthen the effectiveness of existing sanctions.
5. **To increase the leverage of U.S. foreign policy:** The legislation combines financial sanctions, energy restrictions and tariff threats, giving the U.S. administration additional economic instruments to influence the behaviour of Russia and countries maintaining significant economic links with it.

What are the major implications of the Graham Act, particularly for India?

1. **Threat to energy security:** India imports over 88% of its crude-oil requirements, with Russia accounting for a large share (45% of India's crude import). Any significant disruption to Russian supplies could increase India's dependence on alternative suppliers and expose it to higher international oil prices.
2. **Higher import costs and inflationary pressure:** If India has to rapidly substitute Russian crude with more expensive supplies, the resulting increase in energy costs could affect transport, manufacturing, logistics and consumer prices, creating broader inflationary pressures.
3. **Impact on Indian exports to the US:** A U.S. tariff of up to 100% could make Indian products substantially more expensive in the American market, potentially affecting sectors such as electronics, engineering goods, textiles and other export-oriented industries.
4. **India-US trade relations may face additional strain:** The legislation introduces another potential source of friction at a time when India and the U.S. are seeking to expand bilateral trade. India has already warned that the measure could have implications for the bilateral relationship.
5. **Challenge to India's strategic autonomy:** The Act puts pressure on India to align its energy purchases with U.S. geopolitical preferences. This could create a dilemma between maintaining strategic autonomy and preserving relations with a major strategic partner, the USA.

6. **Impact on India-Russia relations:** Pressure to reduce Russian energy purchases could affect India's broader relationship with Russia, including cooperation in defence, nuclear energy, space and other strategic sectors.
7. **Global energy-market implications:** Removing a major buyer such as India from the Russian oil market could disrupt global supply chains and potentially push up crude prices. India has specifically highlighted the possible implications for the international energy market.

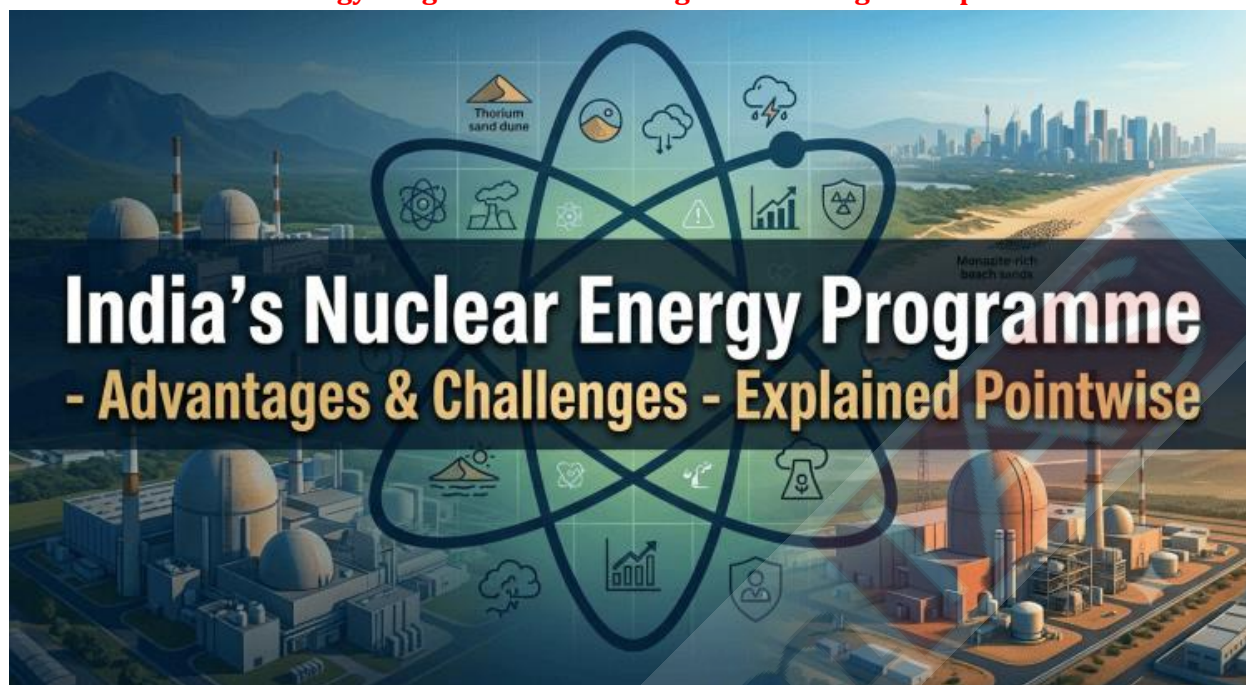
What should be the way forward?

1. **Pursue diplomatic engagement:** India should engage proactively with the USA to seek exemptions or a calibrated application of the Graham Act, highlighting its energy-security concerns and the broader impact of sanctions on global energy markets. Simultaneously, India should maintain dialogue with Russia to ensure stable and predictable energy supplies.
2. **Diversify energy sources:** India should reduce excessive dependence on any single country for crude oil by diversifying imports across the Middle East, Africa and Latin America.
3. **Strengthen strategic petroleum reserves:** India should expand its Strategic Petroleum Reserves (SPRs) to cushion the economy against geopolitical disruptions, sanctions and sudden spikes in global crude prices. Greater storage capacity would provide short-term energy security while allowing India time to diversify suppliers and manage supply shocks.
4. **Accelerate clean-energy transition:** India should accelerate the shift towards renewable energy, nuclear power, green hydrogen and electric mobility, while improving energy efficiency. This would reduce dependence on imported fossil fuels, strengthen energy security and limit India's vulnerability to geopolitical disruptions and external sanctions.
5. **Diversify export markets:** India should expand exports to Europe, ASEAN, Africa, West Asia and Latin America to reduce excessive dependence on the US market. Greater geographical diversification would enhance export resilience, protect domestic industries and reduce vulnerability to unilateral trade restrictions.
6. **Use multilateral platforms:** India should use forums such as the **G20, BRICS, WTO and SCO** to highlight the wider economic and energy-security implications of unilateral sanctions, advocate predictable trade rules, and promote dialogue-based solutions to geopolitical disputes.
7. **Maintain strategic autonomy:** India should pursue an independent, interest-based foreign policy without aligning completely with any major power bloc. It should engage constructively with the US, Russia and other partners, while prioritising its energy security, economic interests and national sovereignty.

UPSC GS-2: International Relations

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India's Nuclear Energy Programme – Advantages & Challenges – Explained Pointwise



India's top nuclear scientist Anil Kakodkar has advocated the early introduction of thorium-based fuel into the indigenous pressurized heavy water reactor (PHWR) fleet, while continuing in parallel with 3-stage nuclear programme, to speed up the utilisation of the country's abundant thorium reserves.

Earlier this year, on April 6, 2026, India achieved a major milestone in its nuclear programme as the **Prototype Fast Breeder Reactor at Kalpakkam, Tamil Nadu reached criticality**-successfully sustaining a controlled nuclear fission chain reaction for the first time. With this, India joins a select group of nations with advanced fast breeder reactor technology, and once fully operational, it will become only the second country after Russia to run a commercial fast breeder reactor.

What is India's three-stage nuclear energy program?

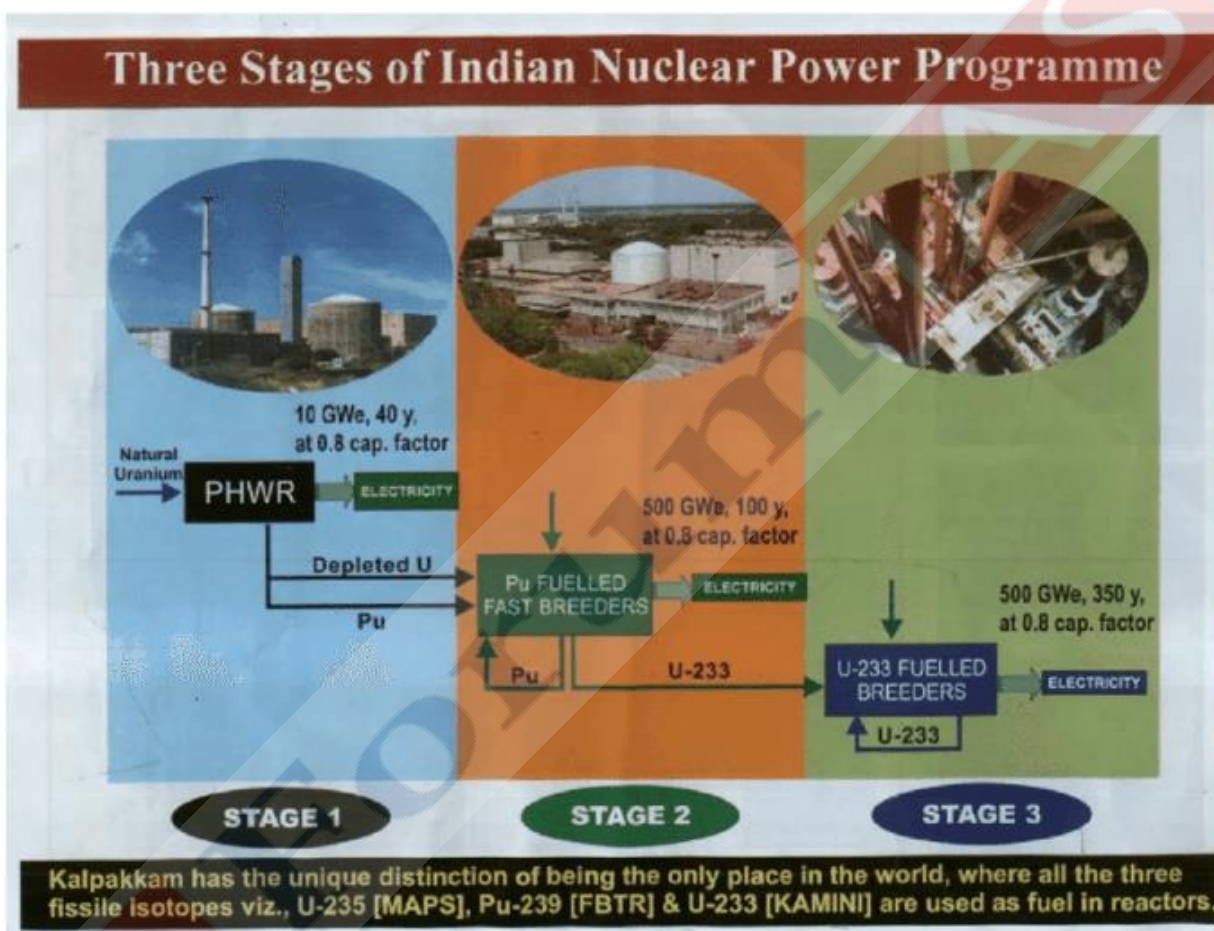
- The roadmap of India's three-stage nuclear program was envisioned by **Dr. Homi J Bhabha** in 1954. It is a long-term strategy designed to achieve national energy independence.
- The program had been conceived with the ultimate objective of utilising the country's vast reserves of **thorium-232**.
- It was designed to overcome India's **limited uranium resources** by eventually utilizing its abundant **thorium reserves** (India holds **less than 2% of the world's uranium reserves**, but possesses nearly **25% of global thorium reserves** (found in monazite beach sands)).
- It is based on a **closed nuclear fuel cycle**, where the spent fuel from one stage becomes an important input for the next.

Three-stage Nuclear Energy Program:

Stages	Aim	Fuel	Nuclear Reactor
Stage I	Establishment of domestic nuclear power industry	Uranium	Pressurized Heavy Water Reactors (PHWRs)

Stage II	Development of self-sustaining nuclear fuel cycle.	Plutonium	Fast Breeder Reactor (PFBR)
Stage III	Complete energy independence through domestic thorium resources.	Thorium	Advanced heavy water reactors (AHWRs)

Working of 3-Stages



Source: Yojana

Stage I	- In the Stage-I, India used the Pressurized Heavy Water Reactors (PHWRs) with natural uranium-238 (U-238) as the fuel. The U-238 contained minuscule amounts of U-235, as the fissile material. - A nuclear fission process was initiated and heavy water (water molecules containing the deuterium isotope of hydrogen) slowed the release of neutrons released by one fission reaction enough to be captured by other U-238 and U-235 nuclei and cause new fission.
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	- The reactions produce fissile Plutonium-239 (Pu-239) and energy. Natural Uranium → PHWR → Plutonium - India has successfully established indigenous expertise in the design, construction and operation of PHWRs, meaning Stage 1 has effectively reached the industrial domain.
Stage II	- Only U-235 can sustain a chain fissile reaction. However, it is consumed fully in stage I. Hence, Stage II aims at using the fissile Plutonium-239 (Pu-239) produced as the end product of Stage I with U-238 to produce energy, U-233 and more Pu-239. - By the end of the second stage of the cycle, the reactor produces more fissile material than it consumes. Hence, it is called a 'Breeder' reactor. In these 'fast breeder' reactor, the neutrons aren't slowed. - Plutonium → Fast Breeder Reactor → Uranium-233 - A major milestone was achieved when India's indigenous 500 MWe Prototype Fast Breeder Reactor (PFBR) at Kalpakkam attained first criticality in April 2026, marking India's entry into Stage 2.
Stage III	Fuel used: Uranium-233 derived from thorium. - Thorium-232 itself is not directly fissile, it is converted into fissile Uranium-233 through nuclear reactions. - In this stage Pu-239 with Thorium-232 (Th-232) are combined in advanced heavy water reactors to produce energy and U-233. - This stage uses the naturally available thorium-232 in India and hence will help in achieving nuclear energy self-sufficiency. - Uranium-233 + Thorium → Thorium-based reactors (AHWR) → Long-term nuclear energy



India's 3-Stage Nuclear Energy Program

India starts stage II of the program

STAGE I

Aim- Establishment of domestic nuclear power industry

Fuel- Uranium

Type of Nuclear Reactor- Pressurized Heavy Water Reactors (PHWRs)

Working Methodology

- In the Stage-I, India used the Pressurized Heavy Water Reactors (PHWRs) with natural uranium-238 (U-238) as the fuel. The U-238 contained **minuscule amounts of U-235, as the fissile material**.
- A nuclear fission process is initiated and heavy water (water molecules containing the deuterium isotope of hydrogen) slows the release of neutrons released by one fission reaction enough to be captured by other U-238 and U-235 nuclei and cause new fission.
- The reactions produce **fissile Plutonium-239 (Pu-239)** and **energy**.

STAGE II

Aim- Development of self-sustaining nuclear fuel cycle.

Fuel- Plutonium

Type of Nuclear Reactor- Fast Breeder Reactor (PFBR)

Working Methodology

Only U-235 can sustain a chain fissile reaction. However, it is consumed fully in stage I. Hence, Stage II aims at using the **fissile Plutonium-239 (Pu-239)** produced as the end product of Stage I with U-238 to produce **energy, U-233 and more Pu-239**. By the end of the second stage of the cycle, the reactor produces more fissile material than it consumes. Hence, it is called a '**Breeder**' reactor. In these '**fast breeder**' reactor, the neutrons aren't slowed.

