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Content

Navigating Global Trade Barriers Through FTAs

This editorial is based on "Rise of protectionism and the free trade conundrum" which was published in Hindustan Times on 27/02/2025. The article brings into the picture the global shift towards protectionism, especially in the US, where the revival of the "America First" agenda signals a move away from multilateral trade.

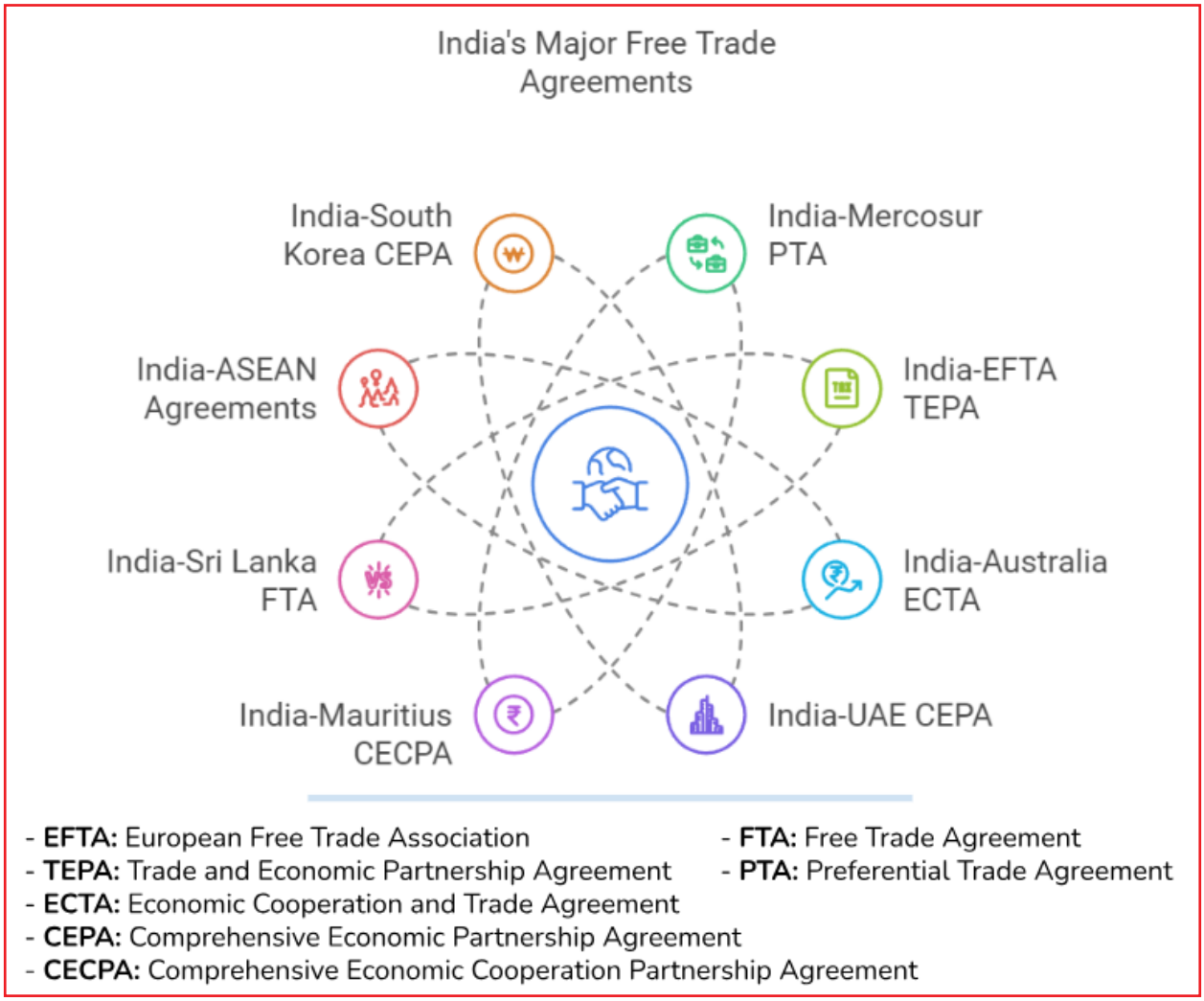
Tag: GS Paper - 3, Effect of Policies & Politics of Countries on India's Interests, GS Paper - 2, International Treaties & Agreements, Government Policies & Interventions

