ForumIAS

7 PM COMPILATION

3rd and 4th week March, 2026

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India as Global Skill Capital: Significance and Challenges – Explained Pointwise

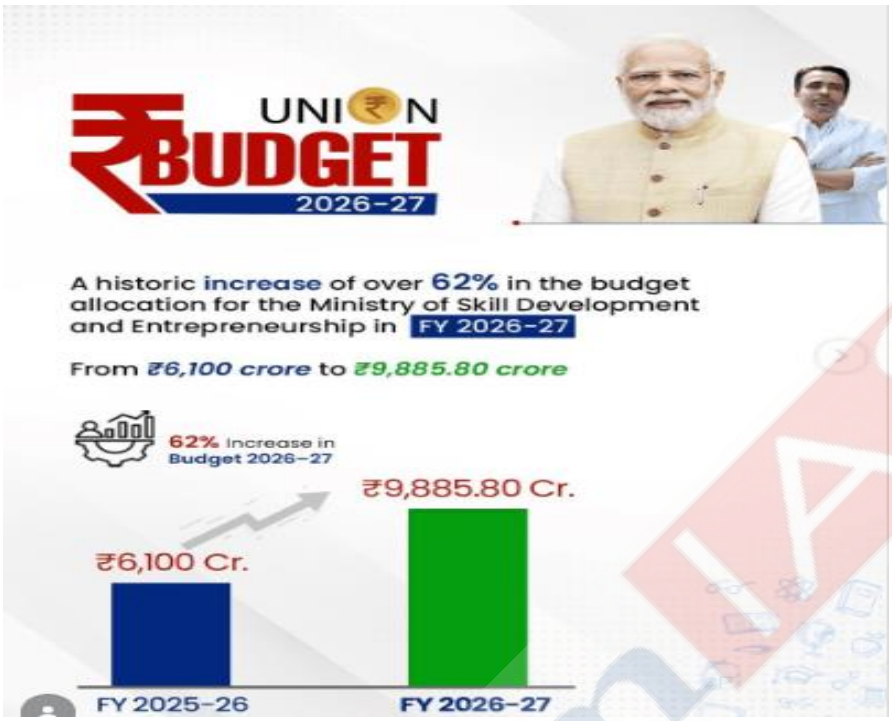
To position India as the Global Skill Capital, the recent partnership between the Ministry of Skill Development and Entrepreneurship (MSDE) and the GATI Foundation acts as a critical bridge. It transforms skilling from a domestic welfare goal into a strategic export engine.

Definition of Skill Development

Skill Development is defined as the strategic process of acquiring new or enhancing an individual's existing proficiency, knowledge, and professional attitude to augment the overall productivity of the workforce. It represents a multi-dimensional approach encompassing formal vocational training, specialized technical courses, and experiential on-the-job learning.

Strategic Importance of Skill Development for India

- **Optimizing the Demographic Dividend: India currently possesses one of the world's youngest populations, with approximately 62% in the working-age group (15–59 years) and over 54% below the age of 25. To transform this numerical strength into an economic asset, high-quality skilling is the primary vehicle.**
- **Transition to a Global Knowledge Economy: As the global economic landscape shifts toward automation and Industry 4.0, India must align the aspirations of its youth with the requirements of an innovation-led economy. Skilling serves as the bridge between academic theory and market-ready application.**
- **Enhancing Labor Productivity: Skill development is a prerequisite for improving the Human Capital Index (HCI). By moving the workforce from low-productivity informal sectors to high-value formal sectors, India can sustain long-term GDP growth.**
- **Global Workforce Integration: To realize the vision of becoming the "Global Skill Capital," India must standardize its vocational frameworks to match international benchmarks, ensuring the seamless mobility of Indian talent across global borders.**
- **Social Equity and Inclusion: Effective skilling acts as a powerful tool for poverty alleviation. It provides marginalized sections of society with the technical "know-how" required to break traditional socio-economic barriers and participate in the formal economy.**



Source: PIB

Read More about Digitalisation & Enhancing Skill Development in India

Key Components of an Integrated Skilling Framework

Component	Objective
Technical Skills	Proficiency in domain-specific tools and technologies (e.g., AI, Precision Engineering).
Vocational Skills	Hands-on, practical expertise tailored to specific industry trades.
Soft Skills	Cognitive abilities including communication, problem-solving, and adaptability.

Status of Skill Development in India

According to India Skills Report, 2026:

- **Employability Growth: National employability improved from 46.2% (2022) to 54.81% (2025) and further to 56.3% (2026).**
- **AI Talent Strength: India accounts for 16% of global AI talent and is expected to reach 1.25 million AI specialists by 2027.**
- **Tech Adoption: More than 90% of employees are using generative AI tools, indicating rapid digital integration in workplaces.**
- **Gig Workforce Expansion: The gig and freelance workforce is projected to reach 23.5 million by 2030, with project-based hiring increasing by 38% annually.**
- **Sectors Driving Demand**
    - **High-growth sectors include technology, BFSI, manufacturing, renewable energy, and healthcare.**
    - **Key in-demand skills: AI, data analytics, cloud computing, cybersecurity.**
- **Most Employable States (2026): Uttar Pradesh, Maharashtra, Karnataka emerge as leading states in employability.**

Key Institutes related to Skilling Ecosystem in India

The improvement in overall employability can be attributed to a "Triple-Helix" collaboration between government, industry, and academia:

Body	Strategic Nature	Key Responsibility
Ministry for Skill Development and Entrepreneurship(MSDE)	Apex Ministry (Est. 2014)	The nodal agency for policy coordination; focuses on removing demand-supply disconnects and fostering Vision 2025 for social mobility.
National Council for Vocational Education and Training (NCVET)	Unified Regulator	An overarching body that regulates vocational entities, sets standards for Awarding Bodies, and ensures quality across long/short-term training.
National Skill Development Corporation (NSDC)	PPP "Market-Maker"	Catalyzes private sector participation; provides financing in missing markets and aligns training with international standards.

Directorate General of Training (DGT)	Apex Executive Arm	Frames policies and norms for vocational programs; specifically oversees Women's Training and the Apprenticeship Act 1961.
Sector Skill Councils (SSCs)	Industry-Led Bodies	Autonomous councils that develop Occupational Standards and competency frameworks; they ensure training is demand-driven.
Industrial Training Institutes (ITIs)	Operational Training Units	Deliver technical education to post-secondary students to build a localized skilled workforce for industries.
National Skill Training Institutes (NSTIs)	Instructor Training Hubs	Premier institutes run by DGT to train the instructors who teach at ITIs, ensuring a "multiplier effect" on training quality.
National Skill Development Fund (NSDF)	Investment Trust	A CAG-audited fund that pools resources from Govt/Non-Govt sectors to fuel initiatives implemented by the NSDC.

Initiatives Taken to Strengthen the Skilling Ecosystem of India

Key Initiatives & Schemes	Core Objective, Impact & Details
Pradhan Mantri Kaushal Vikas Yojana 4.0 (PMKVY)	• Focus: Short-term training, reskilling, and upskilling in 400+ new courses (AI, 5G, Green Hydrogen). • Features: Includes On-the-Job Training (OJT) and Recognition of Prior Learning (RPL). Aligned with PM Surya Ghar & National Green Hydrogen Mission. • Target: Age 15–59 years.

Pradhan Mantri National Apprenticeship Promotion Scheme (PM-NAPS)	• Focus: Industry-led apprenticeship with 25% stipend support (up to ₹1,500/month) via DBT. • Features: Focuses on MSMEs, Aspirational Districts, and North-East. High priority on AI, Robotics, and Blockchain. • Target: Age 14–35 years.
Sector Skill Councils (SSCs)	• Focus: 36 industry-led bodies bridging the policy-workforce gap. • Core Functions: Developing National Occupational Standards (NOS), conducting assessments, "Train the Trainer" (ToT) programs, and tracking Labour Market Information (LMIS).
Jan Shikshan Sansthan (JSS)	• Focus: Community-driven, low-cost vocational training for rural youth and women. • Alignment: Linked with PM JANMAN and ULLAS for inclusive skilling. • Target: Age 15–45 years.
Skill India Digital Hub (SIDH)	• Focus: The "Digital Backbone" for the ecosystem. • Features: Aadhaar-based authentication, digital onboarding, and issuance of DigiLocker verifiable certificates. Integrates with e-Shram and National Career Service (NCS).
Pradhan Mantri Skilling and Employability Transformation through Upgraded ITIs (PM-SETU)	• Focus: Institutional reform by upgrading 1,000 Government ITIs. • Model: Uses a "Hub and Spoke" system to spread modern infrastructure across 7,000+ Skill Hubs in schools and colleges.

Skill India International (SIIC)	• Focus: Preparing youth for overseas markets. • Features: 30 centres providing domain training, language coaching, and Pre-Departure Orientation (PDOT). Supported by agreements with 8+ countries (UAE, Japan, Germany, etc.).
PM Vishwakarma Scheme	• Focus: Supporting 18 traditional trades/artisans. • Benefits: Provides toolkit incentives (₹15,000), collateral-free loans, and basic/advanced skill training to modernize traditional crafts.
Structural Reforms	• Focus: NEP 2020 & Apprentices Act amendments. • Impact: Integrates vocational studies into mainstream education from Grade 6; decriminalizes apprenticeship compliance to favor business ease.

Significance of India as a Global Skill Capital

- **Demographic Dividend Arbitrage:** With a median age of 28, India serves as the primary hedge against the "Grey Awakening" (aging workforce) in the Global North. By 2030, India is projected to provide a surplus of 45 million professionals, filling critical global labor shortages.
- **Economic Value Addition:** Enhancing employability is the cornerstone of the $5 trillion economy goal. The ISR 2026 reports a record national employability rate of 56.35%, signaling a successful shift toward high-value, industry-ready talent.
- **Institutional Export Engine:** The Skill India Mission has evolved from a domestic welfare scheme into a strategic export engine. Programs like PMKVY and NAPS now utilize "competency-based" frameworks that align directly with international employer requirements.
- **Strategic Talent Corridors:** Through Skill India International Centres (SIIC) in cities like Varanasi and Bengaluru, India provides "pre-departure orientation" and language training, ensuring Indian youth are "plug-and-play" ready for overseas markets.
- **Bilateral Mobility & Recognition:** Strategic partnerships with Germany, Japan, and the UAE have created standardized mobility pathways. These agreements ensure Indian certifications are recognized globally, reducing barriers to international employment.
- **Standardization & Quality Assurance:** The NCVET, as a unified regulator, has approved over 9,026 qualifications aligned with global sectoral demands. This institutional oversight ensures Indian talent meets the "Gold Standard" of international industries.
- **Future-Proofing via Industry 4.0:** Collaborations with tech giants like IBM, Microsoft, and AWS have mainstreamed tracks in AI, Robotics, and Green Tech. This prepares the workforce for a "borderless" innovation-led economy rather than just traditional labor.

- **Strategic Soft Power: Indian professionals act as "Knowledge Ambassadors" abroad. By holding roughly 16% of global AI talent, India's skilled workforce has become a vital tool in international diplomacy and global economic influence.**
- **Productivity & Formalization: Integrating the informal workforce into formal tracks is essential for sustainable GDP growth. The flexible/gig economy has matured to 16%, allowing Indian talent to participate effectively in the global remote-work stack.**

Read More about Skill India as Herculean Challenges

Challenges & Critical Gaps in India's Skilling Ecosystem

- **Unemployability Trap: Despite improvements, nearly 44% of graduates remain outside the "job-ready" bracket.**
- **Sectoral Skew: High employability remains heavily skewed toward tech, with Computer Science (80%) and Information Technology (78%) dominating the market. While the traditional and vocational streams are struggling with a significant "industry-readiness gap," creating a lopsided talent pool.**
- **Inclusion Flip: For the first time, female employability (54%) has surpassed male employability (51.5%).**
- **Structural Barriers: While digital skilling and hybrid work have boosted participation, a "Digital Gender Divide" still persists in high-end STEM and AI-intensive roles where men continue to hold a larger share of the workforce.**
- **Urban Concentration vs. Tier-2 Rise: Historically, hiring was skewed toward four major metros. However, 2026 data shows a shift, with Tier-2 cities like Lucknow (79.45% employability), Kochi, and Chandigarh emerging as strong hubs.**
- **Rural Connectivity Gaps: Despite Tier-2 growth, only 10% of the rural workforce has received formal skills training, leading to localized "Brain Drain" and a lack of access to high-demand platforms.**
- **Social Devaluation: Vocational training is still socially viewed as a "second-class" career path compared to traditional academic degrees.**
- **Low Formalization: Only 4.1% of India's workforce has formal vocational training, far below the 44-70% seen in OECD countries.**
- **CSR vs. Core Investment: Most Indian firms treat skilling as a corporate social responsibility (CSR) activity rather than a core business investment, leading to training modules that are often obsolete upon graduation.**
- **Participatory Gap: Only 5% of enterprises in India participate in formal Skill Development programs, resulting in a persistent feedback loop failure between industry needs and academic curricula.**
- **Low R&D Linkage: Skilling remains largely restricted to "operational tasks" rather than "innovative problem solving." India's R&D spend (0.65% of GDP) limits the development of "Deep-tech" experts required for the high-end global market.**
- **AI Readiness: While 70% of IT organizations use AI in hiring, the pace of curriculum reform in universities often fails to match the speed of AI evolution, creating a gap in "AI Safety" and ethical AI design skills.**

- **Global Recognition Issues: Multiple awarding bodies and a lack of unified global equivalence mean that Indian certificates often require expensive re-validation abroad.**
- **Fragmented Governance: Despite the NCVET's role, the ecosystem still faces challenges in standardizing quality across thousands of private training providers.**

Way Forward

- **Mainstreaming via NCrF: Fully operationalize the National Credit Framework to enable seamless "Cross-Credit" mobility between vocational training and academic degrees, removing the social divide between skills and diplomas.**
- **Industry-First Apprenticeships: Shift from government-led models to Industry-led apprenticeships by simplifying NAPS for MSMEs, ensuring training curricula are dictated by real-time market demands rather than static syllabi.**
- **Targeted Future-Skills Funnel: Leverage the surge in female employability (54% in ISR 2026) by launching specialized subsidies and mentorship in AI, Cybersecurity, and Green Tech to bridge the high-end STEM gender gap.**
- **Decentralized Skill Hubs: Focus on emerging talent centers in Tier-2/3 cities (e.g., Lucknow, Kochi) to distribute the projected 40% hiring intent more equitably and curb rural-to-urban "brain drain."**
- **International Harmonization: Accelerate Migration and Mobility Partnership Agreements (MMPAs) with the EU, Japan, and USA to ensure Indian skill credentials achieve "Gold Standard" equivalence for global labor portability.**
- **R&D-Skilling Linkage: Incentivize Research-to-Market bridges in universities to move beyond service-based models, fostering "Deep-tech" expertise and increasing private sector R&D investment beyond 0.65% of GDP.**
- **Dynamic "Rolling Curriculum": Implement a bi-annual update cycle for course content in collaboration with tech leaders to ensure training in Robotics and Green Hydrogen remains relevant to Industry 4.0 evolution.**
- **Outcome-Linked Financing: Empower students through Digital Skill Vouchers to choose accredited private providers, while prioritizing NSTIs to produce high-quality instructors capable of teaching cutting-edge technologies.**

Conclusion

The transition to a Global Skill Capital requires us to shift our focus from "how many we train" to "how well they earn." By linking the Skill India Mission with Industry 4.0, we can overcome old hurdles like the prestige gap and regional imbalances. Ultimately, matching the flexibility of NEP 2020 with global mobility pacts will ensure that India's demographic dividend doesn't merely look for work, but becomes the primary architect of the global innovation economy.

Medical Tourism in India- Explained Pointwise

India's medical tourism sector, long supported by affordable and high-quality healthcare, is currently facing disruptions due to escalating tensions in West Asia. Hospitals, including Fortis Healthcare, have reported a decline in international patients by 30%, particularly from the Middle East, plummeting by 75% . Geopolitical uncertainty, airspace restrictions, and rising travel costs have constrained patient mobility.

What is Medical Tourism?

Medical tourism (also called medical travel, health tourism or global healthcare) is a term used to describe the rapidly-growing practice of travelling across international borders to seek healthcare services. Services typically sought by travelers include treatment of acute illnesses, elective surgeries like in cardiology, oncology, orthopaedics, etc. with an objective to promote India as a health destination.