STAGE III

Aim- Development of self-sustaining nuclear fuel cycle.

Fuel- Plutonium

Type of Nuclear Reactor- Fast Breeder Reactor (PFBR)

Working Methodology

It focuses on **combining Pu-239 with thorium-232 (Th-232)** in advanced heavy water reactors to produce energy and U-233. This stage uses the naturally available thorium-232 in India and hence will help in **achieving nuclear energy self-sufficiency**.

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What are the important milestone events in India's Nuclear Energy Program?

The establishment of several institutions has played a critical role in driving India's Nuclear Energy Program.

Passive Phase:

1945	Tata Institute of Fundamental Research (TIFR) was established by Homi J. Bhabha with the goal of conducting research in fundamental sciences.
1948	The Atomic Energy Commission of India (AEC) was established as a government agency responsible for formulating and implementing the country's nuclear policy.

1954	The Department of Atomic Energy (DAE) was created. It has been engaged in the development of nuclear power technology and applications of radiation technologies in the fields of agriculture, medicine, industry, and basic research.
1957	Atomic Energy Establishment, Trombay (AEET) was established by Dr. Homi Bhabha for a multidisciplinary research program essential for the ambitious nuclear program of India. In 1966, AEET was renamed Bhabha Atomic Research Centre (BARC) .
1963	The USA and India sign an accord for the supply of enriched fuel to India's Tarapur nuclear power plant .
1969	Nuclear Power Grid connection was established from the Tarapur Plant .

However, **India did not sign the NPT in 1970, did not become a member of the NSG in 1974**. After **India's first nuclear Test, Smiling Buddha in 1974**, there was widespread condemnation from the international community. There was international apartheid against India in supply of nuclear fuel.

Active Phase:

1985	Dhruva research reactor became operational: The indigenous Dhruva reactor at BARC strengthened India's capabilities in research, isotope production and nuclear science.
1987	Nuclear Power Corporation of India Limited (NPCIL) was established as a public sector undertaking responsible for the generation of electricity from nuclear power.
2003	Bharatiya Nabhikiya Vidyut Nigam Ltd. (BHAVINI) was set up by the Department of Atomic Energy (DAE) as a special-purpose vehicle to implement stage II of the 3-stage nuclear power program.
2008	India received the NSG waiver: The Nuclear Suppliers Group granted India a waiver for civil nuclear trade, opening avenues for international nuclear cooperation despite India not being a party to the Nuclear Non-Proliferation Treaty (NPT).
2013	Kudankulam Nuclear Power Plant began commercial operation, marking a major expansion of India's nuclear power capacity through Indo-Russian cooperation.
2022	22 operational reactors in India with a total installed capacity of, 6780 MWe (Megawatts electric). 10 nuclear power reactors with a total of 8000 MW capacity are under construction.
2025	Nuclear Energy Mission announced: The Union Budget 2025-26 announced a ₹20,000 crore outlay for the development of Small Modular Reactors (SMRs), with a target of at least 5 indigenously developed SMRs operational by 2033. India also set an ambition of 100 GW nuclear capacity by 2047.

2025	a. The SHANTI Act, 2025 received Presidential assent on 20 December, replacing the Atomic Energy Act, 1962 and the Civil Liability for Nuclear Damage Act, 2010, and enabling private sector participation in nuclear power. b. The Atomic Energy Regulatory Board (AERB) granted approval for fuel loading of the PFBR at Kalpakkam as part of its commissioning process.
2026	PFBR at Kalpakkam achieved criticality on 6 April, sustaining a controlled fission chain reaction for the first time, marking India's entry into the second stage of its 3-stage nuclear power programme.



Source- World Nuclear Association

What are the advantages of India's Nuclear Energy Programme?

1. **Energy Sovereignty:** Fossil-based energy sources contributed about 82% of the primary energy supplied in 2021. India imports a significant part of its fossil fuels (coal and gas) for energy generation. Bulk fuel imports raise economic and strategic vulnerabilities for a developing country like India. Nuclear energy can help India reduce its dependence on imported fuel.

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Fuel	Consumption (EJ)	Percentage	Combined Percentage
Oil	184.21	30.95	82.28
Natural Gas	145.35	24.42	
Coal	160.10	26.90	
Nuclear Energy	25.31	4.25	17.72
Hydroelectricity	40.26	6.76	
Renewables	39.91	6.71	
Total	595.14	100.00	100.00

Source- NITI Aayog

- Decarbonisation of Power Sector:** Nuclear power produces electricity with very low operational greenhouse gas emissions. It can complement solar and wind energy by providing firm, round-the-clock electricity, supporting India's climate commitments and net-zero target.
- Limitations attached with other renewable energy sources:** Solar energy is land intensive, wind energy requires energy storage systems. Also, they require imported technologies and materials such as photovoltaic cells, batteries, and storage equipment. On the other hand, indigenous nuclear reactors have reduced dependency in critical imports.
- Cheaper to Operate:** Nuclear power plants are cheaper to operate than coal or gas plants, despite the cost of managing radioactive fuel and disposal. According to estimates, nuclear plants cost only 33-50% of a coal plant and 20-25% of a gas combined-cycle plant.
- Ensures Reliable Base-Load Power:** Nuclear power plants can operate continuously for extended periods, irrespective of weather conditions. They can help meet India's growing electricity demand and complement the variable output of renewable energy sources.
- Utilisation of Abundant Thorium Reserves:** India possesses significant thorium resources, particularly in monazite-bearing beach sands. The 3-stage programme aims to convert thorium-232 into fissile uranium-233, creating a potential long-term domestic nuclear fuel resource.
- Strengthens Technological Self-Reliance:** Indigenous development of Pressurised Heavy Water Reactors (PHWRs), fast breeder reactors and advanced nuclear technologies strengthens India's capabilities in reactor design, fuel fabrication, reprocessing and nuclear engineering.
- Supports Industrial and Economic Development:** The nuclear programme stimulates demand for high-precision manufacturing, heavy engineering, specialised materials, electronics and scientific instrumentation. It can generate skilled employment and strengthen India's advanced manufacturing ecosystem.
- Promotes Strategic Autonomy:** Domestic nuclear capabilities reduce vulnerability to external technology restrictions and fuel-supply disruptions. They also strengthen India's strategic autonomy in a sector closely linked to national security and critical infrastructure.

What are the challenges to India's Nuclear Energy Programme?

- High capital cost and financing constraints:** Nuclear power plants require massive upfront investment, long construction periods and extended payback timelines.. There have been cost over runs in recently built nuclear power plants.
- Delays in project execution:** Nuclear projects often face delays due to complex engineering, regulatory clearances, equipment procurement and commissioning requirements. The long gestation period can escalate costs and postpone electricity generation.

3. **Insufficient Installed Capacity:** As of 2025-26, India's installed nuclear power capacity is about 8,780 MW across 24 reactors, against a target of 100 GW by 2047 under the Nuclear Energy Mission.
4. **Nuclear Safety:** Local communities in India have been resisting nuclear reactors due to fears of nuclear disasters like Chernobyl, 1986 or Fukushima, 2011. **For e.g.** Locals protesting against the Mithi viridi nuclear project in Gujarat.
5. **Nuclear Liability Concerns:** Civil Liability for Nuclear Damage Act, 2010 had been a long-standing deterrent to foreign suppliers due to unlimited supplier liability. The SHANTI Act, 2025 now replaces it with a graded, capped liability framework – removing automatic supplier liability and introducing tiered operator caps based on reactor size. However, opposition parties have raised concerns about dilution of supplier accountability.
6. **Limited private sector participation:** The Atomic Energy Act, 1962, historically reserved nuclear power generation primarily for government entities, restricting private sector involvement. However, recent reforms have begun to enable greater, albeit limited, private participation in the sector.
7. **Hurdles created by NSG and NPT:** India's non-ratification of NPT and lack of NSG membership, has created diplomatic hurdles in accessing more nuclear fuel and better nuclear technologies.
8. **Use of outdated technology:** Currently operational Indian nuclear reactors have become outdated and suffer from multiple operational problems. **For e.g.** 6 VVER (water-water energy reactor) design reactors encountering operational problems at Kudankulam.
9. **Dependence on imported technology and components:** Despite significant indigenous capabilities, India continues to depend on foreign technology and suppliers for certain reactor systems, specialised components and fuel-cycle inputs. This can expose projects to supply disruptions, export restrictions and geopolitical uncertainties.

What should be the way forward?

1. **Small Modular Reactors (SMRs):** Indigenous Small Modular Reactors (SMRs) must be built at coal plant sites which would be retiring in the coming decades. SMRs offer the advantages of being safe, economical, compact and adaptable. Partnerships with NTPC and other thermal plant owners must be explored.
2. **Expansion of indigenous PHWR reactors:** The indigenous 700 MWe PHWR, must be expanded in fleet mode to add to the installed nuclear power capacity in India.
3. **Scale up the Fast Breeder Reactor programme:** With the PFBR achieving criticality in 2026, two additional FBRs must now be constructed at Kalpakkam, followed by four more beyond 2030. This will consolidate Stage II and generate sufficient U-233 from thorium blankets to fuel Stage III reactors.
4. **Accelerate Stage III – Advanced Heavy Water Reactor (AHWR):** Design validation and peer review of the AHWR is ongoing. The project must be formally launched at the earliest to utilise India's vast thorium reserves, estimated to sustain energy needs for around 60,000 years.
5. **Augmentation of safety of nuclear facilities:** There must be constant updation of safety skills of nuclear operators. Further, masses must be comprehensively sensitised about the functioning of nuclear power plants using highly intellectual individuals having mass appeal. **For e.g.** Dr. APJ Abdul Kalam sensitizing the masses before the establishment of the Kudankulam nuclear power plant.
6. **Ensuring Regulatory Autonomy:** The AERB, India's nuclear regulatory body, must be provided functional autonomy by removing its reporting from the Department of Atomic Energy (DAE).
7. **Attract Private & Captive Investment:** Mobilize domestic private capital and foreign investment to fund capital-intensive builds. Commercial models like public-private partnerships (PPPs) can help build dedicated nuclear plants for energy-intensive industries (e.g. green hydrogen, steel, data centers).

Conclusion: India's nuclear energy programme offers a unique, self-reliant blueprint for clean power. By leveraging vast thorium reserves, fostering private-sector participation, and deploying advanced breeder reactors, India is securing sustainable, baseline energy essential for its Net-Zero 2070 goal.

Read More: [Indian Express](#)

UPSC Syllabus- GS 3- Science and Technology, Indigenisation of technology

Article 371 & Special Constitutional Safeguards for Ladakh – Significance & Challenges – Explained Pointwise

The Centre has proposed the insertion of a new **Article 371K** in the Constitution to provide special constitutional safeguards for Ladakh. The proposal follows an “in-principle understanding” between the Ministry of Home Affairs and representatives of the Leh Apex Body and Kargil Democratic Alliance to establish a directly elected UT-level body with legislative, executive, financial and planning powers. In this context, it is important to understand Article 371 and the implications of extending a special constitutional framework to Ladakh.

What is Article 371?

- Article 371 is a constitutional provision that enables the Centre to provide special provisions for certain States in India, taking into account their unique historical, social, cultural, administrative and developmental circumstances.
- It aims to address regional aspirations, protect the interests of local communities, promote balanced development and ensure effective governance while maintaining India's constitutional framework.
- It is part of Part XXI of the Constitution, titled **Temporary, Transitional and Special Provisions**.

Core Objectives of Article 371:

1. **Safeguard Indigenous & Tribal Rights:** Protecting customary laws, socio-religious practices, and land ownership rights of indigenous communities, particularly in the Northeast, from Parliamentary interference without the consent of the State Legislature.
2. **Bridge Regional Economic Disparities:** Setting up dedicated development boards and ensuring quota allocations in local jobs and higher education for underdeveloped areas.
3. **Ensuring Political and Administrative Stability:** Facilitating smooth political and administrative transitions during the integration of regions into full statehood, as seen in Sikkim, Nagaland and Mizoram.

Why has the Centre proposed special constitutional safeguards for Ladakh?

1. **Addressing the governance gap after 2019:** Following the Jammu and Kashmir Reorganisation Act, 2019, Ladakh became a Union Territory, but without a legislature. While this arrangement provides for direct administration by the Union, it has also raised concerns about limited local participation in policymaking and decision-making. Special constitutional safeguards under the proposed Article 371K could provide greater institutional protection for local interests.
2. **Protection of tribal identity and culture:** Ladakh has a predominantly tribal population (**over 90%**). Constitutional safeguards could protect its distinct languages, customs, traditions and cultural heritage from external pressures.
3. **Safeguarding land ownership rights:** Ladakh's communities have expressed concerns that unregulated transfer or acquisition of land by outsiders could weaken local ownership and affect the traditional livelihoods of tribal communities. Special constitutional safeguards could provide a

framework to regulate land transfers, protect community-owned land and give greater legal protection to customary land-use practices.

4. **Protection of local employment:** Special constitutional safeguards could enable the creation of mechanisms to reserve or prioritise certain government jobs for local residents. It will protect employment opportunities for local youth from excessive competition with applicants from outside the region.
5. **Responding to demands for greater autonomy:** The proposal seeks to address longstanding demands raised by the Leh Apex Body (LAB) and Kargil Democratic Alliance (KDA), including greater local self-governance and constitutional protection.
6. **Preservation of fragile Himalayan ecology:** Constitutional protection of land, forests, natural resources and the environment could help address concerns regarding unregulated development in Ladakh's ecologically sensitive region.

What are the major challenges in providing constitutional safeguards to Ladakh?

1. **Balancing local aspirations and national interests:** Ladakh has significant strategic importance due to its borders with China and Pakistan. Safeguards must protect local interests while ensuring that national security and strategic infrastructure are not constrained.
2. **Balancing Leh and Kargil interests:** Ladakh comprises two distinct regions – **Leh** and **Kargil** – with differences in geography, demography, culture and political aspirations. Designing an arrangement acceptable to both can be challenging.
3. **Administrative complexity:** Providing special constitutional safeguards to Ladakh could create overlapping institutional jurisdictions if the powers of the Union Territory administration, Lieutenant Governor, Hill Development Councils and any proposed new constitutional body are not clearly defined.
4. **Protecting local employment while attracting investment:** Strong restrictions on employment or investment by outsiders could protect local opportunities but may also affect the availability of skills, capital and private investment.
5. **Balancing autonomy with administrative efficiency:** Greater local decision-making can strengthen participation, but excessive fragmentation of authority may complicate coordinated governance and implementation.
6. **Ensuring effective implementation:** Constitutional protection by itself may not guarantee better outcomes. It would need to be supported by clear legislation, capable institutions, adequate finances and effective accountability mechanisms.

What should be the way forward?

