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HISTORY
ECONOMICS
POLITY
SCIENCE AND TECHNOLOGY
GEOGRAPHY AND ENVIRONMENT

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Analyze how India can reconcile expanding industrial manufacturing and rising domestic consumption demands with its national emission reduction commitments.

Introduction

As India advances toward Viksit Bharat 2047, manufacturing expansion and rising consumption are accelerating energy demand. Simultaneously, India has reduced GDP emission intensity by 37.38% since 2005, highlighting the decarbonisation challenge.

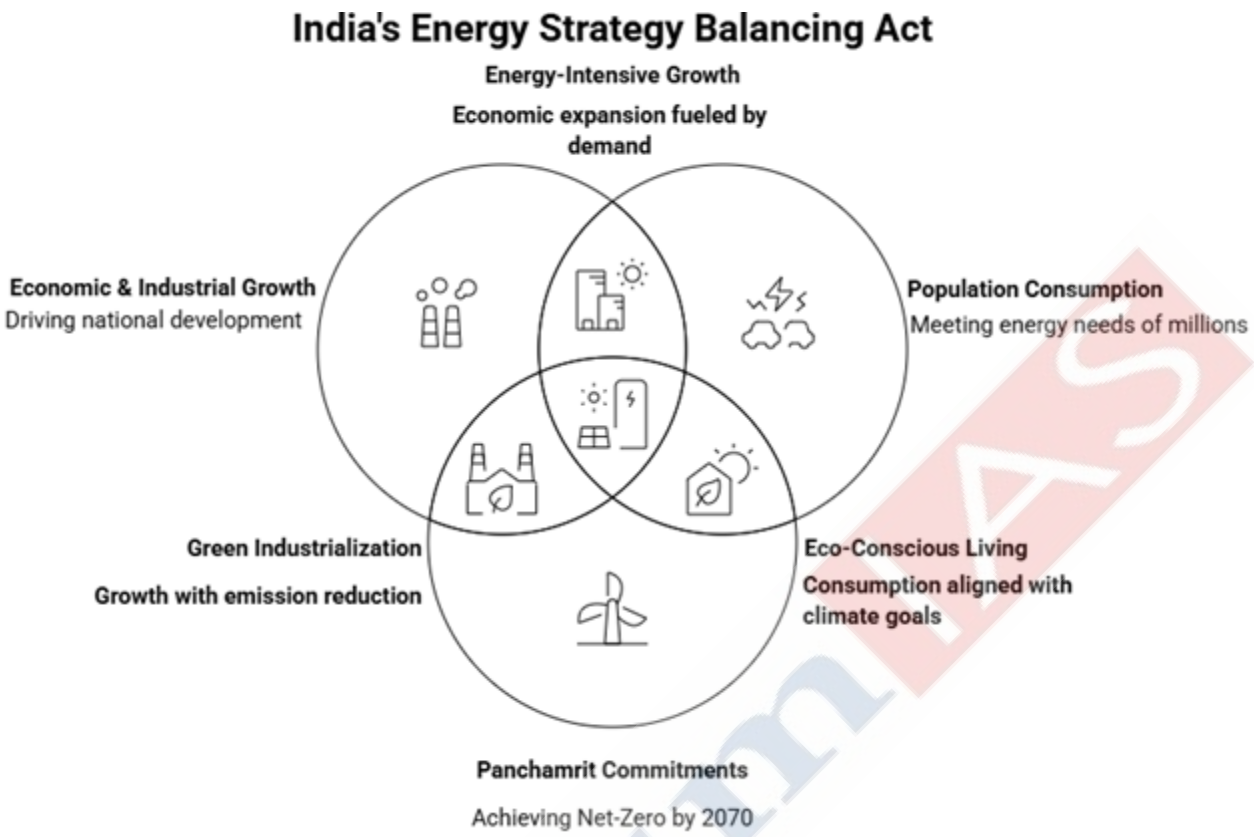
The Development–Climate Trilemma

India must balance three competing imperatives:

1. Rapid industrialization through Make in India, PLI schemes and infrastructure expansion.
2. Rising consumption from a growing middle class demanding mobility, cooling and housing.
3. Climate commitments under Panchamrit, NDCs and Net-Zero 2070. The challenge is not limiting growth but decoupling emissions from growth.

Why the Challenge is Intensifying?

1. **Industrial Manufacturing as a Major Emission Source:** India's First Biennial Transparency Report (BTR-1) shows manufacturing industries and construction contribute a significant share of national emissions. Steel, cement, petrochemicals and fertilizers remain heavily dependent on fossil fuels. Hard-to-abate sectors lack commercially viable alternatives. Example: Blast-furnace steel.
2. **Rising Consumption-Driven Emissions:** Urbanization fuels demand for automobiles, air-conditioners, appliances and housing. Consumption growth often offsets efficiency gains achieved in production. Peak electricity demand is increasingly driven by cooling requirements. Example: Urban AC boom.
3. **Coal-Dependent Energy Structure:** Coal remains crucial for industrial competitiveness and energy security. Renewable expansion alone cannot yet provide reliable baseload power. Storage and transmission gaps persist. Example: Grid intermittency.
4. **MSME Decarbonisation Deficit:** MSMEs form the backbone of manufacturing but face capital and technology constraints. Lack of affordable green finance delays adoption of cleaner technologies. Example: Textile clusters.
5. **Policy Coverage Gaps:** NITI Aayog's climate dashboard analysis indicates a large portion of industrial emissions falls under broadly classified "non-specific industries", often escaping targeted mitigation measures. This weakens sector-specific decarbonisation efforts. Example: Emission blind spots.



India's Emerging Strategy for Green Industrial Growth

1. **Intensity-Based Decoupling Model:** India follows an emissions-intensity approach rather than absolute emission caps. Emission intensity reduced by 37.38% between 2005 and 2022. New NDC targets a 47% reduction by 2035. This allows GDP growth while reducing carbon emitted per unit of output.
2. **Carbon Market-Based Regulation:** Transition from PAT Scheme to Carbon Credit Trading Scheme. Covers major sectors such as steel, cement, aluminium, petroleum and textiles. Rewards efficient firms and penalizes excessive emitters. Example: Carbon certificates.
3. **Renewable Energy Expansion:** Non-fossil sources account for over 51.9% of installed power capacity. India achieved its 50% non-fossil capacity target ahead of schedule.
4. **Green Hydrogen Mission:** Critical for steel, fertilizer and refinery sectors. Reduces dependence on imported fossil fuels. Example: Green steel.
5. **Energy Efficiency Measures:** Dynamic star-rating systems. Efficient cooling technologies. Smart buildings and appliances. Example: Energy-efficient Acs.
6. **Circular Economy and Resource Efficiency:** Recycling of steel, aluminium and plastics, extended producer responsibility (EPR) and waste-to-resource ecosystems. Example: Scrap-based steel and Mission LiFE.
7. **Industry 4.0 Integration:** AI-enabled energy optimization, smart manufacturing and digital twins and predictive maintenance reducing energy wastage. Example: Smart factories.
8. **Climate Finance Architecture:** Sovereign Green Bonds, blended finance instruments and dedicated low-interest green transition funds. Example: Green credit lines.

Way Forward

1. **Deepening the Carbon Market:** The ICM must expand to encompass the entire iron and steel value chain, supported by strict verification mechanisms.
2. **Demand-Side Management:** Implementing mandates like the LiFE (Lifestyle for Environment) initiative, paired with stricter dynamic star-ratings for consumer appliances, can help cool down consumption-driven energy surges.
3. **Blended Climate Finance:** Creating specialized sovereign green funds to offer low-interest loans directly to the MSME sector for clean technology adoption.

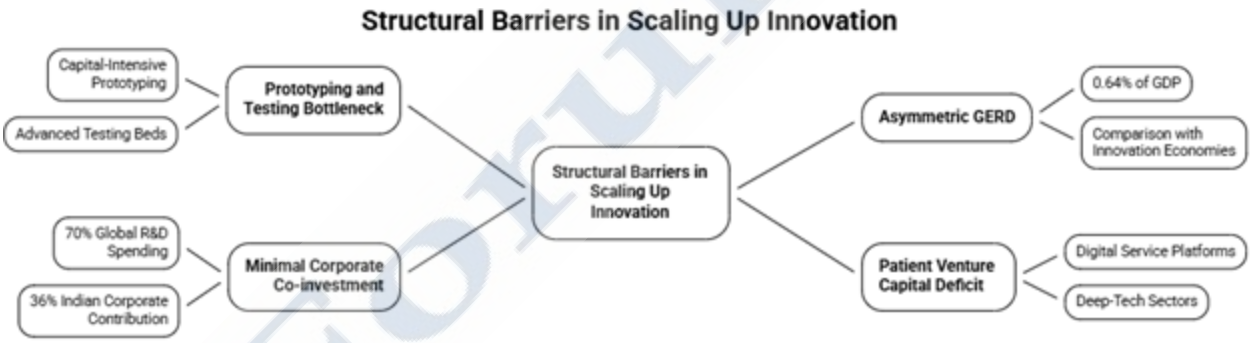
Conclusion

Echoing Prime Minister Narendra Modi's Panchamrit vision and the Economic Survey's development-centred climate framework, India must achieve green industrialization through innovation, efficiency and behavioural transformation, not growth restraint.

Evaluate the structural barriers in translating grassroots innovations into globally dominant technology enterprises in India. Discuss state policy initiatives required to cross this threshold.

Introduction

India ranks 38th in the Global Innovation Index 2025 and hosts the world's third-largest startup ecosystem, yet GERD remains only 0.64% of GDP, exposing a persistent commercialization gap between invention and global-scale enterprise.