Current Status of Medical Tourism in India

- **Market Size: India's medical tourism market is projected to reach $13 billion by 2026 (NITI Aayog).**
- **Global Ranking: India ranks 10th in the Medical Tourism Index (2020-21) among 46 top destinations.**
- **Footfall: Foreign Tourist Arrivals (FTAs) for medical purposes have seen a CAGR of ~12.4%, with over 6.6 lakh medical tourists arriving in 2024.**
- **Major Source Countries: Bangladesh (largest contributor), Iraq, Afghanistan, and African nations.**

Drivers of Medical Tourism Growth in India

- **Global Standing: India ranks 10th in the Medical Tourism Index (2020-21), recognized globally for high-quality, affordable healthcare.**
- **Cost Competitiveness: Specialized treatments cost only a fraction (20%–30%) of what they do in source markets; for example, a heart bypass costing $100,000 in the US is available for $5,000–$8,000 in India.**
- **World-Class Infrastructure: Access to top-of-the-line diagnostic equipment from global conglomerates at over 40 Joint Commission International (JCI) and 600+ National Accreditation Board for Hospitals & Healthcare Providers (NABH) accredited hospitals.**
- **Efficiency & Access: Unlike the West, India offers minimal to no waiting periods for complex surgeries like liver transplants, oncology, and bariatric procedures.**
- **Policy Support: Streamlined entry via e-Medical Visas and the Union Budget 2026-27 proposal for five Regional Medical Hubs to decentralize and scale medical infrastructure.**
- **Skilled Workforce: A large pool of doctors and Allied Health Professionals (AHPs) mostly fluent in English with 1 lakh more AHPs to be added over the next 5 years (Budget 2026).**
- **"Dual-Track" Advantage: India offers a unique blend of modern tertiary care (Allopathy) and traditional wellness (AYUSH).**
- **Ancient Healing Systems: Systems like Ayurveda, Yoga, and Panchakarma are global attractions. States like Kerala have pioneered "Health Tourism" as a core product, integrating Ayurveda centers into luxury resorts.**
- **Patient Experience: High-end hospitality and luxury amenities are accessible even to budget-conscious travelers, coupled with India's rising status as a popular global tourist destination.**

Source: PIB

Government Initiatives to Promote Medical Value Tourism (MVT)

- **Institutional & Policy Framework**
  - **National Strategy & Roadmap: A comprehensive blueprint formulated by the Ministry of Tourism to coordinate actions between Central Ministries, State Governments, and industry stakeholders.**
  - **National Medical & Wellness Tourism Board: Established under the Chairmanship of the Minister of Tourism to provide a dedicated institutional framework for sector promotion.**
  - **Global Standards Adoption: The Bureau of Indian Standards (BIS) has adopted ISO 22525, ensuring India's MVT services meet credible, internationally recognized benchmarks.**
  - **Investment Incentives: Allowing 100% Foreign Direct Investment (FDI) in medical infrastructure and providing fiscal incentives for medical service exports to create a competitive ecosystem.**
- **Union Budget 2026-27: The "Regional Hub" Model**
  - **Five Regional Medical Hubs: A flagship proposal to support States in establishing integrated healthcare complexes. These PPP-mode hubs combine tertiary care, medical education, and research under one roof.**
  - **Biopharma SHAKTI: A ₹10,000-crore outlay to boost domestic production of biologics and biosimilars, directly lowering the cost of treating chronic diseases for international patients.**
  - **Integrated Facilitation: These hubs will house dedicated MVT Facilitation Centres, advanced diagnostics, and post-treatment rehabilitation units to ensure a seamless "patient journey."**
- **Strengthening the AYUSH & Wellness Ecosystem**
  - **AYUSH Quality Mark: Launched in late 2025 to provide an internationally aligned assurance framework, building global trust in the quality of Indian traditional medicine.**

    - Institutional Expansion: Setting up three new All India Institutes of Ayurveda and upgrading the WHO Global Traditional Medicine Centre in Jamnagar to bolster evidence-based research.
    - Insurance Integration: Expanding global confidence by enabling 27 insurance companies to cover AYUSH treatments, facilitating "cashless" holistic care.
- Digital Integration & Ease of Access
    - 'Heal in India' Portal: A centralized "One-Stop Shop" for international patients to discover accredited hospitals, compare specialized treatment costs, and access verified healthcare providers.
    - India Healthcare Tourism Website: Developed by the Services Export Promotion Council (SEPC) under Ministry of Commerce, this portal provides a comprehensive database on visas, hospitals, and wellness centers.
    - Visa Liberalization: Extension of e-Medical and e-Medical Attendant Visas to citizens of 171 countries, including the newly introduced 'Ayush Visa' for traditional healing seekers.
- Infrastructure & State-Level Outreach (The Gujarat Model)
    - Infrastructure Funding: Financial assistance provided via schemes like Swadesh Darshan and PRASHAD to develop tourism infrastructure around medical and spiritual hubs.
    - State-Led Branding: Using Gujarat as a template for Health Diplomacy, the government organizes "Familiarisation (FAM) trips" for global stakeholders and showcases healthcare expertise at international summits.
    - Capacity Building: Specialized training for paramedical staff and Allied Health Professionals (AHPs) to ensure service quality meets global hospitality standards.

Challenges associated with Medical Tourism in India

- Data Fragmentation: The lack of centralized, state-wise, or purpose-wise revenue data hinders accurate economic assessment and the identification of high-growth medical corridors.
- Regulatory Gaps: Absence of a uniform national framework for pricing leads to significant cost variations across private hospitals, creating a trust deficit for international patients.
- Standardization Hurdles: While 600+ hospitals are NABH accredited, a large portion of the private sector lacks uniform quality protocols, making it difficult to maintain "Service Quality" across the new Regional Medical Hubs.
- Information Asymmetry: Potential markets in Africa and Central Asia often lack awareness of India's high-end surgical capabilities (e.g., Robotic surgery), with marketing still over-relying on "low cost" rather than "clinical excellence."
- Infrastructure & Connectivity: Poor "last-mile" connectivity to wellness centers in Tier-2 cities and a lack of direct flights from key patient-origin regions (like CIS countries) increase travel fatigue.
- Insurance Barriers: Many high-cost tertiary treatments lack synchronization with global insurance providers, leading to high out-of-pocket expenses compared to competitors like Thailand or Singapore.
- Regional Disparity: MVT success is heavily concentrated in the Southern States and NCR; there is a critical need to decentralize growth to other regions as proposed in the Budget 2026-27.

- **Ethical & Reputation Risks: Occasional lapses in organ transplant protocols and clinical trial ethics dent the sector's global image, necessitating stricter enforcement of the Ayush Quality Mark (2025).**
- **Unorganized Facilitators: The presence of unregulated medical travel agents often leads to patient exploitation, highlighting the need for a formal National Accreditation for MVT Facilitators.**

Way Forward

- **Institutional Accreditation: Establish a mandatory National Accreditation Framework for MVT facilitators to eliminate unregulated agents and ensure ethical patient handling.**
- **Data Centralization: Implement a robust mechanism to track State-wise and purpose-wise revenue data, addressing the data fragmentation gap.**
- **Infrastructure Decentralization: Rapidly operationalize the Budget 2026-27 proposal for five Regional Medical Hubs to reduce geographic concentration in the NCR and Southern States.**
- **Global Insurance Portability: Collaborate with international TPAs to enable "Cashless" treatment, reducing the out-of-pocket expense burden on international patients.**
- **Strategic Branding: Shift the "Heal in India" narrative from "low-cost" to "Clinical Excellence" by showcasing high-end surgical outcomes and the Ayush Quality Mark (2025).**
- **Skill Augmentation: Leverage the Budget 2026 commitment to add 1 lakh Allied Health Professionals to bridge the gap in specialized nursing and post-operative rehabilitation.**
- **Digital Integration: Transform the 'Heal in India' portal into a multi-lingual, blockchain-enabled platform for transparent pricing and real-time visa assistance.**
- **Medical Diplomacy: Integrate healthcare services into bilateral trade agreements, particularly with BIMSTEC, African, and CIS nations, to streamline patient inflow.**

Conclusion

By integrating the Ayush Quality Mark with the new Regional Medical Hubs, India can transition from being the "Pharmacy of the World" to the "Healing Hub of the World." This structured ecosystem will not only boost forex earnings but also establish India as a global leader in holistic, evidence-based healthcare.

Read more: The Hindu
UPSC Syllabus- GS 3: Economic Development

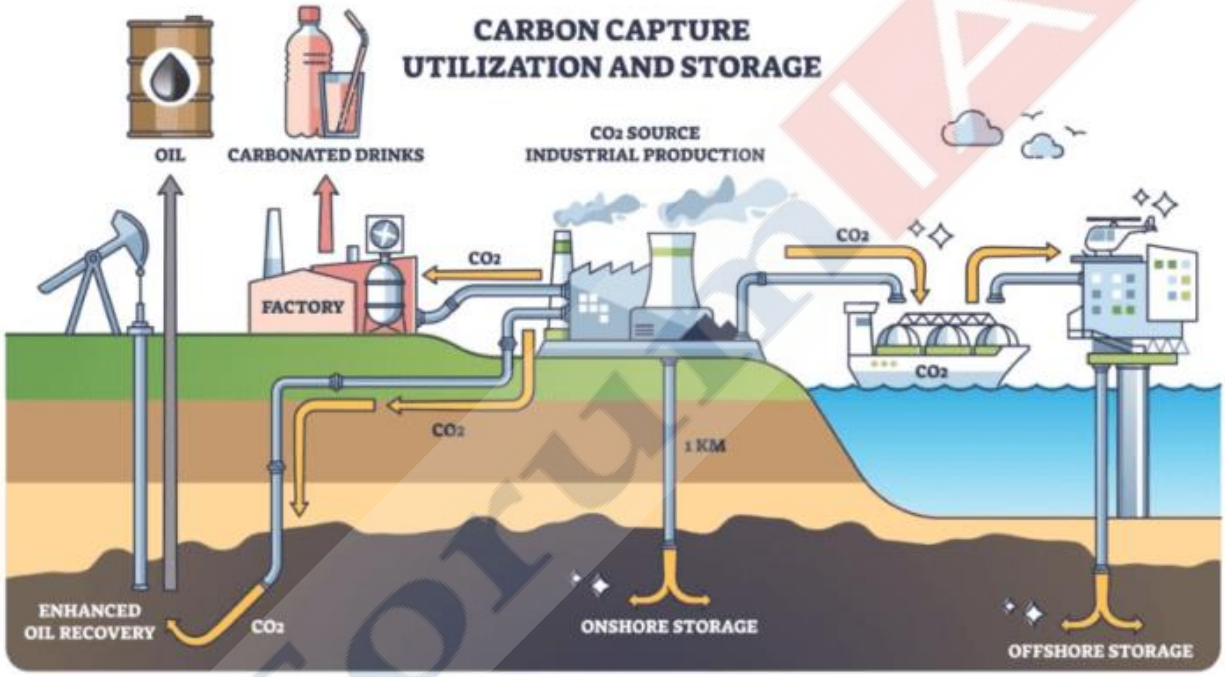
India's New Carbon Credit Plan- Significance and Challenges -Explained Pointwise

The Union Budget 2026's allocation of ₹20,000 crore for a "Carbon Credit Programme" has ignited a significant policy debate. While the funding is technically earmarked for industrial Carbon Capture, Utilization, and Storage (CCUS), a parallel narrative has emerged regarding Carbon Farming for the agricultural sector.

What is CCUS?

Carbon Capture, Utilization, and Storage (CCUS) is a strategic suite of technologies engineered to intercept CO2 emissions directly at the point of origin such as factory smokestacks or power generation facilities. The process generally follows a three-step lifecycle:

- Capture: Specialized equipment isolates carbon dioxide from industrial exhaust before it enters the atmosphere.
- Transportation: The captured CO2 is compressed and moved via pipelines, ships, or tankers to a designated site.
- End-of-Life: The gas is either recycled into commercial products (like synthetic fuels, chemicals, or building materials) or sequestered permanently in deep geological formations, such as depleted oil fields or saline aquifers.



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Strategic Focus: Industrial Decarbonisation

The bedrock of the Union Budget 2026 announcement is the R&D Roadmap for Carbon Capture, Utilisation, and Storage (CCUS), introduced by the Department of Science and Technology (DST) in late 2025.

- Targeting "Hard-to-Abate" Sectors: The policy specifically funnels resources into the power, steel, cement, refinery, and chemical industries. These sectors are designated as "hard-to-abate" because their high-density emissions cannot be eliminated by transitioning to renewable energy alone.
- Fiscal Commitment: A ₹20,000 crore outlay is earmarked to catalyze the large-scale implementation of CCUS.
- The Mechanism: This technology intercepts CO2 at the industrial source, either converting it into usable products (utilization) or sequestering it in geological formations (storage).

Why is Agriculture Excluded from India's CCUS Framework?

The Department of Science and Technology (DST) roadmap excludes the agricultural sector from the ₹20,000 crore CCUS outlay due to fundamental technical and structural differences. Here is why agriculture does not fit the CCUS model:

- Diffuse vs. Point-Source Emissions: CCUS is designed for point-source capture (e.g., factory flues or power plant chimneys) where CO2 is highly concentrated. Conversely, agricultural emissions are diffuse, originating from vast, scattered landscapes like open fields and livestock.
- Biological Mediation: Farming emissions primarily Methane (CH4) and Nitrous Oxide (N2O) are products of complex biological processes (soil microbes, enteric fermentation). These gases cannot be trapped using the mechanical scrubbers used for industrial CO2.
- Technological Mismatch: CCUS focuses on intercepting new emissions before they enter the atmosphere. Agricultural solutions are geared toward Carbon Dioxide Removal (CDR) , the process of drawing down existing atmospheric CO2 through natural sinks.
- Strategic Distinction (Prevention vs. Removal): The policy framework draws a clear line:
    - CCUS: A technical tool for industrial decarbonization.
    - CDR: A nature-based strategy for soil carbon sequestration, agroforestry, and biochar application to enhance natural storage.

Key Opportunities from India's Carbon Plan

- Industrial Decarbonization (CCUS): CCUS serves as a vital pillar for mitigating emissions from "hard-to-abate" sectors (steel, cement, power) which contribute to 25% of India's total emissions. The ₹20,000 crore allocation facilitates capturing CO2 for industrial reuse or permanent geological storage.
- Diversified Rural Income Streams: Developing a credible domestic carbon market for agriculture can transform farming into a climate solution. By adopting regenerative techniques, farmers can generate and sell carbon credits, creating a sustainable secondary revenue source.
- Enhanced Soil Carbon Sequestration: India's extensive agricultural landmass has the potential to act as a significant natural carbon sink. Implementing nature-based solutions like agroforestry and biochar application allows for the effective drawdown of atmospheric CO2 into the soil.
- Expansion of Voluntary Carbon Markets (VCM): Increasing global and domestic demand for nature-based credits incentivizes private-sector participation. Current pilot projects already demonstrate models that compensate farmers for measurable increases in Soil Organic Carbon (SOC).
- Promotion of Climate-Resilient Farming: Carbon-friendly practices directly support long-term soil health and fertility. These methods improve moisture retention and ecosystem stability, aligning with the Agriculture Ministry's goals for climate-adaptive food systems.

Key Challenges in India's Carbon Strategy

- Communication Ambiguity: The broad use of the term "Carbon Credit" in the Budget has blurred the distinction between industrial and agricultural initiatives. This has led to conflicting public expectations, with many assuming the ₹20,000 crore outlay is a direct subsidy for farmers.

- **Prohibitive Implementation Costs: CCUS is a capital-intensive, high-tech endeavor. The current ₹20,000 crore allocation over five years is merely a foundational investment, highlighting the massive funding gap required for a full-scale nationwide industrial transition.**
- **Measurement and Verification Hurdles: Unlike concentrated industrial emissions, agricultural emissions are diffuse and biologically complex. Establishing a credible "soil narrative" requires a robust Monitoring, Reporting, and Verification (MRV) framework that is currently absent from the industrial roadmap.**
- **Policy Conflation: Current frameworks fail to clearly differentiate between preventing new emissions (Industrial CCUS) and sequestering existing atmospheric CO2 (Nature-based Removal). Experts argue that carbon farming requires a distinct policy architecture and separate funding.**
- **Managing Stakeholder Expectations: There is a significant risk of public disappointment if agricultural stakeholders realize the budget does not directly fund carbon farming. The government must clarify that the 2026 outlay is a strategic bet specifically on industrial decarbonization.**

Way Forward

- **Policy Segmentation: The government must explicitly distinguish between "Smokestack" (Industrial CCUS) and "Soil" (Agricultural Carbon Farming). Clear demarcation is essential to manage investor expectations and prevent the misallocation of resources.**
- **Institutional Framework for Carbon Farming: A dedicated, well-funded policy is required specifically for Nature-Based Solutions (NBS). This includes establishing a robust Monitoring, Reporting, and Verification (MRV) system to make Indian agricultural credits credible in global markets.**
- **Precision in Communication: Addressing the communication gap is vital. Terminology must clearly separate high-tech CCUS (Carbon Capture, Utilisation, and Storage) from Voluntary Carbon Markets (VCM) to avoid public and stakeholder confusion.**
- **Accelerating Industrial Deployment: Successful execution of the DST's CCUS roadmap is non-negotiable for hard-to-abate sectors. Scaling these technologies will determine India's ability to meet its national decarbonization milestones.**
- **Incentivizing Rural Participation: The government should facilitate Carbon Farming through financial incentives, capacity building, and institutional support. This empowers farmers to participate in emerging markets, turning climate action into a viable secondary income stream.**

Conclusion

India's climate strategy is currently at a critical juncture, balancing a major financial commitment to industrial CCUS with the untapped potential of nature-based carbon markets. While the ₹20,000 crore Budget outlay provides a necessary foundation for heavy industry, the rising interest in Carbon Farming highlights the need for a parallel, comprehensive agricultural policy. By advancing both fronts with equal vigor, India can forge a holistic and sustainable roadmap toward its climate goals.

Read More: The Hindu
Syllabus: GS3 Environment

India's Clean Energy Transition- Explained Pointwise

India's clean energy transition has shifted from a phase of "ambition" to "massive execution." As of March 2026, India has officially surpassed its 2030 target of 50% non-fossil fuel capacity, hitting this milestone four years ahead of schedule.

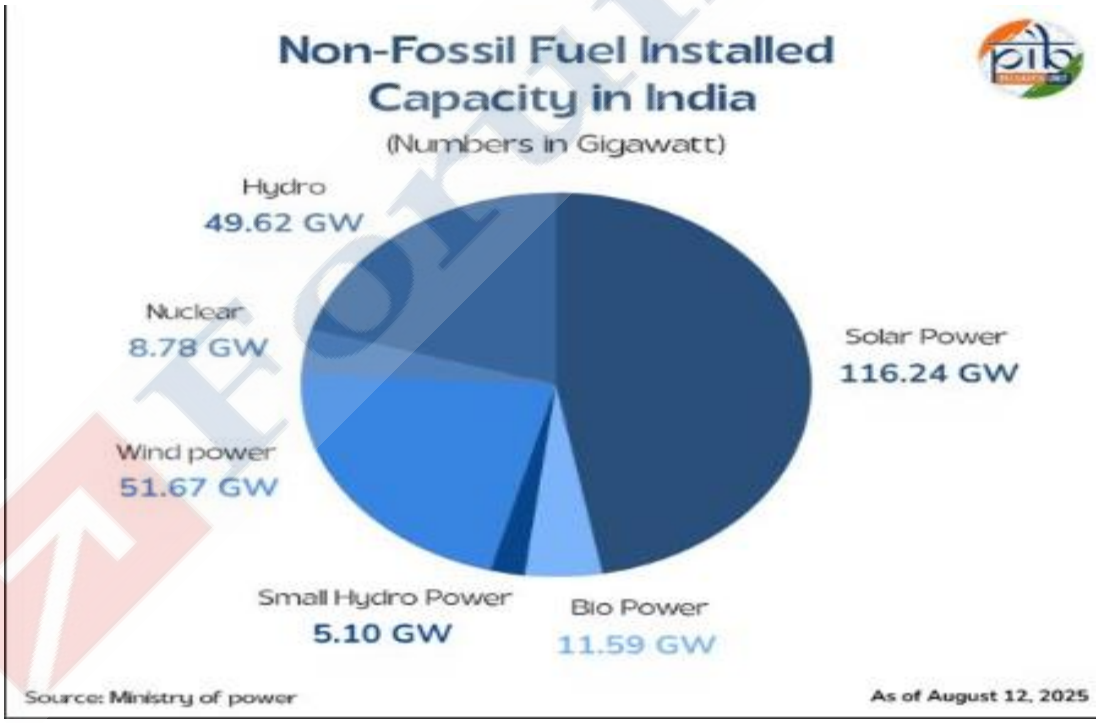
What is Clean Energy Transition?

