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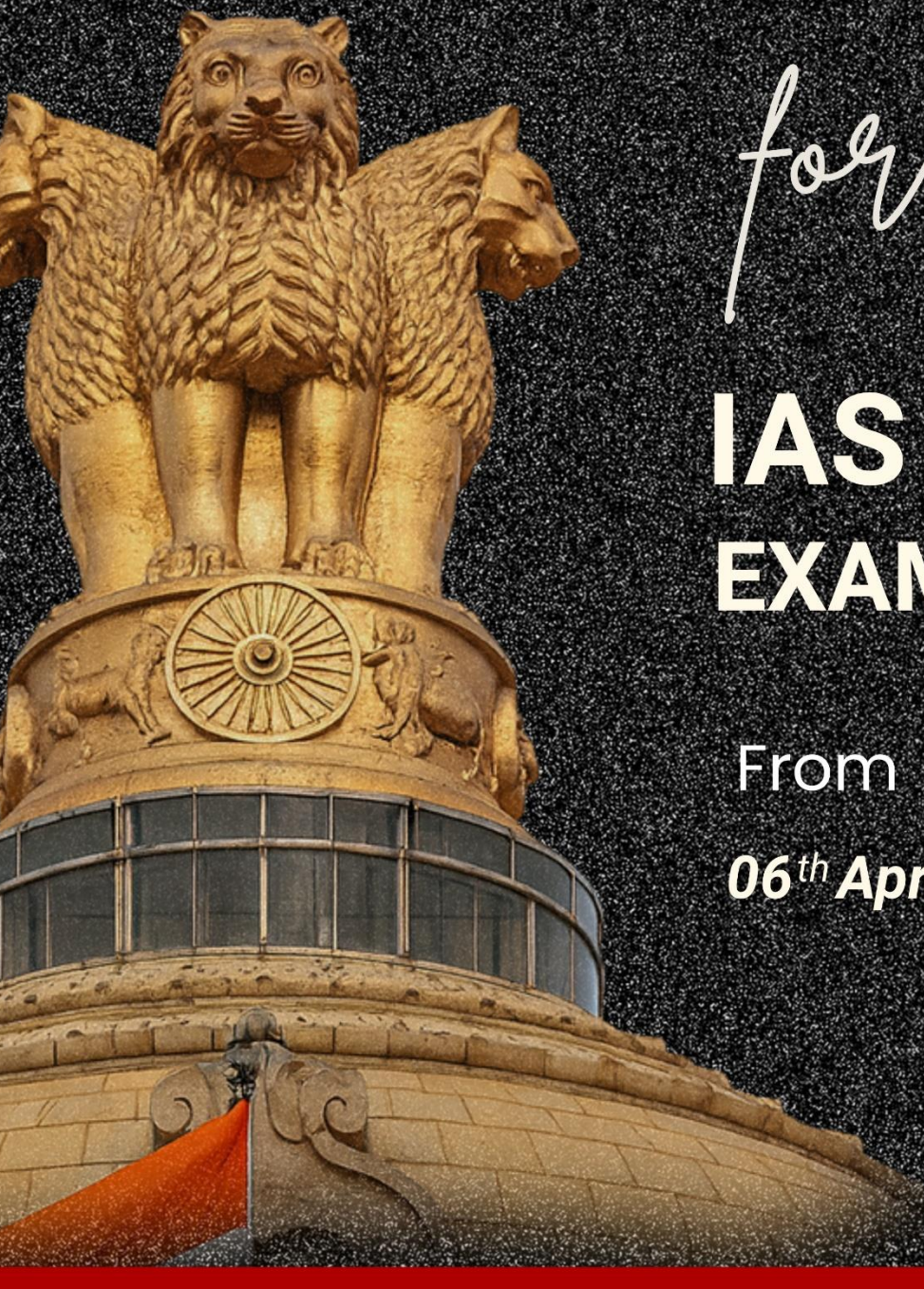
DEEP ANALYSIS



for

IAS MAINS EXAMINATION

From

06th April to 11th April 2026

INDEX

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GENERAL STUDIES 1

1.1. SOCIETY

1.1.1. NARI SHAKTI: INDIA'S DEFINING REFORM FOR THE NEXT DECADE

Context:

The paradigm shift from **"Development for Women"** to **"Women-led Development"** marks a cornerstone of India's strategy for Viksit Bharat @2047. Nari Shakti (Women Power) is no longer viewed as a welfare objective but as a critical driver of the nation's socio-economic and political transformation.

Key Pillars of Women Empowerment in India

1. **Political Empowerment: The Legislative Milestone**

   The **Nari Shakti Vandan Adhiniyam (106th Constitutional Amendment Act, 2023)** is the flagship reform intended to restructure the political landscape.

   - **Key Provisions:**
   - Reserves **33%** of seats for women in the Lok Sabha, State Legislative Assemblies, and the Delhi Assembly.
   - Applies to seats reserved for SCs and STs within these bodies.
   - Implementation is contingent upon the **post-2026 Delimitation** exercise and the completion of the next Census.
   - **Significance:**
   - **Breaking the "Proxy" Governance:** Aims to replicate the success of the 73rd/74th Amendments (where over **1.4 million** women serve in local bodies) at the national and state levels.
   - **Policy Inclusivity:** Ensures gender-sensitive legislation in areas like finance, defense, and labor.

2. **Economic Empowerment: From Job Seekers to Job Creators**

   The focus has shifted toward building "Technical Sovereignty" and financial independence for women.

   - **Lakhpati Didi Initiative:** Targets the creation of **3 crore** Lakhpati Didis (rural women earning ₹1 lakh+ annually) by leveraging the network of nearly 10 crore Self-Help Group (SHG) members.
   - **Financial Inclusion:** Under **PM Mudra Yojana**, approximately **70%** of loans have been sanctioned to women entrepreneurs.
   - **Stand-Up India** reserves 80% of its beneficiaries for women, specifically focusing on greenfield enterprises.
   - **STEM Participation:** India currently boasts a **43% female enrollment** rate in higher education STEM courses, one of the highest globally, signaling a shift in the traditional workforce.

3. **Social and Life-Cycle Interventions**

True reform requires removing structural "bottlenecks" that limit a woman's time and agency.

- **Dignity and Safety: Swachh Bharat Mission:** Construction of over 11 crore toilets addressed sanitation-related health risks and safety concerns.
  - **Jal Jeevan Mission:** Providing tap water to rural households reduces the "time poverty" of women who traditionally spent hours fetching water.
- **Asset Ownership: PM Awas Yojana (PMAY)** prioritizes women as owners or co-owners of houses, significantly enhancing their bargaining power within the household.
- **Mission Shakti 2.0:** A unified umbrella scheme for the safety (Sambal) and empowerment (Samarthya) of women through a life-cycle approach.