Structural Barriers in Scaling Grassroots Innovation

1. **Innovation Valley of Death (TRL Gap):** India performs reasonably well in TRL 1–3 (Technology-Readiness-Levels) (research, proof-of-concept) but struggles in TRL 4–9 (prototype, pilot, commercialization). Limited access to testing facilities, certification labs, fabrication units, and pilot-scale manufacturing delays market entry. Example: Simputer failed to evolve into a global platform despite technological foresight.
2. **Low R&D Intensity and Funding Deficit:** GERD remains 0.64% of GDP, far below Israel (~5%), South Korea (~4.5%) and the US (~3%). Research institutions often generate patents without commercialization pathways. Result: Knowledge-production paradox.
3. **Weak Corporate Participation:** Globally, private firms contribute over 70% of R&D expenditure; India's corporate contribution remains comparatively limited. Many firms focus on assembly, adaptation, and service delivery rather than frontier innovation. Example: Electronics manufacturing ecosystem.

4. **Deep-Tech Capital Constraints:** Venture capital is concentrated in fintech, e-commerce, and consumer platforms. Long-gestation sectors such as AI chips, biotechnology, quantum computing, advanced materials, and robotics face funding shortages. Result: Patient-capital deficit.
5. **Fragmented Academia–Industry Linkages:** Universities, CSIR labs, startups, and industry often operate in silos. Technology transfer offices remain underdeveloped. Public research rarely reaches commercial scale. Example: Laboratory-to-market disconnect.
6. **Procurement and Market Access Barriers:** Government procurement largely follows the L1 (lowest-cost) model. Innovative domestic products struggle against established global vendors. Startups face difficulty obtaining first large-scale customers. Example: Indigenous hardware procurement.
7. **Intellectual Property and Regulatory:** Patent filing costs, lengthy approvals, and weak commercialization support reduce incentives. Regulatory uncertainty in emerging sectors delays investment. Example: Health-tech approvals.
8. **Manufacturing Ecosystem Weaknesses:** Lack of semiconductor fabs, component ecosystems, precision manufacturing clusters, and supply-chain depth. Innovations often remain prototypes due to production bottlenecks. Example: Semiconductor Complex Limited (SCL).
9. **Talent and Brain Drain:** High-end researchers frequently migrate toward ecosystems offering better funding and commercialization opportunities. Creates a gap between scientific discovery and industrial deployment. Example: AI research migration.
10. **Geopolitical and Scale Constraints:** Global technology leadership increasingly depends on control over standards, supply chains, and critical minerals. Indian startups often lack access to global distribution networks. Example: Advanced chip ecosystem.

State Policy Initiatives Required

1. **Operationalize the ₹1 Lakh Crore RDI Fund:** Use milestone-based co-investment for TRL 4–9 projects. Share commercialization risks with private industry. Focus on strategic sectors such as semiconductors, AI, biotech, and space technologies.
2. **Strengthen ANRF-Led Translational Research:** Establish Translational Research Centres (TRCs) linking universities, startups, industry and convert patents into scalable products. Example: ANRF ecosystem.
3. **Reform Public Procurement:** Shift from L1 procurement to Value-Based Procurement. Provide preferential procurement for indigenous deep-tech products. Example: Defence iDEX model.
4. **Create National Prototyping Infrastructure:** Shared testing facilities, semiconductor fabs, biotech incubators, AI compute clusters and reduce commercialization costs. Example: Common technology platforms.
5. **Incentivize Corporate R&D:** Enhanced tax incentives, matching grants for industry-academia projects and mandate innovation spending in strategic sectors. Example: Mission-mode R&D.
6. **Expand Deep-Tech Financing:** Dedicated sovereign venture funds for quantum, AI, aerospace, and advanced materials. Encourage pension and insurance funds to participate. Example: Deep-tech fund-of-funds.
7. **Build Global Innovation Partnerships:** Leverage Quad, iCET, and semiconductor partnerships. Gain access to markets, technology standards, and supply chains. Example: India-US semiconductor cooperation.
8. **Strengthen IP Commercialization:** Fast-track patent examination, establish technology transfer offices in major universities. Example: Bayh-Dole inspired model.

Way Forward

1. Move from startup-centric to scale-up-centric policy.
2. Integrate National Manufacturing Mission, IndiaAI Mission, Semiconductor Mission, ANRF, and RDI Fund into a unified innovation architecture.
3. Promote mission-driven collaborations in AI, quantum technologies, critical minerals, biotechnology, and advanced manufacturing.
4. Create globally competitive technology clusters around universities and industrial corridors.

Conclusion

India's intensity-based strategy with robust policy support can harmonise manufacturing ambitions and consumption needs with climate commitments.

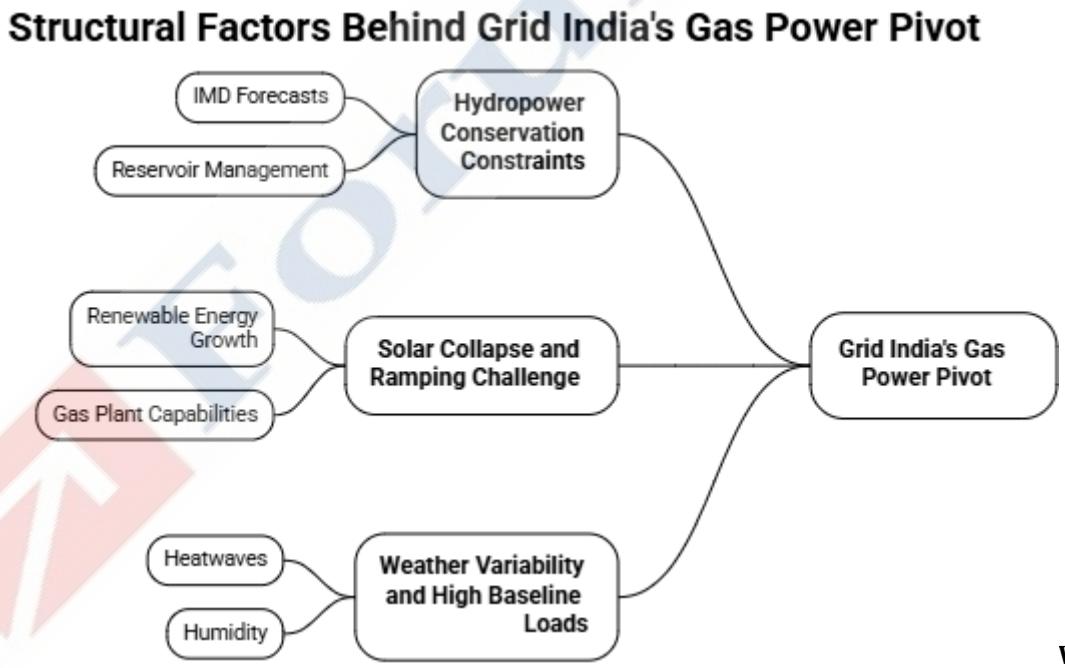
Analyze the structural factors compelling Grid India's seasonal reliance on gas-based power generation. Evaluate the challenges it poses to India's long-term energy transition.

Introduction

Despite crossing 50% non-fossil installed power capacity ahead of its 2030 target, India's 2026 resource adequacy assessments reveal that gas-based plants remain indispensable for balancing seasonal demand, renewable intermittency, and hydrological uncertainty.

India's Power Transition Is Witnessing A Paradox

As renewable energy expands rapidly, the need for flexible balancing resources has increased. Grid India's June 2026 advisory directing gas stations to secure fuel reflects this emerging reality.



Why Grid India Relies on Gas-Based Power Seasonally

1. **Renewable Intermittency:** Sharp solar collapse during evening peaks creates rapid ramping demand. Gas turbines possess fast-ramping capability and can quickly compensate for sudden renewable shortfalls. Example: Duck Curve Challenge.

2. **Hydropower Conservation During Weak Monsoons:** Below-normal monsoon forecasts compel hydro conservation for irrigation. Hydro stations reduce flexible peak-hour generation here gas plants fill the resulting balancing gap. Example: Reservoir management.
3. **Rising Cooling Demand and Weather Extremes:** Persistent high baseline loads from heat and humidity sustain demand. Demand remains high even during monsoon transition periods. Example: Cooling economy.
4. **Coal Plants Lack Operational Flexibility:** as plants provide essential flexibility absent in rigid coal or variable renewables. Fast-start capabilities balance intermittent solar and limited hydro. Example: Peak-hour support.
5. **Resource Adequacy and Grid Reliability Requirements:** Grid India's planning framework incorporates demand forecasts, renewable generation profiles, outages, and weather information. Gas generation acts as a reliability buffer during uncertain conditions. Example: Resource adequacy planning.
6. **Declining System Inertia in Renewable-Rich Grids:** Higher renewable penetration reduces conventional rotating generation. Gas plants provide ancillary services such as frequency regulation and voltage stability. Example: Grid stability support.

Challenges for India's Long-Term Energy Transition

1. **Energy Security and Geopolitical Vulnerability:** India relies heavily on imported LNG, West Asian conflicts and maritime disruptions constrain supplies and raise prices. Spot-market fuel procurement surges during shortages.
2. **Financial Stress on DISCOMs:** Spot gas prices have risen amid disruptions, expensive gas-based generation increases procurement costs for utilities this ultimately affects tariffs and DISCOM finances. Example: Tariff pressure.
3. **Carbon Lock-In Risks:** Though cleaner than coal, natural gas remains a fossil fuel. Prolonged dependence delay deep decarbonization pathways, weaken momentum toward Net-Zero 2070 goals. Example: Bridge-fuel dilemma.
4. **Delayed Storage Deployment:** Dependence on gas can postpone investment in utility-scale storage solutions. Battery Energy Storage Systems (BESS) and Pumped Storage Projects (PSPs) are essential for a renewable-dominated grid. Example: Storage substitution.
5. **Stranded Asset Concerns:** India possesses around 24 GW of gas-based capacity, much of which remains underutilized. Seasonal operation creates poor asset utilization and economic inefficiencies. Example: Idle infrastructure.
6. **Renewable Curtailment and Market Distortions:** Inadequate storage and transmission infrastructure force renewable energy curtailment during surplus periods. This reduces investor confidence and project viability. Example: Solar curtailment.
7. **Climate Commitment Challenges:** India's updated NDCs and Panchamrit commitments require sustained reductions in emission intensity. Excessive reliance on gas may complicate long-term decarbonization trajectories. Example: Net-Zero pathway.