India's clean energy transition is the systemic shift of its energy sector from a fossil-fuel-dominated model to one powered by renewable and non-fossil sources. It is driven by the "Triple Imperative" of Energy Security (reducing imports), Economic Growth (creating a green industrial base), and Climate Action (meeting Net Zero by 2070).

As of March 2026, India has officially transitioned from a "power-deficient" to a "power-surplus" nation, having met its key Paris Agreement target four years early.

Current Status & Capacity Milestones

- **Total Installed Capacity: As of January 31, 2026, India's total power generation capacity reached 520.51 GW.**
- **Non-Fossil Achievement: India hit a historic milestone in June 2025, reaching 50% non-fossil capacity.**
    - **By January 2026, this share grew to 52.3% (271.97 GW).**

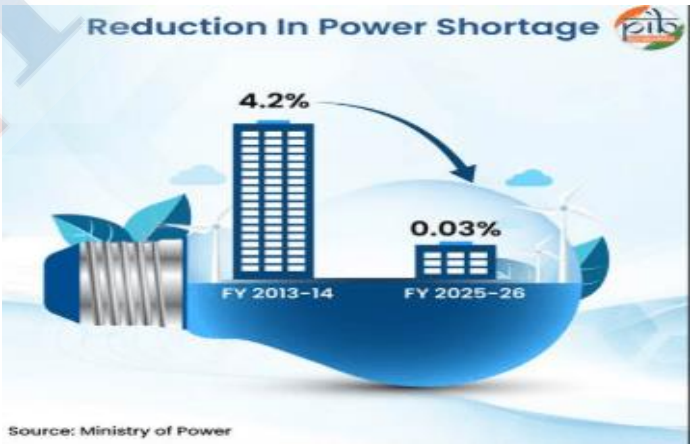


Source: PIB

- **Solar Power Dominance: Solar capacity reached 140.60 GW, accounting for 27% of the national energy mix.**

Source: PIB

- **Wind & Hydro Presence: Wind power stands at 54.65 GW, while Hydro contributes 51.16 GW.**
- **Record Annual Growth: FY 2025-26 saw the highest-ever capacity addition in a single year, with 52,537 MW added by January 2026 alone.**
- **Global Ranking: India maintains its position as 3rd in Solar, 4th in Wind, and 4th in Total Renewable Energy capacity globally.**



Source: PIB

Need of Clean Energy Transition

- **Energy Sovereignty: Reducing a massive import bill; ethanol blending has already saved ₹1.59 lakh crore in foreign exchange and substituted 270 lakh metric tonnes of crude oil.**
- **Green Growth & Jobs: The transition is projected to create 1,00,000 Solar PV Technicians through schemes like PM Surya Ghar.**
- **Public Health: Mitigation of air pollution to reduce the burden of respiratory diseases; 813 lakh metric tonnes of CO2 emissions have been avoided through biofuels alone.**
- **Clean Cooking Access: Over 10.41 crore beneficiaries have been reached under the PM Ujjwala Yojana (PMUY) as of January 2026, shifting rural India toward LPG.**
- **Strategic Diplomacy: Leadership in the International Solar Alliance (ISA) and the Global Biofuels Alliance (GBA) positions India as a "Climate Vishwa-Guru."**
- **Geopolitical Resilience (West Asia Crisis): The 2026 conflict pushed Brent crude past $120/barrel, highlighting India's reliance on the Gulf for 91% of its LPG. Solar and wind are now treated as national security assets to bypass vulnerable maritime chokepoints like the Strait of Hormuz.**
- **Supply Chain Autonomy (Atmanirbharta): To end "China dependency" in solar and batteries, India launched the National Critical Minerals Mission (2025). This initiative secures domestic and foreign access to 30 strategic minerals, including Lithium and Cobalt, essential for the EV revolution.**
- **AI-Driven Grid Modernization: Under the Electricity (Amendment) Rules 2026, India is deploying Artificial Intelligence to slash transmission losses and manage renewable intermittency. These "smart grids" ensure 24/7 reliability even during global fossil fuel shortages or supply chain disruptions.**

Major Policy Catalysts of Clean Energy Transition

Scheme/ Policy	Features
PM-Surya Ghar: Muft Bijli Yojana	As of March 5, 2026, more than 25 lakh rooftop solar systems had been installed under PM Surya Ghar Muft Bijli Yojana. The 2026-27 Budget allocated ₹22,000 crore to hit the 1-crore home target by next year, effectively creating millions of domestic "prosumers."
SHANTI Act, 2025	Enacted in Dec 2025; it ends the state monopoly on nuclear power. It allows private sector & joint ventures to build and operate Small Modular Reactors (SMRs) to provide clean baseload power for heavy industries.
National Green Hydrogen Mission	The SIGHT programme (₹17,490 cr) is now fully operational with 15 companies awarded electrolyser manufacturing contracts. India's first dedicated Green Ammonia export terminal in Gujarat began trial operations in Jan 2026.

Carbon Credit Trading Scheme (CCTS)	Officially operationalized for 7 energy-intensive sectors (Steel, Cement, etc.). Entities now trade Carbon Credit Certificates (CCCs) on national exchanges; over-achievers earn credits while laggards must buy them to meet targets.
Electricity (Amendment) Rules, 2026	Notified in March 2026 to simplify Captive Power rules. It mandates Smart Metering (4.05 crore units installed) and introduces Time-of-Day (ToD) Tariffs, making power cheaper during peak solar hours (daytime).
National Critical Minerals Mission	Launched the ₹1,500 crore Recycling Incentive to recover Lithium and Cobalt from E-waste. It also established Dedicated Rare Earth Corridors in Odisha and Kerala to process minerals for EV magnets.
KABIL Overseas Acquisitions	The joint venture (KABIL) secured 5 Lithium brine blocks in Argentina and is currently negotiating for Cobalt assets in Australia to insulate India's EV supply chain from West Asian oil shocks.
National Biofuel Policy (2026 Update)	Achieved 15% Ethanol Blending nationwide by Jan 2026. The "Global Biofuels Alliance" has successfully substituted 270 lakh metric tonnes of crude oil imports since its inception.

India's Key Solar & Hybrid Parks (2026)

The infrastructure has shifted toward Ultra Mega Parks that combine solar, wind, and storage in a single location to ensure grid stability.

- Khavda Renewable Energy Park (Gujarat)
  - The World's Largest Hybrid Park (30 GW target).
  - NTPC and Adani Green have commissioned a combined ~9.7 GW as of March 2026. It utilizes the Rann of Kutch's wasteland to power nearly 20 million homes.
- Bhadla Solar Park (Rajasthan)
  - Fully Operational at 2,245 MW.
  - Located in a high-radiation zone; uses robotic dry-cleaning for panels to save water in the Thar Desert.
- Pavagada Solar Park "Shakti Sthala" (Karnataka)
  - Operational at 2,050 MW.

- Unique land-lease model where 2,300+ farmers receive annual rent while retaining ownership of the land.
- Ladakh High-Altitude Park
  - Under Construction (7.5 GW capacity).
  - It will include a 13 GW high-voltage direct current (HVDC) line to evacuate power to Northern India, braving sub-zero temperatures.
- Rewa Ultra Mega Solar (Madhya Pradesh)
  - 750 MW Operational.
  - Famous for being the first to supply solar power to an inter-state "Open Access" customer—the Delhi Metro, meeting 60% of its daytime needs.

Key Challenges Clean Energy Transition

- **Intermittency & Peak Demand:** Power demand peaked at 250 GW in 2025. Without massive storage, coal plants are often extended to meet night-time peaks.
- **Grid Infrastructure Gaps:** Integrating 500+ GW requires the development of 1,37,500 circuit kilometers of new transmission lines, costing approximately ₹7.93 lakh crore.
- **Critical Mineral Scarcity:** India remains significantly dependent on imports for Lithium, Cobalt, and Nickel. China currently processes 70-85% of the world's rare earths needed for India's EVs.
- **Financial Health of DISCOMs:** Despite recent profits, aggregate technical and commercial (AT&C) losses stand at 15.04%, impacting the ability to pay renewable developers on time.
- **Supply Chain Vulnerability:** India's solar sector faced a $7 billion import bill in 2024-25, highlighting the lag in domestic wafer and cell manufacturing.
- **Land Acquisition and Community Resistance:** Renewable projects, especially vast solar parks, face delays due to conflicts over tribal lands and ecologically sensitive zones. In Rajasthan, the Great Indian Bustard conservation case highlights the tension between green infrastructure and biodiversity.
- **Technological Barriers in Storage:** While BESS (Battery Energy Storage Systems) is growing, pumped hydro and green hydrogen storage remain in early deployment stages. High upfront costs for large-scale storage prevent renewables from providing stable, round-the-clock (RTC) power.
- **Socio-Economic Transition (Coal-Dependent States):** Transitioning away from fossil fuels risks economic collapse in regions like Jharkhand and Chhattisgarh. Millions of workers rely on coal mining, necessitating a "Just Transition" framework to prevent mass unemployment.
- **Inconsistent State-Level Policies:** While central targets are ambitious, regulatory friction in states such as the reversal of net metering or delays in Green Energy Open Access approvals creates uncertainty for private investors.
- **Recycling and E-Waste Management:** India currently lacks a robust framework for recycling solar panels and Li-ion batteries. By 2030, the surge in expired components could lead to a massive environmental hazard without a Circular Economy policy.

- **Financing and High Capital Cost: Clean energy projects require nearly $400 billion in investment by 2030. High interest rates and perceived risks in emerging markets make it difficult to secure low-cost, long-term International Climate Finance.**

Way Forward

- **Storage Expansion: Target of 236 GWh of BESS (Battery Storage) by 2032 to balance the grid and manage the 24/7 power demand.**
- **Decentralized Solutions: Promoting Agri-voltaics (solar farming) to ensure dual land use, allowing farmers to generate solar power while continuing crop cultivation for food security.**
- **Viksit Bharat 2047 Goals: Shifting from "capacity addition" to "system efficiency" through Smart Metering and the SHANTI Act 2025, aiming for a fully decarbonized industrial base.**
- **Circular Economy: Implementing Battery Waste Management Rules to recover lithium, cobalt, and nickel from old EV batteries to feed new domestic "Gigafactories."**
- **International Financing: Pushing for the Global Environment Facility (GEF) and Green Climate Fund to provide low-interest "Green Bonds" and "Blended Finance" for the Global South.**
- **AI-Driven Grid Resilience: Deploying Artificial Intelligence for real-time demand forecasting and "Chip-to-Grid" optimization to reduce transmission losses and prevent blackouts during peak summer loads.**
- **Green Hydrogen Hubs: Establishing dedicated Export Hubs at Deendayal and Chidambaranar Ports to position India as the primary supplier of Green Ammonia to the EU and Japan.**
- **Small Modular Reactors (SMRs): Transitioning heavy industries like Steel and Aluminium to baseload nuclear power via private-sector-led SMR deployments under the 2026 regulatory framework.**
- **Skilling for the Green Economy: Launching the "Green Yoddha" Initiative to upskill 1.5 million workers in wind turbine maintenance, electrolyser repair, and EV infrastructure by 2030.**
- **Carbon Market Maturity: Scaling the Indian Carbon Market (ICM) to allow MSMEs to monetize their emission reductions, creating a new revenue stream for small-scale green innovators.**

Conclusion

India is rapidly evolving into a global green superpower, leapfrogging traditional energy hurdles to redefine the 21st-century industrial landscape. By fusing massive solar-wind clusters with a high-tech Green Hydrogen backbone, the nation is successfully decoupling economic expansion from carbon dependency. This transition is no longer just a policy goal, it is a futuristic blueprint for total energy autonomy and high-growth resilience. As India scales its domestic manufacturing, it secures its position as the primary engine of the global net-zero revolution.

Read More: The Pioneer
UPSC Syllabus: GS 3: Economy

Digital Governance in India- Explained Pointwise

India's digital governance is increasingly shadowed by "digital exile," as the surge in blocking orders under IT Rules targets independent voices. By expanding the definition of "public order," the use of emergency powers to censor dissent risks institutionalizing arbitrary censorship. This shift creates a

critical tension between technological transformation and the protection of constitutional digital rights.

What is Digital Governance?

Digital Governance refers to the paradigm shift from merely using IT as a tool to creating an integrated ecosystem where data and technology redefine the state-citizen relationship. It is based on the core philosophy of *"Minimum Government, Maximum Governance."* Its aim is to ensure that governance is faceless, paperless, and cashless, aligning with the vision of a "Viksit Bharat" by 2047.

The "Yogakshema" Framework

Modern digital governance in India is an evolution of ancient Indian statecraft.

- Minimum Government, Maximum Governance: This is not about the absence of the state, but about the disappearance of the bureaucracy behind a seamless digital interface.
- Ethical Leadership (Chanakya's Principles): Digital tools act as a check on "Matsya Nyaya" (law of the jungle/corruption) by ensuring that every rupee spent is tracked via Direct Benefit Transfer (DBT).
- Public Welfare (Yogakshema): The ultimate aim of digital governance is the "well-being" of the citizen. Technology is used to ensure that the state is proactive (providing benefits before the citizen asks) rather than reactive.

Evolution of Digital Governance in India

Phase & Timeline	Primary Focus	Milestone & Governance Impact
Phase I: Computerization (1970s–1980s)	Automation of data-heavy central functions.	NIC (1976): Established the backbone for departmental connectivity, moving Railways and Census from paper to digital databases.
Phase II: Networking (1990s)	Connectivity between government offices.	Education & Research Network of India (ERNET) & National e- Governance Plan(NeGP): Shifted from "standalone" computers to networked systems, laying the foundation for inter-departmental data sharing.
Phase III: Online Presence (2000s–2010s)	Web-Enabling citizen services (G2C).	MCA21 & Passport Seva: Revolutionized citizen touchpoints by moving services to portals, significantly reducing physical "red tape."

Phase IV: Transformation (2015–Present)	Unified Ecosystems & Platform Governance.	India Stack (Aadhaar, UPI): Transitioned governance from a service provider to an "enabler," focusing on social inclusion and real-time DBT.

The Architectural Backbone of Digital India

- **Identity Layer (Presence-less): Aadhaar (1.43 billion+ IDs as of 2026). It enables remote authentication via e-KYC; eliminates "ghost beneficiaries" in Direct Benefit Transfer (DBT).**
- **Payments Layer (Cashless): UPI and AEPS (Aadhaar Enabled Payment System). Democratizes financial access; UPI processes ~21.7 billion transactions monthly (Jan 2026), formalizing the informal economy.**
- **Data Layer (Paperless): DigiLocker (62 crore+ users) and Account Aggregator framework. It replaces physical documents with digitally verified copies at the source; reduces "compliance burden" and administrative costs.**
- **Service/Consent Layer (Open Network): UMANG (2,000+ services) and ONDC (Open Network for Digital Commerce). It aggregates fragmented government services into a "Super-App"; breaks e-commerce monopolies to favor small MSMEs.**

Key Initiatives related to Digital Governance in India

- **Digital India 2.0: Deepening Infrastructure**
  - **Transitioning from "Basic Connectivity" to "Broadband for All" via the final phase of BharatNet.**
  - **Aims to provide 5G-ready fiber connectivity to all 2.5 lakh Gram Panchayats, enabling high-speed access to tele-medicine, e-education, and digital land records in the remotest corners.**
- **Mission Karmayogi 2.0: Modernizing Human Capital**
  - **Moving from "Rule-based" to "Role-based" bureaucracy through the iGOT Karmayogi platform.**
  - **Integrates AI-powered iGOT Tutors for personalized training and a Recruitment Rule Generator to standardize administrative hiring, ensuring the workforce is technically equipped to manage a digital-first state.**
- **Bhashini: Breaking the Linguistic Divide**
  - **An AI-led National Language Translation Mission covering all 22 Scheduled Languages.**
  - **Acts as a "bridge" for non-English speakers, allowing them to access government portals, judicial orders, and digital services in their mother tongue, thereby ensuring Linguistic Democracy.**
- **Ayushman Bharat Digital Mission (ABDM): Universal Health Interface**
  - **Creating a seamless Health ID (ABHA) ecosystem with over 75 crore linked records as of 2026.**
  - **Enables Portable Healthcare; a patient's medical history can be accessed digitally by any authorized hospital across India, reducing diagnostic repetition and improving emergency response.**
- **e-NAM 2.0: Digitalizing the Agrarian Economy**

- Integrating 1,500+ mandis into a single National Agriculture Market.
- Facilitates transparent price discovery and "One Nation, One Market" for 1.8 crore farmers. It reduces the influence of middlemen and ensures direct, digital payments to farmers' bank accounts.

- **PM-WANI (Wi-Fi Access Network Interface):**
  - Creating a massive network of "Public Data Offices" (PDOs) across the country.
  - It aims to "democratize" internet access by allowing small shopkeepers to provide low-cost Wi-Fi, similar to the PCO revolution of the 1990s.
- **SVAMITVA Scheme**
  - Using Drone Technology and GIS mapping to provide "Records of Rights" to village household owners.
  - Digitizes rural land records, enabling villagers to use their property as financial assets (collateral) for bank loans, reducing property disputes.
- **Jan Vishwas Act 2.0**
  - Decriminalizing minor offenses and digitizing the "Compliance Burden" for businesses.
  - Governance Impact: Enhances Ease of Doing Business by moving from physical inspections to "Digital Self-Certifications" and automated risk-based monitoring.
- **ULPIN (Unique Land Parcel Identification Number)**
  - Often called "Aadhaar for Land," it provides a 14-digit alphanumeric ID for every land parcel in India.
  - Ensures a single source of truth for land ownership, preventing fraudulent transactions and simplifying real estate governance.