Despite widespread academic support for **free trade**, **rising protectionist economic policies** have gained global traction, particularly in developed nations like the US, recent election has brought back **"America First" agenda** signals a return to **mercantilist principles, higher tariffs, and bilateral deal-making** outside established multilateral frameworks like the WTO. India must navigate this shifting landscape **through meticulous partnerships and effective negotiation strategies** to defend its interests in bilateral, multilateral bilateral trade relations and overall **geo-economic outlook.**

What Role does Free Trade Agreements Play in India's Geo-Economic Outlook?

- **Boost to Exports and Market Access:** FTAs provide Indian exporters preferential market access, reducing **tariffs and non-tariff barriers,** making Indian goods more competitive globally.
  - This is crucial for sectors like **textiles, pharmaceuticals, and electronics,** where India enjoys a comparative advantage.
  - With growing global trade fragmentation, FTAs help Indian industries integrate into global supply chains, enhancing export-led growth.
    - For instance, under the **CEPA with the UAE,** India's exports to the UAE reached **$31.3 billion in 2022-23,** marking a **12% increase from $28 billion in 2021-22.**
- **Job Creation and Industrial Growth:** By expanding market opportunities, FTAs encourage **manufacturing expansion,** boosting employment in labor-intensive sectors like textiles, leather, and agriculture.
  - Lower input costs due to **duty-free imports under FTAs** also help MSMEs scale up and compete globally.
  - Strengthening domestic industries through FTAs aligns with **India's Production-Linked Incentive (PLI) schemes**, attracting foreign investment.
  - **India's textile industry,** once faced a setback, is now on the brink of expansion, with total textile exports projected to reach US$ 65 billion by FY26, largely attributed to India's rising trade agreements.
- **Strengthening India's Position in Global Supply Chains:** FTAs facilitate integration into **global value chains (GVCs)** by promoting trade in intermediate goods, reducing dependency on single sources like **China.**
  - This is vital as India seeks to position itself as a manufacturing hub under **'Make in India' and 'Atmanirbhar Bharat.'**
  - India's FTA negotiations with the **UK, EU, and Canada** aim to boost sectors like **automobiles, electronics, and IT services**, enhancing India's GVC participation.
- **Attraction of Foreign Direct Investment (FDI):** FTAs improve **investor confidence by ensuring a stable trade environment,** leading to increased FDI inflows, especially in manufacturing and services.
  - By offering tariff concessions, India attracts investment from partner countries looking to access its large domestic market.
  - For instance, the **India-Republic of Korea Comprehensive Economic Partnership Agreement** eases restrictions on foreign direct investments for both countries.
  - Also, in **October 2021,** the **UAE pledged to allocate US$75 billion** in sovereign funds to India to help promote clean energy.
- **Energy Security and Raw Material Access:** Trade agreements facilitate duty-free or concessional imports of crucial raw materials like **crude oil, LNG, and rare earth minerals,** ensuring supply chain resilience.
  - This is critical as India aims to transition to clean energy and reduce import dependency on a few countries.
  - India is actively seeking to secure rare earth minerals through partnerships with countries like Australia, by joining initiatives like the **Minerals Security Partnership** (MSP).

- **Agricultural and Dairy Sector Growth:** FTAs open new markets for Indian agricultural exports like **rice, spices, and marine products**, boosting farmer incomes and rural development.
  - However, careful negotiations are needed to protect vulnerable sectors like dairy from excessive competition.
  - For instance, the **India-Japan Comprehensive Economic Partnership Agreement (CEPA)** removes duties on almost 90% of products traded between the two countries including many agricultural products.
- **Strategic and Geopolitical Leverage:** FTAs are vital tools for economic diplomacy, strengthening India's global influence and reducing reliance on China-centric supply chains.
  - By engaging with diverse partners, India counters China's dominance in regional trade and promotes its Indo-Pacific strategy.
  - For instance, India recently **signed a Trade and Economic Partnership Agreement (TEPA) with EFTA (Switzerland, Norway, Iceland, Liechtenstein) in 2024**, enhancing economic resilience.