Way Forward

1. **Accelerate Energy Storage Infrastructure:** Scale up BESS through VGF support and National Energy Storage Mission. Expand pumped-storage hydro projects. Example: Pumped storage hubs.
2. **Develop Market-Based Ancillary Services:** Strengthen real-time electricity markets and flexibility markets. Reward fast-response resources. Example: Ancillary service market.
3. **Repurpose Thermal Assets:** Convert ageing thermal plants into synchronous condensers for grid stability without emissions. Example: SYNCON conversion.

4. **Enhance Demand-Side Flexibility:** Time-of-day tariffs, smart meters, and industrial demand response programs. Example: Peak load shifting.
5. **Strengthen Transmission Infrastructure:** Expand Green Energy Corridors and interstate transmission networks. Example: National grid integration.
6. **Promote Green Hydrogen for Long-Duration Storage:** Integrate the National Green Hydrogen Mission with power sector balancing needs. Example: Hydrogen storage.

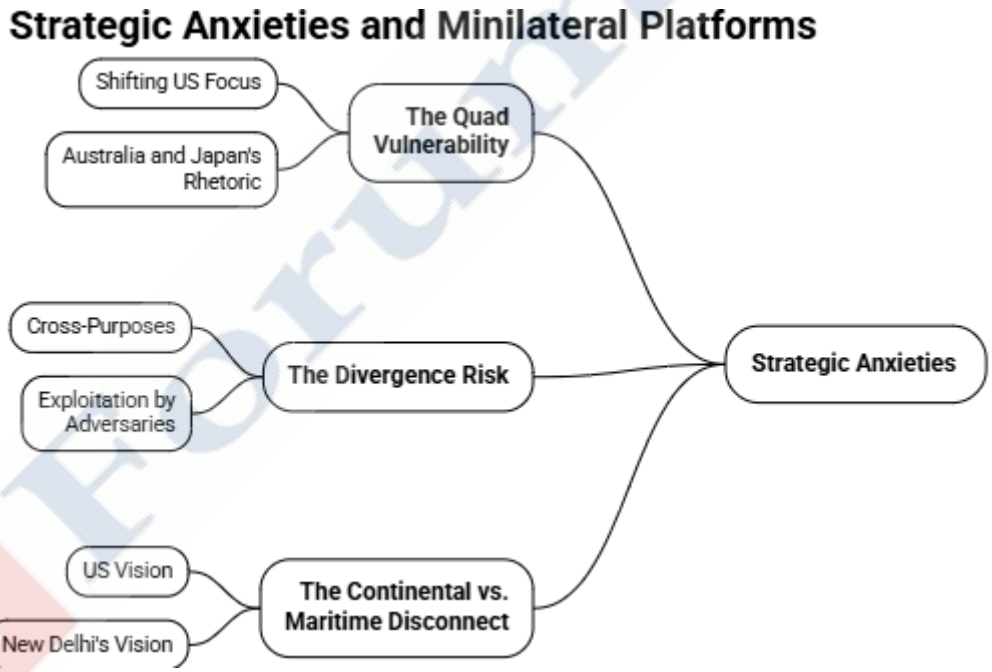
Conclusion

India's transition must move beyond temporary gas-based balancing toward storage-led flexibility, ensuring reliability, affordability, and climate-compatible growth simultaneously.

Examine the geopolitical implications of Washington reverting from INDOPACOM to PACOM. How should India recalibrate its strategic posture to safeguard its maritime interests?

Introduction

With nearly 95% of India's trade by volume moving through maritime routes and the Indo-Pacific driving global geopolitics, Washington's 2026 shift from INDOPACOM to PACOM raises critical questions regarding regional security architecture and India's maritime strategy.



Geopolitical Implications of Reverting from INDOPACOM to PACOM

1. **Symbolic Dilution of the Indo-Pacific Construct:** The 2018 renaming acknowledged the strategic integration of the Indian and Pacific Oceans and India's growing role in regional security. Reversion to PACOM may signal a narrower U.S. prioritization of the Western Pacific over the broader Indo-Pacific theatre. Example: "Pacific-first" outlook.
2. **Recalibration of U.S. Strategic Priorities:** Indicates concentration on immediate challenges posed by China's military expansion around Taiwan and the First Island Chain. Reflects growing U.S.

preference for burden-sharing rather than extended security commitments. Example: Taiwan contingency.

3. **Implications for the Quad:** Raises concerns regarding the long-term strategic coherence of the Quad involving India, Japan, Australia and the U.S. Creates perception of reduced American emphasis on India's centrality within regional security calculations. Example: Quad uncertainty.
4. **Fragmentation of Maritime Security Architecture:** Weakens the conceptual linkage between the Indian Ocean Region (IOR) and Pacific Ocean envisioned by former Japanese Prime Minister Shinzo Abe through the "Confluence of the Two Seas". Adversaries may exploit operational and diplomatic gaps between the two theatres.
5. **Geopolitical Signalling to China:** The nomenclature shift coincides with greater emphasis on direct U.S.-China competition within the Pacific theatre. May encourage Beijing to expand influence in the Indian Ocean where American engagement appears less pronounced. Example: PLAN deployments.
6. **Strategic Autonomy Imperative:** Reinforces the classical realist lesson that great-power interests overlap but rarely coincide permanently. India cannot outsource Indian Ocean security to any external power.

Why the Shift Matters More for India

1. **Historical:** India's Indo-Pacific vision extends from Africa's eastern coast to the Western Pacific, unlike the narrower U.S. military definition. Demonstrates divergence between Indian and American geographical imaginations.
2. **Economic:** Around 80% of India's crude oil imports and substantial external trade pass through the Indian Ocean. Maritime insecurity directly threatens economic growth and energy security. Example: Hormuz dependence.
3. **Geopolitical:** Expanding Chinese presence through the “String of Pearls” strategy increases strategic pressure. Reduced Indo-Pacific emphasis may widen China's maneuvering space in the IOR.
4. **Security:** Maritime chokepoints such as Malacca, Bab-el-Mandeb, Lombok and Hormuz remain critical for India's security. Greater responsibility may increasingly fall upon India as the resident naval power.

How India Should Recalibrate Its Strategic Posture

1. **Strengthen Indigenous Maritime Power:** Fast-track construction of SSNs, aircraft carriers, unmanned maritime systems and anti-submarine warfare capabilities. Expand indigenous defence production under Aatmanirbhar Bharat. Example: Project-75I.
2. **Transform Andaman & Nicobar Command into a Forward Operating Hub:** Upgrade airstrips, logistics infrastructure and ISR assets. Enhance surveillance over Malacca Strait approaches. Example: Eastern gatekeeper.
3. **Deepen Maritime Domain Awareness (MDA):** Expand the role of Information Fusion Centre – Indian Ocean Region. Integrate satellite, drone and undersea sensor networks. Example: Real-time tracking.
4. **Diversify Minilateral Partnerships:** Strengthen IORA, Colombo Security Conclave, India-France-UAE cooperation and India-Japan-Australia trilateral. Reduce dependence on any single security architecture.
5. **Operationalise SAGAR 2.0:** Expand HADR, coastal radar networks, defence training and capacity-building for island nations. Consolidate India's role as a net security provider. Example: Mauritius patrol vessels.

6. **Preserve Strategic Autonomy:** Maintain defence interoperability with the U.S. through LEMOA, COMCASA and BECA while avoiding alliance entrapment. Continue multi-alignment with ASEAN, France, Japan and Gulf partners.
7. **Leverage Emerging Technologies:** Expand maritime AI, autonomous vessels, underwater drones and space-based surveillance. Align with the Economic Survey 2025-26 emphasis on strategic technologies and resilience.

Way Forward

1. Develop a comprehensive Indian Ocean Security Strategy integrating Navy, Coast Guard, Space and Cyber domains.
2. Institutionalise annual maritime threat assessments through National Security Council Secretariat.
3. Increase defence R&D expenditure and maritime infrastructure investments.
4. Position India as the indispensable stabilizing power of the Indian Ocean rather than a peripheral participant in Pacific-centric frameworks.