E-Governance vs. Digital Governance

Feature	E-Governance	Digital Governance
Primary Goal	Digitizing manual processes to improve speed.	Transforming the governance model to create public value.
Approach	Top-Down: Government pushes services to citizens online.	Collaborative: Multi-stakeholder participation (Govt, NGOs, Citizens).
Technology	Use of ICT (Internet, Computers, Basic Software).	Use of Emerging Tech (AI, Big Data, Blockchain, Cloud).
Scope	Service delivery (e.g., applying for a PAN card online).	Ecosystem-wide (e.g., a "paperless" and "faceless" tax system).
Data Usage	Data is stored in departmental silos.	Data is an open asset used for predictive policy-making.

Citizen Role	Passive recipient of digital services.	Active participant in data-driven governance (MyGov).
Success Metric	Number of transactions or "clicks."	Quality of outcome and level of social inclusion.

Significance & Impact of Digital Governance in India

- Economic Impact
  - GDP Contribution: The digital economy is projected to contribute ~13% to India's GDP by 2026 according to MoSPI, driven by fintech, e-commerce, and IT services.
  - Formalization: Digital payments (UPI) have brought millions of unorganized small businesses into the formal financial fold, expanding the tax base.
  - Ease of Doing Business: Digitization of compliance (GSTN, MCA21) has reduced the "Inspector Raj," fostering a more vibrant startup ecosystem.
  - Transaction Volume: UPI recorded a record 21.7 billion transactions in January 2026 alone, valued at ₹28.33 trillion according to NPCI.
  - Fiscal Savings: Cumulative savings through Direct Benefit Transfer (DBT) have reached ₹4.31 lakh crore, primarily by eliminating 5.8 crore ghost beneficiaries according to DBT Bharat Portal.
- Social Impact
  - Financial Inclusion: The JAM Trinity (Jan Dhan-Aadhaar-Mobile) has achieved in 10 years what would have taken 50 years of traditional banking, providing credit access to the "unbanked."
  - Digital Identity: Aadhaar saturation has reached approximately 143 crore live holders (1.43 billion) according to UIDAI – March 2026.
  - Empowerment of Marginalized: Schemes like PM-SVANidhi use digital footprints to provide collateral-free loans to street vendors.
  - Health Access: Under the Ayushman Bharat Digital Mission (ABDM), over 75 crore ABHA IDs (Health IDs) have been created to enable portable health records according to the National Health Authority (NHA) Dashboard.
  - Rural Transformation: SVAMITVA has provided digital property cards to millions, reducing land disputes and empowering rural homeowners.
- Administrative Impact
  - Paperless Governance: DigiLocker has crossed 62 crore registered users, with over 6.5 billion documents issued according to National e-Governance Division (NeGD).
  - Procurement Transparency: The Government e-Marketplace (GeM) has crossed ₹4.5 lakh crore in cumulative gross merchandise value (2026), allowing MSMEs to compete fairly with large corporations.
  - Data-Driven Policy: Real-time dashboards (like the Gati Shakti portal) allow for integrated planning of infrastructure, reducing departmental silos.
  - Public Grievance Redressal: CPGRAMS has drastically reduced the turnaround time for citizen complaints through automated routing and monitoring.
- Political Impact

- Participatory Governance: Platforms like MyGov (30 million+ users) allow citizens to contribute directly to policy formulation and the "Mann Ki Baat" agenda.
- Transparency & Trust: By making the government "Faceless," digital governance reduces the scope for petty corruption and middlemen, enhancing the citizen's trust in the state.
- Electoral Integrity: The use of e-EPIC (Digital Voter ID) and digitized electoral rolls has streamlined the democratic process and increased voter convenience.
- Decentralization: Digital tools have empowered Panchayati Raj Institutions (PRIs) through the e-GramSwaraj portal, making local government spending visible to every villager.

Key Regulations for Digital Governance in India

- Information Technology (IT) Act, 2000 & Rules 2021
  - The bedrock of India's digital law, recently updated to address the complexities of social media and OTT platforms.
  - Section 69A: Grants the government power to issue "blocking orders" to intercept or restrict content in the interest of sovereignty, integrity, and public order.
  - Safe Harbour Provisions: Defines the liability of intermediaries (like X, Google, Meta). The 2021 Rules mandated "Grievance Officers" and rapid takedown timelines (within 24–72 hours).
- Digital Personal Data Protection (DPDP) Act, 2023
  - India's first dedicated data privacy law, marking a shift toward "Data Sovereignty."
  - Data Principal & Fiduciary: Establishes the rights of individuals (Data Principals) over their data and the obligations of entities (Data Fiduciaries) to process data only for specified, lawful purposes.
  - Consent Managers: Introduces a novel framework where citizens can manage, withdraw, or audit their data consents through a single digital interface.
  - Personal Data Protection Board (PDPB): An adjudicatory body to resolve disputes and levy penalties (up to ₹250 crore) for data breaches.
- National Cyber Security Policy & CERT-In Mandates
  - CERT-In (Indian Computer Emergency Response Team): The national nodal agency for responding to computer security incidents.
  - 2022 Directions: Mandatory reporting of cyber incidents within 6 hours of detection and the requirement for VPN service providers to maintain logs of users for five years.
- National Strategy for Artificial Intelligence (#AIforAll)
  - This NITI Aayog framework dictates how AI is integrated into Indian governance.
  - Responsible AI Principles: Focuses on mitigating "Algorithmic Bias" to ensure that automated welfare systems (like Aadhaar-based authentication) do not unfairly exclude marginalized citizens.
  - AIRAWAT: Establishing an AI-specific cloud computing infrastructure to ensure data remains within sovereign borders while fostering domestic R&D.
- RBI Framework for Digital Lending & Fintech
  - The Reserve Bank of India (RBI) governs the Payments Layer of the India Stack to prevent "Debt Traps" and unauthorized data access.
  - First Loss Default Guarantee (FLDG): Regulates how Fintech startups and traditional Banks share risk, ensuring financial stability in the digital credit market.

- Direct Disbursement: Rules requiring that loan amounts flow directly from the bank to the borrower's account, bypassing third-party "Lending Apps" that often harvested excessive personal data.

Challenges and Democratic concerns in Digital Governance

- The Crisis of "Digital Exile" and Censorship: The institutionalized silencing of dissent through the weaponization of IT Rules 2021 allows the state to bypass judicial oversight via "Emergency Powers."
  - This creates a direct conflict between Article 19 (Freedom of Expression) and the Reasonable Restrictions under Article 19(2), where terms like "Public Order" or "Sovereignty" are used to justify the arbitrary suppression of journalists and activists, effectively forcing critical voices into a digital exile.
- Systemic Suppression through Shutdowns and Bans: The frequent use of internet blackouts in states like Manipur, Punjab, and Haryana often criticized by the Supreme Court serves as a primary tool for pressing critical voices.
- The Persistent Digital Divide: While urban penetration is ~63%, rural areas lag at ~37% according to the NSS 78th round survey . Furthermore, a gender digital divide persists, with fewer women having independent access to smartphones and data.
- Infrastructure & Connectivity Issues: Frequent internet shutdowns in sensitive zones and inconsistent "last-mile" connectivity in hilly or tribal regions disrupt the delivery of essential services like DBT and tele-health.
- Critical Infrastructure Targets: With over 1.1 million cyber incidents recently, entities like AIIMS, Power Grids, and NPCI are under constant threat, necessitating a move toward "Zero Trust Architecture."
- Consent Fatigue: In a society with low digital literacy, implementing the Digital Personal and Data Protection (DPDP) Act 2023 is difficult. Citizens often experience "consent fatigue," clicking through complex privacy terms without understanding how their data is being harvested.
- Linguistic & Content Exclusion: The dominance of English in high-end digital tools creates a "Language Apartheid." Most technical manuals, grievance forms, and AI bots are not yet fully intuitive in all 22 scheduled languages.
- E-Waste & Sustainability: The rapid push for digital devices (tablets for schools, smartphones for frontline workers) is leading to a massive e-waste footprint, with inadequate recycling infrastructure at the district level.
- Bureaucratic & Cultural Inertia: A segment of the lower bureaucracy views digital tools as "monitoring devices" rather than "enabling tools," leading to passive resistance in updating real-time data on portals.
- Algorithmic Bias: Increased reliance on AI for beneficiary identification can lead to "Digital Exclusion Errors," where genuine beneficiaries are denied rights due to biometric failures or flawed algorithms.

Way Forward

- Judicial Oversight and Constitutional Safeguards: To counter the rise of "Digital Exile," India must institutionalize the Proportionality Test laid down in the Anuradha Bhasin (2020) and

Shreya Singhal (2015) judgments, ensuring that any "Reasonable Restriction" under Article 19(2) is the least restrictive measure possible.

- Infrastructure Saturation (BharatNet 3.0): Focus on providing "Quality of Service" (QoS) rather than just "Point of Presence." Every Gram Panchayat must be equipped with 5G-ready fiber and community Wi-Fi zones to foster local entrepreneurship.
- Institutionalizing "AI for All": Integrating Predictive Analytics into CPGRAMS 7.0 to identify recurring grievance hotspots. AI can be used to "auto-populate" forms for citizens based on existing Aadhaar data, moving toward "Zero-Entry" governance.
- Linguistic Inclusion via Bhashini: Mandatory integration of the Bhashini AI tool into all G2C (Government-to-Citizen) platforms, ensuring a villager can interact with the state in their mother tongue through voice commands.
- Mission Karmayogi 2.0: Moving beyond basic IT training to "Data-Driven Leadership." Training civil servants in data ethics, cybersecurity, and agile project management to handle 21st-century administrative complexities.
- Strengthening Cyber Resilience: Establishing a National Cyber Coordination Centre (NCCC) at the state level. Implementing "Cyber Swachhta" programs to secure personal devices of citizens against malware and financial fraud.
- Universal Digital Literacy (PMGDISHA 2.0): Shifting the curriculum from "how to use a phone" to "Digital Financial & Legal Agency." Every household should have a "Digital Sahayak" capable of navigating the DPDP Act and digital banking safely.
- Circular Digital Economy: Formulating a robust National E-Waste Policy that mandates the "Right to Repair" and ensures that the digital transition is environmentally sustainable.
- Proactive "Life-Event" Governance: Transitioning to a system where the government proactively reaches out to citizens (e.g., sending a digital notification for a child's vaccination or a senior citizen's pension) based on integrated data triggers.

Conclusion

Digital Governance has successfully transformed India from a "Data-Poor" to a "Data-Rich" nation. The next frontier is ensuring "Data-Wisdom," where technology is used not just to monitor or deliver, but to emancipate. By bridging the digital divide and securing the cyber-frontier, India can ensure that technology serves as a bridge to a transparent, equitable, and Viksit Bharat by 2047.

Read More: The Hindu
UPSC Syllabus: GS 2 Governance

Empowering Women Farmers in Agriculture- Explained Pointwise

The United Nations has designated 2026 as the International Year of the Woman Farmer (IYWF 2026), in recognition of the vital and indispensable role of women in global agriculture. In India, women form a formidable backbone of the Indian agricultural system, with 80% of rural women in India are employed in the agricultural sector.

What is the current status of Women's Participation in Agriculture?

Overall FLFPR of Women	According to the Periodic Labour Force Survey (PLFS) 2023–24, India's overall Female Labour Force Participation Rate (FLFPR) for women aged 15 and above has risen significantly to 41.7% from the earlier 23.3% in 2017-18.
Rural Women FLFPR in agriculture	Rural women are heavily involved in agriculture. According to PLFS data, 70.9% of working rural women are engaged in the agricultural sector.
High Engagement but lack of ownership	12.8% of operational land holdings are owned by women
Lack of fair access to government schemes	Only 25.1% of women farmers are PM-KISAN beneficiaries and only 15.6% of women farmers are enrolled in Pradhan Mantri Fasal Bima Yojana (PMFBY).

Factors leading to the Feminization of Indian Agriculture

- **Distress-Driven Male Out-Migration- Rural women have become the de facto custodians of family farms, due to male-out migration.**
    - **According to 2011 Census, 33.7% of rural males migrate for better job opportunities, leaving women to manage farms.**
- **Sectoral Shift in Labor: Due to declining agriculture's share in the GDP, the male workforce is moving toward urban areas, leaving a labor vacuum in the primary sector which is filled by rural women.**
- **Lack of Non-Farm Alternatives: In many regions, the absence of diverse rural industries forces women into subsistence farming and animal husbandry for survival.**
- **Climate Change and Agrarian Crisis: Decline in household income due to rising input costs and frequent crop failures**
- **Institutional Empowerment via SHGs: The rise of Self-Help Groups (SHGs) has enabled women to transition from passive wage earners to entrepreneurial leaders through collective farming and organic ventures.**

Significance of Women's Empowerment in Agriculture

- **Important Support for Global Food Security: Women are the primary architects of the food system, contributing to 60–80% of food production in developing nations.**
- **Traditional Knowledge Holders: Women play a vital role in preserving and transmitting expertise in seed selection, soil health, and medicinal plants.**
- **Leaders in Sustainable Practices: Driven by a focus on family nutrition, women are more likely to adopt regenerative agriculture and eco-friendly farming.**

- **Strengthened Decision-Making: Empowerment boosts their participation in farm management, allowing for more balanced and effective decision-making.**
- **Multipliers of Human Capital: Studies show that when women control income, they invest more in children's education and health, creating a multiplier effect.**
- **Climate Change Adaptation: Women are central to disaster risk reduction and adopting water-efficient technologies in water-stressed regions.**

Key Government Initiatives for Empowering Women Farmers

- **Financial Empowerment and Credit Access**
  - **PM-KISAN: As one of the world's largest DBT programs, it provides direct income support of ₹6,000 annually. Notably, over ₹1.01 lakh crore has been disbursed to women beneficiaries, accounting for roughly 25% of the total payout.**
  - **Modified Interest Subvention Scheme (MISS): Ensures affordable short-term credit via Kisan Credit Cards (KCC). Recent reforms have increased the collateral-free loan limit to ₹2 lakh (effective Jan 2025), easing the path for landless women farmers.**
  - **Agriculture Infrastructure Fund (AIF): Provides medium-to-long-term debt financing with a 3% interest subvention. By early 2025, projects worth ₹2,377 crore were sanctioned to women for post-harvest assets.**
- **Technological and Skill Intervention**
  - **Namo Drone Didi Scheme: A cutting-edge initiative aiming to provide 15,000 drones to Women Self-Help Groups (SHGs). It offers an 80% subsidy (up to ₹8 lakh) to modernize farming and create high-tech service-based livelihoods.**
  - **Sub-Mission on Agricultural Mechanization (SMAM): Focuses on reducing physical drudgery by providing 50% to 80% assistance to women for purchasing gender-friendly tools and setting up Custom Hiring Centres (CHCs).**
  - **Krishi Sakhi Programme: A community-led extension model training 70,000 women as para-extension professionals. These "Sakhis" bridge the last-mile gap in knowledge regarding Natural Farming and soil health.**
- **Institutional Support and Collectivization**
  - **Mahila Kisan Sashaktikaran Pariyojana (MKSP): A sub-component of DAY-NRLM, it has supported over 4.62 crore women in adopting sustainable agro-ecological practices and livestock management.**
  - **Women-Led FPOs: Under the "10,000 FPOs" scheme, there is a mandate for female representation on every Board. Currently, 1,175 FPOs are 100% women-owned, enabling collective bargaining and better market linkages.**
  - **Specialized Research Bodies: Institutions like ICAR-CIWA (Bhubaneswar) and NGRCA lead gender-focused research, developing "drudgery-reducing" technologies and climate-smart extension models like GRIHA and JANANI.**
- **Sector-Specific Missions**
  - **Dalhan Aatmanirbharta Mission: States must ensure at least 20% of funds are allocated to women farmers to boost pulse production.**
  - **Mission for Integrated Development of Horticulture (MIDH): It is a Centrally Sponsored Scheme implemented since 2014–15, supports India's horticulture sector. The schemes follow a 60:40 Centre-State funding pattern and 90:10 for the North-Eastern and Himalayan states.**

Source: PIB

Global Best Practices

Country / Initiative	Intervention Model	Strategic Takeaway for India
Rwanda (Land Reform)	Implementation of mandatory joint-spousal land titling, which has improved women's access to collateral and long-term soil conservation.	Integrate SVAMITVA drone mapping with mandatory co-titling to formalize women's land rights.
Kenya (M-Shamba)	A digital, SMS-based climate advisory platform tailored for women, which successfully doubled maize yields through timely information.	Scale up Kisan Sarathi and Digital Public Infrastructure (DPI) in vernacular languages for last-mile delivery.
Philippines (Budgeting)	Institutionalized Gender-Responsive Budget Tagging across all agricultural line items to ensure equitable fund utilization.	Mandate comprehensive Gender Budget Statements across all State Agriculture Departments to track actual outlays.

Vietnam (Cooperatives)	Promotion of women-led agricultural cooperatives that focus specifically on high-value organic exports and value addition.	Leverage the "10,000 FPOs" Scheme to create exclusive women-led export clusters for global value chain integration.