What are the Key Issues Protectionism Poses in India's Geo-Economic Outlook?

- **Declining Export Opportunities and Trade Barriers:** As major economies impose **higher tariffs and non-tariff barriers** to protect their domestic industries, Indian exports face reduced market access and competitiveness.

- This particularly affects labor-intensive sectors like **textiles, gems & jewelry, and agricultural products,** limiting India's ability to expand global trade.
- Protectionist policies like **localization rules and increased tariffs in the U.S.** and EU hurt Indian manufacturers, leading to a slowdown in export growth.
- For instance, India is opposed to the **EU's proposal to impose high tariffs of 20% to 35% from January 2026 on high-carbon goods** including steel, aluminium and cement.
  - The EU has so far not indicated any relief, saying the higher tariffs were part of its clean energy targets.

- **Trade Wars and Retaliatory Tariffs:** The rise of trade conflicts between **major economies, such as the U.S.-China trade war disrupts** global trade flows, indirectly affecting India's exports and investments.
  - Countries imposing retaliatory tariffs make Indian goods more expensive, reducing demand in key markets like the U.S. and EU.
  - Additionally, India's trade deficit with key partners may widen as protectionist measures disrupt balanced trade agreements.
    - For instance**, India's exports to China contracted by 14.85%**, from $13.48 billion in April 2023-January 2024 to $11.48 billion in **April 2024-January 2025** due to extended protectionism measures.
- **Reduced Foreign Direct Investment (FDI) and Capital Inflows:** Tighter investment restrictions in developed economies, particularly on foreign acquisitions, make it harder for Indian companies to expand globally and attract capital.
  - The **U.S. and EU** are implementing stricter foreign investment screening mechanisms, affecting Indian firms seeking to acquire technology and businesses abroad.
  - Global foreign direct investment (FDI) fell by **2% to $1.3 trillion in 2023** amid an economic slowdown and rising geopolitical tensions, according to the **World Investment Report 2024.**
    - Total (or gross) FDI inflows into India fell over **16% to $70.9 billion (Rs 6 lakh crore) in FY24.**
- **Restrictions on IT and Services Exports:** Many developed countries are tightening **work visa policies and implementing data localization laws**, directly impacting India's IT and outsourcing sectors.
  - **Stricter H-1B visa norms and rising anti-outsourcing sentiment** in the U.S. and Europe make it harder for Indian tech professionals to access key markets.
    - Indian skilled workers received **only 72.3%** of all **H-1B visas** issued between October 2022 to September 2023.
  - This weakens India's dominance in the global IT sector, affecting employment and foreign exchange earnings.
- **Disruptions in Supply Chains and Higher Import Costs:** Global protectionist measures disrupt supply chains, making it harder for India to source critical raw materials like **semiconductors, rare earth metals, and energy resources**.
  - Import restrictions in countries like the **U.S. and China** increase costs for Indian manufacturers, affecting sectors like electronics, defense, and renewable energy.
  - For instance, India still **imports 85% of its crude oil**, and post-Russia-Ukraine war, crude oil prices surged, raising India's import bill.
    - Additionally, **India imports about 65-70% of its electronic components, mainly from China**, posing significant concern.
- **Rising Costs for Indian Pharma Exports and Generic Drugs Market:** As developed nations **tighten intellectual property (IP) laws and impose stricter regulatory standards** on pharmaceuticals, Indian generic drug exports face higher compliance costs.
  - Countries like the **U.S. and EU are increasing scrutiny** on Indian pharmaceutical firms, delaying approvals and limiting market access.
  - The **World Health Organization** linked Indian-made cough syrups to the acute kidney failure and deaths of 66 children in the Gambia, which further questions India's credibility.
- **Weakening India's Role in Multilateral Trade Agreements:** With rising protectionism, developed economies are focusing more on regional trade blocs like **Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP)**, sidelining India in global trade negotiations.