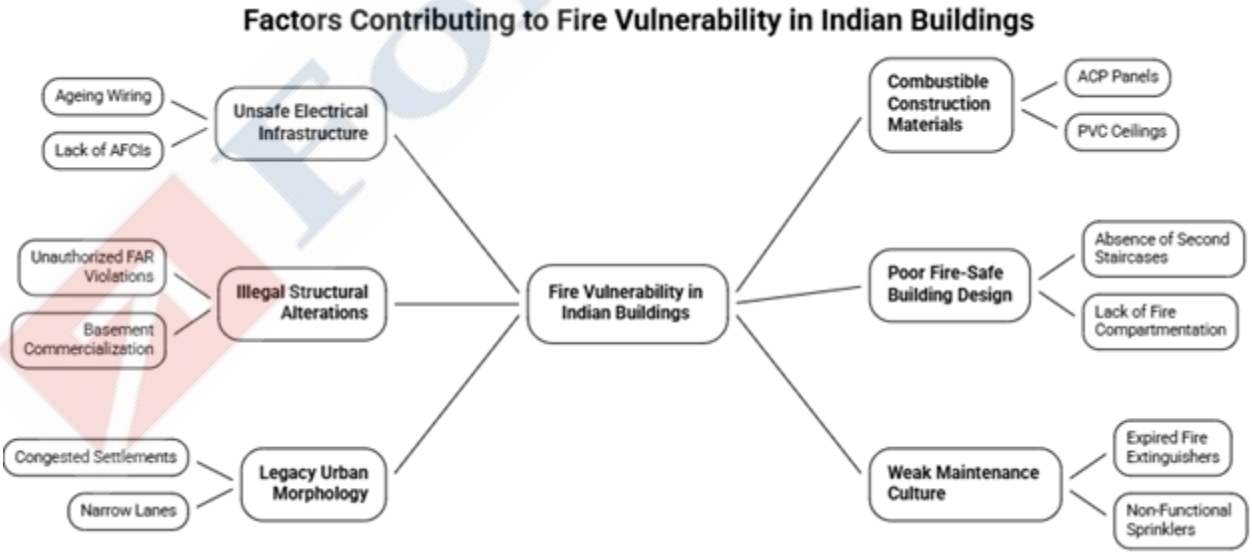
Conclusion

Strategic autonomy rests on indigenous capability. India must strengthen maritime power and regional leadership, ensuring security irrespective of shifting external alignments.

Why India's buildings are vulnerable to fire? Examine the problems faced in this regard and suggest improvements.

Introduction

With nearly 13,000–15,000 fire deaths annually (NCRB) and rapid urban densification, recurring tragedies expose that India's buildings remain structurally unsafe, demanding a shift from reactive firefighting to preventive fire-resilient urban planning.



Why are India's Buildings Vulnerable to Fire?

1. **Aging Electrical Infrastructure**: ~70% of urban fires originate from electrical short circuits due to overloaded legacy wiring unable to handle modern electrical loads. Absence of Arc-Fault Circuit Interrupters (AFCIs) and smart electrical monitoring aggravates risks. Example: Coaching centres; Commercial complexes.
2. **Unsafe Building Design:** Unauthorized FAR violations, sealed balconies, basement storage and single escape routes create death traps. Lack of compartmentalisation and second staircases accelerates fire spread. Example: Delhi B&B fire (2026).
3. **Use of Combustible Materials:** Cost-cutting encourages plastic panels, ACP cladding, combustible false ceilings and synthetic interiors. External façade fires spread vertically (chimney effect). Example: Grenfell Tower lessons.
4. **Rapid Urbanisation & Mixed Land Use:** Residential buildings illegally converted into warehouses, coaching centres or factories. Hazardous chemicals stored inside residential areas. Example: Old Delhi markets.
5. **Climate Change & Heat Stress:** Rising temperatures increase AC usage, overloading electrical systems. Longer dry seasons elevate ignition risks. Example: IMD heatwave trends.

Problems in Fire Safety & Management

1. **Weak Governance & Enforcement:** Fire services fall under State List (Seventh Schedule) resulting in fragmented regulations. Fire NOCs become one-time approvals instead of continuous compliance and weak municipal inspections. Example: Delhi's 450 red-flagged buildings.
2. **Infrastructure Deficit:** According to Ministry of Home Affairs 97.6% shortage of fire stations, 96.3% shortage of firefighters and 80% shortage of modern equipment. Example: NDMA Fire Audit.
3. **Non-binding National Building Code:** NBC Part IV provides comprehensive standards but becomes enforceable only after State adoption and uneven implementation across States.
4. **Poor Urban Accessibility:** Narrow lanes, encroachments and illegal parking delay emergency response. Conventional fire tenders cannot access dense settlements. Example: Chandni Chowk; Burrabazar.
5. **Low Public Preparedness:** Few evacuation drills, poor maintenance of extinguishers, sprinklers and weak fire-risk awareness. Example: Schools; Hospitals.

Way Forward

1. **Strengthen Regulatory Framework:** Enact a Model National Fire Safety Law harmonising NBC standards across States. Digitise Fire NOCs using blockchain for transparent renewal. Example: Smart Governance.
2. **Technology-led Prevention:** Mandatory AFCIs, smart smoke detectors, AI-based fire monitoring and IoT alarms. GIS-based emergency response systems. Example: Smart Cities Mission.
3. **Retrofitting Existing Buildings:** Mandatory compartmentalisation, fire-resistant façade materials, smoke extraction systems and second staircases. Independent third-party fire audits every two years. Example: Hospitals; Coaching institutes.
4. **Modernise Fire Services:** Implement 15th Finance Commission recommendations for modern fire equipment. Deploy mini fire tenders and motorcycle-mounted mist systems in congested areas. Example: Old city markets.
5. **Risk-sensitive Urban Planning:** Integrate fire-risk mapping into Master Plans under AMRUT and Smart Cities. Ensure minimum road widths and dedicated emergency corridors. Example: Transit-oriented development.

6. **Community-Centred Preparedness:** Expand Aapda Mitra, compulsory mock drills, school fire education and insurance-linked Fire Safety Scores. Promote Resident Welfare Association fire volunteers. Example: Community resilience.

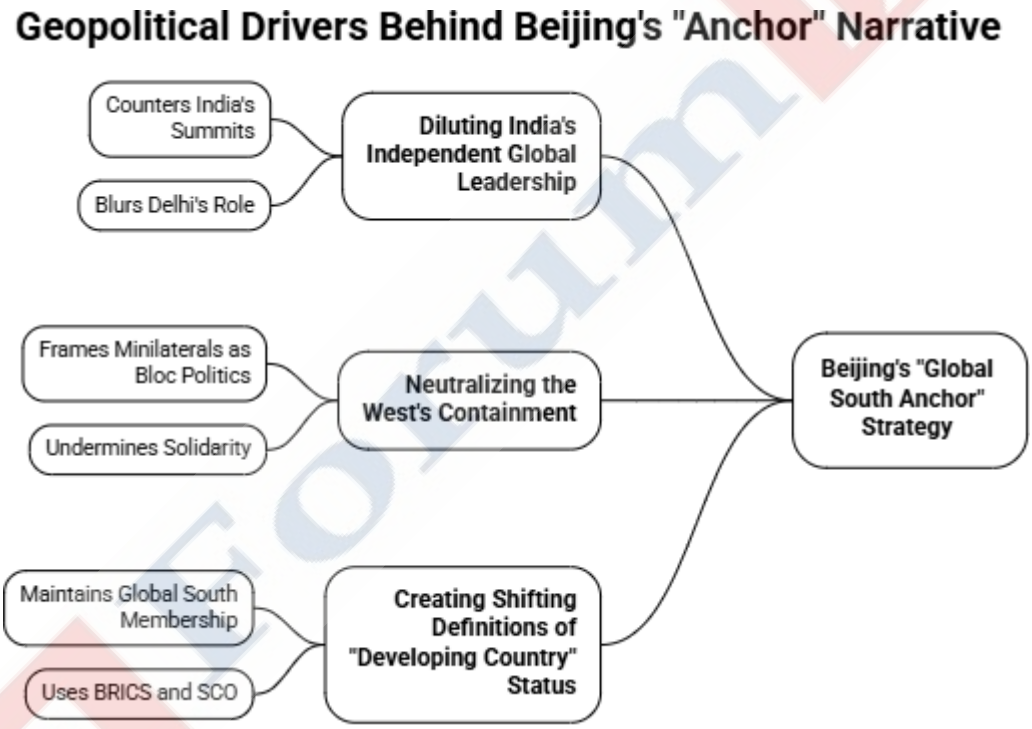
Conclusion

Envisioned a developed India founded on safe infrastructure, resilient cities require prevention over reaction, making fire safety an indispensable pillar of Viksit Bharat 2047.

Examine the geopolitical drivers behind Beijing's narrative of India and China acting as Global South anchors. How should India counter this strategic alignment?

Introduction

With BRICS expanding and the Economic Survey 2025-26 highlighting South-South cooperation as a growth driver, China's Global South anchor narrative reflects an emerging contest over leadership, norms and influence across developing economies.



Geopolitical Drivers Behind Beijing's Global South Anchor Narrative

1. **Consolidating Leadership of the Global South:** China seeks to project itself as the principal representative of developing countries despite being the world's second-largest economy. It portrays itself as championing reforms in global governance. Example: BRICS expansion.
2. **Diluting India's Independent Leadership:** India's Voice of Global South Summits created an autonomous platform outside Chinese influence. The co-anchor narrative seeks to blur India's unique bridge between the Global North and South. Example: Voice of Global South.
3. **Countering Western Strategic Coalitions:** Beijing portrays the Quad, iCET and Indo-Pacific initiatives as bloc politics. It seeks to discourage India's deeper strategic convergence with the US and its allies. Example: Quad narrative.

4. **Legitimising China's Global Governance Vision:** China's Global Governance White Paper argues that China will always remain part of the Global South. It seeks greater influence in the UN, WTO, IMF and BRICS institutions. Example: Global Governance White Paper.
5. **Expanding Economic Influence:** The narrative supports Chinese-led initiatives like BRI, AIIB and Digital Silk Road. It helps sustain market access and resource diplomacy across Africa, Asia and Latin America. Example: BRI corridors.
6. **Managing Strategic Competition with India:** The "anchor" concept shifts attention away from unresolved issues like the **LAC**, military deployments and maritime competition. It attempts compartmentalisation of disputes. Example: Post-Galwan diplomacy.

Challenges in Beijing's Narrative

1. **Credibility Deficit:** Win-win cooperation contrasts with debt distress in Hambantota (Sri Lanka) and fiscal pressures in CPEC (Pakistan).
2. **Strategic Contradictions:** Simultaneous calls for cooperation alongside assertive actions in the South China Sea and Indian Ocean Region (IOR).
3. **Asymmetrical Partnership:** China's economic size risks reducing India to a junior stakeholder within a Beijing-led framework.