1. **Clearly define institutional powers:** The proposed constitutional arrangement should clearly demarcate the powers of the UT administration, autonomous councils and local representative institutions to avoid administrative overlap.
2. **Protect land and employment:** The constitutional framework should provide clear safeguards for land ownership, transfer and use to protect the interests of local and tribal communities while allowing essential public infrastructure and responsible private investment. Similarly, appropriate provisions for local employment and skill development can improve opportunities for Ladakhi youth without restricting the investment, entrepreneurship or access to specialised skills required for the region's development.
3. **Strengthen local self-governance:** The proposed constitutional safeguards should be accompanied by greater devolution of powers, functions and financial resources to local institutions in Ladakh. Local

bodies should have a meaningful role in decisions relating to land use, local development, tourism, employment, culture and natural-resource management.

4. **Ensure equitable regional development:** Special constitutional safeguards should ensure that development benefits reach both Leh and Kargil in a balanced manner, rather than being concentrated in a few urban or tourist centres. Resource allocation should consider differences in population, geography, infrastructure gaps and socio-economic needs.
5. **Adopt an environment-sensitive development model:** Ladakh's cold desert ecosystem, limited water availability and vulnerability to climate change make environmentally sustainable development particularly important. Development policies should therefore be based on carrying-capacity assessments, especially for tourism, construction and urban expansion.

Conclusion: The proposed constitutional safeguards for Ladakh provide an opportunity to reconcile local aspirations with development and national interests. However, the framework should be carefully designed so that it not only increases the public participation in the governance, but also protect the land, culture, livelihood & fragile ecology of the cold desert.

UPSC GS-2: Polity

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Election Commission of India (ECI) – Roles, Responsibilities & Limitations – Explained Pointwise



A recent investigation by a leading newspaper has brought renewed attention to the internal functioning and decision-making process of the Election Commission of India (ECI). According to the investigation, Election Commissioners Sukhbir Singh Sandhu and Vivek Joshi reportedly recorded objections at least 14 times over the past 10 months regarding decisions and orders connected with the Special Intensive Revision (SIR), including voter registration, deletion and restoration of names and electoral-roll management.

What is the Election Commission of India (ECI) & What are its constitutional status and composition?

- The **Election Commission of India (ECI)** is an autonomous, permanent **constitutional body** established on January 25, 1950, responsible for supervising, directing and controlling elections to Parliament, State Legislatures, and the offices of the President and Vice-President.
- It is a **permanent constitutional body** and derives its authority directly from the Constitution.
- Since October 1993, the ECI is a **three-member body** comprising the CEC and two Election Commissioners.

Constitutional Status:

- **Part XV (Articles 324–329):** Governs the electoral system in India.
- **Article 324** of the Constitution provides for the establishment of the ECI.

Composition:

- Under **Article 324**, the ECI consists of:
 - **Chief Election Commissioner (CEC)**
 - Such number of **Election Commissioners (ECs)** as the President may determine from time to time.
- The **President appoints** the CEC and other Election Commissioners, subject to the law made by Parliament. Currently, appointments are governed by the **Chief Election Commissioner and Other Election Commissioners Act, 2023**.
- When other Election Commissioners are appointed, the **CEC acts as the Chairperson** of the Commission.
- The Commission may also have **Regional Election Commissioners**, who may be appointed by the President after consultation with the ECI.
- **Tenure: 6 years** or until attaining the age of **65 years**, whichever occurs earlier.
- All Election Commissioners enjoy **equal voting rights and equivalent status**, with decisions of the Commission taken by **majority**.
- They are entitled to salary and other conditions of service equivalent to those of a **Judge of the Supreme Court of India**.

What are the major roles and responsibilities of the Election Commission of India (ECI)?

Administrative Functions & Responsibilities	1. Delimitation & Constituencies: Determines the territorial boundaries of electoral constituencies across the country based on the Delimitation Commission Acts. 2. Electoral Rolls & EPIC: Prepares, updates, and periodically revises the voter list (electoral roll) to register all eligible citizens and issue Electronic Photo Identity Cards (EPIC). 3. Election Schedule & Operations: Formulates and announces the dates and schedules for elections, receives and scrutinizes candidate nomination papers, and manages polling stations and counting centers. 4. Registration of Political Parties: Grants official recognition to political parties and classifies them as National or State parties based on their poll performance. 5. Symbol Allocation: Allots official election symbols to recognized political parties and independent candidates.
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	6. Model Code of Conduct (MCC): Enforces the MCC during elections to ensure a level playing field, preventing the misuse of official machinery, state resources, or corrupt campaign practices by political parties and candidates. 7. Monitoring Campaign Expenditure: Sets ceiling limits for candidate campaign spending and monitors expenditures to curb the influence of money power in elections. 8. Poll Control & Cancellation: Vested with the power to cancel or postpone polls in cases of booth-capturing, widespread violence, rigging, or operational irregularities.
Advisory Functions	1. Disqualification of MPs: Advises the President of India on matters concerning the post-election disqualification of sitting Members of Parliament (MPs). 2. Disqualification of MLAs: Advises the Governors of respective states regarding the post-election disqualification of sitting Members of Legislative Assemblies (MLAs). 3. President's Rule & Elections: Advises the President whether elections can be held in a state under President's Rule to determine if the state emergency can be extended beyond one year.
Quasi-Judicial Functions	1. Party Recognition & Symbol Disputes: Acts as a court to hear and settle disputes relating to the recognition of political parties or rival claims to party names and symbols (e.g. party splits or mergers). 2. Candidate Disqualifications: Recommends the disqualification of candidates found guilty of corrupt election practices by the High Courts or Supreme Court. 3. Non-submission of Expense Accounts: Exercises the power to disqualify candidates who fail to lodge their election expenditure accounts within the prescribed time and format.

What are the key powers of the Election Commission of India under the Constitution?

- 1. Superintendence, direction and control of elections:** The ECI has overall constitutional authority to supervise and manage elections to Parliament, State Legislatures, and the offices of the President and Vice-President.
- 2. Preparation of electoral rolls:** It supervises the preparation and revision of electoral rolls and ensures that electoral rolls are properly maintained.
- 3. Appointment of election officials:** The ECI can require the necessary staff and personnel for conducting elections and exercises control over election-related officials during the electoral process.
- 4. Fixing the election schedule:** It determines the election programme, including the timing of various stages of elections, subject to the statutory framework.
- 5. Regulating electoral conduct:** The ECI monitors compliance with the **Model Code of Conduct** and can issue directions to maintain a level playing field during elections.
- 6. Countermanding or postponing polls:** In appropriate circumstances provided by law, the ECI can order adjournment or fresh polling where serious electoral irregularities, violence or other disruptions affect the integrity of the poll.

7. **Residual powers under Article 324:** Where legislation is silent or inadequate, the Supreme Court has recognised that the ECI can exercise plenary powers under Article 324, provided such action is consistent with the Constitution and existing law.

What are the major limitations & criticisms of the Election Commission of India (ECI)?

1. **Appointment-related concerns:** The method of appointing Election Commissioners has been debated in the context of institutional independence. The current statutory framework provides for a selection committee comprising the Prime Minister, a Union Cabinet Minister nominated by the Prime Minister and the Leader of Opposition in the Lok Sabha.
2. **Post-Retirement Appointments:** The absence of restrictions on CECs and Election Commissioners accepting government or political appointments after retirement may raise concerns about potential conflicts of interest and the perceived independence of the Commission.
3. **Unequal removal protection:** Under Article 324(5), the CEC enjoys protection similar to a Supreme Court judge regarding removal, while other Election Commissioners can be removed by the President only on the recommendation of the CEC. The ECI itself has previously advocated stronger constitutional protection for all its members.
4. **Dependence on government machinery:** The ECI relies considerably on central and state government officials and administrative machinery for conducting elections, which can raise questions about operational autonomy.
5. **Limited control over political parties:** Although the ECI can register and recognise political parties and regulate aspects of their electoral conduct, its powers over internal democracy, organisational functioning and political-party finances remain limited by the existing legal framework.
6. **Non-statutory Model Code of Conduct:** The MCC is an important mechanism for maintaining a level playing field, but much of it does not have the status of a standalone statute. The ECI therefore often relies on existing election laws and its constitutional powers for enforcement.
7. **Challenges in regulating election expenditure:** Monitoring actual campaign expenditure can be difficult because of the scale of elections, indirect spending and expenditure by political parties and third parties.
8. **Non-Charged Expenditure:** Unlike the salaries of Supreme Court judges or the Comptroller and Auditor General (CAG) – which are directly charged to the Consolidated Fund of India – the ECI's administrative budget relies on parliamentary approval, leaving it financially dependent on the government.
9. **Special Intensive Revision (SIR):** The SIR exercise faced criticism over the large-scale deletion or potential exclusion of voters, with concerns that marginalised and vulnerable groups could be disproportionately affected due to difficulties in verification and documentation requirements. Questions were also raised regarding the transparency of the verification process, the basis for identification of voters and procedural safeguards.

What are the various recommendations made by different commissions & Supreme Court to improve the effectiveness, transparency and accountability of the Election Commission of India (ECI)?

1. **Independent appointment mechanism:**
 - **Tarkunde Committee (1975), Dinesh Goswami Committee (1990), and the Law Commission (255th Report, 2015)** recommended that appointments of the CEC and Election Commissioners (ECs) should be by a multi-member collegium consisting of: the Prime Minister, Leader of Opposition in the Lok Sabha, and Chief Justice of India (CJI).
 - **2nd Administrative Reforms Commission (ARC)** recommended adding the Union Law Minister and Deputy Chairman of the Rajya Sabha to the selection panel

- The Supreme Court in **Anoop Baranwal v. Union of India (2023)** directed that, until Parliament enacted a law, the CEC and ECs should be appointed on the recommendation of a committee comprising the Prime Minister, Leader of Opposition in the Lok Sabha and Chief Justice of India. The Court emphasised the need for a fair, transparent and independent selection process.
- 2. **Strengthen institutional independence:** The **Law Commission's 255th Report (2015)** recommended reforms to strengthen the independence and effectiveness of the ECI. The Commission's electoral-reform work specifically identified strengthening the Election Commission as an important objective.
- 3. **Equal protection for all Election Commissioners:** The **Law Commission (255th Report)** argued for greater security of tenure for Election Commissioners, including protection comparable to that available to the CEC, to reduce the possibility of executive influence.
- 4. **Greater financial autonomy:** The ECI's institutional independence can be strengthened by providing greater financial autonomy, including consideration of charging its administrative expenditure on the Consolidated Fund of India, rather than making it dependent on the annual appropriation process.
- 5. **Statutory backing to the Model Code of Conduct:** The Law Commission and other reform bodies have suggested strengthening the legal framework governing electoral conduct and MCC violations, enabling more effective and timely action against serious violations.
- 6. **Strengthen electoral-roll management:** Electoral-roll revision should combine accuracy with due process, ensuring that eligible voters are not inadvertently excluded. Clear notice, accessible claims-and-objections procedures and effective grievance redressal are important safeguards. The Supreme Court's 2026 decision concerning Bihar's SIR recognised the ECI's power to undertake such revision while examining its statutory and constitutional safeguards.
- 7. **Promote coordination with State Election Commissions:** The 2nd Administrative Reforms Commission recommended an institutional mechanism bringing the ECI and State Election Commissions onto a common platform for coordination, sharing of experience and resources.

Conclusion: One of the objectives of electoral reforms in India should be to strengthen the ECI by making it financially autonomous as well as transparent & accountable. Strengthening the Commission while ensuring appropriate checks and judicial oversight can enhance public confidence in India's electoral democracy.

UPSC GS-2: Indian Polity – Constitutional Bodies

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Drought in India - Causes, Consequences & Mitigation Measures - Explained Pointwise



Drought in India - Causes, Consequences & Mitigation Measures - Explained Pointwise

In Maharashtra, demands for declaring drought have emerged amid concerns over rainfall deficiency, with El Niño-related weather conditions affecting the State's agriculture-dependent economy. Widespread water scarcity has further aggravated the situation, putting additional pressure on farming and rural livelihoods.

What is drought, and what are its major types?

- Drought is a prolonged period of abnormally low rainfall or water availability that results in water scarcity and adversely affects agriculture, ecosystems, livelihoods and human activities.
- Unlike sudden natural disasters like flash floods or earthquakes, a drought develops slowly over months or years, impacting ecosystems, agriculture, and human populations.

Major types of drought:

Meteorological Drought	Occurs when rainfall in a region is significantly below its normal or expected level for a prolonged period.
Hydrological Drought	Occurs when surface and groundwater resources such as rivers, reservoirs, lakes and aquifers fall significantly below normal levels.
Agricultural Drought	Occurs when soil moisture becomes inadequate to meet the water requirements of crops , leading to crop stress and reduced yields.
Socio-economic Drought	Occurs when water scarcity begins to affect the supply of goods and services , including food, drinking water, energy and other economic activities.

Ecological Drought	Occurs when prolonged water scarcity causes stress or damage to ecosystems , affecting biodiversity and ecological functions.
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What are the major causes of drought in India?

1. **Erratic Monsoon:** The Indian monsoon is characterised by considerable spatial and temporal variability. Delayed onset, prolonged dry spells, uneven distribution of rainfall and early withdrawal can create significant water deficits in particular regions.
2. **Monsoon Failure:** As a large part of the country's rainfall is received during the southwest monsoon season. A delayed onset, prolonged breaks, early withdrawal or significant rainfall deficiency can reduce soil moisture, groundwater recharge and reservoir levels. This can adversely affect crop production, drinking-water availability, livestock and rural livelihoods, particularly in rain-fed and drought-prone regions.
3. **El Niño Events:** In India, El Niño conditions are generally associated with a higher probability of below-normal southwest monsoon rainfall, although the impact varies across regions and individual years. Reduced monsoon rainfall can lower soil moisture, reservoir levels and groundwater recharge, thereby increasing the risk of agricultural and hydrological drought.
4. **Climate Change:** Climate change can increase the frequency, duration and intensity of drought conditions by altering rainfall patterns and raising temperatures. Higher temperatures increase evaporation and evapotranspiration, reducing soil moisture and surface-water availability. Changes in monsoon behaviour, including longer dry spells between rainfall events, can further increase drought vulnerability.
5. **Uneven Rainfall Distribution:** India receives most of its annual rainfall during the southwest monsoon, but its spatial and temporal distribution is highly uneven. Some regions may receive adequate or even excess rainfall while others experience prolonged dry spells. Similarly, a long break in monsoon rainfall during the crop-growing season can cause soil-moisture deficiency and crop stress even when seasonal rainfall is close to normal.
6. **Groundwater Over-extraction:** Excessive withdrawal of groundwater can aggravate drought conditions by lowering the water table and reducing the availability of groundwater during dry periods. When extraction exceeds natural recharge, aquifers take longer to recover, reducing water security during prolonged rainfall deficits.
7. **Poor Water Management:** Poor water management can turn rainfall deficiency into a more severe drought situation. Inefficient irrigation methods, excessive groundwater extraction, inadequate rainwater harvesting, poor maintenance of water-storage structures and wastage of water reduce the availability of water during dry periods.
8. **High Agricultural Dependence on Rainfall:** A significant part of Indian agriculture remains dependent on rainfall, particularly the southwest monsoon, due to inadequate irrigation coverage in many regions. Consequently, delayed, deficient or uneven monsoon rainfall can cause soil-moisture stress, crop failure and reduced agricultural productivity. This dependence makes drought-prone regions especially vulnerable to rainfall variability and climate change.
9. **Rapid Urbanisation and Industrialisation:** Rapid urbanisation and industrialisation increase the demand for water for domestic, commercial and industrial purposes, putting immense pressure on already stressed water resources. Unplanned urban growth, groundwater over-extraction, industrial water consumption and the encroachment of lakes and wetlands reduce water availability and groundwater recharge.