Emerging Opportunities for Nari Shakti

1. **Frontier Tech & Digital Economy**
   - **"AI by HER" Initiative:** Direct funding (up to ₹2.5 Cr) for women-led AI startups targeting healthcare and agriculture.
   - **Drone Sakhis (Namo Drone Didi):** Evolution from pilots to **Agri-Tech service providers**, managing drone fleets for precision farming.
   - **Semiconductor Mission:** Increasing integration into high-end VLSI design and assembly-test-mark-pack (ATMP) roles.
2. **Green Energy & Circular Economy**
   - **Decentralized Renewable Energy (DRE):** Transition from consumers to **owners** of solar mini-grids and solar-powered industrial units.
   - **Oorja Sakhis:** A technical cadre managing solar infrastructure and EV charging stations in Tier-2 and Tier-3 cities.
   - **Waste-to-Wealth:** SHG partnerships with global brands for sustainable fashion and ethical plastic recycling.
3. **Financial & Strategic Inflection Points**
   - **WEP Next & Mudra 2.0:** Enhanced credit limits and specialized techno-entrepreneurship incubation for the North-East and hilly regions.
   - **SHE-Mart & GeM:** Direct access for women-led SHGs to compete in large-scale government public procurement.
   - **Blue Economy:** New leadership roles in maritime logistics and sustainable aquaculture.
4. **Space & Defense**
   - **Space-Tech:** Expansion into **Satellite Data Analytics** and private space-tech startups following Chandrayaan-3's success.
   - **Combat & Command:** Entry into all Armed Forces branches, specifically in Cyber Security and Electronic Warfare leadership.

Challenges to Nari Shakti and Women-led Development

1. **Political and Governance Hurdles**
   - **The "Proxy" Phenomenon:** Despite 44% representation in local bodies, "Sarpanch Patis" often hijack decision-making, reducing empowerment to tokenism.
   - **Legislative Lag:** Implementation of the **Nari Shakti Vandan Adhiniyam (2023)** awaits the post-2026 census and delimitation, delaying national representation until 2029 or 2034.
   - **The "Stained Glass Ceiling" in Judiciary:** Structural barriers in the collegium system and late-stage appointments lead to critically low female representation in the Supreme Court and High Courts.
2. **Economic and Labor Market Barriers**
   - **The "Sticky Floor" Effect:** Nearly 94% of women work in the informal sector (agriculture/textiles), trapped in low-paying roles with zero social security.
   - **The Motherhood Penalty:** A "leaky pipeline" at mid-management persists due to lack of flexible infrastructure, forcing high-potential women to exit the workforce.
   - **Credit Rationing:** Women-led startups receive only **4% of total venture funding**, hindered by a lack of collateral and systemic investor bias.
3. **Socio-Cultural and Structural Constraints**
   - **Systemic Time Poverty:** Women perform 84% of unpaid care work, creating a "double burden" that limits skill acquisition and leadership opportunities.
   - **The "Missing" Asset Base:** Disproportionately low ownership of land and assets weakens women's economic bargaining power within households.
   - **Digital Harassment:** Deepfakes and tech-facilitated abuse create a new frontline of violence, silencing women in digital public spaces.
4. **Emerging Challenges**
   - **AI and Design Bias:** With only 22% of AI professionals being women, algorithmic designs often lack gender-sensitive safety and privacy perspectives.
   - **Climate-Induced "Triple Burden":** Climate-led male migration forces rural women to manage farm labor, domestic care, and resource scarcity without legal land titles.

Way Forward

- **Transforming Political Representation:** Move beyond tokenism by institutionalizing governance training for women and creating digital whistleblowing channels to eliminate "Sarpanch Pati" (proxy) interference.
- **Judicial and Institutional Diversity:** Reform the collegium system to ensure a mandatory minimum threshold for female representation in the High Courts and Supreme Court.
- **Scaling Economic Independence:** Utilize the LokOS app and Digital Aajeevika Register to monitor income growth, ensuring 3 crore rural women achieve "Lakhpati Didi" status.
- **Market and Career Equity:** Bridge the "Motherhood Penalty" through performance normalization policies and provide SHGs direct market access via SHE-Mart and GeM integration.

- **Digital and Technological Sovereignty:** Increase female participation in AI and STEM to 50% to ensure gender-neutral algorithms while strengthening the Digital India Act against deepfakes and tech-abuse.
- **Climate and Asset Resilience:** Transition women to "Agri-Managers" through climate-smart hiring centers and incentivize joint property titling to secure credit collateral for rural women.

Conclusion

Nari Shakti is the bridge between a developing and a developed India. The next decade will be defined not just by how many women are in the workforce, but by how many are in positions of **command and decision-making**.

Q. *Examine the role of the 'Life-Cycle' approach in government schemes like Nari Shakti Vandan Adhiniyam in ensuring the long-term dignity and agency of women in India. 15 Marks*

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GENERAL STUDIES 2

2.1. POLITY & GOVERNANCE

2.1.1. JAN VISHWAS 2.0

Context

The **Jan Vishwas 2.0 Bill** is a landmark legislative effort aimed at "Decriminalizing India" by recalibrating the balance between regulatory enforcement and ease of doing business. It builds upon the foundation laid by the original 2023 Act.

The evolution of the Jan Vishwas framework

1. **Pre-Reform Era: The Compliance Paradox**

Before 2023, India's regulatory landscape was characterized by **"over-criminalization."**

- **The Burden:** Thousands of minor, technical, and procedural lapses (such as a delay in filing a report or a clerical error in a ledger) carried the threat of imprisonment.
- **The Impact:** This created "compliance anxiety," particularly for MSMEs, and clogged the judiciary with millions of cases that did not involve actual criminal intent (*mens rea*).
- **The Resource Drain:** Administrative and judicial energy was diverted away from serious offenses to monitor minor paperwork issues.

2. **Jan Vishwas 1.0 (2023): The Proof of Concept**

The **Jan Vishwas (Amendment of Provisions) Act, 2023** served as the first major legislative intervention to systematically "cleanse" the statute books.

- **Scope:** It targeted 42 Central Acts across 19 Ministries.
- **Metric:** Decriminalized **183 provisions**.
- **Key Achievement:** It successfully replaced criminal imprisonment with monetary penalties for technical defaults, establishing the precedent that the state can trust businesses to self-correct without the threat of jail.

3. **Jan Vishwas 2.0 (2026): Scale and Sophistication**

The 2026 Bill represents a massive scaling-up of the initial logic, moving from a pilot-style reform to a comprehensive overhaul. Scaled up to cover **784 provisions** across **79 Central Acts** administered by 23 Ministries. Moving from a "fear-based" compliance model (criminal sanctions) to a "trust-based" model (civil penalties).