Strategic Framework for India's Counter-Response

1. **Preserve Independent Global South Leadership:** Institutionalise Voice of Global South Summit as an annual platform focused on development priorities. Example: Development diplomacy.
2. **Promote Democratic Development Partnerships:** Expand Digital Public Infrastructure (UPI, Aadhaar, CoWIN), capacity building and transparent development financing. Example: DPI exports.
3. **Strengthen Maritime Leadership:** Reinforce SAGAR, IFC-IOR, Colombo Security Conclave and humanitarian assistance to remain the preferred net security provider. Example: Indian Ocean.
4. **Deepen Multi-Alignment:** Simultaneously strengthen Quad, BRICS, SCO, G20 and ISA, reflecting India's policy of strategic autonomy. Example: Multi-alignment.
5. **Defend Rules-Based Order:** Continue insisting that normal bilateral relations require peace along the LAC, respect for sovereignty and adherence to international law. Example: Border stability.
6. **Build Alternative Economic Architecture:** Scale up India-Middle East-Europe Economic Corridor (IMEC), resilient supply chains and South-South development financing. Example: Connectivity diversification.
7. **Expand Soft-Power Leadership:** Promote affordable healthcare, pharmaceuticals, digital governance, climate finance and education partnerships. Example: Vaccine Maitri.

Way Forward

1. Create a Global South Development Fund focusing on climate adaptation and resilient infrastructure.
2. Expand NITI Aayog's Digital Public Infrastructure model globally.
3. Strengthen India-Africa, India-Pacific Islands and India-Latin America partnerships.
4. Position India as a trusted development partner, not merely a geopolitical balancer.

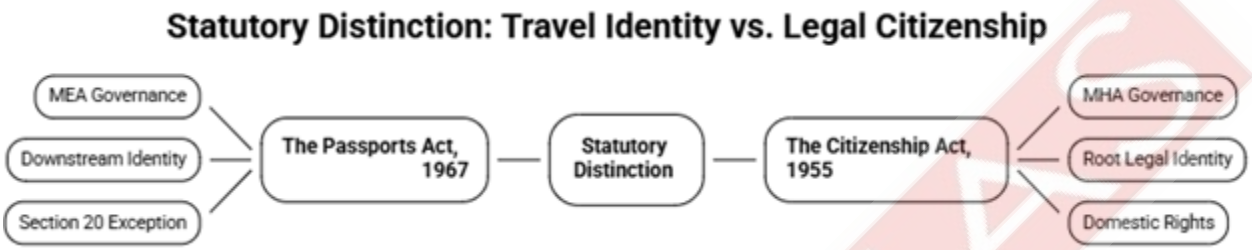
Conclusion

Cooperation succeeds only with mutual respect. India's Global South leadership must therefore rest on sovereignty, transparency, inclusivity and strategic autonomy not geopolitical subordination.

Examine the statutory distinction between 'travel identity' and 'legal citizenship' in India. Detail how citizenship is conclusively established under current legislative frameworks.

Introduction

During Passport Seva Divas 2026, the MEA reaffirmed that a passport is primarily a travel document—not conclusive proof of citizenship highlighting the constitutional distinction between identity documentation and legal nationhood under Indian law.



Statutory distinction between Travel Identity and Legal Citizenship

1. **Constitutional Angle:** Articles 5–11 empower Parliament to regulate citizenship through law. Citizenship is a legal status, whereas a passport merely facilitates exercise of the right to international travel. Example: Constitution Part-II.
2. **Legislative Direction:** Passports Act, 1967, administered by MEA. Governs issuance of passports solely for international travel. Section 20 permits passports/travel documents even to non-citizens in public interest (e.g., stateless persons), proving that passport ≠ conclusive citizenship. Citizenship Act, 1955, administered by MHA. Sole legislation governing acquisition, determination and termination of citizenship.
3. **Administrative:**

Passport = downstream identity document. Citizenship records = root legal documents based on birth, parentage or statutory grant.

4. **Judicial Angle:** Maneka Gandhi v. Union of India (1978), passport reflects nationality for overseas protection but derives validity from citizenship. Lal Babu Hussein (1995), electoral roll creates only a rebuttable presumption of citizenship. 2026 SIR judgment, aadhaar establishes identity not citizenship.
5. **International Dimension:** Most democracies distinguish **travel documentation** from **citizenship determination**, reducing fraud while preserving sovereign control. Example: **Stateless persons**.

How Citizenship is Conclusively Established in India

Unlike many Western nations, Indian jurisprudence recognizes citizenship as a legal status arising from specific historical facts, rather than a status proved by any single government-issued card. To conclusively establish citizenship under the Citizenship Act, 1955, authorities rely on a combination of birth dates, lineage, and official certificates:

Applicant's Birth Window	Primary Legal Requirements for Citizenship	Conclusive Documentary Evidence

Born between Jan 26, 1950, and July 1, 1987	Citizenship by birth, irrespective of parental nationality.	Official Birth Certificate or verified entry in early Electoral Rolls.
Born between July 1, 1987, and Dec 3, 2004	Born in India, and at least one parent must be an Indian citizen at the time of birth.	Birth Certificate paired with parental ancestral records/land titles.
Born on or after Dec 3, 2004	Born in India, and both parents must be Indian citizens (or one parent is a citizen and the other is not an illegal migrant).	Certified parentage records and verified domestic birth certificates.
Non-Natural Citizens (Migrants/Foreigners)	Granted status through formal application pathways under specified statutory timelines.	Formal Certificate of Naturalisation or Certificate of Registration issued by the MHA.

Documentary Matrix for Citizenship

Document	**Legal Value**
Birth Certificate	Primary evidence
Parentage records	Establish lineage
Citizenship Certificate	Conclusive (Registration/Naturalisation)
Passport	Evidence of nationality; not conclusive
Aadhaar	Identity only
Voter ID	Electoral eligibility
Electoral Roll	Rebuttable presumption

Challenges in Current Framework

1. **Legal:** No single universal citizenship document. Example: Documentation disputes.
2. **Administrative:** Multiple authorities (MHA, MEA, ECI, UIDAI). Example: SIR debate.
3. **Social:** Low public awareness about documentary hierarchy. Example: Passport controversy.
4. **Technological:** Legacy paper records hamper verification. Example: Old municipal registers.
5. **Federal:** Inconsistent birth registration quality across States. Example: Rural registrations.

Way Forward

1. Digitise civil registration through interoperable birth and death databases. Example: CRVS integration.
2. Strengthen Civil Registration System for universal birth registration. Example: Digital India.
3. Issue standard citizenship verification protocols for all agencies. Example: MHA guidelines.

4. Integrate e-governance databases while safeguarding privacy under the Digital Personal Data Protection Act.
5. Mass legal awareness campaigns distinguishing identity from citizenship. Example: Passport Seva Kendras.
6. Periodic legislative clarification through executive manuals and FAQs to avoid public confusion. Example: MEA initiative.

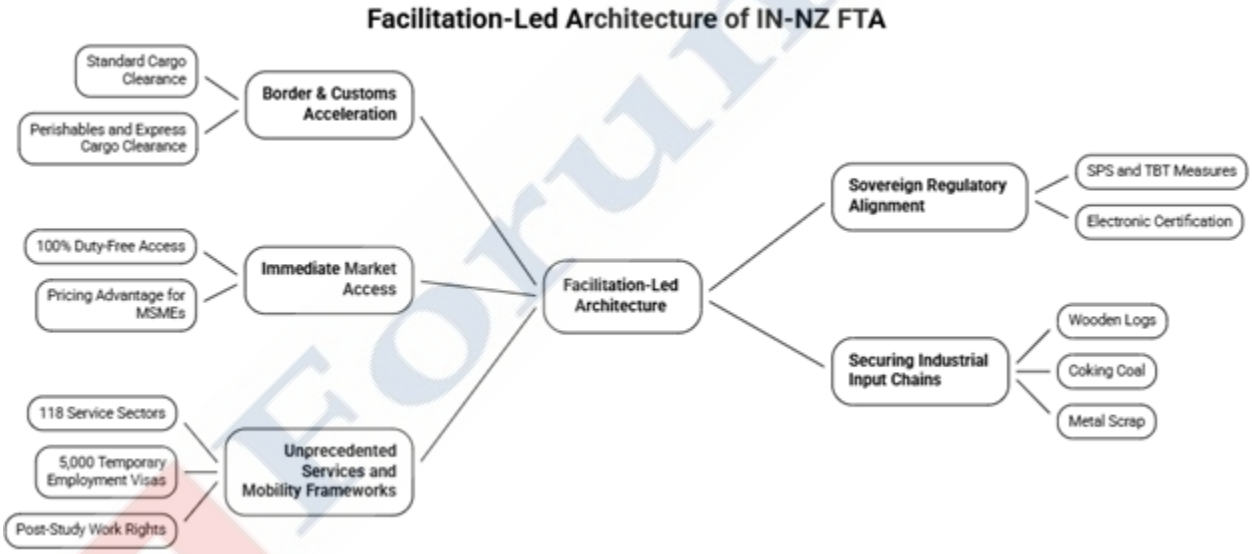
Conclusion

As Dr. B.R. Ambedkar envisioned constitutional governance through the rule of law, citizenship must rest on statutory certainty, ensuring national integrity while protecting every genuine citizen's constitutional rights equally.

Evaluate how the India–New Zealand Free Trade Agreement reflects India's paradigm shift towards a facilitation-led trade policy while protecting its defensive agricultural interests.

Introduction

With bilateral merchandise trade at about US$1.3 billion (FY 2024–25), the India–New Zealand FTA signifies India's shift from tariff-centric protectionism to facilitation-led trade while safeguarding strategic agricultural interests.