What are the socio-economic & environmental consequences of drought in India?

Socio-Economic Consequences:

1. **Agricultural Losses:** Water shortages reduce crop yields, cause crop failures and affect livestock, particularly in rain-fed farming regions.
2. **Food Insecurity:** Declining agricultural production can reduce food availability, increase food prices and worsen malnutrition among vulnerable households.
3. **Rural Distress and Farmer Indebtedness:** Crop losses and declining farm incomes can force farmers to borrow, sell assets or rely on government assistance.
4. **Loss of Livelihoods and Unemployment:** Drought reduces demand for agricultural labour and affects allied sectors, such as dairy, fisheries and agro-based industries.
5. **Distress Migration:** Water scarcity and declining rural employment may compel people to migrate to cities in search of jobs and better livelihood opportunities.
6. **Economic and Fiscal Burden:** Drought-related losses can reduce rural consumption and economic activity while increasing government expenditure on relief, compensation, water supply and employment programmes.

Environmental Consequences:

1. **Groundwater Depletion:** Reduced rainfall and excessive extraction of groundwater for irrigation and drinking purposes can lower water tables and dry up wells.
2. **Degradation of Soil:** Prolonged moisture deficiency reduces soil fertility and biological activity, while dry and exposed soil becomes more vulnerable to erosion.
3. **Desertification and Land Degradation:** Recurrent drought, especially when combined with unsustainable land use, can accelerate desertification and reduce the productive capacity of land.
4. **Loss of Biodiversity:** Water scarcity and habitat degradation threaten terrestrial and aquatic species, disrupt food chains and reduce ecosystem resilience.
5. **Forest Degradation and Wildfires:** Prolonged dry conditions increase vegetation stress and can raise the risk and intensity of forest fires.
6. **Human-Wildlife Conflict:** Scarcity of water and food in natural habitats may drive wildlife closer to human settlements, increasing competition for resources and conflict.

What is the procedure for declaring a drought in India?

- Drought in India is officially declared by respective **State Governments** following the standardized protocols outlined in the Manual for Drought Management issued by the Ministry of Agriculture.
- As water management and disaster relief primarily fall within the purview of the States, India does not have a single, legally binding national definition of drought. Instead, states use a structured, 3-step framework to make the declaration scientific and objective down to the block, tehsil, or taluka level:

Mandatory Indicators (Triggers)	The state checks two mandatory baseline criteria: rainfall deviation (deficiency compared to normal averages) and the presence of a prolonged dry spell .
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Impact Indicators	If the first trigger is met, the state evaluates four core impact categories: ○ Agriculture (crop condition/sown area) ○ Remote sensing vegetation indices (like NDVI) ○ Soil moisture ○ Hydrology (reservoir and groundwater levels) States select three of these four impact indicators (one from each chosen type). If all 3 show severe anomalies, it indicates a severe drought; if 2 show moderate-to-severe levels, it indicates a moderate drought.
Ground Verification	After the initial triggers activate, state authorities conduct physical sample surveys on the ground to verify crop damage, fodder availability, and drinking water shortages. The final field report determines the official severity grade.

- Once verified, the state government issues an official notification detailing the geographic boundaries of the affected areas, which generally remains valid for **6 months** unless extended or withdrawn.
- Issuing the notification activates relief funds from the **State Disaster Response Fund (SDRF)**, triggers crop insurance claims (PMFBY), enables agricultural loan restructuring, and allows the state to submit a memorandum seeking additional assistance from the **National Disaster Response Fund (NDRF)**.

What are the major challenges in drought prediction and management in India?

1. **Microclimate and Rainfall Variability:** The Indian monsoon is highly erratic, making accurate localised forecasting challenging. While predictions may be relatively reliable at the national or state level, block- and district-level forecasts often struggle to capture microclimatic differences and localised dry spells.
2. **Emergence of Flash Droughts:** Flash droughts can develop rapidly within 2-3 weeks due to sudden heatwaves and increased evapotranspiration. Traditional meteorological early-warning systems often struggle to detect these rapid changes in soil moisture, limiting timely preparedness and response.
3. **Political and Administrative Delays in Declaration:** State governments often delay formally declaring a drought due to political reluctance or bureaucratic hurdles in field level assessment. Such delays may postpone the release of emergency financial assistance, relief measures and crop compensation to affected farmers.
4. **Institutional Fragmentation:** Drought management involves multiple Central and State departments, including Agriculture, Jal Shakti, Disaster Management and Rural Development. Overlapping responsibilities and coordination gaps among these institutions can create administrative bottlenecks and affect the timely implementation of drought preparedness and mitigation measures.
5. **Neglect of Traditional Water Storage:** Encroachment, siltation and urbanisation have damaged many traditional water-harvesting systems such as tanks, johads and bawris. Their decline has reduced local water storage and increased vulnerability to prolonged dry spells.

What are the major drought mitigation measures recommended in the NDMA guidelines?

1. **Rainwater Harvesting and Water Conservation:** Promote rooftop rainwater harvesting, farm ponds, check dams, percolation tanks and other local structures to capture and store rainwater.
2. **Integrated Watershed Development:** Adopt watershed-based approaches involving soil-moisture conservation, groundwater recharge, afforestation and treatment of degraded land.

3. **Drought-Resilient Agriculture:** Promote drought-resistant and short-duration crop varieties, crop diversification, mixed farming and climate-resilient agricultural practices.
4. **Efficient Irrigation:**
5. **Groundwater Management:** Implement artificial recharge techniques for depleted aquifers, promote community-based water budgeting, and mandate regulatory controls on deep borewells.
6. **Restoration of Traditional Water Bodies:** Restore and maintain tanks, ponds, johads, bawris and other traditional water-harvesting systems to increase local water-storage capacity.
7. **State Drought Monitoring Cells (DMCs):** Establish dedicated DMCs under State Disaster Management Authorities (SDMAs) to track real-time indicators like rainfall deficit, reservoir levels, and soil moisture.
8. **Drought Early-Warning Systems:** Strengthen monitoring of rainfall, soil moisture, groundwater, reservoir levels and vegetation conditions to provide timely warnings and enable early action. NDMA's current SACHET platform demonstrates the broader emphasis on geo-targeted, technology-enabled disaster warnings.

What measures can be adopted to improve drought resilience in India?

1. **Strengthen Water Conservation:** India needs to strengthen decentralised and community-based water conservation to reduce vulnerability to drought. This includes expanding rainwater harvesting, farm ponds, check dams, percolation tanks and groundwater-recharge structures.
2. **Promote Watershed Development:** Watershed development should be strengthened as a long-term drought-resilience strategy, particularly in rain-fed and drought-prone regions. It involves soil and water conservation, rainwater harvesting, groundwater recharge, afforestation and restoration of degraded land within a watershed.
3. **Promote Climate-Resilient Agriculture:** Promoting climate-resilient agriculture is essential for reducing farmers' vulnerability to drought and erratic rainfall. This includes adopting drought-resistant and short-duration crop varieties, crop diversification, millets, mixed and intercropping systems, micro-irrigation and improved soil-moisture conservation.
4. **Restore Traditional Water Systems:** Reviving traditional water-harvesting structures such as tanks, ponds, johads, bawris and ahars can strengthen local water security in drought-prone regions. These systems capture rainwater, support groundwater recharge and provide water during dry periods.
5. **Improve Drought Forecasting:** India should strengthen high-resolution, location-specific drought forecasting by integrating rainfall forecasts with satellite imagery, soil-moisture data, groundwater levels, reservoir storage and crop-condition indicators. Advanced technologies such as remote sensing, GIS, artificial intelligence and machine learning can help identify emerging drought conditions and flash droughts at the district and block levels.
6. **Strengthen Drought Contingency Planning:** Drought contingency plans should be district-specific, regularly updated and action-oriented, rather than prepared only after drought conditions emerge. They should identify vulnerable areas, water sources and high-risk crops in advance and provide clear measures such as alternative crop planning, changes in sowing schedules, livestock protection, drinking-water arrangements, fodder availability and employment support.
7. **Improve Centre-State Coordination:** Drought management requires effective coordination among the Central Government, State Governments, district administrations and local bodies. A common framework for drought assessment, real-time sharing of rainfall, groundwater and crop data, and clearly defined responsibilities can reduce delays in declaring drought and providing relief.

Conclusion: Drought management in India needs to move beyond a relief-centric approach towards a long-term resilience-based strategy.

UPSC GS-3: Disaster Management; GS-1: Geography
Read More: [Indian Express](#)

Women Safety in India – Challenges & Impact – Explained Pointwise

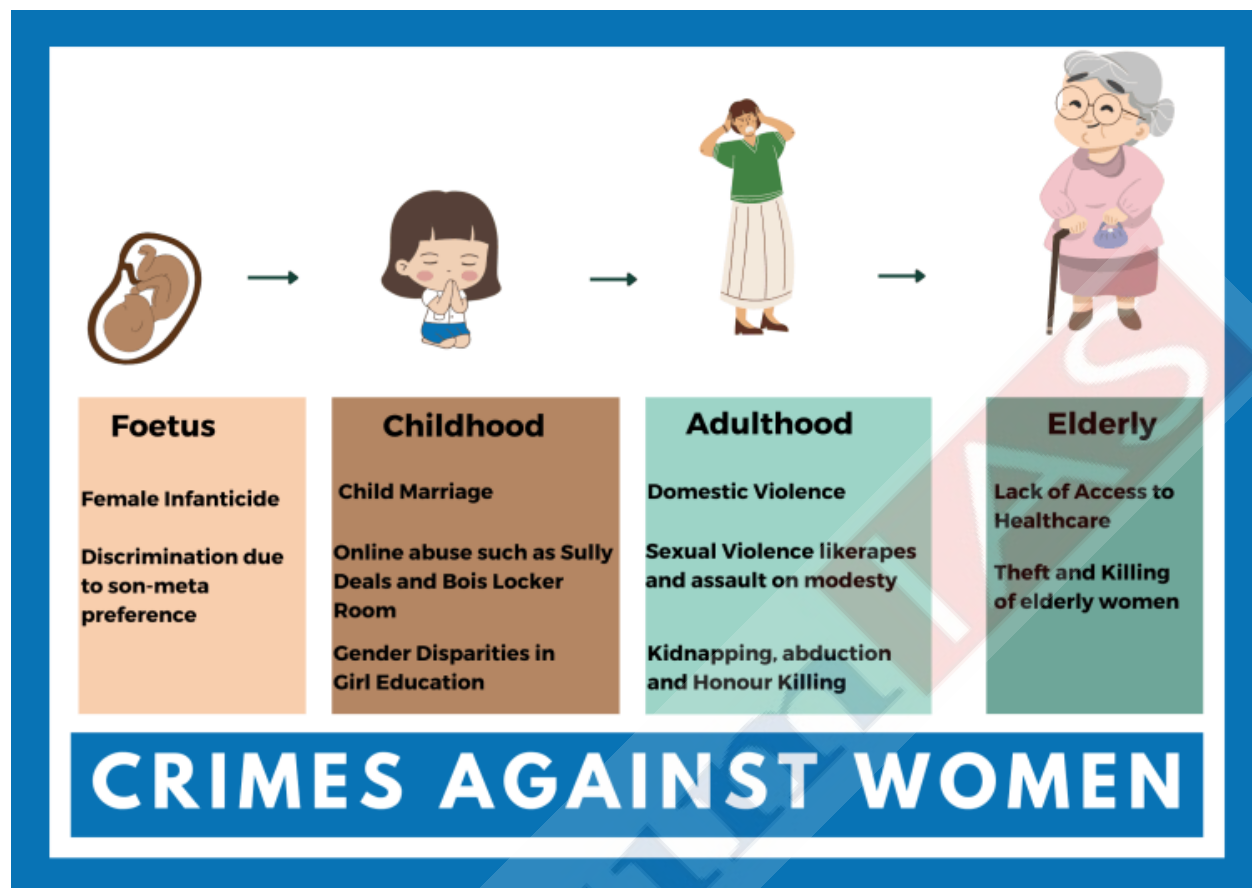


“The day a woman can walk freely on the roads at night, that day we can say that India has achieved independence” - Mahatma Gandhi

Despite advancements in technology and urbanization, women in India continue to face violence and discrimination. It is deeply distressing that nearly 88 rape cases are reported daily in the country, with many more likely going unreported. Our rich cultural heritage and value system have failed to protect the very individuals who are the foundation of society.

What are the safety issues faced by women in India? What are the data regarding women safety in India?

- Women in India face safety challenges across **public spaces, workplaces, homes, digital platforms and transportation**. Major issues include:
 1. **Gender-based violence:** Crimes such as rape, sexual assault, domestic violence, stalking and harassment remain major concerns.
 2. **Domestic violence:** Violence within households, including physical, sexual, emotional and economic abuse, can remain underreported due to social stigma and dependence.
 3. **Sexual harassment in public spaces:** Women may face harassment in streets, markets, educational institutions, workplaces and other public places.
 4. **Unsafe public transport:** Crowding, inadequate surveillance, poorly lit stations and insufficient last-mile connectivity can increase women’s vulnerability.
 5. **Cyber harassment:** Women increasingly face cyberstalking, online abuse, impersonation, image-based abuse, doxxing and threats on social media.



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NCRB Report 2023 Data related to crime against women:**1. Increase in crimes against women:**

- According to the NCRB Report 2023, **crimes against women** in India has increased by 4% in 2022, with reported cases rising from 4.28 lakh in 2021 to 4.45 lakh in 2022.
- The report indicates that the **crime rate per lakh women population** rose from 64.5 in 2021 to 66.4 in 2022.

2. Crimes against women: The most prevalent types of crimes reported include:

- Cruelty by Husband or His Relatives- 31.4%
- Kidnapping and Abduction of Women- 19.2%
- Assault on Women with Intent to Outrage her Modesty- 18.7%
- Rape- 7.1%

- Women's Safety Indices:** According to the **Women, Peace, and Security Index 2023**, **India ranks 128th out of 177 countries**. The **index score for India is 0.58**, which places it in the fourth quin tile for women's safety.
- National Family Health Survey (NFHS-5):** As per the National Family Health Survey (NFHS-5), around **30% of women in India** between **15-49 years** of age have experienced physical, sexual or domestic violence. The prevalence was around **31% in rural areas compared with 25% in urban areas**.