Key Objectives of Jan Vishwas 2.0

- **Trust-Based Governance:** Shifting the state-citizen relationship from suspicion to trust, assuming "good faith" in business and personal compliance.
- **Decriminalization of Minor Lapses:** Removing imprisonment for 717 provisions across 79 Acts, ensuring that technical or procedural errors do not lead to criminal records.

- **Ease of Doing Business (EoDB):** Eliminating "compliance anxiety" to encourage entrepreneurship, reduce the cost of doing business, and attract global investment.
- **Ease of Living:** Reducing the daily legal harassment of citizens by decriminalizing municipal and administrative lapses (e.g., municipal water use or license renewals).
- **Judicial De-clogging:** Reducing the burden on the overstretched judiciary (50M+ cases) by diverting minor violations to administrative adjudicators.

Salient Features of Jan Vishwas 2.0

- **Expansive Scope:** It proposes amendments to **784 provisions** across **79 Central Acts** nearly doubling the reach of the 2023 Act. These acts are administered by 23 different Ministries.
- **Large-Scale Decriminalization:** Out of the 784 provisions, **717 are being decriminalized**. Imprisonment clauses for minor, technical, or procedural defaults are replaced with monetary penalties.
- **Graded Enforcement (Improvement Notices & Warnings):**
  - **First-time offenders:** The Bill introduces "Advisories" or "Warnings" for 76 offenses across 10 Acts.
  - **Rectification:** "Improvement Notices" allow businesses to fix non-compliance within a specific timeframe before a penalty is imposed.
- **Adjudication Mechanism:** It moves away from court-imposed "fines" to **"administrative penalties"** determined by Executive Adjudicating Officers. This bypasses the lengthy criminal trial process.
- **Appellate Structure:** To ensure fairness, it establishes an internal appellate mechanism where an officer higher in rank to the Adjudicating Officer hears appeals.
- **Automatic Inflation Adjustment:** To maintain the deterrent effect, the monetary penalties will automatically increase by **10% every three years** without requiring fresh legislation.
- **Retroactive Relief:** It addresses long-standing concerns by allowing for the **review and closure of pending cases** in criminal courts that relate to the now-decriminalized offenses
- **Specific Sectoral Reforms:**
  - **Motor Vehicles Act:** Introduces a **30-day grace period** for expired licenses.
  - **Health Sector:** Minor violations under the Drugs and Cosmetics Act (non-maintenance of records) will now be civil penalties, not criminal.
  - **NDMC Act:** Modernizes property tax through a uniform **"Unit Area Method"** and reclassifies illegal water use as a civil penalty.

Significance of Jan Vishwas 2.0

1. **Economic: Boosting "Animal Spirits"**

- **MSME Empowerment:** Eliminates "Compliance Tax" and the threat of jail for clerical errors, allowing small units to scale without legal fear.
- **FDI Attraction:** Enhances India's global image by creating a **predictable, non-punitive** regulatory environment, curbing "tax/regulatory terrorism."
- **Risk Culture:** Protects entrepreneurs from criminal records for procedural failures, fostering a culture of innovation and risk-taking.

2. **Judicial: De-clogging the System**

- **Case Pendency:** Directly addresses the **50 million+ backlog** by shifting minor technical violations from criminal courts to administrative adjudicators.
- **Resource Optimization:** Frees up police, prosecutors, and judges to focus on **heinous crimes** and national security rather than paperwork errors.

3. **Governance: The "Trust-Based" Paradigm**

- **Philosophical Shift:** Moves from "Suspicion by Default" to **"Trust by Default,"** treating citizens as partners rather than potential offenders.
- **Principle of Proportionality:** Ensures the "punishment fits the crime" via **Improvement Notices** and civil penalties instead of disproportionate jail terms.
- **Decolonizing Laws:** Modernizes the statute book by purging **colonial-era redundancies**, aligning laws with a 21st-century digital economy.

4. **Societal: Ease of Living**

- **Decriminalizing Daily Life:** Protects ordinary citizens from criminal records for minor lapses like license renewals or municipal utility issues.
- **Reduced Discretionary Power:** Standardized penalties and the **"Unit Area Method"** for taxes limit the power of low-level officials, effectively curbing petty corruption.

Challenges of Jan Vishwas 2.0

1. **Dilution of Deterrence**

- **Fear of Impunity:** Critics argue that replacing imprisonment with civil penalties may weaken the "fear of the law," particularly in sensitive sectors like **environmental protection** and **public safety**.
- **Fixed vs. Variable Penalties:** Some penalties remain low (e.g., ₹1,000 for water misuse), which large corporations might treat as a mere "cost of doing business" rather than a deterrent.

2. **Institutional Capacity & Impartiality**

- **Executive Adjudication:** Shifting power from independent judges to **Executive Adjudicating Officers** raises concerns about the separation of powers and potential bias towards the government.
- **Lack of Training:** Bureaucrats are not traditionally trained in judicial inquiry; their ability to handle complex adjudication in a fair and time-bound manner is yet to be proven.

3. **Implementation Inconsistency**

- **Ministerial Discretion:** With 23 different Ministries involved, there is a risk of **lack of uniformity** in how "trust-based" principles are applied across different sectors.
- **Overlapping Jurisdictions:** Some offenses are removed from specific Acts but remain criminal under the general law (Bharatiya Nyaya Sanhita, 2023), leading to legal ambiguity.

4. **Excessive Delegation**

- **Rule-Making Power:** In several instances (e.g., the Apprentices Act), the Bill empowers the executive to set penalty amounts through "Rules" rather than the Act itself. This is seen as **an excessive delegation of legislative power** without sufficient parliamentary oversight.

5. Administrative Hurdles

- **Digital Infrastructure:** The success of the "graded response" (warnings/notices) depends on a robust, real-time digital database of offenders to track first-time vs. repeat violations.
- **Backlog of Transition:** Reviewing and closing millions of pending cases in criminal courts to move them to the new framework is a massive administrative task

Way Forward

1. Institutional Strengthening

- **Capacity Building:** Specialized training for **Adjudicating Officers** is essential to ensure they handle quasi-judicial functions with impartiality and legal soundess.
- **Separation of Roles:** Clearly demarcating the roles of the investigator (who finds the lapse) and the adjudicator (who decides the penalty) to prevent bias.

2. Digital & Technological Integration

- **Unified Compliance Portal:** Develop a "Single Source of Truth" database to track violations across ministries, facilitating the **Graded Enforcement** model (identifying first-time vs. repeat offenders).
- **Automated Notices:** Use AI-driven systems to issue **Improvement Notices** and warnings automatically, reducing human discretion and potential corruption.

3. Monitoring & Evaluation

- **Impact Assessment:** Periodic reviews (e.g., every 2 years) to ensure that decriminalization is boosting **Ease of Doing Business** without compromising environmental or safety standards.
- **Standardized Penalty Scale:** Establish a national framework for calculating penalties to ensure "Uniformity of Justice" across different sectors and states.