Challenges Faced by Women in Agriculture

- **Lack of Land Ownership: Women-operated land holdings accounted for 13.96% of total holdings, as per the Agriculture Census 2015-16.**
- **Mechanization and Technology Gap: Most farm machines are designed for men. Because of this, women often have to rely on manual tools, which reduces their productivity.**
- **Financial Exclusion and Debt Cycles: Limited access to institutional credit compels women to rely on exploitative informal moneylenders. This creates a cycle of rural indebtedness.**
- **Dual Burden of work: Women do most of the unpaid household and care work. Because of this extra responsibility, they have less time to learn new skills, take part in markets, or start other income-earning activities.**
- **Climate Vulnerability and Risk: As the primary managers of water, fodder, and fuel, women are the first to suffer from climate-induced crop failures.**
- **Market and Mobility Barriers: Social constraints, lower literacy levels, and limited access to digital tools often restrict the mobility and market access of women.**

Way Forward

- **Legal Recognition of 'Farmer' Status: Change the definition of a farmer from someone who owns land to someone who actually works on it. This will help landless women get loans, insurance, and benefits like PM-KISAN.**
- **Strengthening Resource Rights: Promote joint land titling and simplify inheritance procedures. To unlock long-term farm investments and financial autonomy.**
- **Gender-Sensitive Mechanization: Designing women- friendly tools by moving away from "gender-blind" machinery will enhance productivity while reducing physical strain.**
- **Scaling Women-Led Value Chains: Empower Women-FPOs and SHG collectives to achieve economies of scale. This allows women to bypass middlemen and engage directly with processing units and markets.**
- **Data-Driven Policy Reforms: Precision policymaking is required to address the specific challenges of women across different agro-climatic zones.**
- **Comprehensive Social Security: Establish a robust safety net including maternity support, old-age pensions, and climate-risk insurance. This ensures that caregiving burdens do not hinder the economic resilience of women farmers.**

Conclusion

The shift toward a gender-inclusive agricultural landscape is no longer a matter of "welfare" but a strategic importance for national resilience. As we navigate the International Year of the Woman Farmer (2026), the goal must change from mere labor participation to achieve true economic agency. By dismantling structural barriers to land and credit, India stands to unlock a "Triple Dividend" with a

surge in aggregate farm productivity, a direct leap in household nutritional security, and the birth of a more equitable rural economy.

Read More: PIB
UPSC Syllabus: GS 3- Agriculture

The Transgender Persons (Protection of Rights) Amendment Bill, 2026- Explained Pointwise

The Ministry of Social Justice and Empowerment has introduced a new bill by the name of Transgender Persons (Protection of Rights) Amendment Bill, 2026, to update and change the current laws that protect the rights of transgender people under Transgender Persons (Protection of Rights) Act, 2019.

What is The Transgender Persons (Protection of Rights) Amendment Bill, 2026?

The Transgender Persons (Protection of Rights) Amendment Bill, 2026, represents a pivotal shift in India's legal framework for gender identity. It seeks to amend the existing Transgender Persons (Protection of Rights) Act, 2019 to address gaps in the legal recognition and welfare of transgender persons in India. The Bill aims to streamline procedures related to gender certification, improve access to welfare schemes, and strengthen institutional mechanisms for protection of rights.

What changes have been introduced in the Transgender Persons (Protection of Rights) Amendment Bill, 2026?

Provision	Features
Shift in Approach of Identification	• The Bill removes the legal recognition of self-determination under Section 4(2) of 2019 Act. • Legal recognition now depends on external verification rather than personal identity.
Restricted the Definition of person considered as Transgender	• Recognition has been limited to sociocultural identities such as kinner, hijra, aravani, jogta, eunuch. • New Category Introduced: It includes individuals who are forced to adopt transgender identity through medical procedure, coercion or manipulation.
Introduction of Medical Certification	• A Medical Board (headed by Chief Medical Officer/Deputy CMO) will assess applicants. • The District Magistrate will issue certificates based on the Board's recommendation. This replaces the earlier system where no medical examination was required.

Stricter Penal Provisions	Graded punishments are introduced for offences against transgender persons, including abuse, forced labour, abduction, and forcing transgender identity, with penalties up to life imprisonment.
Changes in Institutional Structure	Representatives on the National Council for Transgender Person from States/UTs must now hold a minimum rank of Director in the relevant Ministry or Department, leading to higher-level bureaucratic oversight.
Changes in Legal Documentation	Individuals can change their names in official documents, but only after meeting the newly proposed statutory definition of a transgender person.

What are the Challenges Associated with the Transgender Persons (Protection of Rights) Amendment Bill, 2026?

1. **Rejection of Self-Identification Principle- By removing Section 4(2) of the 2019 Act (which provided for self-determination rights of transgenders), the Bill contradicts the core principle of the NALSA judgment (2014).**

NALSA Judgement (2014)

The judgment recognised the Right to Self-Determination, which does not require proof through external or medical means.

2. **Clinical Gatekeeping- The requirement of a Medical Board headed by a Chief Medical Officer (CMO) introduces a system of clinical gatekeeping. Gender identity is treated as a medical condition rather than a personal or social identity.**
3. **Burden of Proof and Institutional Barriers- Access to fair and sensitive healthcare remains a major concern. This creates institutional barriers, especially in a system affected by transphobia.**
4. **Exclusion of Gender Fluidity- The Bill excludes self-perceived and gender-fluid identities from legal recognition. It ignores a large section of the community that does not fit rigid biological categories.**
5. **Fear of Exclusion– Recognition is limited to socio-cultural identities like *Hijra, Kinner, Aravani, Jogta*. Trans persons outside traditional guru–chela systems may lose legal recognition and protection.**
6. **Concerns over Forced Identity Clauses- Provisions related to "forced transgender identity" may be misused. Actions may be wrongly labelled as allurement or inducement under stricter provisions.**

What is the Significance of the Transgender Persons (Protection of Rights) Amendment Bill, 2026?

1. Reduced ambiguities in transgender identification: The revised definition and identification process of transgender aims to reduce ambiguity present in the 2019 Act.
2. More Precise Targeting of Benefits: A more specific definition of transgender persons is intended to ensure that legal protections reach those facing severe social discrimination.
3. Stronger Legal Safeguards: The introduction of graded punishments for serious offences enhances protection against violence, exploitation, and abuse.
4. Protection of Bodily Integrity and Dignity: By penalising forced identity changes and acts causing bodily harm, the Bill reinforces the principles of dignity and bodily autonomy.
5. Addressing Gaps in the 2019 Act: The amendment seeks to resolve challenges arising from the broad and vague definitions in the earlier law.

Transgender Persons (Protection of Rights) Act, 2019

- **Definition of Transgender**
  - The Act defines a transgender person as someone whose gender identity does not match the gender assigned at birth.
  - It includes trans men, trans women, intersex persons, and socio-cultural identities such as kinner and hijra, irrespective of any medical procedures.
- **Right to Self-Identification**
  - The Act recognises the right to self-perceived gender identity.
  - Individuals can obtain a certificate of identity from the District Magistrate through an administrative process, without any medical examination.

  Prohibition of Discrimination
  - The law prohibits discrimination against transgender persons in areas such as education, employment, healthcare, and access to public services.

  Institutional Mechanism
  - It establishes a National Council for Transgender Persons.
  - The Council advises the government on policies, monitors implementation, and ensures coordination among different ministries.

  Offences and Penalties
  - The Act provides penalties for offences like abuse, forced labour, and denial of rights.
  - Punishment ranges from 6 months to 2 years of imprisonment along with a fine.

What are the Government Initiatives for Transgender Persons in India?

- National Portal for Transgender Persons (2020)
  - Launched in 2020, the portal allows transgender persons to apply online for identity certificates.
  - It also provides easier access to various government benefits and services.
- SMILE Scheme (2022)
  - The SMILE (Support for Marginalised Individuals for Livelihood and Enterprise) Scheme, introduced in 2022, focuses on livelihood support and skill development.
  - It offers shelter facilities through Garima Greh centres and healthcare coverage under Ayushman Bharat TG Plus.
- Equal Opportunities Policy for Transgender Persons

  - Issued by the Department of Social Justice & Empowerment, this policy aims to ensure equal access to employment opportunities and reduce discrimination in workplaces.
- National Council for Transgender Persons
  - A statutory body under the Ministry of Social Justice and Empowerment that works to protect and promote the rights of transgender persons.
  - It includes five representatives from the transgender community, along with members from NHRC, NCW, State Governments, UTs, and NGOs.
- Transgender Protection Cells and National Portal Integration
- Establishment of district-level Transgender Protection Cells under the District Magistrate.
- These cells help in monitoring offences, ensuring timely FIR registration, and conducting sensitisation programmes.

What should be the Way Forward for the welfare of transgender persons in India?

1. **Restoring Self-Identification: Align the Transgender Bill 2026, with the NALSA (2014) judgment, to ensure gender identity remains a matter of personal autonomy, not medical certification.**
2. **Strengthening Legal Protection and Implementation- Ensure strict enforcement of anti-discrimination laws and provide easy access to justice for transgender persons.**
3. **Promote Social Awareness & Cultural Change- Promote public awareness campaigns and respectful media representation to reduce stigma. Example: Campaigns like "I Am Also Human".**
4. **Enhanced Livelihood Opportunities: Expand employment opportunities and inclusive hiring practices for transgender persons. Example: Karnataka's 1% job reservation in government services.**
5. **Provide Holistic Healthcare Access: Standardise Gender Reassignment Surgery (GRS) and hormone therapy in government hospitals to make them affordable and safe.**

Conclusion

The Transgender Persons (Protection of Rights) Amendment Bill, 2026 marks an important step towards building a more inclusive and responsive legal framework for gender identity in India. Its effective implementation can strengthen access to legal recognition, healthcare, education, and livelihood opportunities for transgender persons. With continued policy refinement and inclusive governance, India can move towards a future where dignity, equality, and full participation of transgender individuals are firmly embedded in society.

Read More: The Hindu
UPSC Syllabus: GS 2– Governance

Semiconductor Industry in India- Significance and Challenges- Explained Pointwise

India is emerging as a semiconductor hub, developing indigenous chips like VIKRAM 3201, DHRUV64 to boost self-reliance. The market is growing from $38 billion in 2023 and is expected to reach $100–110 billion by 2030.

In a major boost, the Union Budget 2026–27 announced India Semiconductor Mission 2.0 (ISM 2.0) with a provision of Rs. 1,000 crore, reinforcing India's ambition to emerge as a global semiconductor hub.

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

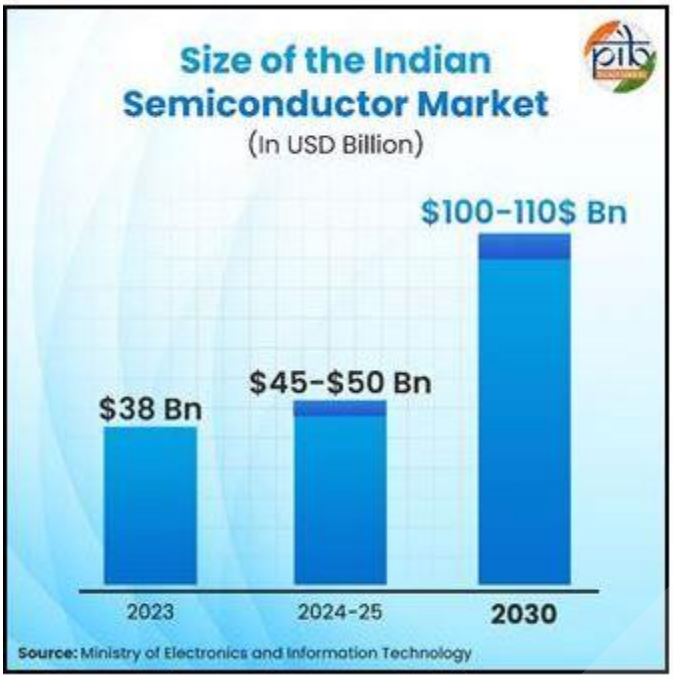


Figure 1. Source- PIB

What are semiconductors? What is their importance?

Semiconductors- Semiconductors are materials which have a conductivity between conductors and insulators. They can either be pure elements, like silicon or germanium or compounds, like gallium, arsenide, or cadmium selenide.

Properties- Semiconductors have less resistivity than insulators and more than conductors. The resistance of the semiconductor decreases with an increase in temperature and vice versa.

Importance of Semiconductor chips

1. Heart and brain of modern technology products- Semiconductor chips are the heart and brain of all modern electronics and communications technology products, contemporary automobiles, household gadgets such as refrigerators, and essential medical devices such as ECG machines.

2. Propeller of emerging technologies- The development of emerging technologies like AI, 5G, or driverless cars is dependent upon a fast and cheap semiconductor industry.

3. Most traded products after petroleum- Semiconductors are globally the most-traded products after petroleum and cars, with an annual turnover of $500 billion.

4. Aiding the further development of electronic devices- Semiconductors make the devices more compact, less expensive, and more powerful. For ex- Semiconductor chips have enhanced the features of smartphones with powerful processing.

5. Transformative potential- Semiconductors continue to enable the world's greatest breakthroughs and transformation in industries, ranging from aerospace and consumer electronics to energy and medicine.

What are the defining features of Semiconductor manufacturing?

Semiconductor manufacturing has the following defining features-

1. Front-end manufacturing and back-end assembly- Semiconductor manufacturing comprises the front-end fab manufacturing and the back-end assembly, including packaging and testing. However, the front-end fab manufacturing is a complex process, with only a handful of companies involved in large scale fab-manufacturing.

2. Complexity in manufacturing- The semiconductor manufacturing is a complex process requiring at least 300 different high-technology inputs.

3. Highly concentrated global supply chain- Globally, the entire semiconductor value chain has seeped in the interdependence between a handful of countries like the USA, Taiwan, Japan, China, and some European nations. Within this chain, there's an extraordinary degree of specialisation that makes it vulnerable to shocks. For ex-100% of the world's most advanced (below 10 nanometres) semiconductor manufacturing facilities are located in just two countries, Taiwan and South Korea.

4. Large investment- The semiconductor product development requires the largest investment on both R&D and manufacturing. It is estimated that over the next decade about $3 trillion in investment will be needed.

5. Revenue sharing b/w few companies- The top three companies in each stage of the semiconductor supply chain take in about 80-90% of the revenue.

Semiconductor manufacturing status in India

1. Semiconductor R&D footprint in India- India has an existing base for design and verification for the semiconductor industry. Most of the global semiconductor companies having an R&D footprint in India.

2. Fabrication facilities limited to strategic semiconductor development- India has two fabs — SITAR, a unit of the Defence Research and Development Organisation (DRDO) in Bengaluru, and a semiconductor laboratory in Chandigarh. These build silicon chips for strategic purposes like defence and space, and not for commercial use.

3. High import dependence- 100% of our semiconductor chips, memory, and display cards are imported into the country. In 2020, India spent $15bn on electronic imports, with 37% coming from China.

4. Progress under ISM 1.0- As of December 2025, 10 projects worth Rs. 1.60 lakh crore have been approved across six states, covering silicon fabs, silicon carbide fabs, advanced packaging, and ATMP facilities.

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

1. Over concentration of manufacturing units- Semiconductor chip manufacturing is concentrated in a few countries. For ex- Taiwan produces over 60% of the world's semiconductors, and along with South Korea makes 100% of the most advanced chips (below 10 nanometers).

2. Supply chain disruption due to epidemic- The semiconductor industry experienced significant supply shortages during the pandemic due to disruptions in China's production.

3. Geo-political conflicts- The ongoing Russia-Ukraine conflict has resulted in shortages of raw materials for domestic industries. For ex- Ukraine plays a critical role as a key supplier of neon, which is an essential input in semiconductor manufacturing.

4. Potential of another round of shortages due to emerging geo-political contestations- The European Union and the United States has refused to sell advanced manufacturing equipment to China. In retaliation, China imposed export controls on crucial inputs such as gallium and germanium. This may lead to another potential round of shortages in the semiconductor industry. For ex- US has restricted its firms and its allies from assisting the Chinese production of 16 nanometers or smaller chips.

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

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

1. Tackling supply shocks- The pandemic and the subsequent lockdowns impacted the supply of chips to India. For ex- Automobile manufacturers like Mahindra & Mahindra and Tata group were compelled to reduce their production due to the shortage.

2. Meeting the rising demand- Experts estimate that around 50 crore people will join the internet in the next decade, which will increase the demand of more phones and laptops. Similarly, the post-pandemic world is showing a greater inclination towards work from home culture. This warrants an enhanced demand for servers, internet connectivity, and cloud usage. Hence, indigenous semiconductor industry is needed to meet the rising demands. There is a huge domestic market for semiconductors which could exceed $60 billion by 2026.

3. Employment Creation- Indigenous manufacturing of chips will build its smartphone assembly industry and strengthen its electronics supply chain. This will create numerous employment opportunities for the Indian youth.

4. Revenue boost- Indigenous capacity would attract local taxes and boost the export potential. Further, India would be required to import fewer semiconductor chips, which would decrease the import bill. For ex- India imports almost all semiconductors to meet its demand, which is estimated to reach around $100 billion by 2025.

5. Enhanced Security- Chips made locally will be designated as "trusted sources" and can be used in products ranging from CCTV cameras to 5G equipment. This would improve the national cybersecurity profile.

6. Geopolitical Benefits- Countries having a sufficient supply of chips would be in a better position to mould the future course of geopolitics, driven by data and the digital revolution. Further self-sufficiency will decrease reliance on Chinese chip imports, especially during hard times like the recent Galwan Valley border clash.

7. Increased competitiveness- Indian manufacturers globally competitive to attract investment in the areas of core competency and cutting-edge technology.

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

National Policy on Electronics, 2019	It envisions positioning India as a global hub for Electronics System Design and Manufacturing (ESDM) sector. It aims to encourage the development of core components (including chipsets) and create an enabling environment for the industry to compete globally.
Semicon India programme	The government has approved the Semicon India programme with a total outlay of INR 76,000 crore for the development of semiconductor and display manufacturing ecosystem in the country.

'Modified Scheme for setting up of Semiconductor Fabs in India'	It aims to attract large investments for setting up semiconductor wafer fabrication facilities in the country. The Scheme extends a fiscal support of 50% of the project cost on an equal footing basis for setting up of Silicon complementary metal-oxide semiconductor (CMOS) based Semiconductor fabrication in India.
Modified Electronics Manufacturing Clusters (EMC 2.0) Scheme	Under this, the government will provide support for the setting up of Electronics Manufacturing Clusters (EMCs) and Common Facility Centres (CFCs).
Foreign Direct Investment	The Government of India has allowed 100 percent (FDI) under the automatic route in the Electronics Systems Design & Manufacturing sector.
Production Linked Incentive Scheme(PLI)	Under this, the government will provide an incentive of 4% to 6% on goods manufactured in India and covered under target segments to eligible companies for a period of five years.
India Semiconductor Mission 2.0	The Union Budget 2026–27 launched India Semiconductor Mission 2.0 with Rs. 1,000 crore to boost domestic chip capabilities through local equipment and material production, full-stack IP design, and industry-led R&D and skilling.

What are the challenges in the semiconductor industry in India?

1. High Cost of establishment- As per a government estimate, it would cost roughly $5-$7 billion to set up a chip fabrication unit in India.