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What are the reasons behind lack of women safety in India?

1. **Prevalence of patriarchy:** There is deeply entrenched patriarchal culture in India. This perpetuates the belief in male superiority and normalizes violence against women. **For e.g.** Prevalence of 'Ladka hai Galti ho jaati hai mindset' in India.
2. **Objectification of Women:** The degenerated portrayal of women in media and entertainment reduces them to objects. This objectification often leads to increased instances of harassment and violence. **For e.g.** Increased objectification of sexuality in movies.
3. **Cultural Stigma:** Cultural stigmas regarding sexual violence and harassment, leads to underreporting of crimes, many women fear societal backlash on account of reporting of harassment issues. **For e.g.** Brushing off the child molestation issues under the carpet.
4. **Victim-Blaming:** Victims often face social judgment and victim-blaming rather than support. Questions about their clothing, choice of friends, time of outing, use of public spaces or lifestyle choices can shift attention from the perpetrator's responsibility to the victim's behaviour.
5. **Economic Dependency:** Feminization of poverty and high economic dependency on male family members, exacerbate the vulnerability of women. The lack of financial independence, makes it difficult for them to escape domestic abuses. **For e.g.** Increase in cases of domestic violence against housewives.
6. **Lack of Awareness and Education:** Many women in India are unaware of the legal protections available for women, such as the Domestic Violence Act, Sexual Harassment Act. This leads to a culture of violence and abuse against women.
7. **Inadequate safety in public places:** Inadequacies in public infrastructure, such as poorly lit streets, lack of safe transportation options, lack of CCTVs, increase vulnerability of women to crime. **For e.g.** Nirbhaya Rape in a public transportation and Kolkata rape in a public hospital highlights the lack of public safe spaces for women.
8. **Weak implementation of laws:** India has a comprehensive legal framework to protect women, including laws addressing domestic violence, sexual harassment at workplaces, sexual offences, child sexual abuse and trafficking. However, gaps in police response, investigation, prosecution, victim support and institutional compliance can reduce their deterrent effect.
9. **Digital technology and cybercrime:** The rapid expansion of smartphones, social media, digital payments and online communication has created new dimensions of safety risks for women. While digital technology has improved women's access to education, employment and public services, it has also enabled perpetrators to harass, threaten and exploit women remotely and anonymously. **For e.g.** Cyberstalking & online harassment faced by women.

What initiatives have been taken by the Government to prevent crimes against women?

Legal Protection:

Against violence	Child	● Prohibition of Child Marriage Act, 2006 ● Juvenile Justice (care and protection of children) Act, 2015 ● The Commissions for Protection of Child Rights Act ● The Protection of Children from Sexual Offences Act, 2012
Against objectification of women		● Indecent Representation of Women (Prohibition) Act, 1986.

Against Sexual Offences	• Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013. • Criminal Law (Amendments), Act 2013 for effective legal deterrence against sexual offences. • Criminal Law (Amendment) Act, 2018 for even more stringent penal provisions including death penalty for rape of a girl below the age of 12 years.
Against Domestic Violence	• Dowry Prohibition Act, 1961 • Protection of Women from Domestic Violence Act, 2005.

Central Government Initiatives:

1. **Establishment of Nirbhaya Fund:** A dedicated, non-lapsable fund was created to finance projects aimed specifically at women's safety and security. It supports initiatives such as ERSS-112, Safe City projects, Women Help Desks, Anti-Human Trafficking Units, forensic facilities and Fast Track Special Courts.
2. **Emergency Response Support System (ERSS-112):** The nationwide **112 emergency number** provides a single point for emergency assistance. It integrates police, fire, health and other emergency services and accepts distress requests through multiple channels.
3. **Women Helpline 181 (WHL):** A toll-free helpline integrated directly with ERSS-112 across states to offer emergency intervention, counseling, and referral services.
4. **Safe City Projects:** Safe City projects use CCTV surveillance, crime-hotspot mapping, command-and-control centres, improved street lighting, women police patrols, panic buttons and safer public infrastructure. Projects have been approved for eight cities: Ahmedabad, Bengaluru, Chennai, Delhi, Hyderabad, Kolkata, Lucknow and Mumbai.
5. **Mission Shakti:** Mission Shakti is the umbrella programme for women's safety, security and empowerment. Its **Sambal** component covers One Stop Centres, Women Helplines, Beti Bachao Beti Padhao and Nari Adalats.
6. **Investigation Tracking System for Sexual Offenses:** MHA has launched it to monitor and track time-bound investigation in sexual assault cases in accordance with Criminal Law (Amendment) Act 2018.
7. **National Database on Sexual Offenders:** MHA has launched it to facilitate investigation and tracking of sexual offenders across the country by law enforcement agencies. NDSO has data of over 5 lakh sexual offenders.
8. **National Cyber Crime Reporting Portal:** The portal provides an online mechanism for reporting cybercrime, with a specific facility for crimes against women and children. It also permits anonymous reporting for specified categories of sexually explicit content.
9. **Establishment of One stop centers:** Scheme of One Stop Centers has been launched to provide integrated support and assistance to women affected by violence.
10. **Scheme for Universalization of Women Helpline:** It has been launched to provide 24 hours emergency and non-emergency response to women impacted by violence.

State Government and other Initiatives:

1. **Mission Shakti:** It has been launched by the **UP government** to make improvements to women's safety, and reduce the consequent violence and exploitation faced by them.
2. **Police pink booths:** Launched by the **Delhi government**, these booths are dedicated to addressing the grievances of women passersby.
3. **Shakti Criminal Laws (Maharashtra Amendment) Act:** The **Maharashtra Assembly** passed the Shakti Criminal Laws (Maharashtra Amendment) Act to approve death penalty for heinous offences of rape and gangrape.
4. **Meri Saheli Initiative:** Launched by the **Railway Protection force**, this initiative ensures security of lady passengers that are traveling by train by a dedicated Mahila officers team.
5. **Online Movements and campaigns:** **#CallItOut because #ItsNotOK campaign, #MeToo movement**, have been launched to facilitate knowledge transfer and coordinate efforts towards the prevention of harassment against women.

What are the challenges in ensuring safety of women despite the legal and policy initiatives?

1. **Under-reporting of crimes:** Social stigma, victim-blaming, fear of retaliation and family pressure may discourage women from reporting violence, particularly domestic and sexual violence.
2. **Under-Representation of Female Officers:** Women make up less than **12% of the total police force** in India, limiting the availability of gender-sensitive personnel at entry points.
3. **Delayed Justice:** The inefficiencies of the justice system, such as prolonged legal processes and lenient punishments for sexual offenders, undermines public confidence in law enforcement.
4. **Laxity in conviction procedure:** 39% of officers believe complaints of gender-based violence are baseless. Prevalent culture of prompt registration of FIRs, lack of time-bound investigations and ineffective collection of forensic evidence in sexual assault cases, lead to inordinate delays in conviction of sexual harassment cases.
5. **Implementation Gap:** SC has called out the 'authorities/management/employers' for failing to ensure a "safe and secure work place" for women. It has been observed that the implementation of the Sexual Harassment of Women at Workplace (Prevention, Prohibition, Redressal) Act, 2013, has been half-hearted.
6. **Ineffective utilisation of public funds:** Even though the budgetary allocation of the Nirbhaya Fund has increased by 100% between 2013 to 2022, less than half of the allocation to the fund has been used.
7. **Challenges in cybercrime enforcement:** Cyberstalking, online harassment, impersonation, deepfakes and image-based abuse can spread rapidly, while identifying perpetrators and preserving digital evidence can be difficult.
8. **Rural and regional disparities:** Access to police stations, courts, forensic facilities, helplines, shelters and counselling services is not uniform across the country.

What are the implications of prevailing attitudes and crimes against women?

1. **Restriction of women's freedom and mobility:** Fear of sexual harassment, assault, stalking and other forms of violence can significantly restrict women's freedom to move and participate in public spaces. Over time, such restrictions can reduce women's access to education, employment, healthcare, political participation and social opportunities.
2. **Dissuades women from entering the workforce:** Concerns about workplace harassment, unsafe transportation and commuting can discourage women from entering or remaining in paid employment, resulting in underutilisation of India's female workforce. At the macro level, exclusion of women from economic activity limits India's growth potential.

3. **The “Pink Tax” on Safety:** Women spend significantly more money than men on safer transport options for e.g. opting for auto-rickshaws or cabs over cheaper public buses and trains, or renting apartments in expensive, gated localities purely for security.
4. **Impact on education:** Families may restrict girls from travelling alone, attending institutions located far from home or participating in activities outside regular hours due to safety concerns. These concerns can contribute to absenteeism, early discontinuation of education and reduced participation in higher education.
5. **Reinforcement of patriarchal norms:** Prevailing attitudes towards crimes against women can reinforce patriarchal norms by placing greater emphasis on regulating women’s behaviour than on holding perpetrators accountable. Such attitudes normalise restrictions on women’s freedom, reinforce traditional gender roles and weaken women’s agency.
6. **Physical and Mental Health Consequences:** Victims of sexual violence experience severe physical injuries, which can lead to long-term health issues such as chronic pain, reproductive health problems, and increased susceptibility to sexually transmitted infections (STIs) including HIV.
7. **Impact on Families and Children:** Children who witness violence against their mothers often face the risk of developing emotional and behavioral problems. They may also become victims of abuse themselves, perpetuating a cycle of violence across generations.
8. **Digital exclusion:** Cyberstalking, online abuse and threats can cause women to withdraw from social-media and digital platforms, limiting their access to education, networking, entrepreneurship and public expression.
9. **Challenge to India’s development goals:** Persistent insecurity undermines gender equality, women’s economic empowerment and inclusive development, making women’s safety an important component of India’s demographic and economic dividend.

What Should be the Way Forward?

1. **Ensure effective implementation of laws:** India has a comprehensive legal framework to protect women, but effective implementation is essential for converting legal rights into actual safety. The focus should be on strengthening the entire justice chain – from reporting and investigation to prosecution, trial and victim support.
2. **Police reforms:** There should be gender focused recruitment and training in police. Rapidly scale up female recruitment to meet the recommended target of **at least 33% female representation** across all ranks in state police forces.
3. **Judicial reforms:** There should be establishment of Fast track courts and enhanced punishment in grave cases like rape, as recommended by Justice Verma Committee. Further, the women representation in judiciary must be enhanced.
4. **Training and capacity building:** Manpower training and skill building programs for Investigation Officers, Prosecution Officers and Medical Officers must be stepped up. Gender-sensitive training and monitoring in criminal law procedures must be promoted to ensure that staff handle cases with a trauma-informed approach.
5. **Make public spaces safer:** Public safety should be integrated into urban planning, transport systems and local governance rather than relying only on policing after an incident occurs. Authorities should conduct regular gender-sensitive safety audits to identify poorly lit streets, isolated areas and crime hotspots.
6. **Establishment of Rape Crisis Centres:** Rape Crisis Centres like in countries like Australia, Canada, America, United Kingdom, etc, can be set up in India. These centres can provide the rape victims with medical help, counselling, and financial help by way of providing job opportunities etc.

7. **Sensitivity on part of Media:** The media must be sensitive to the plight of the rape victim and must not highlight the name or any inference leading to the identification of the victim. The media must highlight those cases where the offender has been convicted, as it will infuse the feeling of deterrence among the people.
8. **Promote gender sensitisation from an early age:** Gender sensitisation should begin in schools and families, where attitudes towards gender roles are formed. Children should be taught gender equality, mutual respect, consent, personal boundaries and dignity, along with the rejection of stereotypes that portray women as subordinate or responsible for preventing their own victimisation.

Conclusion: India needs to bridge the gap between laws and their implementation while transforming patriarchal attitudes, strengthening institutions and creating safer physical and digital spaces. A whole-of-society approach involving government, families, educational institutions, communities and citizens can help ensure that women can exercise their rights, mobility and opportunities with dignity and security.

Read More- [The Indian Express](#)

UPSC Syllabus- GS1 Issues related to Women

India's Nuclear Doctrine – Advantages & Challenges – Explained Pointwise



India's nuclear doctrine – Advantages & Challenges – Explained Pointwise

India's nuclear doctrine, formally articulated in 2003, has remained largely unchanged for over two decades, with key principles such as credible minimum deterrence, No-First-Use and civilian control at its core. However, evolving security challenges and emerging technologies necessitate an assessment of whether the doctrine remains adequate for India's contemporary strategic environment.

What are the key features of India's Nuclear Doctrine?

The core principles of India's nuclear doctrine were articulated by the **Cabinet Committee on Security** in **2003** and continue to be reaffirmed by the Government.

Key features of India's Nuclear Doctrine are:

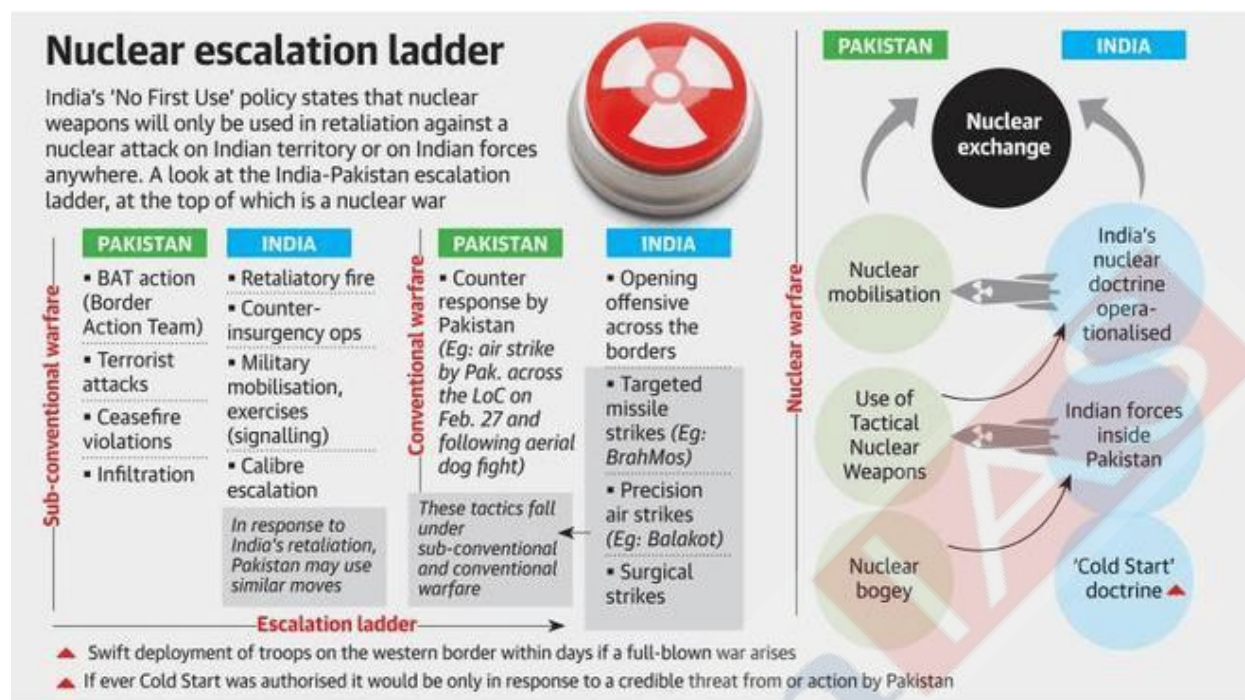
- **No First Use (NFU):** India committed to not being the first to use nuclear weapons in a conflict but would retaliate if attacked with such weapons.
- **Credible Minimum Deterrence:** India would maintain a sufficient number of nuclear weapons to deter a nuclear attack, but it would not seek to match other countries' arsenals in size.
- **Non-use Against Non-Nuclear Weapon States:** India would not use or threaten to use nuclear weapons against countries that do not possess them.
- **Retaliation to a Nuclear Attack:** If India is subject to a nuclear attack, it would retaliate, causing massive damage to the aggressor.
- **Civilian Political Control:** The authority to order nuclear retaliation rests with the civilian political leadership through the **Nuclear Command Authority (NCA)**. This ensures that nuclear weapons remain under strong political control.
- **Commitment to Nuclear Disarmament:** India supports **universal, non-discriminatory and verifiable nuclear disarmament** and advocates the eventual elimination of nuclear weapons globally.