4. Harmonization of Laws

- **BNS Alignment:** Ensure that offenses decriminalized under specific Acts are not prosecuted under broader sections of the **Bharatiya Nyaya Sanhita (BNS)**, which would defeat the Bill's purpose.
- **State-Level Adoption:** Encourage States to enact similar "Jan Vishwas" legislation for State-level Acts, as a large chunk of compliance burdens (labor, land, local taxes) falls under State jurisdiction.

5. Collaborative Governance

- **Continuous Stakeholder Dialogue:** Maintain a feedback loop with industry bodies (like CII/FICCI) and civil society to identify emerging "regulatory bottlenecks" that need future rationalization.

Conclusion

Jan Vishwas 2.0 institutionalizes a **trust-based ecosystem**, bridging the gap between regulatory rigor and economic dynamism. By leveraging technology and proportionality, it pivots India toward a **predictable, investor-friendly future**, balancing growth with responsible governance.

Q. *"The Jan Vishwas 2.0 Bill represents a fundamental shift from 'command and control' to 'trust-based' governance." Discuss how this legislative reform seeks to balance regulatory enforcement with the ease of living for citizens. 15 Marks*

2.2. INTERNATIONAL RELATIONS

2.2.1. INDIA'S STRATEGIC PRAGMATISM IN FOREIGN POLICY

Introduction

India's foreign policy is witnessing a significant pivot from "emotional diplomacy" to "strategic pragmatism." Following a period of diplomatic freeze triggered by the **May 2025 India-Pakistan conflict (Operation Sindoor)**, New Delhi has initiated a re-engagement process with **Turkiye and Azerbaijan**. This shift underscores India's traditional strength in maintaining bilateral ties based on national interest rather than being confined to rigid multilateral "camps" or hyphenated with Pakistan.

Background of Strained Relations -The "Diplomatic Chill"

The conflict led to a sharp freeze in relations with countries perceived as supportive of Pakistan's stance or military capabilities.

A. Adversarial Groupings

- **The "Triple Adversary" Concept:** For the first time, Indian military briefings explicitly named **Turkiye** as a functional adversary alongside Pakistan, citing their diplomatic and military support.
- **Azerbaijan's Role:** Baku was believed to have provided technological and intelligence support to Pakistan during the 96-hour conflict.
- **Malaysia & The OIC:** Statements from Malaysia and several OIC members questioning India's decision to launch strikes led to immediate diplomatic demarches.

B. Economic and Social Hardline

- **Boycott Movements:** Significant drops in trade and tourism occurred as influential Indian social media accounts called for boycotts of Turkish and Azerbaijani goods/travel.
- **Visa & Trade Restrictions:** India suspended the SAARC Visa Exemption Scheme for Pakistani nationals and kept the **Indus Waters Treaty** in abeyance as a pressure tactic.

C. Strategic Counter-Alignments

- **The Armenia-Greece Axis:** India pointedly built a counter-alignment with **Armenia and Greece** (traditional rivals of Azerbaijan and Turkiye).
- **Alternative Land Routes:** During the evacuation of Indians from Iran in June 2025 (following Israel-Iran tensions), the MEA explicitly directed citizens to use Armenia and Turkmenistan, avoiding Turkiye and Azerbaijan.

Key Drivers of the Recent Diplomatic Shift

1. Regional Volatility and the "Iran Factor"

- **Logistical Necessity:** The June 2025 U.S.-Israel strikes on Iran made the boycott of Turkiye/Azerbaijan land routes unsustainable.
- **Humanitarian Icebreaker:** Azerbaijan's recent facilitation of **200+ Indian evacuees** from Iran prompted a diplomatic rethink.

- **Energy Resilience:** Restoring ties ensured the resumption of Azerbaijani crude (98% of bilateral trade) and protected **ONGC Videsh** investments.

2. **Breaking the Trilateral "Axis"**

- **Strategic De-hyphenation:** Revived Foreign Office Consultations (Baku, April 3; Delhi, April 8) force bilateral engagement, bypassing their "brotherly" ties with Pakistan.
- **Mirror Diplomacy:** Leveraging strong partnerships with **Greece and Armenia** to signal that India has viable alternatives if Ankara and Baku remain recalcitrant on Kashmir.

3. **Economic "Realpolitik"**

- **Economic Recovery:** Reversing the 2025 "Boycott Turkiye" impact, which caused a **36% drop in tourism** and a **16% trade decline**.
- **Mutual Interests:** India seeks market access in Turkiye (its 2nd largest market after China), while Turkish firms target "Make in India" opportunities.
- **Connectivity:** Engagement is essential for the **INSTC**, India's primary gateway to Europe and Central Asia.

4. **"Counter-Terrorism" as a Common Language**

- **Direct Engagement:** Post-Operation Sindoor, India is centering "Cross-border Terrorism" in formal FOC readouts.
- **Conditional Normalization:** Security cooperation is now a prerequisite for trade, signaling an end to India's tolerance for pro-Pakistan rhetoric while keeping the door open for functional ties.

Key Challenges in Re-engagement

- **The Trilateral Entrenchment:** The deeply rooted **Pakistan-Azerbaijan-Turkiye axis** remains a hurdle, as these nations often coordinate their diplomatic stances against India on international forums like the OIC.
- **Sovereignty & Kashmir Rhetoric:** Ankara's persistent tendency to comment on India's internal security and the **Kashmir dispute** continues to trigger diplomatic friction and limits the scope of a full "strategic partnership."
- **Public Sentiment & Digitized Outrage:** The rapid escalation from **online boycott campaigns** to official policy makes diplomacy vulnerable to domestic emotional outbursts, which can undermine long-term pragmatic goals.
- **The "Armenia-Greece" Balancing Act:** India must carefully manage its new, robust defense and strategic ties with **Armenia and Greece** without letting them become a permanent barrier to functional engagement with their rivals, Baku and Ankara.
- **Military Distrust:** Overcoming the lingering military suspicion from **Operation Sindoor**, where Turkiye was viewed as a "functional adversary," requires significant transparency and confidence-building measures (CBMs).
- **Multilateral "Camp" Pressure:** Navigating a fractured global order without being forced into rigid blocs, ensuring India maintains its **Strategic Autonomy** while dealing with nations that are historically closer to its adversaries.