2. Bureaucratic inefficiencies- The process of establishing an indigenous semiconductor facility requires clearances and approvals from multiple government departments. Further, there exists a considerable degree of bureaucratic delays at each stage that discourages the establishment of manufacturing units.

3. Unstable power supply- The smooth production of semiconductors requires the availability of an uninterrupted 24*7 power supply. However, this requirement is not fulfilled by many regions in the country. This restricts production to very few locations.

4. Technological Constraint- The indigenous manufacturing of semiconductors requires the use of high-end technologies. These technologies are licensed from patent holders at a very high price.

5. Structural Flaws- FDI in electronics is less than 1% of the total FDI inflow because of the dearth of skilled labor, delays in land acquisition, and the uncertain tax regime.

What should be the focus area for Indian Semiconductor Industry?

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

What Should be the Way Forward?

1. Provision of adequate funding- Adequate funding must be provided to augment the research and development potential of technical institutes. For ex- **IIT Madras developed a microprocessor named 'Moushik'** with funding support from the Ministry of Electronics and Information Technology.

2. Expeditious execution of Sovereign Patent Fund (SPF)- The Sovereign Patent Fund (SPF) under **National Policy on electronics** should be established expeditiously. It is a **wholly or partly Government-backed entity that aims to bolster domestic businesses** through the acquisition and licensing of patented technology.

3. Domestic procurement assurances- The manufacturers need to be given an assurance of minimum domestic procurement by the government and the private sector. The focus should be on **manufacturing economical and technically viable options like 28nm chips**.

4. Support of businesses- The government should also support businesses in the acquisition of semiconductor manufacturing units in other countries. This is easier than setting up a domestic facility and can be done swiftly for ensuring a continuous supply of chips. Hand-holding startups of entrepreneurial engineers can also produce large payoffs.

5. Intial Focus on back-end of manufacturing- Semiconductor foundries are the world's most expensive factories, accounting for 65% of industry capital expenditure but only 25% of the value addition. Therefore, to lower the risks of investment, India should especially look at back-end of manufacturing such as assembly, packaging and testing. Once it stabilises and an ecosystem develops, front-end of manufacturing will follow.

6. Proactive cooperation of states- Areas like stable power, large quantities of pure water and land, are state subjects, and the state governments should also create the right climate for easy implementation of semiconductor projects.

Conclusion

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

Read More-Daily Pioneer
UPSC Syllabus- GS 3- Indian Economy

World Trade Organization (WTO) -Relevance & Challenges – Explained Pointwise

The World Trade Organization's (WTO) 14th Ministerial Conference (MC14) is being held from March 26–29, 2026 in Yaoundé, Cameroon – marking the first time it has been hosted in Sub-Saharan Africa. WTO Director-General Ngozi Okonjo-Iweala said global trade is facing its worst disruption in 80 years, with with US reciprocal tariffs drawing comparisons to the Smoot-Hawley Tariffs of 1930 that hastened the Great Depression. As a result, WTO reform is the main focus, with members discussing the Yaoundé Ministerial Statement and future work plan.

This article examines the WTO – its significance, the challenges it faces today, key issues at MC14, and the way forward.

Source- NOA

What is the WTO and what are its core principles?

The World Trade Organization (WTO) is the only international organisation that deals with the rules of trade between nations. It was established in 1995 under the Marrakesh Agreement, replacing the General Agreement on Tariffs and Trade (GATT), which had been in effect since 1948.

It currently has 166 members representing 98% of world trade – Timor-Leste and Comoros being the most recent additions in 2024. Its headquarters is in Geneva, Switzerland.

The WTO operates on several core principles:

Non-Discrimination	**The Most-Favoured-Nation (MFN) principle requires equal treatment among all trading partners, while the National Treatment principle requires that foreign products be treated no less favourably than domestic ones.**
Bound Tariffs	**Members cannot exceed agreed tariff limits, creating a ceiling on protectionism.**
Reciprocity	**Countries must lower trade barriers in exchange for similar concessions from others.**
Trade Liberalisation	**Gradual and progressive reduction in tariffs and quotas.**
Transparency	**Member countries are required to publish trade regulations; the WTO collects and disseminates trade information among all members.**

Dispute Settlement	**Provides a legal and institutional framework for resolving trade conflicts through its Dispute Settlement Body (DSB).**

Umbrella	AGREEMENT ESTABLISHING WTO		
	Goods	Services	Intellectual property
Core principles	**GATT**	**GATS**	**TRIPS**
Additional information	Agreements and annexes for another goods	Services annexes	
Market access commitments	Commitments of member countries are scheduled	Commitments of member countries are scheduled (and MFN exemptions)	
Dispute settlement	**DISPUTE SETTLEMENT**		
Transparency	**TRADE POLICY REVIEWS**		

Source: WTO, 2021

The Ministerial Conference (MC) is the WTO's supreme decision-making body, which convenes trade ministers from all member nations, usually every two years, and takes decisions on all matters under WTO agreements through consensus.

What have been the achievements of the WTO?

1. Facilitation of International trade – Binding rules for global trade in goods and services have enabled dramatic growth in cross-border commerce. The real volume of world trade has expanded by 2.7 times since WTO's inception in 1995.

2. Reduction in tariffs – After the creation of the WTO, average tariffs have almost halved, from 10.5% to 6.4%, which has significantly facilitated the growth of international trade.

3. Boost to national incomes – Accession to the WTO has given a lasting boost to national incomes of several developing economies, improving their living standards and development prospects.

4. Rise of global value chains – The predictable market conditions fostered by the WTO, combined with improved communications technology, have enabled the rise of global value chains. Trade within these chains today accounts for almost 70% of total merchandise trade.

5. Reduction in poverty – The free and fair trade principles of the WTO have contributed to a reduction in world poverty. Taking the World Bank's $1.90 threshold for extreme poverty, the poverty level has fallen from ~33.33% in 1995 to ~10% today.

6. Dispute settlement – The DSB has handled over 600 disputes, many involving major powers like the US, EU, and China. It has been instrumental in preventing trade wars and enforcing compliance with international norms.

7. Support for developing nations – The WTO has provided technical assistance, training, and special provisions to developing countries, including the Aid for Trade initiative for Least Developed Countries (LDCs), helping them integrate into the global trading system.

8. New Multilateral Agreements – The WTO has delivered the Trade Facilitation Agreement and the Agreement on Fisheries Subsidies – two landmark new multilateral agreements that demonstrate the institution's ability, albeit limited, to legislate on new trade issues.

Why is trade multilateralism reeling under a crisis today?

The WTO was expected to perform three key functions: the negotiating function, the dispute settlement function, and the trade monitoring function. It has been struggling on all three fronts, and the context of MC14 underlines this crisis vividly:

1. US disillusionment with the WTO – Washington increasingly believes that the WTO, which the US itself was instrumental in creating in 1995, has not served American interests well. Consequently, the US now seeks to shed the very legal constraints it once accepted under WTO law.

2. Rise of China and its WTO membership – China's rapid rise has brought it close to the U.S. in trade and manufacturing. Its entry into the WTO, supported by the U.S., was expected to limit its state-led policies, but this did not happen. WTO rules have struggled to handle this, as China now produces over half of the world's steel and exports it globally-often affecting other countries-without technically breaking WTO rules.

3. US assault on WTO Principles – The US has weaponised tariffs in a manner that violates the foundational Most-Favoured-Nation (MFN) rule and its bound tariff obligations. Its 2026 Trade Policy Agenda explicitly calls for reorienting the WTO's negotiating function and reassessing the MFN principle itself.

4. Paralysis of the Appellate Body – Since 2019, the US has blocked appointments to the WTO's Appellate Body – its highest judicial arm. By December 2019, the last remaining members' terms expired, leaving the body non-functional and the entire dispute settlement system paralysed.

5. Sluggishness in new rule-making – The WTO's consensus-based decision-making has been extremely slow. In three decades, it has produced only two new multilateral agreements – the Trade Facilitation Agreement and the Agreement on Fisheries Subsidies – pushing countries towards bilateral Free Trade Agreements (FTAs) and plurilateral deals outside the WTO framework.

What are the challenges and key areas of reform for WTO today?

The WTO was expected to be a rule-setter, a judge, and a watchdog for global trade. On all three counts, it is falling short. The key challenges are:

1. Stalemate in trade negotiations (Doha Round Failure) – The Doha Development Round, launched in 2001 to improve trade conditions for developing countries, failed due to deep disagreements- developed countries wanted greater market access, while developing countries demanded reforms in agricultural subsidies. This failure shows the WTO's inability to adapt to changing global economic realities.

2. Rising Protectionism and trade restrictions – The Most-Favoured-Nation (MFN) principle – the bedrock of the WTO, enshrined in Article 1 of the WTO Agreement – is now being quietly abandoned. Many countries, especially developed ones, find it easier to negotiate tariffs bilaterally through Free Trade Agreements (FTAs). Trade restrictions by advanced economies have already affected an estimated $747 billion in global imports and dampened business investment worldwide.

3. Bias towards developed countries – WTO rules are widely perceived as favouring rich nations. Developed countries like the EU and US continue to provide massive agricultural subsidies while

simultaneously pressuring developing nations to open up their markets – aggravating North-South tensions within the WTO.

4. Shift to Plurilateral agreements – Increasingly, groups of WTO members are striking plurilateral agreements among themselves, bypassing the full membership. Since developed countries hold greater negotiating power in such settings, these deals tend to reflect their interests. Plurilateral deals bind only their signatories but require consensus from all WTO members for formal incorporation into the WTO legal framework.

5. Misuse of Special and Differential Treatment (S&DT) – S&DT provisions were designed to protect developing and least developed countries. However, high-income economies like South Korea and China have availed themselves of these concessions since developing-country status is based on self-declaration – a loophole that distorts the very purpose of the framework.

6. Lack of consensus on reform – The Global South demands rationalisation of fisheries subsidies and protection of public stockholding programmes. Developed nations, meanwhile, have shelved their old obligations and are pushing for new rules on e-commerce – an area where they hold a decisive competitive edge. The result is a persistent deadlock that paralyses the WTO's reform agenda.

7. Emerging trade issues left unaddressed – The WTO's slow, consensus-driven processes have made it unable to keep pace with modern trade realities – e-commerce, digital services, climate-related trade policies, and green industrial subsidies remain largely ungoverned by WTO rules.

8. Lack of support for Least Developed Countries (LDCs) – Despite repeated commitments, LDCs continue to struggle to access global markets due to complex rules, high compliance costs, and limited representation in negotiations. The WTO has simply not delivered on its development agenda for the world's poorest countries.

What are the key issues being debated at MC14 (2026)?

MC14, which opened in Yaoundé on March 26, 2026, is being described as a "reform ministerial" – its stated ambition is not to resolve every challenge at once, but to establish a structured work plan for the WTO's future. The key battleground issues are:

1. WTO Reform and the Yaoundé Ministerial Statement – Norway's Ambassador Petter Ølberg has circulated a draft work plan addressing three issues: reforming decision-making, ensuring a level playing field on subsidies, and protecting development mandates and S&DT. Given current geopolitical tensions, the most realistic MC14 outcome is an agreement to continue discussions.

2. E-Commerce moratorium – Since 1998, WTO members have maintained a moratorium prohibiting customs duties on electronic transmissions, renewed every two years, and set to expire on March 31, 2026. Developed nations want it made permanent; developing countries including India oppose this, citing significant revenue losses.

3. Investment Facilitation for Development Agreement (IFDA) – Backed by 127 WTO members, the IFDA seeks to promote sustainable investment by simplifying procedures and reducing regulatory uncertainty. India and South Africa oppose its formal incorporation into the WTO's legal framework, arguing it undermines inclusive multilateralism and dilutes development safeguards.

4. Dispute Settlement Reform – Restoring the WTO's Appellate Body – dysfunctional since 2019 – is a critical MC14 agenda item. Proposals under discussion include expanding the panel from seven to nine

judges, converting membership from part-time to full-time, and insulating the appointment process from political interference.

5. Special and Differential Treatment (S&DT) – The US wants to restrict S&DT benefits for larger developing economies such as China, India, Brazil, and Indonesia. Developing countries view any dilution of S&DT as an existential threat to the WTO's development mandate.

6. Fisheries subsidies – Implementation and expansion of the Agreement on Fisheries Subsidies, achieved at MC12 (2022), remains on the agenda. LDC members are pushing for special and differential treatment in this domain.

7. Agriculture and Food Security – Developing nations including India are pushing for a permanent solution to the public stockholding controversy. LDCs are also pushing back against climate-linked trade barriers such as the EU's Carbon Border Adjustment Mechanism (CBAM), which they view as protectionism dressed in green clothing.

8. Trade and Environment – Ahead of MC14, 79 WTO members under the Trade and Environmental Sustainability Structured Discussions (TESSD) unveiled an outcome package covering climate-related measures, environmental goods and services, circular economy, and subsidies. Developing countries, however, remain wary that these discussions could impose additional compliance burdens on them.

What are India-specific challenges at the WTO?

India's engagement with the WTO is a study in competing pressures – balancing its development needs, food security imperatives, and export ambitions against the demands of a trading system that does not always reflect its realities. The key challenges are:

1. Agricultural subsidies and food security – India relies heavily on domestic production and public procurement to feed its population. Limiting agricultural subsidies to the WTO's 10% ceiling would directly compromise its developmental and food security objectives. The "Peace Clause" offers temporary protection from legal challenges, but a permanent solution remains elusive.

2. Public stockholding programme – India's large-scale public stockholding programmes for food security are contested by other WTO members, who argue they distort global trade. A durable, legally binding resolution to this issue is still pending.

3. Services trade barriers – India's greatest competitive strength lies in services – IT, finance, and education. Yet market access in developed countries remains restricted, including through visa caps such as the H-1B cap in the US. Negotiations under the General Agreement on Trade in Services (GATS) have not yielded adequate gains for India's service exporters.

4. TRIPS and generic medicines – The WTO's Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) constrains India's generic pharmaceutical industry, which supplies affordable medicines both domestically and to the world. Stringent patent rules limit India's ability to produce generics, with direct consequences for public health at home and in developing countries globally.

5. Non-Tariff Barriers – Developed countries routinely deploy non-tariff barriers – Sanitary and Phytosanitary (SPS) measures and Technical Barriers to Trade (TBT) – that Indian exporters find costly and difficult to comply with, creating an uneven playing field.

6. Opposition to plurilateral agreements – India has opposed plurilateral initiatives, including on investment facilitation, arguing there is no legitimate mandate for such negotiations at the WTO. While

this position is grounded in genuine concerns about equitable multilateralism, it has at times isolated India at WTO Ministerials.

7. Asymmetry in negotiating power – India regularly faces a significant power imbalance against developed country blocs. While building coalitions with other developing countries partially offsets this, it remains a structural challenge that limits India's ability to advance its interests effectively within the WTO.

What are the suggested WTO reforms?

Reform Area	Key Suggestion
Dispute Settlement Revival	Restore Appellate Body functionality; expand panel from 7 to 9 judges; make membership full-time; de-politicise appointments
Special and Differential Treatment (SDT) Reform	Replace self-declared developing-country status with objective criteria (GDP per capita, trade share, human development indicators); graduate advanced developing economies out of SDT benefits
Decision-Making	Frame clear guidelines for veto usage; consider voting for Appellate Body member election in lieu of consensus
New Rules on Emerging Domains	Consensus-based agreements on e-commerce, investment facilitation, digital trade, and climate-linked trade measures
India's 30 for 30 Proposal	India proposed at least 30 operational improvements to the WTO before its 30th anniversary. These include a one-year cooling-off period before hiring diplomats, resolving existing issues before taking up new ones, and a time-bound work programme to make dispute settlement more accessible for developing countries.
Transparency	WTO members should proactively disclose subsidies to build trust; negotiate processes should be made more inclusive of civil society and smaller members
Increasing Trade Participation	Efforts to make it easier, safer, and more viable for women and smaller businesses to participate in global trade, making the system more inclusive
Independent Arbiter	An independent panel could play the role of arbiter to evaluate competing claims and overcome political deadlocks

What should be India's role at MC14 and beyond?

1. Champion of multilateralism – India should reaffirm its support for trade multilateralism and reclaim its role as a normative leader for the Global South. India is actively negotiating bilateral trade agreements with the EU, UK, and US – giving it a strong hand at MC14 which it must use to defend the multilateral order rather than dilute it

2. Defending core WTO Principles – India must protect the foundational principles of the WTO – Most Favoured Nation, consensus-based decision-making, single undertaking, and S&DT — and push to strengthen the existing architecture to protect the interests of LDCs and developing countries.

3. Strategic alliances – India should forge and lead coalitions with other developing countries to defend S&DT and WTO's development mandate, while avoiding the perception of being a purely obstructionist actor.

4. Flexibility on plurilaterals – New Delhi should revisit its entrenched opposition to all plurilateral agreements. A more nuanced, case-by-case approach – engaging constructively on some initiatives while firmly opposing others – would better serve India's long-term interests.

5. Pushing for Dispute Settlement Restoration – India should unequivocally demand the restoration of the Appellate Body and support innovative solutions such as election-based appointment of Appellate Body members, bypassing the US veto.

What should be the Way Forward?

1. Restoring the Appellate Body – Members should explore innovative solutions such as election-based appointment of Appellate Body members to bypass the US veto, expand the panel from seven to nine judges, and convert membership from part-time to full-time. Without a functioning judicial arm, the WTO cannot enforce its own rules.

2. Reforming Special and Differential Treatment (S&DT) – Developing-country status must be determined through objective criteria such as GDP per capita, trade share, and human development indicators, rather than self-declaration. Advanced developing economies should be gradually phased out of S&DT benefits, while full protections are retained for LDCs.

3. Permanent solution on Public Stockholding – The WTO must move beyond the temporary "Peace Clause" and deliver a permanent, legally binding solution on public stockholding for food security. For countries like India, this is not a negotiating position – it is a developmental and humanitarian necessity.

4. Strengthening technical Assistance for LDCs – Adequate resources must be directed at WTO's technical assistance programmes to help Least Developed Countries and developing countries build negotiating capacity, meet compliance standards, and participate meaningfully in global trade negotiations.