What is the evolution of India's nuclear doctrine?

- **Origin of India's Nuclear Doctrine:** India's nuclear doctrine originated in the years following its first nuclear test in 1974, which was termed as a 'peaceful nuclear explosion.' However, the real evolution of its nuclear doctrine began after the 1998 nuclear tests, when India declared itself a nuclear weapon state.
- **Draft Nuclear Doctrine (1999):** Following the 1998 tests, the National Security Advisory Board (NSAB) of India released a Draft Nuclear Doctrine in 1999. This draft provided the basic framework of India's nuclear policy, emphasizing a policy of 'No First Use' (NFU) and asserting that nuclear weapons would only be used for retaliation against a nuclear attack.
- **Official Nuclear Doctrine (2003):** In 2003, the Indian government reviewed and released the official nuclear doctrine. It retained the core principles of the 1999 draft but added more details. The 2003 doctrine emphasized "Credible Minimum Deterrence," reasserted the 'No First Use' policy, and stated that India would not use nuclear weapons against non-nuclear weapon states.

Current Debates: Given the evolving regional security environment, especially the growing nuclear capabilities of China and the persisting threat from Pakistan, there are ongoing debates in India about whether changes or clarifications to the nuclear doctrine are necessary. Some argue for a review of the 'No First Use' policy, while others believe that the principle of 'Credible Minimum Deterrence' might need to be reinterpreted in the face of new threats.

What are the advantages of India's nuclear doctrine?



Source: The Hindu

1. **Credibility and Clarity:** India's nuclear doctrine provides a clear and credible stance on the country's position regarding the use of nuclear weapons. The "No First Use" policy clearly signals that India views nuclear weapons primarily as a deterrent and not as an offensive tool, which contributes to regional stability.
2. **Promotes peace and stability:** The doctrine, particularly the "No First Use" and "Non-use Against Non-Nuclear Weapon States" provisions, contributes to regional and global peace and stability. These principles assure non-nuclear weapon states that they will not be threatened or attacked with nuclear weapons by India.
3. **Supports Disarmament Goals:** The "Credible Minimum Deterrence" stance aligns India with global disarmament goals and reduces the chances of a costly arms race. India maintains that its nuclear capability is a security necessity rather than an endorsement of permanent nuclear weapons.
4. **Reinforces India's Responsible Image:** The doctrine's principles, especially the "No First Use" policy and "Non-use Against Non-Nuclear Weapon States", reinforce India's image as a responsible nuclear power. This has strategic benefits for India in terms of its international standing and relations with other countries.
5. **Mitigates the Risk of Accidental Nuclear War:** The doctrine's "No First Use" policy reduces the risk of an accidental nuclear war, as it removes the pressure for a rapid decision to launch in a crisis. This allows for a more measured response, potentially averting catastrophe.
6. **Enhances India's strategic autonomy:** An independent nuclear deterrent reduces India's dependence on external security guarantees and provides greater freedom in pursuing an independent foreign policy.

What are the challenges raised against India's nuclear doctrine?

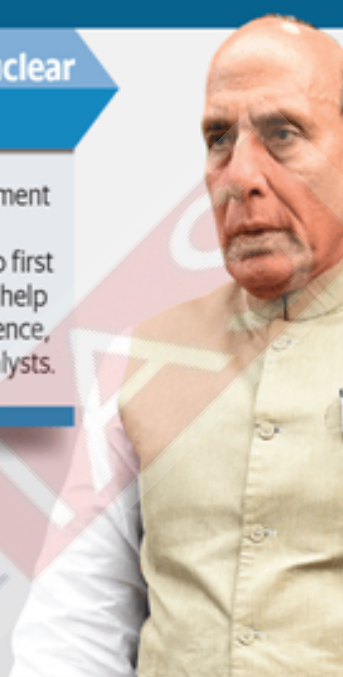
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NUCLEAR REACTION

The Indian position	The Pakistani doctrine	The new nuclear option
NEW DELHI has held that it will not be the first to initiate a nuclear strike, but will retaliate should deterrence fail.	ISLAMABAD does not espouse a no-first use policy. Its doctrine promises 'massive retaliation' to any aggression.	ADDING an element of flexibility to unconditional no first use posture can help underpin deterrence, according to analysts.

Pokhran witnessed Atalji's firm resolve to make India a nuclear power and yet remain committed to the doctrine of 'no first use'. India has adhered to this. What happens in future depends on the circumstances.

RAJNATH SINGH, Defence minister



Source: Live Mint

1. **Changing Regional Dynamics:** India's nuclear doctrine is being tested by the rapidly changing security dynamics in its region. The modernization and expansion of China's nuclear capabilities pose a significant challenge to India's policy of minimum deterrence. This transformation in the nuclear landscape could potentially strain India's ability to respond effectively in a crisis.
2. **Pakistani Tactical Nuclear Weapons:** Pakistan's development of tactical nuclear weapons challenges India's NFU policy. The use of such weapons in a limited war scenario could potentially escalate the conflict, putting India in a difficult position given its NFU commitment.
3. **Debate over No First Use Policy:** The NFU policy's credibility has also been questioned. Doubts arise about whether India would stick to its NFU commitment if it had reliable information about an imminent nuclear strike. This ambiguity could potentially undermine the doctrine's deterrence value.
4. **Credibility of Deterrence:** India's commitment to a "Minimum Credible Deterrence" raises questions about whether it possesses enough nuclear weapons to effectively deter potential aggressors, particularly given China's rapid military modernisation and nuclear expansion.
5. **Lack of Counter-Force Strategy:** India's nuclear doctrine does not explicitly mention a counter-force strategy, focusing on enemy military assets. Critics argue that this could potentially limit India's strategic options in the event of a nuclear conflict.
6. **Vulnerability to First Strike:** The "No First Use" policy potentially exposes India to a damaging first strike from an adversary. Critics argue that in such a case, India's ability to launch a retaliatory strike could be significantly compromised.
7. **Credibility of Massive Retaliation:** India's declared policy of **massive retaliation** has been questioned on the ground that responding to a limited or tactical nuclear strike with a massive nuclear attack could appear disproportionate and potentially escalate the conflict into an all-out nuclear war.

What are the implications of shifting from the present nuclear doctrine?

1. **Elevated Regional Tensions:** If India were to abandon its “No First Use” policy, it could escalate tensions in the region, particularly with Pakistan and China, who might interpret such a move as a sign of increased aggression.
2. **Arms Race:** A shift in India’s nuclear doctrine could potentially trigger an arms race, with neighbouring countries feeling the need to expand their own nuclear arsenals in response to India’s perceived shift in stance.
3. **International Reputation:** India has traditionally been viewed as a responsible nuclear state, due in part to its “No First Use” policy and commitment to minimum credible deterrence. Altering this doctrine could tarnish that reputation and lead to international criticism.
4. **Destabilize the region:** The current doctrine contributes to strategic stability in the region by making it clear that India’s nuclear weapons are purely for deterrence and defensive purposes. A shift in this policy could destabilize the region by creating uncertainty around India’s intentions.
5. **Resource Allocation challenges:** A change in doctrine, particularly one leading to the expansion of India’s nuclear arsenal, would require substantial financial resources. This could divert funds from other critical areas like conventional military capabilities or economic development.

What should be the way forward for India’s nuclear doctrine?

1. **Maintain Strategic Restraint:** India should continue to adhere to its current nuclear doctrine of “No First Use” and “Credible Minimum Deterrence”. These policies have served India well by maintaining regional stability and preserving its international reputation as a responsible nuclear state.
2. **Strengthen Conventional Capabilities:** While maintaining a credible nuclear deterrent, India should also focus on strengthening its conventional military capabilities. This can help deter conventional conflicts that may escalate to the nuclear level.
3. **Promote Nuclear Disarmament:** India should continue advocating for global nuclear disarmament and non-proliferation. This includes supporting international treaties aimed at nuclear disarmament and urging other nuclear states to adopt “No First Use” policies.
4. **Enhance Crisis Management Mechanisms:** India should work with other regional actors to enhance crisis management mechanisms. This could include establishing hotlines, conducting joint military exercises, and agreeing on confidence-building measures to prevent accidental escalation during times of crisis.
5. **Invest in Missile Defense Systems:** To counter the growing threat from China’s modernizing nuclear arsenal, India should invest in developing and deploying advanced missile defense systems. This could offer an additional layer of protection against potential nuclear strikes.
6. **Strengthen second-strike capability:** India should strengthen its second-strike capability by ensuring that its nuclear forces remain survivable even after a first attack. This requires strengthening sea-based nuclear forces, secure communication systems, hardened infrastructure and dispersed assets.
7. **Strengthen nuclear diplomacy:** India should strengthen nuclear diplomacy by promoting strategic stability, nuclear risk reduction and confidence-building measures with China, Pakistan and other nuclear-armed states. It should participate actively in global forums, support universal and non-discriminatory nuclear disarmament, and advocate dialogue, transparency and crisis-communication mechanisms to reduce the risk of accidental or unintended nuclear escalation.

Conclusion: India’s nuclear doctrine should evolve through a balance of credible deterrence, strategic restraint and adaptability.

Sources: [The Hindu](#)

Syllabus: GS 2: International Relations – India's Nuclear Policy.

Right to Vote as Fundamental Right – Arguments in Favour & Against – Explained Pointwise



A recent newspaper investigation found that 97 eligible voters in Goa were excluded from electoral rolls after centralised ECINet software prevented Electoral Registration Officers (EROs) from reversing the decisions. The incident highlights concerns over electoral inclusion and has renewed the debate on whether the right to vote should be elevated to a Fundamental Right.

What is the constitutional and legal basis of the right to vote in India?

- The right to vote in India is primarily a **statutory right**, rather than a Fundamental Right.
- However, the right to vote in India has constitutional & statutory basis:

Constitutional Basis	○ Article 326 provides for elections to the Lok Sabha and State Legislative Assemblies on the basis of adult suffrage. ○ Every Indian citizen who is 18 years or above is entitled to be registered as a voter, subject to constitutionally permitted disqualifications.
Statutory Basis	○ The right to vote is regulated mainly by the Representation of the People Act, 1950 and the Representation of the People Act, 1951. ○ RPA 1951 (Section 62): Establishes the statutory right to vote in a specific constituency, provided the person's name appears on the electoral roll.

	○ RPA 1952 (Section 62(5)): Restricts individuals under confinement (prison, police custody) from voting, with an exception for those under preventive detention.
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● **Constitutional Assembly Debate:**

- Dr. **B.R. Ambedkar** and **K.T. Shah** initially argued for it to be a Fundamental Right. However, **Sardar Patel** and **C. Rajagopalachari** opposed this, fearing that the Princely States would refuse to join the Union if their electoral autonomy was immediately restricted.
- It was decided to place universal adult suffrage in **Article 326** (Part XV on Elections) instead. The logic was that the right was fundamental in importance, but it could be provided for outside the chapter on Fundamental Rights to accommodate the political realities of the time.

How has the judiciary interpreted the right to vote in India?

Jyoti Basu v/s Debi Ghosal Case (1982)	<u>Right to vote is not a Fundamental Right:</u> The Supreme Court held that the right to elect, the right to be elected and the right to dispute an election are statutory rights, and not Fundamental Rights. Therefore, the right to vote is subject to the conditions and limitations prescribed by law.
Kuldip Nayar v/s Union of India (2006)	SC reaffirmed that the right to vote is essentially a statutory right under Section 62 of the Representation of the People Act 1951, and not a fundamental or constitutional right.
Rajbala v/s State of Haryana (2015)	Described the right to vote as a constitutional right, however, the larger bench ruling in Kuldip Nayar case prevails.
PUCL v/s Union of India (2003)	<u>Right to Know (Article 19(1)(a)):</u> Supreme Court held that while casting a vote itself is a statutory right, a voter's "Right to Know" background details (assets, criminal antecedents, educational qualifications) about candidates is a Fundamental Right derived from freedom of speech and expression (Article 19(1)(a)).
PUCL v/s Union of India (2013)	<u>Right to Reject (NOTA):</u> Supreme Court recognized the right to cast a "None of the Above" (NOTA) vote as an integral aspect of free expression under Article 19(1)(a).

Although the right to vote is not a Fundamental Right, the judiciary has recognised its central role in a representative democracy, as it enables citizens to participate in the formation of government and influence public governance.

What is the status of the right to vote in other democracies?

South Africa	Constitution directly lists the right to vote as a Fundamental Right under the Bill of Rights.
Germany	The Basic Law explicitly establishes the right to vote as a fundamental right of the citizen .
Canada	Canadian Charter of Rights & Freedoms guarantees every Canadian citizen the right to vote.
France	The right to vote is a fundamental constitutional right tied directly to national sovereignty.
United Kingdom	The right to vote is a statutory right conferred by Parliament , primarily through the Representation of the People Act 1983 .
United States	The U.S. Constitution does not explicitly grant an affirmative, individual right to vote. Instead, the right is protected through prohibitions on discrimination by various amendments. However, the Supreme Court has recognized voting as a “ fundamental right ” under the Equal Protection Clause.

What are the arguments in favour of elevating the right to vote to the status of a Fundamental Right?