- The lack of access to these agreements puts India at a competitive disadvantage, as its exports face higher tariffs and non-tariff barriers compared to countries within these blocs.
- **India's exclusion from RCEP** has already resulted in trade losses, and further protectionist trends could isolate India economically.

➢ **Inflationary Pressures Due to Limited Access to Cheaper Imports:** When countries impose protectionist policies, global prices for essential commodities like **food, fuel, and industrial inputs rise**, increasing inflationary pressures in India.

- Restrictions on agriculture exports by countries like **Indonesia (palm oil) and Russia (wheat)** have led to higher prices for Indian consumers.
  - **Indonesia's palm oil export ban** in 2023 led to an increase in edible oil prices in India.

➢ **Impact on India's Geopolitical Influence in Global Trade Policy:** As countries embrace economic nationalism, India faces challenges in positioning itself as a leader in global trade governance.

- The increasing use of **unilateral protectionist measures by developed economies reduces the relevance of WTO-led negotiations,** limiting India's influence in shaping fair trade policies.
- Despite India's **G20 Presidency in 2023 advocating WTO reforms**, major economies like the U.S. and EU continued imposing unilateral tariffs**, sidelining India's push for multilateralism**.

How can India Protect its Economic Interests in a Shifting Geoeconomic Landscape?

➢ **Fast-Tracking Free Trade Agreements (FTAs) for Market Diversification:** India must accelerate the negotiation and implementation of FTAs with key economies to secure preferential market access and reduce tariff barriers.

- Strengthening trade ties with regions like the **EU, UK, Canada, and GCC** will help counter growing protectionism in developed economies.
- A balanced approach is **needed to protect domestic industries while ensuring global competitiveness.**
  - Prioritizing **services trade, digital economy clauses, and investment protection in FTAs** will create long-term economic resilience.

➢ **Strengthening Domestic Manufacturing and Global Value Chain Integration:** India must deepen its participation in global value chains (GVCs) by **enhancing domestic manufacturing capacity and reducing dependence on imports.**

- Strengthening the **Production-Linked Incentive (PLI) schemes and simplifying logistics and supply chains** will make Indian industries globally competitive.
- Focusing on high-value sectors like **semiconductors, electronics, and green technology** will reduce vulnerabilities in strategic areas.
  - Aligning trade policies with **export-oriented manufacturing will help India capture a larger share of global trade.**

➢ **Enhancing Trade Diplomacy and Strategic Economic Alliances:** India must adopt a proactive trade diplomacy strategy to counter rising protectionism and negotiate favorable trade terms with key partners.

- Strengthening engagements in forums like the **G20, WTO, and BRICS** will help shape global trade rules that align with India's economic interests.
- Expanding **economic cooperation with Africa and Latin America** will provide alternative markets and reduce dependence on traditional trading partners.
  - Leveraging **diplomatic channels to resolve trade disputes** and lobbying against unfair trade practices will safeguard India's exporters.

➢ **Expanding Services Trade and Digital Economy Cooperation:** India must leverage its strengths in **IT, fintech, and digital services** to expand services trade and counter protectionist policies in developed economies.

- Negotiating liberalized **visa regimes in FTAs** will ensure smooth mobility of **Indian professionals** and maintain India's dominance in global outsourcing.
- Strengthening **Personal Digital Data Protection Act** and aligning with **global digital trade frameworks** will improve India's position in cross-border digital services.
  - Promoting **domestic fintech startups** and expanding financial services to global markets will ensure long-term economic growth.