India's Shift towards a Facilitation-Led Trade Policy

India's recent FTAs reflect a transition from market access alone to trade facilitation, regulatory convergence and resilient supply chains, consistent with the vision of Viksit Bharat 2047.

1. **Trade Facilitation Beyond Tariff Liberalisation:** 100% duty-free access for Indian exports across New Zealand tariff lines, boosting competitiveness. 48-hour customs clearance (24 hours for perishables), reducing logistics costs. Digital certification and paperless trade procedures improve ease of doing business.
2. **Addressing Non-Tariff Barriers:** Dedicated chapters on Sanitary and Phytosanitary (SPS) and Technical Barriers to Trade (TBT). Predictable regulatory standards reduce compliance uncertainty. *Example: Pharmaceuticals*.

3. **Integrating Global Value Chains:** Zero-duty imports of industrial inputs like coking coal, timber logs and metal scrap strengthen Make in India manufacturing. Lower input costs enhance export competitiveness. *Example: Steel sector*.
4. **Services and Human Capital Mobility:** Market access across 118 service sectors. 5,000 skilled-worker visa pathway and enhanced post-study work rights for Indian STEM graduates. *Example: IT professionals*.
5. **MSME and Digital Trade Promotion:** Special emphasis on MSMEs and women-led enterprises. Greater compliance transparency through Rules of Origin (RoO) and traceability provisions. *Example: Handicrafts exports*.

Balancing Liberalisation with Defensive Agricultural Interests

India's FTA strategy demonstrates calibrated openness, protecting vulnerable sectors without abandoning integration.

1. **Complete Dairy Exclusion:** Milk, butter, cheese and infant formula kept outside tariff concessions. Protects nearly 80 million dairy farmers dependent on cooperative-based production. *Example: Amul ecosystem*.
2. **Tariff Rate Quotas (TRQs):** Limited concessions on products such as apples and kiwifruit. Safeguards through quota ceilings, seasonal windows and Minimum Import Prices (MIP). *Example: Apple growers*.
3. **Food Security Perspective:** Supports Article 39(b) and national food security objectives. Prevents import surges from destabilising domestic agricultural markets.
4. **Protecting Rural Livelihoods:** Agriculture supports nearly half of India's workforce. Defensive tariff policy balances consumer welfare with farmer incomes. *Example: Smallholders*.

Strategic and Geopolitical Significance

1. Positions India as a gateway to Oceania and Indo-Pacific supply chains.
2. Strengthens diversification amid global trade fragmentation.
3. Includes US$20 billion investment commitment in logistics, food processing and digital infrastructure.
4. First FTA to formally facilitate AYUSH cooperation, expanding India's soft power.

Way Forward

1. Develop FTA Readiness Cells for MSMEs to maximise utilisation.
2. Upgrade testing laboratories for SPS/TBT compliance.
3. Expand Digital Public Infrastructure for customs and logistics.
4. Introduce safeguard mechanisms against import surges.
5. Integrate agriculture into export value chains through branding and GI promotion.

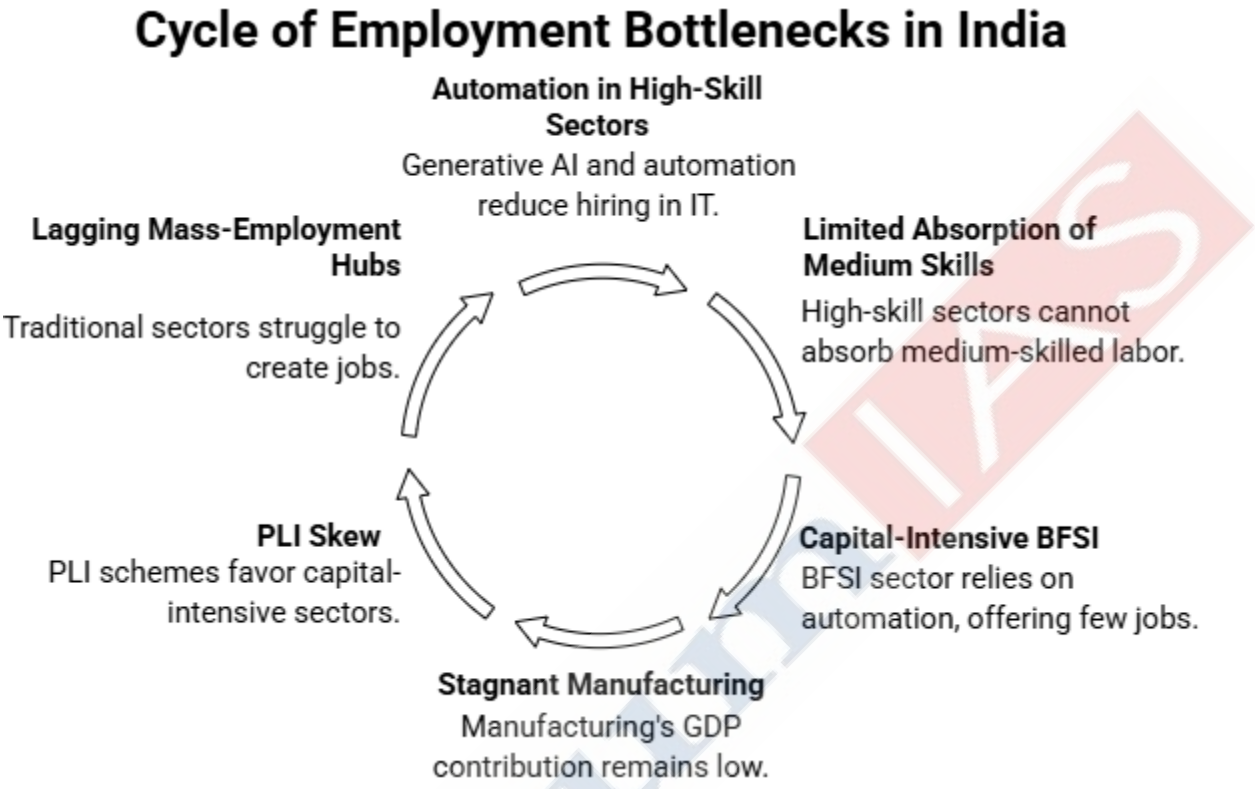
Conclusion

the India-New Zealand agreement successfully balances facilitation-led growth with agricultural protections, setting a model for future strategic trade pacts.

Examine the structural bottlenecks impeding India's transition to a mass-employment generation model. Evaluate the socio-economic risks of an economy driven by low-end services.

Introduction

Despite India remaining the world's fastest-growing major economy (Economic Survey 2025–26), employment elasticity remains weak, exposing a structural disconnect between GDP growth and quality job creation, hindering realization of the demographic dividend.



Structural Bottlenecks Impeding Mass-Employment Generation

1. **Premature Deindustrialisation:** Manufacturing contributes only ~15–17% of GDP, far below East Asian economies during industrial take-off. Labour-intensive sectors textiles, apparel, leather, toys remain globally undercompetitive. Example: Apparel exports.
2. **Capital-Intensive Growth Model:** PLI Scheme has largely favoured electronics, semiconductors, EVs and solar modules with relatively lower employment elasticity where investment has outpaced employment generation. Example: Semiconductor fabs.
3. **MSME Missing Middle:** India has millions of micro enterprises but few medium-sized globally competitive firms. Persistent challenges credit constraints, land acquisition hurdles, compliance burden and limited technology adoption. Example: Dwarfism and Cluster manufacturing.
4. **Skill-Education Mismatch:** India Skills Report consistently highlights employability gaps among graduates. AI, automation and GCCs demand specialised skills, while vocational education remains inadequate. Example: GCC recruitment.
5. **Automation in High-Skill Services:** Generative AI is flattening entry-level hiring in IT-BPM. BFSI increasingly relies on digital platforms and automation, limiting employment expansion. Example: AI coding tools.
6. **Weak Labour-Intensive Export Ecosystem:** Manufacturing exports have stagnated despite global supply-chain diversification. India has yet to fully leverage the China+1 opportunity. Example: Vietnam comparison.

7. **Labour Market Informality:** Over 90% of India's workforce remains informal (Periodic Labour Force Survey/NITI analyses). Labour Codes implementation remains uneven. Example: Construction workers.

Socio-Economic Risks of a Low-End Services Economy

1. **Productivity and Wage Trap:** Gig work, delivery services and informal retail generate employment but low productivity. Limited upward wage mobility restricts long-term prosperity. Example: Food delivery.
2. **Absence of Social Security:** Platform workers often lack: pension, health insurance, provident fund and income protection. Increases vulnerability to economic shocks. Example: Gig workers.
3. **Rising Income Inequality:** High-value ICT and financial services concentrate income among skilled workers. Low-skilled services remain poorly remunerated. Example: GCC salaries.
4. **Demographic Dividend at Risk:** India adds millions of youth annually to the labour force. Persistent underemployment may convert demographic advantage into demographic stress. Example: Youth unemployment.
5. **Weak Domestic Demand:** Low household incomes suppress consumption, discouraging fresh private investment. Creates a vicious cycle of low growth and low employment. Example: Rural demand.
6. **Fiscal Stress:** Growing dependence on welfare transfers instead of productive employment. PRS Legislative Research estimated ₹1.68 lakh crore cash-transfer expenditure by 12 States during 2025–26. Example: Freebie politics.
7. **Social and Regional Imbalances:** Migration towards urban gig work widens regional disparities and strains urban infrastructure. Example: Megacity congestion.