Way Forward

- **Pragmatic Compartmentalization:** Decouple core economic/connectivity interests (like INSTC) from political disagreements on Kashmir. Engage where interests align and hold firms where they don't.
- **Institutionalizing Dialogue:** Transition from sporadic, reactive meetings to regularized **Foreign Office Consultations (FOC)**. This ensures communication channels remain open even during periods of high tension.
- **Leveraging "Mirror Diplomacy":** Use the strong strategic ties with **Armenia and Greece** as a diplomatic stabilizer. It creates a balance of power that encourages Baku and Ankara to treat India with greater parity.
- **Shifting the Narrative:** Move the bilateral conversation toward **trans-national challenges**—such as climate change (DAC technology), energy security, and digital public infrastructure—to dilute the focus on historical rivalries.
- **Counter-Terrorism Diplomacy:** Firmly integrate "cross-border terrorism" into all bilateral frameworks, making it clear that regional stability is a shared responsibility and a prerequisite for advanced trade ties.
- **Managing Domestic Perception:** The government needs to balance nationalistic public sentiment with strategic goals, ensuring that **online outrage** does not restrict the state's room for diplomatic maneuvering.

Conclusion

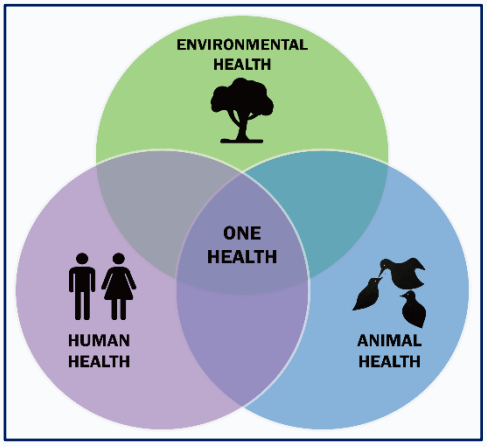
India's re-engagement with Turkiye and Azerbaijan signals a return to **Strategic Autonomy**. By prioritizing **Realpolitik** over emotion, New Delhi is successfully de-hyphenating regional interests, balancing rivalries to assert itself as a pragmatic global power.

Q. *In the context of the India–Pakistan conflict of 2025, examine the challenges and opportunities in India's relations with countries aligned with Pakistan. How should India balance strategic interests and diplomatic principles? 15 Marks*

2.3. HEALTH

2.3.1. THE 'ONE HEALTH' APPROACH

Introduction



One Health is an integrated, multi-sectoral paradigm that recognizes the fundamental **interdependence** between human health, animal health and the resilience of our shared environment.

- **Evolution:** The term was officially coined in 2003-04 (post-SARS), though the concept of "One Medicine" dates back to Rudolf Virchow (19th century).
- **The Quadripartite:** Formally led by a collaboration between:

- **WHO** (World Health Organization)
- **FAO** (Food and Agriculture Organization)
- **UNEP** (UN Environment Programme)
- **WOAH** (World Organisation for Animal Health)

Significance of the 'One Health' Approach

1. **Zoonotic Disease Burden:** According to the **World Organisation for Animal Health (WOAH)**, **60%** of known infectious diseases in humans are zoonotic and **75%** of emerging infectious diseases (like COVID-19, Ebola, and Nipah) originate in animals.
2. **Antimicrobial Resistance (AMR):** Overuse of antibiotics in livestock and humans creates "superbugs" that cycle through the environment.
3. **Food Security:** As per the **FAO**, animal diseases reduce global livestock production by at least **20%**, directly impacting the nutritional security of nearly **1.3 billion people** who depend on livestock for livelihoods.
4. **Climate Change & Biodiversity Loss:** Deforestation and warming temperatures force animals out of natural habitats, increasing human-wildlife conflict and "spillover" events.
5. **Economic Stability:** The **World Bank** estimates that implementing One Health would cost roughly **$10 billion to $11 billion annually**, whereas the cost of a major pandemic (like COVID-19) is measured in **trillions of dollars** of lost GDP.

Global Institutional Frameworks

- **One Health Joint Plan of Action (2022-2026):** A 5-year roadmap by the Quadripartite focusing on health system strengthening and emerging zoonoses.
- **WHO Pandemic Agreement:** A legally binding treaty under Article 19 of the WHO Constitution.
  - **Key Pillar:** The **Pathogen Access and Benefit-Sharing (PABS)** system for equitable access to vaccines and data.
- **Manhattan Principles (2004): Based on the Wildlife Conservation Society's foundational documents**, these 12 principles were the first to formally recognize that "the health of one is the health of all."

India's One Health Ecosystem

A. National One Health Mission (NOHM)

Launched by the **PM-STIAC** (Prime Minister's Science, Technology and Innovation Advisory Council), it is a cross-ministerial effort coordinated by the **Department of Animal Husbandry & Dairying (DAHD)** and the **Ministry of Health**.

- **Surveillance:** Integrated digital platforms for real-time tracking of human and animal disease.
- **Lab Network:** Creation of a network of **BSL-3 and BSL-4 laboratories** across the country (currently 22 labs in the network).
- **Response:** Establishing a "One Health Support Unit" to develop a national roadmap.

B. State-Led Best Practices

- **Odisha:** Pioneering the **Climate Budget** to track resilient development.
- **Kerala:** Participatory carbon-neutral plans (e.g., Meenangadi model).

- **Tamil Nadu:** Green Climate Company and "Cool Roof" projects to mitigate environmental stressors.

Challenges of the 'One Health' Approach

- **Institutional Silos: As per the PM-STIAC**, fragmented coordination persists because human, animal and environmental health fall under separate ministries with conflicting mandates (as per **NITI Aayog**).
- **Funding Asymmetry: According to World Bank and WHO assessments**, global and national funding is skewed toward curative care and preventative sectors like animal health receive less than **15%** of the total budget.
- **Data Fragmentation: Based on NCDC reports**, India lacks a unified digital architecture, as human and veterinary data are stored in incompatible formats, hindering real-time AI outbreak predictions.
- **Legal & Regulatory Gaps:** India lacks a dedicated "One Health Act." **As per the Observer Research Foundation (ORF)**, existing laws like the **Epidemic Diseases Act (1897)** do not address the complex modern human-animal interface.
- **Infrastructure & HR Deficit: According to ICMR and WOAH**, there is a critical shortage of **BSL-3 laboratories** at the district level and a veterinarian-to-livestock ratio that falls below global standards.
- **Socio-Economic Barriers: As per FAO reports**, low awareness among farmers and fear of economic loss (due to culling) often lead to the under-reporting of zoonotic illnesses.