1. **Strengthening democratic participation:** Voting is the primary means through which citizens participate directly in representative democracy. Making it a Fundamental Right would accord greater constitutional protection to political participation.
2. **Reinforcing political equality:** Universal voting rights embody the principle of “**one person, one vote, one value**.” Fundamental-right status could strengthen protection against arbitrary exclusion from the electoral process.
3. **Greater judicial protection:** Fundamental Rights are enforceable under **Articles 32 and 226**. Elevating the right to vote could provide citizens with a stronger constitutional remedy against unjustified restrictions.
4. **Protecting voter access:** It could strengthen constitutional scrutiny of measures that unnecessarily prevent eligible citizens from registering or voting, particularly where administrative failures are involved.
5. **Preventing arbitrary legislative restrictions:** As a statutory right, the right to vote is largely governed by ordinary legislation. Fundamental-right status could subject restrictions on voting to stricter constitutional scrutiny.
6. **Deepening constitutional democracy:** Elevating the right to vote to a Fundamental Right could deepen India's constitutional democracy by recognising political participation as an essential dimension of citizenship.
7. **Strengthening electoral accountability:** A constitutionally protected voting right could reinforce the role of citizens in holding governments and elected representatives accountable.

What are the arguments against elevating the right to vote to the status of a Fundamental Right?

1. **Need for legislative flexibility & regulatory control:** The right to vote involves detailed rules relating to voter registration, preparation of electoral rolls, disqualifications, eligibility and election procedures. Keeping it as a statutory right allows Parliament to modify these rules through ordinary legislation as electoral conditions and administrative requirements evolve. Elevating it to a Fundamental Right could subject such changes to greater constitutional scrutiny and potentially reduce the flexibility needed to regulate the electoral process effectively.
2. **Risk of Judicial Overreach:** Elevating the right to vote to a Fundamental Right could bring a wider range of electoral matters under direct constitutional scrutiny & would bring various electoral matters before courts. Excessive judicial intervention may reduce the flexibility of Parliament and the Election Commission of India in designing and administering detailed electoral rules.
3. **Existing judicial remedies:** Even without Fundamental Right status, citizens can challenge unlawful electoral actions through constitutional remedies, particularly under Articles 226 and 32 where an independent Fundamental Right is implicated.
4. **Slippery Slope:** Elevating the right to vote to a Fundamental Right could trigger demands to accord similar constitutional status to other political rights, such as the right to contest elections. This may broaden the scope of judicial scrutiny over electoral matters and create challenges in maintaining a balance between political participation, representative democracy and orderly electoral administration.

What should be the way forward?

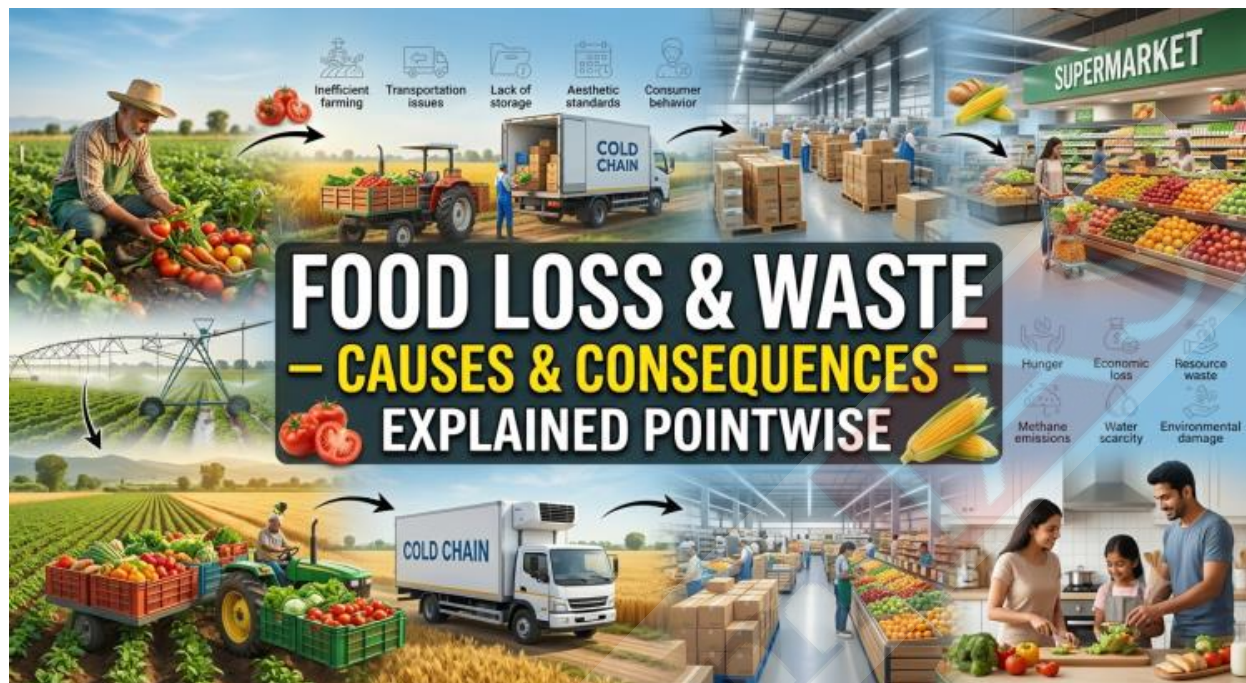
1. **Build consensus before constitutional change:** Any proposal to confer Fundamental Right status should follow wide parliamentary, constitutional and public consultation, examining its implications for electoral legislation and administration.
2. **Focus on substantive electoral participation:** Whether or not the legal status changes, the priority should be to ensure that every eligible citizen can register, access the ballot and exercise the choice freely and effectively.
3. **Strengthen voter access:** Ensure universal, accessible and hassle-free voter registration, particularly for migrants, persons with disabilities, the elderly and other vulnerable groups.
4. **Learn from comparative experience:** India can examine how other democracies constitutionally protect voting rights while retaining reasonable regulations concerning voter eligibility, electoral integrity and administration.
5. **Ensure stronger safeguards:** Robust safeguards should be established against wrongful deletion from electoral rolls, arbitrary disqualification and administrative errors. At the same time, voters should have access to timely notice, grievance-redressal mechanisms and effective judicial remedies to protect their electoral participation.

Conclusion: Rather than treating constitutional elevation as an end in itself, the reform debate should aim to create an electoral framework where the constitutional commitment to universal adult suffrage translates into meaningful and equal political participation.

UPSC GS-2: Indian Polity

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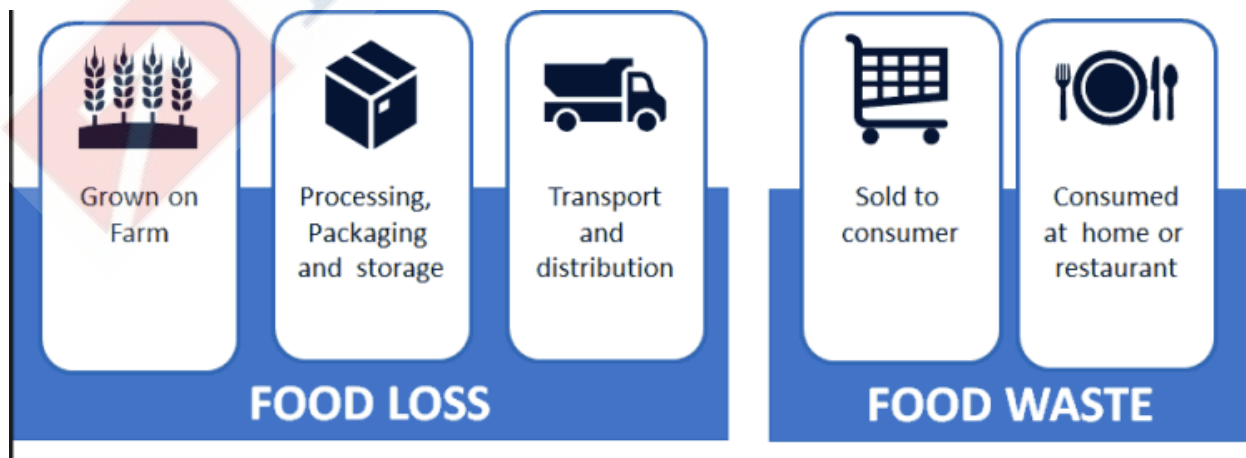
Food Loss & Waste – Causes & Consequences – Explained Pointwise



Observed annually on **29 September**, the **International Day of Awareness of Food Loss and Waste** highlights the need to reduce food lost along supply chains and food wasted at retail, food-service and household levels. Food loss & waste remain one of the world's most persistent challenges, with severe consequences for climate, food security, economic cost, and sustainable use of natural resources.

What is food loss and food waste?

- **Food loss** refers to the decrease in the quantity or quality of food before it reaches the consumer, mainly during production, harvesting, post-harvest handling, storage, processing and transportation.
- **Food waste** refers to food that is discarded or left uneaten at the retail, food-service and household levels, even though it was fit for human consumption.
- Food loss occurs mainly along the food supply chain before retail, while food waste occurs mainly at the retail, food-service and consumer levels.



Source: GDRC

What is the present status of food loss & waste in India & globally?

Globally	- Approximately one-third of all food produced for human consumption globally is lost or wasted. Food loss: FAO estimates that around 13.2% of food is lost globally between the post-harvest stage and before retail. The latest SDG monitoring estimates global losses at 13.3% in 2023, indicating little apparent progress since 2015. Food waste: According to UNEP's Food Waste Index Report 2024, around 1.05 billion tonnes of food was wasted in 2022 at the household, food-service and retail levels – about 19% of food available to consumers. Households are the largest source of this waste – 60% came from households, 28% from food services and 12% from retail. Per Capita Household Waste: The average person globally generates about 79 kg of household food waste annually.
India	- A NABCONS study commissioned by the Ministry of Food Processing Industries (MoFPI), covering 54 crops/commodities for 2020–22, estimated losses of: Cereals: 3.89-5.92% (~5%) Pulses: 5.65-6.74% (~6%) Fruits: 6.02-15.05% (~10%) Vegetables: 4.87-11.61% (~8%) Marine fisheries: 8.76% (~9%) Food Loss: Up to 40% of food produced in India is lost before reaching consumers. Almost 30-50% of perishable produce like fruits & vegetables spoil due to inadequate cold chain infrastructure. Per Capita Household Waste: The average Indian household generates about 50-55 kg of food waste per person per year, lower than the global average of 79 kg.

What are the major causes of food loss and waste in India?

- Inadequate storage infrastructure:** Inadequate and unevenly distributed warehouses, silos, cold-storage facilities and scientific storage systems contribute significantly to post-harvest food losses in India. Perishable commodities such as fruits, vegetables, dairy and fish are particularly vulnerable to spoilage when appropriate temperature and humidity-controlled storage is unavailable. This leads to quality deterioration, distress sales, lower farmer incomes and wastage of edible food.
- Weak cold-chain infrastructure:** India has gaps in integrated cold-chain infrastructure connecting farms, collection centres, storage facilities, refrigerated transport and markets. Inadequate pre-cooling, insufficient refrigerated transportation and uneven distribution of cold-storage facilities can increase post-harvest spoilage and quality deterioration, leading to economic losses for farmers and reduced availability of food.
- Poor post-harvest handling:** Inadequate harvesting, sorting, grading, packaging and handling practices can cause physical damage, bruising and contamination of food, accelerating spoilage. Small and fragmented farms often lack access to modern post-harvest technologies, leading to significant losses.
- Inefficient transportation:** Inadequate transport infrastructure, long transit times, poor road connectivity and insufficient refrigerated vehicles can expose perishable food to heat, moisture and

physical damage. This is particularly significant for fruits, vegetables, dairy, meat and fish, leading to spoilage before they reach markets and consumers.

5. **Fragmented Supply Chains & Middlemen:** Agricultural produce typically passes through multiple intermediaries (local traders, commission agents, regional mandis, and wholesalers) before reaching retail. Each transfer point delays delivery and increases the risk of spillage and spoilage.
6. **Market fluctuations:** Sudden changes in demand, prices and supply can make it uneconomical for farmers to harvest and transport perishable produce. During periods of **market glut**, excess supply of fruits and vegetables may cause prices to fall below the cost of harvesting, leading farmers to leave produce unharvested or allow it to perish.
7. **Low Processing Rates:** India processes less than 10% of its total agricultural output (compared to 60–80% in developed countries). Without sufficient agro-processing facilities to convert excess harvest into longer-lasting preserved items, surplus fresh produce is left to rot.
8. **Excess food in restaurants and events:** Large portions, over-preparation due to uncertain demand and elaborate buffets often result in substantial quantities of edible food being discarded. Weddings, festivals and other large gatherings can further increase food waste due to over-ordering, low consumption and inadequate systems for redistributing surplus food.
9. **Changing Urban Consumption Habits:** Growing urban middle-class populations, increased reliance on food delivery apps, impulse bulk-buying at modern supermarkets, and poor meal planning lead to cooked food spoiling in domestic refrigerators.
10. **Lack of awareness and segregation:** Limited awareness about proper food storage, portion planning, expiry dates and food redistribution often leads to avoidable food waste. Further, inadequate segregation of food waste from other municipal waste makes recovery, composting and processing difficult, resulting in more food being sent to landfills.

What are the consequences of food loss & waste in India?

1. **Threat to food security:** Food loss and waste reduce the effective availability of food despite significant agricultural production. Losses during harvesting, storage and transportation, along with waste at the consumer level, reduce the food available for consumption and can undermine efforts to ensure adequate, affordable and nutritious food, particularly for vulnerable populations.
2. **Economic losses for farmers:** Food loss directly reduces the marketable surplus and income of farmers, as farmers bear the cost of producing, harvesting and transporting food that ultimately gets damaged or spoiled. The NABCONS study (2020–22) estimated post-harvest losses worth ₹26,001 crore in cereals, ₹29,545 crore in fruits and ₹27,459 crore in vegetables in India.
3. **Food Inflation:** Systemic supply losses reduce the net availability of produce in wholesale mandis. This artificial scarcity drives up retail prices, triggering seasonal spikes in food inflation that disproportionately affect lower- and middle-income consumers.
4. **Wasted Freshwater:** Agriculture accounts for about 80-90% of India's freshwater use. Food that is never consumed represents roughly **230-250 cubic kilometers of water wasted** annually which is equivalent to the annual water consumption of major urban centers.
5. **Greenhouse Gas Emissions & Climate Change:** Decomposing organic waste in open municipal landfills releases **methane**, a potent greenhouse gas that is 28 times more effective at trapping atmospheric heat than carbon dioxide over a 100-year timescale. Food waste accounts for 8-10% of global greenhouse gas emissions.
6. **Nutritional losses:** Food loss and waste lead to the loss of calories, proteins, vitamins and minerals that could otherwise contribute to improving India's nutritional security. This is particularly significant because India continues to face substantial malnutrition: **NFHS-5 (2019–21) recorded**

stunting among 35.5%, wasting among 19.3% and underweight among 32.1% of children under five.

7. **Increased fiscal and infrastructure burden:** Food loss and waste result in significant economic losses while also reducing the efficiency of investments made in agricultural and food infrastructure. The NABCONS study estimated that around 68.9 million tonnes of agricultural produce was lost in 2020-21, with an associated monetary loss of about **₹92,000 crore to ₹1.5 lakh crore** – This represents nearly 1% of India's GDP and a significant portion of its agricultural gross value added.
8. **Impedes sustainable development:** Food loss and waste undermine India's progress towards **SDG 2** (Zero Hunger), **SDG 12** (Responsible Consumption and Production) and **SDG 13** (Climate Action).