5. New rules on emerging trade domains – Consensus-based agreements must be pursued on e-commerce, digital trade, investment facilitation, and climate-linked trade measures including the EU's Carbon Border Adjustment Mechanism (CBAM), which must be made development-compatible and not deployed as disguised trade barriers against developing nations.

6. A Credible Roadmap from MC14 – MC14 must produce a credible, time-bound roadmap for WTO reform. Without it, the WTO risks going the way of GATT in its final years – a body of rules that members observe only when convenient.

Conclusion

The WTO is at a crucial turning point. MC14 in Yaoundé is being held at a time of serious disruptions, driven by rising unilateral actions, geopolitical tensions, and a weakened dispute settlement system.

Despite its shortcomings, the WTO remains the most important platform for a rules-based global trade order. Reform is needed to rebuild trust and make the system more fair and inclusive. For countries like India, this is vital for economic sovereignty, food security, and long-term growth.

Read more– Indian Express
UPSC Syllabus – GS II: Important international institutions, agencies and fora – their structure, mandate, and India's concerns.

India's Agricultural Transformation – From Fields to Market: Explained Pointwise

India's agriculture sector has recently come into sharp focus. The country recorded an unprecedented foodgrain output of 357.73 Million Metric Tonnes (MMT) in 2024-25, surpassing all previous records. At the same time, India is engaged at the WTO's 14th Ministerial Conference (MC14) in Yaoundé (March 26–29, 2026), where food security and agricultural subsidies are key contested issues.

This article examines India's agricultural production systems, global standing, policy architecture, and farm-to-market value chain.

What is the significance of Indian agriculture in the economy?

India's agricultural sector remains the backbone of its rural economy and a critical driver of national development:

Aspect	Details / Significance
Contribution to Economy	Agriculture and allied activities contribute nearly one-fifth of India's Gross Value Added (GVA) at current prices.
Employment & Livelihoods	The sector employs approximately 46.1% of the workforce and supports close to 55% of the total population.
Growth Performance	Over the past five years, the sector has recorded an average annual growth rate of about 4.4% (constant prices), driven by improved practices, technological integration, and resilient production systems.

Global Standing	India has the second-largest agricultural land area in the world, positioning it as a key player in global food supply chains.
Overall significance	Agriculture is not just an economic sector-it is a social institution underpinning food security, rural livelihoods, and national sovereignty.

What are India's recent agricultural production achievements?

1. Record foodgrain output- India produced 357.73 MMT of foodgrains in 2024-25, an increase of 25.43 Million Metric Tonnes (MMT) over the previous year, driven by higher output of rice, wheat, maize, and coarse cereals (including millets/Shree Anna).

2. Horticulture surge- Horticulture production reached 362.08 MT in 2024-25 – surpassing total foodgrain output – comprising 114.51 MT of fruits, 219.67 MT of vegetables, and 33.54 MT of other crops. Production has grown from 280.70 MT in 2013-14 to 367.72 MT in 2024-25.

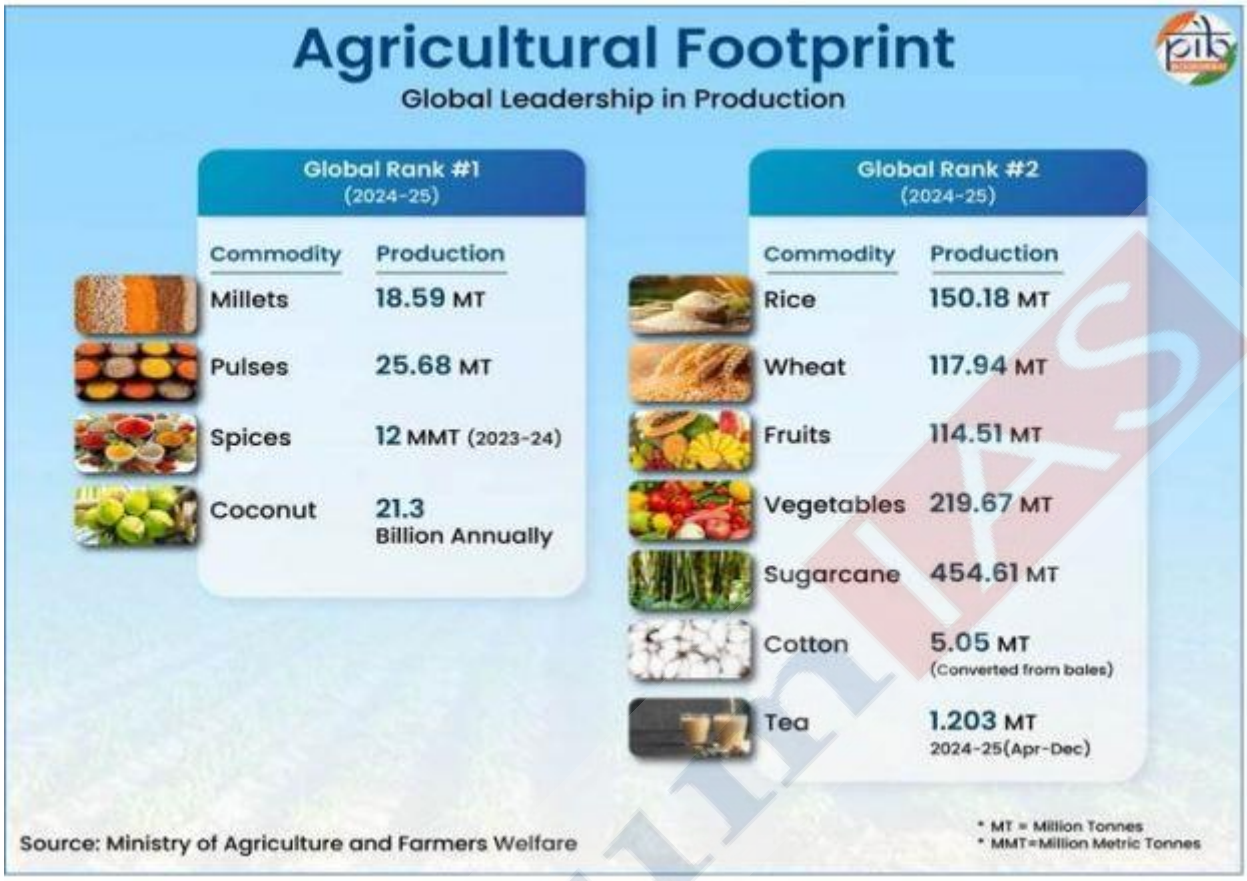
3. Export growth- Agricultural exports grew from USD 34.5 billion (FY20) to USD 51.1 billion (FY25) at a CAGR of 8.2 percent. Agri-food exports constituted 11.2 percent of India's total exports in FY25. The share of processed food in agri-exports rose from 14.9 percent (FY18) to 20.4 percent (FY25), signalling a shift towards value addition.

Source- PIB

Where does India stand globally as an agricultural producer?

The table below summarises India's global ranking and key production and export figures:

Commodity	Global Rank	Production (2024-25)	Export Value	Key Producing States
Rice	2nd	150.18 MT	USD 12.95 billion	UP, Telangana, West Bengal
Wheat	2nd	117.94 MT	Data not specified	UP, MP, Punjab
Pulses	1st	25.68 MT	USD 855 million	MP, Maharashtra, Rajasthan
Millets (Shree Anna)	1st	18.59 MT	USD 59.20 million	Rajasthan, Maharashtra, Karnataka
Fruits	2nd	114.51 MT	USD 1,818.56 million (Food&Vegetables combined)	AP, Maharashtra, UP, Gujarat
Vegetables	2nd	219.67 MT	(combined above)	UP, WB, MP, Bihar, Gujarat
Sugarcane	2nd	454.61 MT	Data not specified	UP, Maharashtra
Cotton	2nd	~5.05 MT	Data not specified	Karnataka, Maharashtra, Gujarat
Spices	1st	12 MMT (2023-24)	USD 4.52 billion (FY25)	MP, Gujarat, Andhra Pradesh
Coconut	1st	~21.3 billion nuts/year	USD 513 million (2024-25)	Kerala, Karnataka, Tamil Nadu
Tea	2nd	1.203 MT (Apr–Dec 2024-25)	USD 605.90 million (Apr–Oct 2025-26)	Assam, WB, Tamil Nadu, Kerala

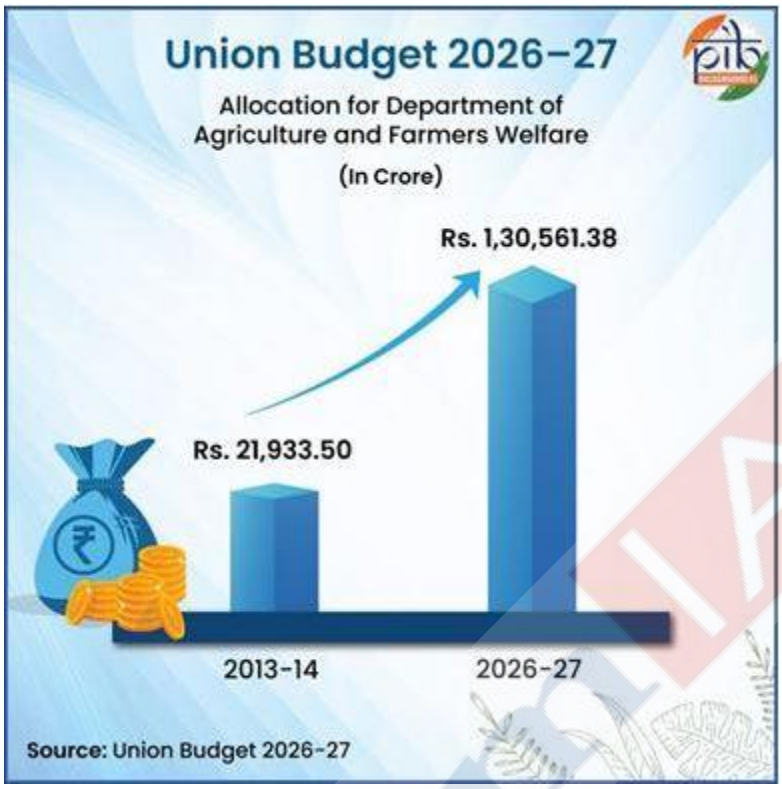


Source- PIB

The Union Budget 2026–27 focuses on promoting high-value crops through region-specific support. It encourages crops like *coconut, sandalwood, cocoa and cashew in coastal areas, agar in the North East,* and *nuts like almonds and walnuts in hilly regions*. This approach aims to use local conditions effectively and shift farmers towards more profitable crops.

What policy interventions support India's resilient production systems?

India's agricultural policy rests on three pillars: input productivity, financial investment, and mission-driven reform.



Source- PIB

1. Budgetary commitment- Budget allocation for the Department of Agriculture and Farmers Welfare grew from Rs. 21,933.50 crore (~USD 2.64 billion) in 2013-14 to Rs. 1,27,290.16 crore (~USD 15.34 billion) in 2025-26. The Union Budget 2026-27 further raised this to Rs. 1,30,561.38 crore (~USD 15.73 billion) – nearly a 6-fold increase in thirteen years.

2. Mission-mode productivity programmes:

- National Food Security and Nutrition Mission (NFSNM)- A centrally sponsored scheme to boost production of rice, wheat, pulses, and nutri-cereals/coarse cereals across the country.
- Mission for Aatmanirbharta in Pulses (2025–31)- It aims to achieve self-sufficiency in pulses by significantly enhancing domestic production and reducing import dependence.
- National Mission on Edible Oils (NMEO)- Including Oil Palm (NMEO-OP) and Oilseeds (NMEO-Oilseeds), it targets self-reliance in edible oils by 2030-31. Between 2014-15 and 2024-25, oilseed area rose by over 18 percent, production by nearly 55 percent, and productivity by about 31 percent. Domestic edible oil availability reached 121.75 lakh tonnes in 2023-24.

3. Quality Seeds and Soil Health:

- Sub-Mission on Seeds and Planting Materials (SMSP)- Approximately 6.85 lakh Seed Villages established, producing 1,649.26 lakh quintals of quality seeds.
- Soil Health Card Scheme- Approximately 25.55 crore cards issued as of mid-November 2025, covering 12 soil parameters (Nitrogen, Phosphorus, Potassium, Sulphur, Zinc, Iron, Copper, Manganese, Boron, pH, Electrical Conductivity, and Organic Carbon). Cards are renewed every two years.

- **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)- Gross irrigated area expanded to 55.8 percent, improving water-use efficiency through drip and sprinkler systems.**

4. Credit, Mechanisation and Technology:

- **Ground-level agricultural credit disbursement reached Rs. 28.67 lakh crore in FY 2024-25.**
- **7.72 crore operative Kisan Credit Card (KCC) accounts as of March 31, 2025 – providing single-window credit access for cultivation, post-harvest, and allied needs.**
- **27,554 Custom Hiring Centres (CHCs) established between 2014-15 and 2025-26, improving access to farm machinery for smallholders.**
- **Livestock support: approximately 125 crore FMD vaccinations since 2020 and 88.32 million artificial inseminations in 2024-25.**

5. Sustainable agriculture and extension:

- **Natural farming expanded to 17,632 clusters covering 6.39 lakh hectares, with 15.79 lakh farmers enrolled.**
- **Kisan Call Centres handled 30.65 lakh farmer queries in 2024-25.**
- **Ethanol blending saved over Rs. 1.44 lakh crore in foreign exchange as of August 2025.**

How has India strengthened farmer welfare and risk management?

1. Price and Income Support:

- **Minimum Support Price (MSP): Announced for 22 mandated crops, fixed at a minimum of 1.5 times the cost of production, with upward revisions for Kharif Marketing Season (KMS) 2025-26 and Rabi Marketing Season (RMS) 2026-27.**
- **PM-KISAN: Over Rs. 4.27 lakh crore disbursed across 22 instalments as on March 17, 2026. The scheme provides annual assistance of Rs. 6,000 per farmer family in three instalments of Rs. 2,000, directly to Aadhaar-linked bank accounts via DBT.**
- **PM Kisan Maandhan Yojana (PMKMY): Enrolled 24.95 lakh farmers (as on February 2, 2026), providing a minimum monthly pension of Rs. 3,000 upon attaining 60 years of age, for small and marginal farmers aged 18–40 years.**

2. Crop Insurance:

- **Pradhan Mantri Fasal Bima Yojana (PMFBY): Insured 4.19 crore farmers across 6.2 crore hectares in 2024-25. Since 2016-17, over 86 crore applications processed and claims exceeding Rs. 1.90 lakh crore disbursed. Coverage expanded by 32 percent compared to 2022-23, strengthening protection against climate and market-related risks.**

3. Cooperatives and Collective Action:

- **Of 67,930 PACS under computerisation, 54,150 have been onboarded onto ERP platforms, with 43,658 operational.**
- **18,183 new multipurpose cooperative societies registered by March 2025.**
- **National Cooperation Policy and Tribhuvan Sahkari University launched to strengthen governance and capacity-building in the cooperative sector.**

How is India modernising its agricultural markets and value chains?

1. Market Infrastructure:

- As of February 28, 2026, 49,796 storage projects received financial assistance of Rs. 4,832.70 crore, and 25,009 marketing infrastructure projects received subsidies of Rs. 2,193.17 crore.
- e-National Agriculture Market (e-NAM): The pan-India electronic trading portal now connects 1.8 crore farmers, 2.72 lakh traders, and 4,724 FPOs across 1,656 mandis in 23 states and 4 UTs -enabling AI-based quality assaying, e-bidding, and direct e-payment to farmers under One Nation One Market.
- 10,000 FPOs registered by February 28, 2026 under the Formation and Promotion of FPOs scheme (launched 2020).
- In the fisheries sector, 2,195 Farmers' Fisheries Producer Organisations (FFPOs) formed; Kisan Credit Card extended to 4.39 lakh fishers.

2. Food Processing and value addition:

- Food processing accounts for 12.91 percent of organised manufacturing employment.
- PM Kisan Sampada Yojana (PMKSY): 1,185 projects completed by November 30, 2025, building modern processing and cold-chain infrastructure.
- PLI Scheme for Food Processing Industry (PLISFI): 169 applications approved, mobilising investments of Rs. 9,207 crore; incentives of Rs. 2,162.55 crore disbursed by December 31, 2025.
- PM Formalisation of Micro Food Processing Enterprises (PMFME): Supported 4,04,062 applications, facilitating 1,72,707 loans worth Rs. 14.19 thousand crore, with seed capital of Rs. 1,277.45 crore extended to women SHGs.

3. Procurement and food security:

- The government procures foodgrains at MSP to ensure food security and provide price support to farmers. In Rabi Marketing Season (RMS) 2025-26, 300.35 LMT of wheat was procured benefiting 25.13 lakh farmers, while in Kharif Marketing Season (KMS) 2024-25, 832.17 LMT of paddy was procured benefiting 118.59 lakh farmers.
- Under the National Food Security Act, subsidised foodgrains are provided to 81.35 crore beneficiaries – covering 75 percent of the rural and 50 percent of the urban population.

4. Digitisation of the Public Distribution System (PDS):

- One Nation One Ration Card (ONORC): Operationalised across all 36 States and UTs with 99.8 percent Aadhaar seeding of ration cards.
- Over 99 percent of the 5.43 lakh Fair Price Shops equipped with ePoS devices, digitising more than 98 percent of transactions.
- In FY24, Rs. 267.6 crore transferred via DBT to over 10 lakh beneficiaries, improving targeting and accountability.

SDG Linkages: India's agricultural initiatives align directly with *SDG 2 (Zero Hunger), SDG 9 (Industry, Innovation and Infrastructure), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action).*

What are the challenges confronting Indian agriculture?

Despite impressive achievements, Indian agriculture faces structural and emerging challenges:

1. Smallholder fragmentation- The majority of India's farmers are small and marginal, with limited bargaining power, poor access to institutional credit, and vulnerability to weather shocks – despite government programmes, outcomes remain uneven.

2. Post-harvest losses- India loses a significant share of horticultural produce due to inadequate cold-chain infrastructure. Despite growth in Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) and storage investments, cold-chain coverage remains far below demand.

3. Import Dependence in edible oils- India remains heavily dependent on imported edible oils (primarily palm oil from Indonesia and Malaysia). The National Mission on Edible Oils (NMEO) seeks to address this, but self-reliance by 2030-31 requires accelerated progress.