Way Forward

- **Integrated Legislative Framework:** India should move toward a dedicated "One Health Act." **As per legal recommendations from the Observer Research Foundation (ORF)**, this would provide the statutory backing needed to mandate inter-ministerial cooperation and shared budgeting.
- **Operationalizing "One Health" Units: According to NITI Aayog's Vision 2035**, India must establish integrated surveillance units at the district level, co-locating medical, veterinary and environmental officers to ensure grassroots rapid response.
- **Unified Data Architecture: Based on Digital India initiatives**, the creation of a "National One Health Digital Portal" is essential to sync data from the **IDSP** (human) and **NADRS** (animal) systems via AI.
- **Incentivized Reporting : According to FAO guidelines**, the government should implement "loss-compensation" schemes for farmers to prevent under-reporting of zoonotic outbreaks due to fear of economic ruin.
- **Strengthening "Environmental" Health: As per UNEP's recommendations**, India must integrate forest officials and ecologists into urban planning to better manage the "wildlife-human interface."
- **Global Leadership:** Leveraging **G20 New Delhi Declaration** commitments, India should lead the Global South in operationalizing the **WHO Pandemic Agreement's PABS system** for equitable sharing of medical countermeasures.

Conclusion

Adopting the **One Health** approach is a biological and economic necessity. By integrating human, animal and environmental health, India can ensure pandemic resilience, global leadership, and sustainable development.

Q. *"Discuss the significance of the One Health approach in strengthening pandemic preparedness and addressing emerging zoonotic diseases in India. What challenges hinder its effective implementation?" 10 Marks*

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3.1. ENVIRONMENT

3.1.1. INDIA'S UPDATED CLIMATE PLEDGES

Introduction

- **"Prakriti Rakshati Rakshita "** (Nature protects if she is protected)
- India's 2035 climate commitments are not just modern policy but an extension of its ancient ethos that views environmental stewardship as a **fundamental duty.**

Evolution of India's Climate Commitments

India's climate journey is characterized by "exceeding expectations." Most of the 2015 (COP21) targets were met nearly a decade ahead of schedule.

Feature	2015 NDC (for 2030)	2022 Updated NDC (for 2030)	2026 Revised NDC (for 2035)
Emissions Intensity	33-35% reduction	45% reduction	**47% reduction**
Non-Fossil Power	40% capacity	50% capacity	**60% capacity**
Carbon Sink	2.5–3 billion tones CO_2	Same as 2015	**3.5–4.0 billion tones CO_2**

Core Pillars of the 2035 Nationally Determined Contributions (NDCs)

The core pillars of India's updated **Nationally Determined Contributions (NDCs)** for the **2031–2035** period, as approved by the Union Cabinet in March 2026, are summarized into these five key points:

1. **Emissions Intensity Reduction (Efficiency Target)**

   India has committed to reducing the **emissions intensity of its GDP by 47% by 2035**, compared to 2005 levels. This is an increase from the 2030 target of 45%. It signifies a decoupling of economic growth from greenhouse gas emissions, focusing on energy efficiency and low-carbon industrial growth.

2. **Non-Fossil Fuel Power Capacity (Energy Transition)**

   The target for non-fossil fuel-based energy resources in the cumulative electric power installed capacity has been raised to **60% by 2035**. Having already surpassed the 2030 goal of 50% early (reaching **~52.6% in early 2026**), this pillar emphasizes a massive scale-up in solar, wind, nuclear and hydro power.

3. **Enhanced Carbon Sink (Sequestration Target)**

   India aims to create an additional carbon sink of **3.5 to 4.0 billion tonnes of CO_2 equivalent** by 2035. This strategic jump utilizes afforestation, the Green Credit Program, and large-scale land restoration.

4. **Adaptation and Resilience (Vulnerability Protection)**

   A significant shift in the 2035 roadmap is the equal emphasis on **Climate Adaptation**. This pillar focuses on protecting vulnerable sectors through:

   - **Mangrove restoration** (MISHTI scheme).
   - **Climate-resilient agriculture** and water security (Jal Jeevan Mission).
   - **Disaster-resilient infrastructure** to combat extreme weather events like cloudbursts and cyclones.

5. **LiFE – Lifestyle for Environment (Behavioral Shift)**

   The NDCs officially integrate the **LiFE movement** as a core pillar. The **LiFE movement** is a core pillar aimed at making climate action a mass movement. It promotes "mindful utilization" over "mindless consumption," championing circular economy principles and global behavioral change.

New Frameworks in India's 2035 NDC

1. **Indian Carbon Market (ICM):** Operationalized under the **Carbon Credit Trading Scheme (CCTS)**, it transitions from voluntary to compliance-based trading. It mandates 490 "Obligated Entities" across nine high-emission sectors (like steel and cement) to meet GHG intensity targets or purchase credits.
2. **Green Credit Program (GCP):** A first-of-its-kind market-based mechanism that incentivizes pro-planet actions beyond carbon. It creates a "land bank" for voluntary afforestation and water conservation, rewarding verified environmental restoration with tradeable credits.
3. **Whole-of-Economy Integration:** Climate goals are now embedded into industrial policy through **Production Linked Incentive (PLI)** schemes for Green Hydrogen, Advanced Chemistry Cells (ACC), and solar modules, aligning the "Viksit Bharat 2047" vision with net-zero pathways.
4. **Disaster-Resilient Infrastructure Framework:** Under **CDRI** leadership, India has formalized a framework to "climate-proof" infrastructure, particularly in Himalayan and coastal regions, ensuring resilience against extreme events like GLOFs and cyclones.
5. **Triple-Link Adaptation Model:** A new domestic architecture linking **Agriculture, Water and Health**. It integrates missions like Per Drop More Crop with the National Mission on Sustainable Agriculture and health-heat action plans to create a unified resilience shield for vulnerable communities.

Significance of India's 2035 Nationally Determined Contributions (NDCs)

1. **Global Leadership & Continuity:** India is among the first major economies to submit its **NDC 3.0**, reaffirming its commitment to the Paris Agreement at a time when several developed nations are scaling back climate policies.

2. **Credible Net-Zero Pathway:** The 2035 targets (47% intensity reduction) provide a mid-term bridge that validates India's long-term **2070 Net-Zero** goal, proving the roadmap is backed by concrete decadal milestones.
3. **Strategic Energy Independence:** By targeting **60% non-fossil capacity**, India reduces its reliance on volatile global fossil fuel markets, enhancing national energy security and insulating the economy from geopolitical shocks.
4. **Decoupling Economy from Carbon:** Achieving a 47% reduction in emissions intensity demonstrates that India can maintain high GDP growth (aiming for **Viksit Bharat 2047**) while significantly lowering the carbon footprint per unit of growth.
5. **Focus on Climate Justice:** Rooted in the principle of **CBDR-RC**, India's targets highlight the balance between developmental needs and environmental responsibility, putting pressure on developed nations to match this ambition with adequate climate finance.