What measures have been taken by the government to reduce food loss and waste in India?

1. **Pradhan Mantri Kisan SAMPADA Yojana (PMKSY):** It aims to create modern food-processing infrastructure and efficient supply chains from the farm gate to the retail outlet, thereby reducing wastage. Its components include Integrated Cold Chain, food-processing capacities, agro-processing clusters and Operation Greens.
2. **PM-FME (PM Formalisation of Micro food processing Enterprises Scheme):** Financial and technical support targeted at small-scale and unorganized food processing micro-units to reduce local produce spoilage.
3. **Integrated Cold Chain and Value Addition Infrastructure:** Supports pre-cooling, sorting, grading, packing, cold storage, refrigerated vehicles and processing facilities to prevent deterioration of perishables during transportation and storage.
4. **Operation Greens:** Supports the development of integrated value chains for perishable agricultural commodities, including better storage, transportation, processing and market linkages, helping reduce post-harvest losses and distress sales.
5. **Mission for Integrated Development of Horticulture (MIDH):** Provides financial assistance for establishing and modernising cold-storage facilities for horticultural produce, thereby reducing post-harvest losses.
6. **Agriculture Infrastructure Fund (AIF):** Promotes investment in post-harvest infrastructure such as warehouses, cold chains, logistics and processing facilities, improving farmers' ability to store and market produce.
7. **Modernisation of foodgrain storage:** The government is strengthening FCI and other storage infrastructure. In 2026, the Smart Warehousing System, using AI and IoT-based technologies, was launched to modernise foodgrain warehousing and improve monitoring and management.
8. **FSSAI's "Save Food, Share Food, Share Joy" Initiative:** Launched by the Food Safety and Standards Authority of India (FSSAI), this initiative created the Indian Food Sharing Alliance (IFSA). It connects food businesses, caterers, and hotels with registered food recovery agencies and NGOs to safely distribute surplus edible food to needy populations.
9. **Food Safety Regulations for Surplus Food (2019):** FSSAI enacted formal regulations (Recovery and Distribution of Surplus Food) establishing hygiene standards for donating surplus food, reassuring businesses that safe donations will not face civil liability.

What should be the way forward for efficient food management?

1. **Strengthen post-harvest infrastructure:** India should expand scientific warehouses, modern silos, cold-storage facilities, pack houses and ripening chambers, particularly near production centres. Decentralised infrastructure can reduce spoilage during storage and transportation, extend the shelf life of perishables and improve farmers' ability to store produce and avoid distress sales.

2. **Develop integrated cold chains:** India should develop end-to-end cold-chain networks connecting farm-gate collection centres, pack houses, refrigerated transportation, cold storage, processing units and retail markets.
3. **Promote food processing and value addition:** Expanding food processing and value addition can reduce post-harvest losses by converting perishable and surplus agricultural produce into products with longer shelf lives.
4. **Improve supply-chain efficiency:** Strengthening farm-to-market linkages through Farmer Producer Organisations (FPOs), digital agricultural markets, better rural roads and efficient logistics can reduce delays, repeated handling and transit losses. Greater integration of storage, cold chains, processing and retail can ensure faster movement of perishable produce and minimise food loss.
5. **Adopt modern technologies:** Modern technologies such as IoT sensors, AI, blockchain and data analytics can enable real-time monitoring of temperature, humidity, storage conditions and inventory levels. AI-based demand forecasting can also reduce overproduction and unsold stocks, while digital traceability can help identify bottlenecks and spoilage across the food supply chain.
6. **Reduce consumer-level food waste:** Consumer-level food waste can be reduced by promoting responsible consumption, better meal and portion planning, proper food storage and awareness about date labels. Households, hotels, restaurants and institutions should adopt demand-based food preparation.
7. **Facilitate redistribution of surplus food:** Establishing stronger mechanisms to collect, safely store and redistribute edible surplus food from households, restaurants, hotels, retailers and large events to food banks, NGOs and vulnerable communities can prevent avoidable waste. Standardised food-safety protocols and better coordination among FSSAI, local bodies, food businesses and civil-society organisations can make such redistribution more effective.
8. **Promote circular food systems:** India should adopt a circular approach to food management by ensuring that food and its by-products remain within the resource cycle for as long as possible. Food unsuitable for human consumption can be diverted towards animal feed, composting, biogas and bioenergy, while agricultural residues can be converted into useful products. This can reduce landfill waste, recover resources and promote a more sustainable and resource-efficient food system.

Conclusion: Reducing food loss and waste is not merely a matter of preventing wastage but of improving the efficiency and sustainability of India's entire food system.

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AFSPA – Significance & Concerns – Explained Pointwise

The Ministry of Home Affairs (MHA) has recently extended the Armed Forces (Special Powers) Act (AFSPA), 1958, for another six months from 1 October 2026 in specified areas of **Manipur, Nagaland and Arunachal Pradesh**, following a review of the security situation.

What is the Armed Forces (Special Powers) Act (AFSPA)?

- AFSPA is a central law that gives special powers to the armed forces in areas officially declared as “**disturbed**” to help them tackle insurgency and serious internal security threats.
- The primary objective of AFSPA is to provide the armed forces (including the Army, Air Force, and paramilitary forces) with special legal immunity and powers necessary to control internal conflict,

militancy, and insurgency in regions where the civil administration and police are deemed incapable of maintaining law and order.

- AFSPA was first promulgated in **1942**, by **Linlithgow**, in response to the **Quit India Movement** in 1942. Its aim was “to confer special powers upon certain officers of the armed forces.
- After Independence, the Act was retained by the ordinance enacted in **1958**, to control increasing violence in the North-eastern States, which the State governments found difficult to control.
- In simple terms, AFSPA gives armed forces the power to maintain public order in “disturbed areas”.

Present Status of AFSPA:

Manipur	In force across the State except areas under 13 police stations in 5 districts.
Nagaland	In force in 9 districts (Dimapur, Niuland, Chümoukedima, Mon, Kiphire, Noklak, Phek, Peren and Meluri) and specified areas under 21 police stations in 5 other districts.
Arunachal Pradesh	In force in Tirap, Changlang and Longding districts , and specified areas under Namsai, Mahadevpur and Chowkham police stations in Namsai district.
Assam	AFSPA previously covered the entire state. It is now maintained only in 3 border districts (Tinsukia, Charaideo, and Sivasagar) due to localized activities of insurgent groups like ULFA.
Jammu & Kashmir	AFSPA is also applicable under a separate J&K Armed Forces (Special Powers) Act, 1990.
Tripura	Withdrawn in 2015.
Meghalaya	Withdrawn in 2018.

What are its key provisions?

1. Declaration of “disturbed area” (Section 3):

- The Governor of a state, the Administrator of a Union Territory, or the Central Government can declare any area “disturbed” if the situation requires deployment of the armed forces to aid civil power.
- Once so notified, the special powers under AFSPA apply in that area.

2. Special powers of the armed forces (Section 4): In a notified disturbed area, any commissioned, warrant, non-commissioned officer or equivalent rank can:

- Use force, even to the extent of causing death, after giving due warning, against persons:
 - acting in contravention of law prohibiting assembly of five or more persons, or
 - carrying weapons or things capable of being used as weapons or explosives.

- Destroy arms dumps, fortified positions, shelters or training camps from which armed attacks are made or likely to be made.
 - Arrest without warrant anyone who has committed, is suspected of having committed, or is about to commit a cognisable offence, using necessary force.
 - Enter and search any premises without warrant to make such arrests or recover arms, ammunition, or explosives.
3. **Duties after arrest (Section 5):** Any person arrested and any seized property must be handed over to the nearest police station “with the least possible delay,” so that normal criminal procedure can then follow.
4. **Legal protection/immunity (Section 6):** No prosecution, suit or other legal proceeding can be instituted against any person acting under AFSPA, except with the prior sanction of the Central Government. This clause is intended to protect personnel acting in good faith during operations, but is also the main focus of human-rights criticism.

What is the significance of AFSPA in maintaining internal security in India?

1. **Enables deployment in high-risk “disturbed areas”:** AFSPA allows the Centre or Governor to declare an area “disturbed,” enabling the armed forces to aid civil authorities where police and local administration cannot control violence or insurgency.
2. **Provides operational flexibility to forces:** Powers to use force after warning, arrest without warrant, and conduct searches and seizures allow the army/paramilitary to react quickly and pre-empt threats such as ambushes, armed mobs, or militant movements.
3. **Strengthens state capacity in conflict zones:** In border and remote regions with difficult terrain and weak policing, AFSPA is seen as necessary to secure roads, infrastructure, elections, and civilian life against insurgent or terrorist groups.
4. **Legal protection for personnel:** Requirement of prior central sanction for prosecution under AFSPA is argued to protect soldiers from vexatious litigation and allow them to act decisively in life-threatening situations.
5. **National security and territorial integrity:** The Act is justified by governments as essential to preserve sovereignty and integrity in regions facing secessionist, insurgent or cross-border militant movements.

What are the major concerns and criticisms associated with the implementation of AFSPA?

1. **Human rights violations:** Wide powers to shoot, arrest without warrant, and search are seen as enabling extrajudicial killings, torture, enforced disappearances, rape, and harassment of civilians in states like Manipur, Nagaland, J&K and others. Human rights groups, UN experts and civil society describe AFSPA as “draconian” and incompatible with international human-rights norms.
2. **Legal immunity and lack of accountability:** Section 6 requires prior central government sanction before prosecuting armed forces personnel, which is rarely granted, leading to near-impunity even in serious abuse cases. This undermines rule of law and victims’ access to justice, and is seen as violating fundamental rights under Articles 14 and 21.
3. **Violation of fundamental rights and militarisation:** Critics say AFSPA effectively suspends normal constitutional protections in “disturbed areas,” normalising prolonged militarisation and eroding civil liberties such as the right to life, liberty, movement and expression. Long-term deployment of the army for internal policing is argued to blur civil-military boundaries and weaken civilian institutions.
4. **Misuse, excess force and distrust:** Supreme Court judgments have noted that any use of excessive or retaliatory force is illegal even under AFSPA, but multiple inquiries have documented fake encounters

and misuse, deepening local resentment and distrust of the state. Critics argue that such practices fuel alienation and may actually worsen insurgency instead of resolving it.

5. Committee recommendations for repeal/reform:

- Jeevan Reddy Committee and the Second Administrative Reforms Commission both recommended repeal of AFSPA, with key provisions to be shifted into a more rights-compliant law like the Unlawful Activities (Prevention) Act.
- Other bodies, like the Santosh Hegde Commission and Justice Verma Committee, have called for strong review, tighter oversight and removal of blanket immunity.

What are the major recommendations of various committees and commissions, along with key Supreme Court judgments, concerning AFSPA?

Supreme Court Judgements on AFSPA	● Naga People's Movement of Human Rights v. Union of India (1998): The Supreme Court upheld the constitutional validity of AFSPA. However, it laid down guidelines and safeguards for the exercise of powers under the Act. It held that the armed forces must act within the framework of law and that the declaration of a "disturbed area" is subject to periodic review. ● Extra Judicial Execution Victim Families Association (EEVFAM) v. Union of India (2016): The Supreme Court ruled that every encounter death must be investigated by the state police, regardless of AFSPA. It held that excessive or retaliatory force is unlawful, even in disturbed areas, and consolidated prior jurisprudence on AFSPA's limits.
Recommendations of Various Committees and Commissions on AFSPA	● Justice B.P. Jeevan Reddy Committee (2004): ○ Repeal AFSPA entirely. ○ Incorporate appropriate provisions to Unlawful Activities (Prevention) Act (UAPA). ○ Set up district grievance cells. ○ Limit army deployment to 6 months with parliamentary review. ● Second Administrative Reforms Commission (2nd ARC) (2007): ○ Recommended replacing AFSPA by incorporating its essential and operational provisions into the UAPA to avoid parallel legal frameworks. ○ Replace it with humane legislation balancing security and rights. ● Justice Santosh Hegde Committee (2013): ○ AFSPA must be reviewed every 6 months to assess whether its continuation is genuinely necessary. ○ Security forces should not enjoy blanket immunity under Section 6. Criminal investigations must proceed if excessive force or illegal acts are committed. ○ Called it a "symbol of oppression." ● Justice J.S. Verma Committee (2013): ○ Review AFSPA urgently, especially for sexual offences by armed forces. ○ Try such cases under ordinary criminal law, not military courts. ● National Human Rights Commission (NHRC):

	○ Restrict AFSPA usage strictly as a temporary measure rather than an indefinite governance tool. ○ Strictly enforce mandatory procedures following arrests or encounters, including mandatory FIR registration, independent magisterial inquiries, and immediate reporting to the NHRC.
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What should be the way forward regarding the continued application of AFSPA?

1. Phased Withdrawal and Review:

- Withdraw AFSPA from areas where normalcy has returned (e.g. parts of J&K, Northeast) after security assessments, as done in Tripura (2015) and Meghalaya (2018).
- Mandate periodic 6-month reviews by Parliament or an independent body, with automatic sunset clauses for notifications.

Approach	Pros	Cons
Full repeal	Ends impunity, restores rights	May weaken counter-insurgency in active conflict zones.
Targeted Reform	Balances security & rights.	Requires political will, implementation capacity.
Phased Withdrawal	Builds trust, tests normalcy.	Risk of resurgence if premature.

2. Reforms to Existing Law:

- Amend Section 6 to make prior sanction faster and more transparent (e.g. time-bound decisions, judicial oversight), and allow prosecution for grave human rights violations without sanction.
- Strengthen Section 5 to ensure arrested persons are handed to police within 24 hours, with mandatory video recording of operations.
- Incorporate Supreme Court guidelines: mandatory FIRs and investigations for all deaths in encounters, independent magisterial inquiries.

3. Institutional Strengthening:

- Create a National Human Rights Commission (NHRC)-monitored oversight mechanism for AFSPA operations, with local grievance cells as recommended by the Jeevan Reddy Committee.
- Enhance training for armed forces on human rights, minimal force, and distinction between combatants and civilians.

4. Long-term Alternatives:

- Shift non-combat powers (arrest, search) to police and paramilitary under UAPA or CrPC, reserving army for active combat only.
- Invest in development, policing capacity, and peace-building in disturbed areas to reduce need for military deployment.

5. **Addressing Root Causes:** AFSPA is a tool to control symptoms, not resolve conflict. Sustainable stability requires political negotiation, political integration, socio-economic development, and resolving identity/ethnic disputes through dialogue.

Conclusion: AFSPA should be viewed as an exceptional security measure rather than a permanent governance mechanism. By strengthening local civil law enforcement, enforcing strict accountability for operational excesses, implementing judicial and commission recommendations, and prioritizing political dialogue, India can transition away from extraordinary martial powers toward normalized civil governance.

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