Way Forward

1. Reorient future PLI incentives towards labour-intensive manufacturing linked to job creation.
2. Scale up Employment-Linked Incentive (ELI) schemes announced in Budget 2026–27.
3. Strengthen MSMEs through easier credit, logistics support and regulatory simplification.
4. Expand apprenticeship programmes aligned with GCCs, AI and advanced manufacturing.
5. Universalise social security for gig workers under Labour Codes and the e-Shram platform.
6. Improve R&D, skilling and industrial clusters as recommended by NITI Aayog and the Economic Survey.
7. Accelerate export-oriented manufacturing through FTAs and logistics reforms under PM Gati Shakti.

Conclusion

Sustainable prosperity demands productive employment, innovation and inclusive industrialisation; only then can India's demographic dividend become its greatest developmental strength.

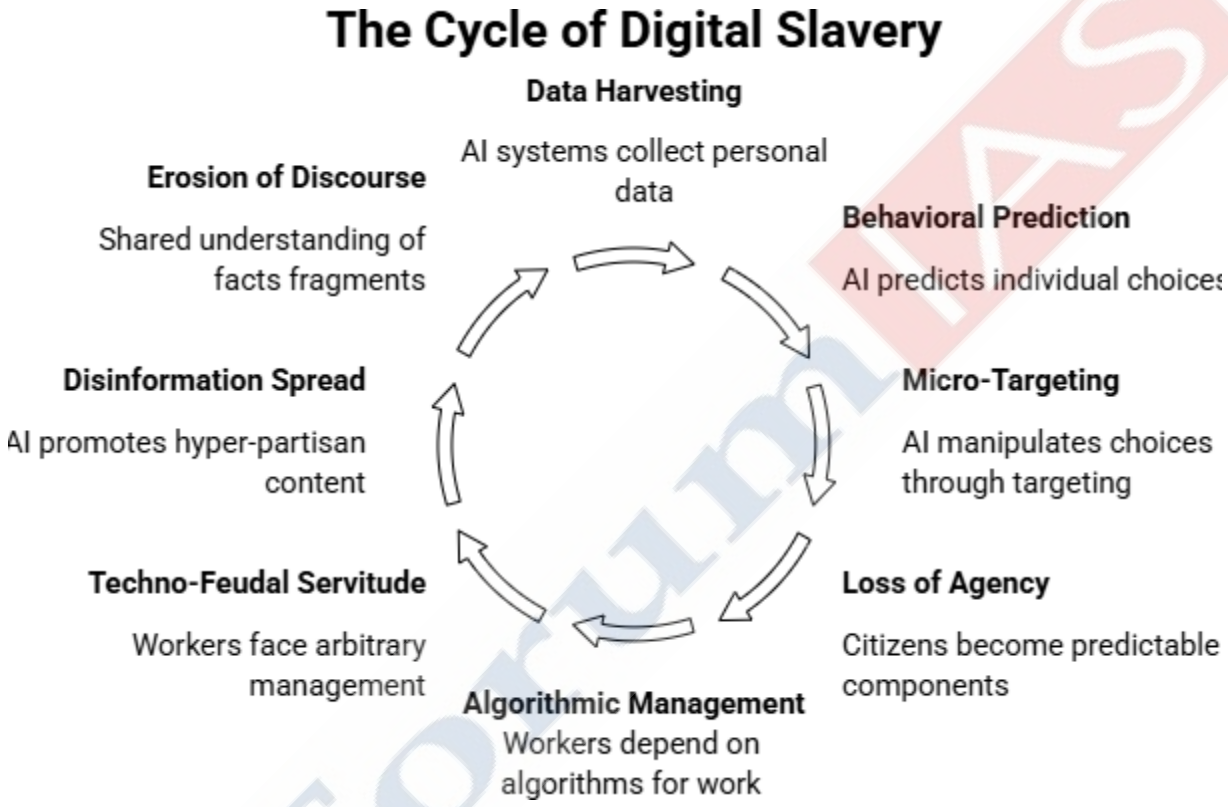
Examine how unchecked artificial intelligence risks creating a form of digital slavery. Discuss the necessity of instituting constitutional guardrails to safeguard democratic values.

Introduction

As AI reshapes governance and economies, the Economic Survey 2025–26 and Budget 2026–27 emphasize trusted AI. Yet unchecked algorithms risk undermining liberty, necessitating constitutional safeguards for democratic resilience and human dignity.

Unchecked AI and the Rise of Digital Slavery

Artificial Intelligence (AI) is transforming governance, commerce and public life. However, when opaque algorithms influence choices, livelihoods and democratic discourse without accountability, they risk creating a new form of digital slavery where humans remain legally free but are algorithmically controlled.



AI and the Emergence of Digital Slavery

1. **Threat to Individual Autonomy:** Behavioural AI predicts and manipulates consumer and political choices through continuous profiling. Undermines cognitive autonomy, an extension of privacy under Article 21. Example: Cambridge Analytica-style political profiling.
2. **Algorithmic Exploitation of Labour:** Gig workers depend entirely on opaque algorithms for work allocation, ratings and earnings. Automated deactivation often occurs without hearing or appeal creates techno-feudal labour relations. Example: Food-delivery platforms.
3. **Data Colonialism:** Personal data becomes the primary economic resource controlled by a few technology corporations. Individuals unknowingly exchange privacy for digital services. Example: Surveillance capitalism.
4. **Democratic Manipulation:** AI-powered recommendation engines amplify sensationalism, misinformation and deepfakes. Weakens informed electoral choices and deliberative democracy. Example: Election-time deepfake campaigns.

5. **Information Monopoly:** Echo chambers reinforce ideological polarisation. Reduces exposure to diverse viewpoints, weakening social cohesion. Example: Algorithm-driven news feeds.
6. **National Security Risks:** AI-enabled disinformation campaigns can be weaponised by hostile foreign actors. Threatens electoral integrity and strategic sovereignty. Example: Coordinated influence operations.
7. **Economic Concentration:** Frontier AI strengthens market dominance of a few global firms through network effects. Limits innovation and digital entrepreneurship. Example: Foundation AI models.

Why Conventional Regulation is Inadequate

1. **Velocity Gap:** AI evolves exponentially while legislation progresses incrementally. Laws become outdated before enforcement. Example: Rapid evolution of Generative AI.
2. **Black-Box Algorithms:** Complex neural networks lack explainability makes proving discrimination or bias legally difficult. Example: AI hiring tools.
3. **Cross-border Jurisdiction:** AI services operate beyond national boundaries, domestic regulators struggle to enforce accountability. Example: Global cloud platforms.
4. **Regulatory Capacity Deficit:** Traditional institutions lack technical expertise for AI audits. **Example:** Algorithmic transparency investigations.

Why Constitutional Guardrails are Necessary

1. **Protecting Fundamental Rights:** Expand Article 21 to include, right to cognitive autonomy, right against algorithmic manipulation and right to mental privacy. Example: Puttaswamy judgment.
2. **Strengthening Equality (Article 14):** Prevent algorithmic discrimination in employment, credit, healthcare and mandate fairness audits. Example: AI recruitment systems.
3. **Due Process in Automated Decisions:** Every adverse AI decision affecting livelihood should carry, human review, reasoned explanation and appeal mechanism. Example: Platform worker suspension.
4. **Horizontal Application of Rights:** Fundamental Rights should increasingly bind dominant digital corporations exercising public power. Example: Large social-media platforms.
5. **Electoral Integrity:** Independent oversight of political AI, synthetic media and algorithmic campaigning. Example: Election deepfake monitoring.
6. **Digital Federalism:** Cooperative framework between Union, States and regulators for AI governance. Example: Digital India ecosystem.

Constitutional, Legal and Institutional Measures

1. **Legislative:** AI-specific legislation aligned with the Digital Personal Data Protection Act, 2023. Risk-based AI classification and mandatory algorithmic audits.
2. **Institutional:** Independent Digital Rights Commission. Specialised AI benches within higher judiciary and parliamentary oversight committee.
3. **Technological:** Explainable AI (XAI), mandatory watermarking of AI-generated content and trusted AI certification.
4. **Economic:** Promote indigenous Responsible AI through IndiaAI Mission and support MSMEs adopting ethical AI.
5. **Educational:** AI literacy in school and university curricula, digital misinformation awareness. And ethical AI training.
6. **International:** Global AI governance aligned with GPAI, OECD AI Principles, and UN Global Digital Compact. Cross-border cooperation on AI safety.

Way Forward

1. Recognise Cognitive Liberty as a constitutional value.
2. Enact a comprehensive AI Accountability Law.
3. Institutionalise algorithmic impact assessments.
4. Guarantee human oversight in high-risk AI decisions.
5. Strengthen independent regulatory capacity.
6. Promote public-interest AI research through IndiaAI Mission.
7. Build nationwide digital literacy against misinformation.
8. Develop international norms for trustworthy AI governance.

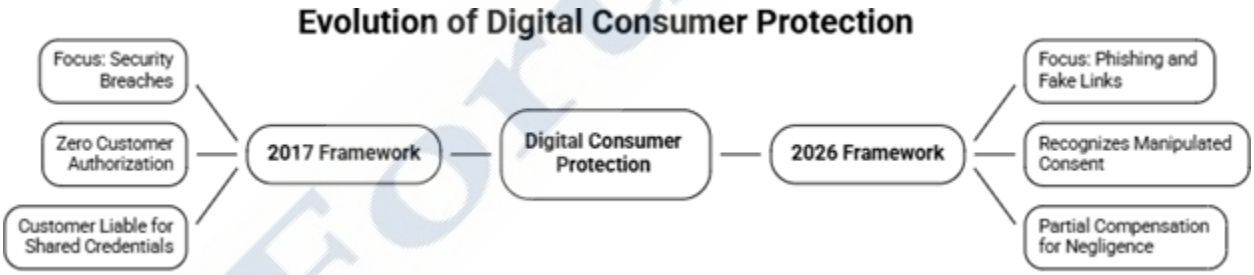
Conclusion

As Dr. B.R. Ambedkar cautioned, constitutional morality must prevail over unchecked power. Extending that principle to AI ensures technology strengthens democracy, protects dignity and preserves citizens' freedoms in the digital age.