Challenges to India's 2035 Nationally Determined Contributions (NDCs)

1. **The Finance Gap:** Estimates suggest India requires over **$2.5 trillion** by 2030 alone to meet its goals. The persistent failure of developed nations to provide the promised **$100 billion annual climate finance** remains the biggest bottleneck for technology transfer and scaling.
2. **Storage & Grid Stability:** Achieving **60% non-fossil capacity** necessitates massive investments in **Battery Energy Storage Systems (BESS)** and Pumped Hydro. Without cost-effective storage, the grid remains vulnerable to the intermittency of solar and wind power.
3. **Hard-to-Abate Sectors:** While the power sector is decarbonizing, sectors like **Steel, Cement and Heavy-duty Transport** are technologically difficult and expensive to green. These "Hard-to-Abate" industries continue to see rising absolute emissions.
4. **The Coal Dependency:** Despite the shift in capacity, coal still provides nearly **70% of actual power generation**. Retiring coal plants prematurely risks energy shortages and high "Stranded Asset" costs for the banking and power sectors.
5. **Land & Resource Constraints:** Creating a **3.5–4.0 billion tonne carbon sink** requires vast tracts of land, leading to potential conflicts with agricultural needs and tribal rights. Additionally, the transition is heavily reliant on **Critical Minerals** (Lithium, Cobalt) currently dominated by global monopolies.

Way Forward for India's 2035 NDC

1. **Transition from Capacity to Generation:** Shift focus from installing renewables to increasing actual power generation. This requires massive investment in **Battery Energy Storage Systems (BESS)** and Pumped Hydro to manage solar and wind intermittency.
2. **Decarbonizing Hard-to-Abate Sectors:** Accelerate the **National Green Hydrogen Mission** and incentivize low-carbon technologies in steel, cement, and chemical industries through the compliance-based **Indian Carbon Market**.
3. **Strengthening Climate Finance:** Lead the Global South in demanding a **New Collective Quantified Goal (NCQG)** from developed nations while leveraging domestic "Green Bonds" and the **Green Credit Program** to attract private capital.

4. **Nature-Based Solutions & Sink Quality:** Shift focus from quantitative forest cover to **quality of sinks**. This involves restoring degraded land and ensuring afforestation under **Ek Ped Maa Ke Naam** and **MISHTI** supports biodiversity over monocultures.
5. **Sub-National Climate Action:** Decentralize targets by empowering states to implement **State Action Plans on Climate Change (SAPCC)**. Integrating resilience into urban planning is vital for protecting communities from heatwaves and flooding.

Conclusion

India's 2035 NDCs bridge the gap toward **Net-Zero 2070**, cementing its status as a green superpower. By synchronizing industrial growth with radical sustainability, India is pioneering a resilient, low-carbon roadmap for the Global South.

Q. *Write a review on India's climate commitments under the Paris Agreement (2015) and mention how these have been further strengthened in COP26 (2021). In this direction, how has the first Nationally Determined Contribution (NDC) intended by India been updated in 2022? 15 Marks*

3.2. SCIENCE & TECHNOLOGY

3.2.1. INDIA'S NUCLEAR ENERGY PROGRAM

Context

India is currently undergoing a paradigm shift in its nuclear energy policy, moving from a state-monopoly "strategic" sector to a "commercial-participation" model. The goal is to scale capacity from **8.8 GW to 100 GW by 2047**, aligned with the **Viksit Bharat** and **Net-Zero 2070** targets.

Why Nuclear is Critical for India?

1. **Reliable Baseload Power**

   Nuclear provides **24/7 constant power**, unlike intermittent solar or wind. In 2024, renewables made up 50% of capacity but only 22% of actual generation. Nuclear ensures grid stability without the prohibitive costs of large-scale battery storage.

2. **Land-Use Efficiency**

   As a land-stressed nation, India benefits from nuclear's compact footprint it is **10 times more land-efficient** than solar or wind farms. Expanding nuclear saves vast tracts of agricultural and forest land required for 100 GW of solar.

3. **Shield Against West Asia Volatility**

   The **"Twin Threat"** of supply disruptions and price shocks in the Middle East jeopardizes India's energy security. Nuclear reduces the **"Risk Premium"** on the economy by cutting long-term reliance on fossil fuel imports from geopolitically unstable regions.

4. **Tapping Thorium Reserves**

   India holds **25% of global Thorium**. Success in the AHWR and HALEU tracks allows India to move from being a "resource-taker" to an "energy-giver," providing centuries of sovereign, self-reliant power.

5. **Decarbonizing "Hard-to-Abate" Industry**

   Heavy industries like **Steel, Cement, and Petrochemicals** require high-grade heat that renewables cannot easily provide. **Small Modular Reactors (SMRs)** offer a localized, carbon-free heat source essential for achieving **Net-Zero 2070**.

6. **Strategic Autonomy & Export Potential**

   The **SHANTI Act (2025)** transitions India from a "technology follower" to a **global exporter**. Our indigenous 220 MW and 700 MW PHWR models are now positioned as cost-competitive solutions for the Global South, enhancing India's diplomatic and technological "Soft Power."

The SHANTI Act (2025): A Legislative Milestone

Key Provisions & Structural Changes

- **Repeal of Legacy Laws:** It replaces the **Atomic Energy Act (1962)** and the **Civil Liability for Nuclear Damage Act (CLNDA, 2010)**, modernizing a decades-old framework.
- **Private & Foreign Participation:** For the first time, private companies (domestic and foreign) are permitted to **build, own and operate** nuclear power plants.
- **Statutory Status for AERB:** The **Atomic Energy Regulatory Board (AERB)**, previously a subordinate body under the Department of Atomic Energy (DAE), is now a statutory, autonomous regulator.
- **Liability Framework Reform:** It revises the "right to recourse" against suppliers, a major historical bottleneck that deterred foreign players like Westinghouse and EDF.

India's Traditional Three-Stage Nuclear Power Programme

Formulated by **Dr. Homi Bhabha** in the 1950s, this program was designed to utilize India's vast **Thorium** reserves, given its limited Uranium.

Stage	Technology / Reactor Type	Fuel Cycle	Objective & Status
Stage I	**PHWR** (Pressurised Heavy Water Reactor)	**Natural Uranium** (Fuel) + **Heavy Water** (Moderator/Coolant)	**Objective:** Generate electricity and produce **Plutonium-239** as a byproduct. **Status:** Mature; 15+ indigenous 220MW/700MW units operational.
Stage II	**PFBR** (Prototype Fast Breeder Reactor)	**Plutonium-239** (Mixed Oxide Fuel) + **Uranium-238**	**Objective:** "Breed" more fuel than consumed. Converts U-238 to more Plutonium. Eventually, uses a **Thorium blanket** to create U-233.

			Status: Kalpakkam PFBR is the lead project.
Stage III	**AHWR** (Advanced Heavy Water Reactor)	**Thorium-232 + Uranium-233**	**Objective:** Utilize Thorium as the primary fuel source for sustainable, centuries-long energy security. **Status:** Under R&D; requires successful completion of Stage II.

Why the Three Stages?