- **Strengthening Energy Security Through Diversification and Green Transition:** India must secure **long-term energy supply agreements** and **invest in renewable energy** infrastructure to reduce dependency on volatile global energy markets.
  - Expanding partnerships for **oil and gas imports** with diversified suppliers will ensure stable energy pricing and supply security.
  - Strengthening **domestic solar, wind, and hydrogen energy production** will reduce reliance on fossil fuel imports and enhance sustainability.
  - Encouraging **private investment in clean energy and battery storage** will help India transition to a green economy.
- **Strengthening Agricultural Trade and Enhancing Global Food Security Role:** India must modernize its agricultural sector and **negotiate favorable trade terms to boost agro-exports** while protecting domestic farmers from unfair trade barriers.
  - Investing in **agri-tech, cold storage infrastructure, and farm mechanization** will improve productivity and export quality.
  - Strengthening **WTO negotiations to counter unfair subsidies** and restrictive trade policies by developed countries will protect Indian farmers.
    - Promoting **sustainable farming practices and export-oriented agriculture** will position India as a global food security leader.
- **Attracting Foreign Direct Investment (FDI) and Strengthening Industrial Policy:** India must create a **predictable, investor-friendly regulatory environment** to attract global capital in high-growth sectors.
  - **Simplifying land acquisition, taxation policies, and labor laws** will encourage foreign companies to set up manufacturing and R&D centers in India.
  - Strengthening **intellectual property rights (IPR) protection** and ensuring ease of doing business will improve investor confidence.
  - Expanding **special economic zones (SEZs) and industrial corridors** will create globally competitive manufacturing hubs.
- **Strengthening Financial and Monetary Resilience Against Global Shocks:** India must ensure **macroeconomic stability** by **maintaining strong foreign exchange reserves,** managing inflation, and diversifying its trade currency basket.
  - Promoting the **internationalization of the Indian Rupee** and **reducing reliance on the U.S. dollar** for trade settlements will enhance economic sovereignty.
  - Strengthening **trade settlement mechanisms** with emerging economies through **rupee-based trade agreements** will reduce currency volatility risks.
    - Encouraging fintech innovations and digital banking will enhance financial inclusion and resilience against external financial shocks.

Conclusion:

In a **world increasingly leaning towards protectionism,** India must strategically leverage FTAs to enhance market access, strengthen global value chains, and attract investments. Balancing domestic industry protection with trade liberalization is crucial to **navigating global trade disruptions.** Strengthening manufacturing, negotiating favorable trade terms, and fostering economic diplomacy will help India secure its geo-economic interests.

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Telecom Sector: Inclusion, Innovation, Regulation

This editorial is based on "Indian telecom: A global leader in the making" which was published in The Financial Express on 03/03/2025. The article brings into picture the rapid growth of India's telecom sector with 1.18 billion subscribers, highlighting the urban-rural teledensity gap.

Tag: GS Paper - 3, Industrial Growth, IT & Computers, GS Paper - 2, Government Policies & Interventions

India's telecom industry is experiencing remarkable growth with **1.18 billion subscribers,** though a significant **urban-rural divide persists in teledensity.** The rapid **5G rollout,** supported by AI and localized data centers, promises further expansion. With leading global data consumption rates despite competitive pricing, the sector faces important challenges in **balancing OTT services, data security, and infrastructure costs**. Beyond technology, the industry's success depends on **skilled manpower development and strategic global partnerships** to sustain its growth trajectory.

What Key Factors Driving the Development of the Telecom Sector in India?