4. Climate vulnerability- Erratic monsoons, heat waves, and unseasonal rainfall increasingly threaten yields. While Pradhan Mantri Fasal Bima Yojana (PMFBY) covers risk ex-post, adaptation infrastructure (drought-resistant varieties, micro-irrigation) needs further scaling.

5. Input-Intensive model and soil degradation- Heavy fertiliser and pesticide use has contributed to soil health deterioration. While Soil Health Cards and natural farming address this, transition at scale remains a challenge.

6. MSP coverage and realisation gaps- MSP is announced for 22 crops but effective procurement happens for only a handful – primarily wheat and paddy. A large proportion of farmers, especially in non-procurement states, cannot access MSP benefits.

7. WTO constraints on domestic support- India's public stockholding programmes and agricultural subsidies face continued challenges within the WTO framework. The 10 percent subsidy ceiling under the Agreement on Agriculture constrains India's food security architecture.

8. Value-addition gap- Despite a rise in processed food exports, India's processing rate for fruits and vegetables remains low relative to global benchmarks, leading to high waste and suboptimal farmer incomes.

What should be the Way Forward?

1. Accelerate micro-irrigation and water efficiency- Expand PMKSY coverage beyond 55.8 percent to ensure water access even for rain-shadow and arid regions. Promote precision irrigation and rainwater harvesting for long-term water security.

2. Scale cold-chain and processing infrastructure- Substantially increase investment in cold-chain logistics, food processing clusters, and rural warehousing to reduce post-harvest losses – particularly for perishable horticultural produce.

3. Expand MSP access beyond wheat and paddy- Move toward a legally assured and operationally expanded procurement mechanism covering pulses, oilseeds, and coarse cereals to benefit farmers across diverse agro-climatic zones.

4. Deepen the FPO ecosystem- The registration of 10,000 FPOs must be followed by capacity-building, market linkages, and financial handholding so FPOs become viable economic entities rather than merely paper structures.

5. Accelerate edible oil self-sufficiency- Intensify the NMEO-Oilseeds and NMEO-Oil Palm programmes to reduce India's dependence on edible oil imports and improve trade balance in agri-commodities.

6. Mainstream natural farming and soil health practices- Expand natural farming clusters beyond 17,632, with incentive structures and market linkages for naturally-farmed produce, reducing the chemical input burden on soils and farmers.

7. Defend food security interests at WTO- India must continue to push for a permanent, legally binding solution to public stockholding at the WTO MC14 and beyond, resisting any dilution of its domestic support mechanisms under pressure from developed countries.

8. Leverage digital agriculture infrastructure- Deepen e-NAM integration, promote AgriStack (a digital public infrastructure for agriculture), and mainstream AI-based advisory services through Kisan Call Centres to improve information symmetry and market integration for farmers.

Conclusion

India has come a long way. From food shortages to record harvests and growing agri-exports, the journey has been remarkable. Yet challenges like smallholder vulnerability, post-harvest losses, edible oil imports, and WTO constraints remain. How India addresses these will determine whether agriculture merely feeds the nation or truly empowers its farmers.

Read more– PIB
UPSC Syllabus- GS III– Indian Economy- Food Security; Major Crops, Cropping patterns, Storage, Transport and Marketing of agricultural produce

Mangrove Ecosystem – Importance & Threats – Explained Pointwise

As world grapples with extreme weather events & rising sea levels, blue carbon ecosystems such as mangroves are critical to climate & economic resilience. However, historically, mangroves have been on the margins of planning & policy priorities in spite of their vital role in anchoring coastal economies & protecting millions from climate extremes.

Source- TOI

What are Mangroves?

- Mangrove forests are a unique type of coastal rainforest found in tropical and subtropical regions. They are characterized by trees and shrubs that thrive in saline and waterlogged conditions, typically along estuaries, deltas, and sheltered coastlines.
- Key features of Mangrove forests:
    - Adaptation to Saline Water: Mangrove trees have developed special adaptations, such as salt-filtering roots and salt-excreting leaves, to survive in saltwater environments.
    - Pneumatophores: Aerial roots that grow upwards from the soil, allowing the roots to breathe (e.g., Avicennia species).
    - Prop Roots/Stilt Roots: Roots that grow from the trunk and branches, providing stability in soft, muddy substrates (e.g., Rhizophora species).
    - Vivipary: Seeds germinate while still attached to the parent tree, increasing their chances of survival in the harsh environment.
- Some important mangrove forests in India are:
    - Sundarbans, West Bengal: This is the largest single block of tidal halophytic mangrove forest in the world and a UNESCO World Heritage Site. It's famous for its unique biodiversity, including the Royal Bengal Tiger, and is formed by the confluence of the Ganga, Brahmaputra, and Meghna Rivers.
    - Bhitarkanika, Odisha: The second-largest mangrove ecosystem in India, known for its rich biodiversity, including saltwater crocodiles. It's a Ramsar site and a National Park.
    - Pichavaram, Tamil Nadu: One of the largest mangrove forests in Tamil Nadu, known for its unique backwater system and eco-tourism.
- The Sundarbans are located in the delta of the Ganga, Brahmaputra, and Meghna rivers. They get both fresh water from rivers and salty water from the Bay of Bengal.

SUNDARBANS:

- Sundarbans is a vast mangrove region in the Ganges-Brahmaputra-Meghna delta in the Bay of Bengal.
- It stretches from West Bengal (India) to Bangladesh, covering 4,260 sq. km in India, which accounts for 60% of the country's mangrove forests.
- It acts as a natural barrier against coastal erosion and storms, supports diverse wildlife, and provides livelihoods through fishing, honey collection, and eco-tourism.
- The Indian Sundarbans is home to 428 bird species, including rare ones like the Masked Finfoot, Buffy Fish Owl, Goliath Heron, and Spoon-billed Sandpiper.
- It also hosts nine out of 12 kingfisher species found in India. The region is famous for its Royal Bengal tigers, with around 101 tigers in the Sundarbans Tiger Reserve.
- The Indian Sundarbans is a UNESCO World Heritage Site and a Ramsar Site, emphasizing its global ecological significance.

What is the importance of Mangroves?

1. Biodiversity Hotspots: They are rich in diverse flora and fauna, supporting unique species adapted to the intertidal zone.
2. Coastal protection: Mangroves act as natural barriers, protecting coastlines from erosion, storm surges, tsunamis, and high winds, thereby reducing the impact of natural disasters.
3. Nurseries for marine life: Their intricate root systems provide sheltered breeding and nursery grounds for a wide array of fish, crabs, shrimp, and other invertebrates, which in turn supports coastal fisheries.
4. Carbon sinks: These ecosystems are highly effective at sequestering large amounts of "blue carbon" (carbon stored in coastal and marine ecosystems) in their biomass and sediments, contributing to climate change mitigation.
5. Livelihood support: Mangroves directly support the livelihoods of millions of coastal communities through activities like fisheries, honey collection, and sustainable forestry products.

What are the threats that they are facing?

1. Anthropogenic Pressures:
   - Encroachment and Conversion: For aquaculture (shrimp farms), agriculture, urban development, and industrial expansion.
   - Pollution: Discharge of industrial effluents, domestic sewage, and agricultural runoff.
   - Over-exploitation: Unsustainable harvesting of timber, fuelwood, and non-timber forest products.
2. Climate change:
   - Sea-Level Rise: Mangroves are highly sensitive to sea-level rise, which can inundate them beyond their tolerance levels.
   - Increased Frequency of Extreme Weather Events: Cyclones and storms can severely damage mangrove forests.
3. Reduced freshwater flow: Diversion of river water for irrigation and other uses reduces freshwater flow to deltas, increasing salinity and stressing mangroves.

4. **Invasive species: Non-native species may outcompete or disrupt native mangrove species, reducing biodiversity and changing ecosystem dynamics.**

What have been the various initiatives for the conservation of mangrove ecosystem?

1. **MISHTI Scheme (Mangrove Initiative for Shoreline Habitats & Tangible Incomes): Launched in June 2023, this flagship program aims to restore and reforest approximately 540 km^2 of mangroves across 9 states and 3 Union Territories over five years. It promotes best management practices and seeks to make local communities stakeholders in conservation and income generation.**
2. **National Coastal Mission Programme: Through its 'Conservation and Management of Mangroves and Coral Reefs' initiative, the government provides guidance and financial assistance to states for preparing and implementing Management Action Plans (MAPs) focusing on survey, demarcation, afforestation, and awareness.**
3. **Coastal Regulation Zone (CRZ) Notification (2019): Under the Environment (Protection) Act, 1986, this regulation strictly regulates development activities in mangrove-adjacent coastal zones.**
4. **Co-Management Committees: In states like Maharashtra, co-management approaches involving local communities, gram panchayats, and women's self-help groups have successfully restored mangroves while improving climate resilience and livelihoods.**
5. **NGO and Public Engagement: Projects led by organizations like WWF India and the Aga Khan Rural Support Programme actively involve locals in restoration and stewardship, promoting education and sustainable aquaculture within mangrove ecosystems.**
6. **Mangrove Alliance for Climate: India became a member of the Mangrove Alliance for Climate (MAC) in 2022, enhancing international knowledge-sharing and scaling up best conservation practices.**

What can be the way forward?

1. **Enhance and enforce national and state-level policies: Update and rigorously enforce laws (like India's CRZ Notification, Forest Acts, and EIA norms) to prohibit destructive activities, enable restoration, and define clear frameworks for ownership and access rights.**
2. **Integrate mangroves into climate and disaster adaptation plans: Recognize mangroves as "natural coastal infrastructure" and prioritize their protection in all national and local planning.**
3. **Empower local communities, women's groups, and indigenous peoples: Communities that posses deep knowledge of mangrove ecosystems & rely on them for their livelihoods – engage them in co-management, benefit-sharing, stewardship, and policy decisions. Capacity-building and community-led restoration have repeatedly proven effective.**
4. **Emphasize natural regeneration: Move beyond monoculture mass-planting towards methods that facilitate the natural recovery of mangrove ecosystems, with targeted planting only where necessary.**
5. **Innovate restoration techniques: Employ methods like the "trenched hydrology" approach for better survival and ecosystem function of restored mangroves.**
6. **Integrated ownership models like Eco-development Communities & Joint Forest Management Committees must be mobilized for conservation of urban mangroves. Engagement platforms like 'Mangrove Mitras' can open avenues for urban citizens & local communities to engage constructively in the conservation of mangroves.**

Conclusion:

Policymakers & businesses must recognise mangroves as vital climate & economic infrastructure rather than mere biodiversity zones. Protecting & restoring these ecosystems demands a coalition where science, business & community voices work in harmony & tandem – each bringing their unique strengths to secure their future.

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Delimitation in India: Ensuring Federalism Within Representation – Explained Pointwise

India is approaching a major electoral milestone. Census 2026 is around the corner. Once Census results are declared, the long-pending delimitation exercise will begin. The freeze on Lok Sabha seats that has been in place since 1976 will finally end. For the first time in nearly five decades, seats will be reallocated among states.

This has raised a serious concern. States that successfully controlled their population growth may end up losing seats. States that did not control their population may end up gaining more seats. This creates a fundamental question – should states that performed well on population stabilisation be penalised in a federal democracy?

What is Delimitation and What is its Constitutional Basis in India?

Delimitation refers to the process of redrawing the boundaries of electoral constituencies to ensure fair representation based on population changes.

Constitutional Basis

Article 81	**It requires seat distribution among states such that the ratio of seats to population is "as far as practicable, the same for all states"**
Article 82	**It mandates delimitation of Lok Sabha constituencies after every Census**
Article 170	**It mandates the same for State Legislative Assemblies**
Delimitation Commission Act, 2002	**It provides the statutory framework for delimitation; the Delimitation Commission constituted under it is a statutory body whose orders have the force of law and cannot be challenged in any court.**

Historical timeline of Delimitation in India

Year	Event
1952, 1963, 1973	First three delimitation exercises conducted

1976	42nd Amendment froze seat allocation (based on 1971 Census)
2002	84th Constitutional Amendment extended freeze until 2026
2002–08	Last Delimitation Commission – only redrew internal boundaries, did not reallocate seats among states
Post-2028	Next Commission (after the Census post-2026, likely around 2028–29) – first reallocation of seats among states since 1976

What is the significance of the upcoming Delimitation Exercise?

1. Restoring democratic legitimacy-India's population has nearly tripled – from 541 million in 1971 to 1.4 billion today – yet the Lok Sabha has been frozen at 543 seats all along. This growing distortion in the voter-to-MP ratio means millions of citizens are effectively under-represented. The upcoming exercise is an opportunity to restore genuine one person, one vote equity.

2. First Seat reallocation in five decades-Unlike the 2002–08 Commission which quietly redrew boundaries within states without touching seat allocation, the next Commission will reallocate seats among states for the first time since 1976 – a far more consequential and politically charged exercise that will reshape India's parliamentary arithmetic.

3. Implementation of Women's Reservation -The Constitution (106th Amendment) Act, 2023 mandates 33% reservation for women in Lok Sabha and state assemblies. Crucially, this reservation kicks in only after the next delimitation – making this exercise a direct prerequisite for India's most significant gender representation reform in decades.

4. Updating Reserved Constituencies- SC and ST reserved constituencies must be redrawn using updated Census 2026 data, ensuring that socially marginalised communities continue to receive adequate and meaningful representation in legislatures.

5. Administrative efficiency- A better voter-to-representative ratio improves grassroots governance and electoral administration – something urban centres like Mumbai and Bengaluru experienced firsthand after the 2002 exercise.

What are the Key concerns associated with the Delimitation Exercise?

1. The Population vs. Development Tension– At the heart of this debate is a troubling irony -states that invested in education, healthcare, and family planning are being asked to accept fewer seats, while states that lagged on these fronts stand to gain more. National Family Health Survey (NFHS-5) (2019–21) data makes this stark:

State	Total Fertility Rate (2021)	Lok Sabha Seats (Current)	Projected Seats (888-member House) (Unofficial estimate)

Uttar Pradesh	~2.35	80	151
Bihar	~3.0	40	82
Tamil Nadu	~1.6	39	53
Kerala	~1.8	20	23

2. Federal imbalance and the North-South divide- Southern states (Tamil Nadu, Kerala, Karnataka, Andhra Pradesh, Telangana) contribute significantly to national revenues, yet population-based delimitation may reduce their parliamentary representation, causing resentment. This concern extends beyond the South to states like Punjab, Haryana, Himachal Pradesh, and Goa, which also achieved replacement-level fertility early.

3. The 84th amendment's unfulfilled promise- The seat freeze was introduced to motivate states to control population. However, by 2021, Bihar, UP, Jharkhand, Meghalaya, and Manipur still record TFRs above 2.1. States that honoured this constitutional commitment are set to lose seats, while those that did not are set to gain. This directly defeats the amendment's original purpose.

4. Risk of political manipulation- Boundary redrawing is never purely technical. The 2022 J&K delimitation faced serious allegations of political bias from several regional parties, highlighting that even statutory commissions are not entirely above political controversy. The risk of gerrymandering, which means drawing boundaries to favour particular parties or groups, remains a genuine concern.

5. Delays and institutional resistance- Census 2021 was delayed to 2026. Based on standard Census processing timelines, results are estimated to be declared around 2028, though no official date has been confirmed by the Registrar General of India. The Commission must then be constituted and complete its work before the 2029 elections, leaving an uncomfortably tight window for a constitutionally complex exercise.

The DemPer Model: A Framework for federal fairness

One proposed solution involves embedding a Demographic Performance (DemPer) principle into the delimitation formula. This approach rewards states that delivered on population stabilisation without abandoning the population-based foundation.

The Finance Commission Precedent: The Finance Commission already uses a composite formula. It gives 50% weight to population, with the rest distributed across demographic performance, fiscal discipline, and forest cover. The delimitation exercise can reasonably borrow from this logic.

The DemPer Formula

Component	Weightage	Criterion

Early Achievement	10%	TFR ≤ 2.1 achieved before 2005
Rate of TFR Decline	90%	Rate of decline between 2005 and 2021

Key Design features:

- **DemPer applies only to additional seats beyond the existing 543. Population stays overwhelmingly dominant.**
- **Every state gains seats in absolute terms. More populous states gain more in absolute numbers.**
- **No state is penalised. Only the distribution of incremental gains is calibrated by performance.**
- **Lok Sabha should be capped at 700 to preserve the quality of parliamentary debate.**

What Should be the Way Forward?

1. Adopt a weighted representation model- Drawing on the broader principles of cooperative federalism emphasised by the Punchhi Commission (2010), a balanced approach combining population with development indicators (such as literacy, health outcomes, and sustained fertility control) can help reconcile democratic equality with federal fairness.

2. Constitutional and Legislative reforms–Amend Articles 81 and 82 to explicitly allow a composite representation formula. The Finance Commission's devolution model already provides a constitutional precedent for multi-criteria allocation and delimitation can follow suit.

3. Strengthen Institutional Independence -The Delimitation Commission must be genuinely insulated from political pressure. The Supreme Court reinforced this in TN Seshan v. Union of India (1995) and Kuldip Nayar v. Union of India (2006), both emphasising independence and federal balance as non-negotiable pillars of fair delimitation.

4. Pre-Commission political consensus -An All-Party Parliamentary Committee should be constituted before the Commission is notified. Getting political buy-in on methodology upfront is far more effective than fighting legal and federal battles after awards are declared.

5. Invest in data infrastructure -The 2019 Amendment Bill's proposal for a Central Data Bank on demographic data must be operationalised urgently. Good delimitation is only as reliable as the data it rests on.

6. Learn from Global Best Practices:

- **Germany uses proportional representation to prevent regional marginalisation.**
- **Canada uses independent commissions with multi-criteria mandates. India can thoughtfully adapt these models to its own federal context.**

Conclusion

Delimitation is ultimately a question of what kind of democracy India wants to be. Pure population arithmetic ignores federal reality. Abandoning population entirely ignores democratic equality.

The answer lies in a balanced framework that treats population as the foundation and demographic performance as a corrective. Fair delimitation is not just a technical exercise. It is a commitment to a Union that works for all its states, not just the most populous ones.

Read more– The Hindu
UPSC Syllabus- GS 2– Issues and challenges pertaining to the federal structure