- **Resource Constraint:** India has only **2%** of global Uranium but **25%** of global Thorium.
- **The Thorium Challenge:** Thorium is not "fissile" (cannot start a reaction alone); it is "fertile." It must be converted into **Uranium-233** in a reactor first.
- **The Sequence:** Stage I builds the inventory of Plutonium. Stage II uses that Plutonium to "cook" Thorium into U-233. Stage III finally burns the U-233 with Thorium for power.

Current Technological Landscape & New Strategies

To reach the 100 GW target, India is diversifying beyond the traditional three-stage plan:

1. **Small Modular Reactors (SMRs): The "Plug-and-Play" Future**

   The 2025-26 Budget allocated **₹20,000 crore** specifically for SMR R&D.

   - **Design Variety:** India is developing five indigenous models (5 MW, 55 MW, and 200 MW).
   - **Industrial Integration:** Targeted at "Hard-to-Abate" sectors Steel, Cement, Petrochemicals, and Data Centers.
   - **Rapid Deployment:** Using modular construction (factory-built components), the "pour-to-power" timeline is targeted at **40 months**.
   - **The 220 MW Workhorse:** The proven indigenous 220 MW PHWR is being redesigned as a modular unit for private sector fabrication.

2. **Scaling High-Capacity Reactors (The GW Giants)**

   While SMRs handle industry, massive 1000 MW+ reactors are needed for the national grid.

   - **Fleet Mode Operation:** Bulk approval for 10 reactors (700 MW PHWRs) to streamline supply chains and reduce costs to **$2 million per MW**.
   - **Foreign Technology Indigenization:**
     - **Jaitapur (French EDF):** 6 reactors of 1,650 MW (EPR design).
     - **Kovvada/Mithi Virdi (US Designs):** Westinghouse-Toshiba and GE-Hitachi models.
     - **Challenge:** These "unproven" designs currently cost **$5 million per MW**; the strategy is to "Indianize" the supply chain to slash costs by 60%.

3. **Breakthroughs in Fuel Technology**

   - **HALEU (High Assay Low Enriched Uranium):** Using HALEU as a driver fuel for Thorium. This allows India to use its Thorium reserves *without* waiting for the full commercialization of Stage-2 Fast Breeder Reactors.

- **Molten-Salt Reactors (MSR):** A shift toward liquid-fueled reactors which are inherently safer (cannot melt down) and more efficient at utilizing Thorium.

Challenges in the India's Nuclear Energy Program

1. **High Capital Outlay & Financing**

- **The Cost Barrier:** Adding 90 GW requires approximately **$200 billion (₹18 lakh crore)**.
- **The Risk Factor:** Nuclear projects have long gestation periods (10–15 years) and high upfront costs. Attracting private and foreign investment requires a transparent **financing model** and clear **tariff structures** to ensure a Return on Investment (ROI).

2. **Technology Indigenization & Cost Parity**

- **Foreign vs. Local:** Imported designs (French EPR, US AP1000) currently cost ~$5 million/MW, whereas India's indigenous 700 MW PHWR costs ~$2 million/MW.
- **The "China Benchmarking":** To be competitive, India must "Indianize" supply chains for foreign reactors to bring costs down to the $2 million/MW level, as demonstrated by China's recent 33-reactor rollout.

3. **Regulatory & Statutory Hurdles**

- **Notification of Rules:** The SHANTI Act is a framework; its success depends on the rapid notification of rules regarding **fuel ownership**, **waste management** and **decommissioning**.
- **Land & Exclusion Zones:** Current regulations for large "nuclear parks" (multiple reactors) must be modified to allow **Small Modular Reactors (SMRs)** to sit within industrial clusters or "Exclusion Zones" of private factories.

4. **Supply Chain & Human Capital**

- **Manufacturing Depth:** Moving to "Fleet Mode" requires a massive scale-up of domestic fabrication capacity for specialized reactor components, pressure vessels and thorium-cladding.
- **Skill Gap:** A 10x increase in capacity requires a parallel 10x increase in specialized nuclear engineers, safety auditors and technicians.

5. **Public Perception & Liability Concerns**

- **Social Acceptance:** Despite the repeal of the 2010 CLNDA, concerns regarding nuclear safety and "Right to Recourse" persist.
- **Transparency:** An **autonomous regulator (AERB)** must prove its independence to maintain public trust, especially with private players now operating plants.

6. **Fuel Security & Enrichment**

- **Uranium Import Dependence:** While India has Thorium, its Stage-1 and Stage-2 reactors still rely on Uranium. Managing the geopolitics of the **Nuclear Suppliers Group (NSG)** and securing long-term fuel ties remains a priority.
- **HALEU Production:** Scaling up **High Assay Low Enriched Uranium (HALEU)** production is technically demanding and essential for the new Thorium-centric strategy.

Way Forward

1. **Rapid Notification of Rules**

   The government must quickly notify supportive regulations under the SHANTI Act. This includes transparent guidelines on **nuclear fuel ownership**, **waste management**, **insurance liability**, and a clear **dispute settlement mechanism** to build investor confidence.

2. **Accelerated SMR Deployment**

   Focus on the indigenous **220 MW PHWR** as a "modular workhorse." By reducing the "pour-to-power" time to **40 months** and modifying **Exclusion Zone** regulations, India can integrate Small Modular Reactors (SMRs) directly into heavy industrial clusters (Steel, Cement, Data Centers).

3. **Aggressive Indigenization of Foreign Designs**

   To reach the cost-benchmark of **$2 million per MW**, India must "Indianize" the supply chains for imported reactors (EDF, Westinghouse). Learning from the Chinese model, building a robust domestic supporting industry is essential to make high-capacity plants economically viable.

4. **Early Exploitation of Thorium**

   Prioritize R&D in **Thorium cladding** with **HALEU** (High Assay Low Enriched Uranium). This provides an alternative to the long-gestation Breeder Reactor route, allowing India to utilize its massive Thorium reserves much earlier in the 2047 timeline.

5. **Innovative Financing Models**

   Given the **$200 billion (₹18 lakh crore)** requirement, the state must move beyond budgetary support. Developing Public-Private Partnership (PPP) models, Green Bonds, and long-term Power Purchase Agreements (PPAs) is critical to attracting both domestic and foreign private capital.

6. **Strengthening Regulatory Autonomy**

   Empower the **Atomic Energy Regulatory Board (AERB)** with true statutory independence. A transparent, autonomous regulator is vital to maintaining high safety standards and public trust, especially as private players enter the "build, own, and operate" space.

Conclusion

The SHANTI Act (2025) pivots India from state-led to market-driven nuclear energy. By leveraging private capital and indigenous SMRs, India can achieve its 100 GW target and Net-Zero 2070 goals.

Q. *With growing energy needs should India keep on expanding its nuclear energy programme? Discuss the facts and fears associated with nuclear energy. 15 Marks*

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