Analyze the significance of shifting from unauthorized to coercion-based digital fraud frameworks. Evaluate the operational challenges of the RBI's shared-risk compensation model.

Introduction

With UPI processing over 18 billion monthly transactions and the Economic Survey 2025–26 highlighting rising cyber fraud risks, RBI's 2026 framework redefines consumer protection by recognising coercion-driven fraud beyond conventional unauthorized transactions.



Significance of the Shift from 'Unauthorized' to 'Coercion-Based' Fraud Framework

1. **Recognition of Behavioural Cybercrime:** Earlier framework covered only transactions executed without customer authorization. New framework recognises consent obtained through fraud, deception or coercion as legally defective. Aligns banking law with principles of free consent under the Indian Contract Act. Example: Digital Arrest scam.
2. **Consumer-Centric Regulatory Evolution:** Acknowledges victims as targets of organised social engineering instead of treating them as negligent customers. Reinforces RBI's objective of strengthening trust in DPI. Example: Fake RBI/KYC calls.
3. **Strengthening Financial Inclusion:** Protects first-time digital users, elderly citizens and rural customers with limited cyber awareness. Encourages wider adoption of UPI and digital banking. Example: Senior citizen phishing.

4. **Adapting to Emerging Cyber Threats:** Modern cybercrime relies predominantly on psychological manipulation rather than malware. Framework reflects evolving fraud patterns involving: OTP theft, QR-code scams, screen-sharing apps and AI-enabled voice cloning. Example: Deepfake impersonation.
5. **Enhancing Trust in India's Digital Economy:** A limited compensation mechanism reduces fear of digital payments, supports Digital India, cashless economy and fintech expansion. Example: Small-value UPI users.
6. **Global Best Practice in Consumer Protection:** Moves towards risk-sharing similar to evolving consumer liability standards in advanced payment systems. Complements FATF recommendations on consumer resilience. Example: Payment fraud safeguards.
7. **Constitutional Perspective:** Protects Article 21 and promotes equitable digital access. Strengthens substantive fairness in digital governance. Example: Inclusive Digital India.

Operational Challenges of RBI's Shared-Risk Compensation Model

1. **Moral Hazard:** Partial reimbursement may reduce consumer vigilance. Users may become less cautious while sharing credentials. Example: Repeated phishing.
2. **Determining Customer Negligence:** Banks must distinguish between: genuine coercion, voluntary negligence, fraudulent claims and high evidentiary burden. Example: OTP sharing dispute.
3. **Interbank Friction:** While the RBI has given banks up to 45 days for domestic cases and 60 days for cross-border fraud resolution, tracking the movement of stolen funds across multiple mule accounts at different beneficiary banks can trigger administrative disputes over who carries the ultimate liability.
4. **Exclusion of High-Value Frauds:** Framework applies only to losses below ₹50,000. Larger fraud victims remain outside the compensation net. Example: Investment scams.
5. **Administrative Delays:** Multiple verification stages may delay settlements. Cross-border transactions require up to 60 days. Example: International gateway fraud.
6. **The Five-Day Reporting Window:** To qualify for compensation, victims must file reports within five calendar days on both the National Cyber Crime Portal (1930) and with their bank.
7. **Fiscal Sustainability:** Shared-risk model may become financially expensive if fraud volumes continue rising. Long-term viability depends upon prevention rather than reimbursement. Example: UPI growth.
8. **Data Privacy Concerns:** Fraud investigation requires greater inter-bank data sharing. Must remain compliant with the Digital Personal Data Protection Act, 2023. Example: Customer profiling.

Way Forward

1. **Technological Measures:** Deploy AI-driven fraud detection across banks (e.g., MuleHunter.AI). Real-time transaction risk scoring using Indian Digital Payment Intelligence Platform (IDPIC). Behavioural analytics and device fingerprinting and mandatory deepfake detection tools.
2. **Regulatory Measures:** Expand coverage gradually beyond ₹50,000 after pilot evaluation. Introduce differentiated compensation for vulnerable groups and standardise fraud reporting across all banks.
3. **Institutional Measures:** Strengthen Cyber Fraud Coordination Centre. Enhance inter-bank information sharing and dedicated cyber forensic units for regional banks.
4. **Consumer Protection:** Nationwide cyber awareness campaigns. Default transaction cooling-off period for suspicious transfers and mandatory multilingual fraud warnings.

5. **Economic Measures:** Incentivise fintech innovation in fraud prevention. Encourage cyber insurance for retail customers and link compensation framework with Digital Financial Literacy Mission.

Conclusion

As Dr. C. Rangarajan observed, financial stability ultimately rests on public confidence. RBI's shared-risk framework must evolve alongside robust cyber resilience, ensuring innovation, consumer protection and trust reinforce India's digital economy.

Evaluate how transitioning to an AI-driven economy can propel India past structural growth traps. What institutional interventions are required to achieve this?

Introduction

With the ₹1 lakh crore Research, Development and Innovation (RDI) Scheme in Budget 2026–27 and the Economic Survey 2025–26 identifying AI as a productivity multiplier, India's next growth acceleration increasingly depends on AI-led structural transformation.

How AI Can Propel India Beyond Structural Growth Traps

1. **Escaping the Middle-Income Trap:** Shift from low-value IT outsourcing to AI products, patents and proprietary foundation models. Capture greater value through intellectual property rather than labour arbitrage, supports transition towards a knowledge economy. Example: BharatGen Param-2.
2. **Raising Productivity Across Sectors:** AI enhances Total Factor Productivity (TFP) in agriculture, manufacturing and services. Enables predictive maintenance, precision farming, smart logistics and improves competitiveness of MSMEs. Example: AI-based crop advisory.
3. **Transforming Manufacturing:** AI-driven automation improves quality control, supply-chain optimisation and inventory management. Complements PLI and Make in India by increasing industrial efficiency, facilitates Industry 4.0 adoption. Example: Smart factories.
4. **Strengthening Digital Public Infrastructure: I**ntegrating AI with Aadhaar, UPI, ONDC and Bhashini enables intelligent public service delivery. Improves administrative efficiency and reduces governance costs. Supports minimum government, maximum governance.
5. **Revolutionising Healthcare:** AI supports early diagnosis, disease surveillance and telemedicine. Addresses shortage of specialists in rural India, reduces healthcare inequalities. Example: TB screening AI.
6. **Strengthening National Security:** Indigenous AI reduces dependence on foreign digital ecosystems. Enhances cyber security, defence analytics and intelligence, supports technological sovereignty. Example: Defence AI.

7. **Climate and Agricultural Resilience:** AI enables precision irrigation, weather forecasting and disaster prediction, supports climate-smart agriculture. Example: Flood prediction.
8. **Boosting India's Global Competitiveness:** AI leadership strengthens India's role in trusted technology partnerships. Expands AI exports and Global Capability Centres (GCCs). Supports India's Digital Global South leadership. Example: IndiaAI Mission.

Structural Bottlenecks Limiting AI-led Growth

1. Low Gross Expenditure on R&D (GERD) (~0.64% of GDP).
2. Dependence on imported GPUs and foreign cloud infrastructure.
3. Shortage of frontier AI researchers.
4. Limited availability of high-quality indigenous datasets.
5. Digital divide across regions.
6. Regulatory uncertainty around AI governance.
7. MSMEs' limited AI adoption.
8. Fragmented academia-industry collaboration.

Institutional Interventions Required

1. **Expand Sovereign Compute Infrastructure:** Scale the IndiaAI Compute Portal with affordable GPU access. Establish regional AI supercomputing centres, encourage multi-vendor hardware ecosystem. Example: NVIDIA-AMD-TPU mix.
2. **Increase Public and Private R&D Investment:** Operationalise the ₹1 lakh crore RDI Scheme, target GERD above 2% of GDP and encourage corporate AI laboratories. Example: Deep-tech grants.
3. **Build AI Talent Ecosystem:** Universal AI literacy in schools and universities. AI Centres of Excellence in IITs, IIITs and NIT, reskilling through Skill India. Example: AI fellowships.
4. **Develop Sovereign Foundation Models:** Promote multilingual LLMs trained on Indian datasets. Reduce dependence on foreign APIs, strengthen digital sovereignty. Example: BharatGen.
5. **Integrate AI with Digital Public Infrastructure:** Build AI applications on UPI, ONDC, Ayushman Bharat Digital Mission and Bhashini, enable citizen-centric governance. Example: Smart public services.
6. **Create a Robust AI Regulatory Framework:** Operationalise the IndiaAI Safety Institute. Ensure algorithmic transparency, accountability and privacy. Align with the Digital Personal Data Protection Act. Example: Responsible AI.
7. **Support AI Adoption by MSMEs:** AI vouchers, cloud credits and tax incentives. Common AI testing facilities and digital extension services. Example: Cluster innovation.
8. **Strengthen Global Partnerships:** Collaborate through Quad, GPAI and trusted AI alliances. Facilitate semiconductor and compute cooperation. Example: India-US AI partnership.

Way Forward

1. Launch a National AI Token Policy for affordable compute access.
2. Establish AI Innovation Zones linked with industrial corridors.
3. Promote open-source Indic AI ecosystems.
4. Create sovereign AI cloud infrastructure.
5. Encourage AI-driven public procurement.
6. Institutionalise ethical AI audits and regulatory sandboxes.
7. Expand AI applications in agriculture, health, judiciary and education.
8. Adopt outcome-based AI funding linked to patents, startups and productivity gains.

Conclusion

Echoing Dr. A.P.J. Abdul Kalam's India 2020, technological self-reliance must underpin national development. AI-led reforms can transform India's demographic dividend into enduring productivity, innovation and inclusive global leadership.