- **Rapid 5G Rollout and Infrastructure Expansion:** India is witnessing one of the fastest **5G deployments globally,** enhancing connectivity and enabling new-age applications like AI-driven automation and IoT.
  - Telecom companies are **aggressively expanding fiber networks** and base stations to ensure seamless high-speed internet.
    - As of June, 2024, out of the **4.48 lakh 5G base stations** deployed in India, approximately **3.03 lakh have been fiberized.**
  - The government's **Right of Way (RoW) policy reforms** have streamlined network expansion, reducing bureaucratic delays.
- **Increasing Smartphone and Internet Penetration:** Rising **affordability of smartphones and data plans** has led to a surge in internet adoption, even in rural areas.
  - The increasing **digital literacy and government-backed initiatives** are promoting deeper smartphone usage across sectors like **e-commerce, fintech, and education.**
  - India will have **1 billion smartphone users by 2026** with rural areas driving the sale of internet-enabled phones
- **Government Policy Support and Telecom Reforms:** The Indian government has implemented **progressive telecom policies**, including **spectrum pricing rationalization, FDI liberalization, and financial relief packages.**
  - The government's decision to **waive bank guarantees needed for past spectrum auctions** supports the telecom industry, enabling better utilization of banking resources for expanding **4G and 5G networks.**
  - Within **3 years of the Telecom PLI scheme,** the scheme has attracted an investment of **Rs 3,400 crore,** the telecom equipment production has exceeded the milestone of Rs 50,000 crore.
- **Surge in Data Consumption and Digital Services:** India has emerged as the **world's largest consumer of mobile data**, driven by **video streaming, gaming, and social media.**
  - The rise of **Over-the-Top (OTT) platforms** and e-commerce has significantly increased internet demand.
    - The **work-from-home (WFH) and hybrid work models** post-pandemic have further fueled data consumption.
  - The **OTT video users** in India is expected to increase by 28.89% between 2024 and 2029, reaching **634.31 million users.**
- **Growth of Indigenous Telecom Manufacturing and R&D:** The push for **Atmanirbhar Bharat (Self-Reliant India)** has strengthened domestic telecom equipment manufacturing, reducing import dependency.
  - The government is encouraging **local production of semiconductors, 5G infrastructure, and network gear**.
  - India is also investing in **research and development (R&D)** for future telecom technologies, including **6G and AI-driven networks**.
  - In **FY 2023-24**, exports of telecom equipment and mobiles combined totaled over **Rs 1.49 lakh crore,** marking a significant growth.
- **Expansion of Satellite-Based Internet Services:** Satellite communication is revolutionizing rural and remote area connectivity, where terrestrial networks are impractical.
  - Companies like **OneWeb, Starlink, and JioSpaceFiber** are working on providing high-speed internet via **Low Earth Orbit (LEO) satellites**.
  - The government is supporting satellite-based internet to bridge the **digital divide** and improve broadband access in difficult terrains. This will play a crucial role in **last-mile connectivity**.
- **Increasing Role of Telecom in Governance and Public Services:** The government is leveraging telecom infrastructure for **e-governance, telemedicine, digital banking, and smart cities**.
  - Initiatives like **Aadhaar-based mobile authentication** and **UPI transactions** rely heavily on strong telecom networks.
  - The success of such programs demonstrates how telecom is now a **critical enabler of public service delivery**.

- UPI transactions hit record high in January 2025, with over 16.99 billion transactions and ₹23.48 lakh crore value.
  - The Ayushman Bharat Digital Mission expanded **telemedicine services** using mobile-based platforms.

What are the Key Issues Related to the Telecom Sector in India?

- **Rural-Urban Digital Divide:** India's urban teledensity stands at **131.01%**, whereas rural teledensity lags at **58.31%**, highlighting severe disparity.
  - Poor infrastructure, low digital literacy, and affordability constraints hinder telecom penetration in rural areas.
    - The slow rollout of fiber networks and limited adoption of **5G-enabled handsets** exacerbate the issue.
  - As of January 2025, through the government's BharatNet programme, **only 1.99 lakh villages out of 6.5 lakh villages**, or 30.4%, had broadband.
- **High Spectrum Costs and Debt Burden:** Indian telecom operators face **one of the highest spectrum costs globally**, leading to massive debt accumulation.
  - The **Adjusted Gross Revenue (AGR)** dues imposed by the government have further strained telecom finances, with companies struggling to stay competitive.
    - The need for **continuous infrastructure upgrades** for **5G and AI-driven networks** adds to the financial stress.
    - India's major telecom operators held a **combined debt of Rs 4.09 lakh crore in FY24.**
  - Price wars between telecom players have reduced tariffs, lowering **Average Revenue Per User (ARPU)**.
- **Affordability and 5G Accessibility:** While 5G roll-out is progressing, affordability remains a barrier, particularly in rural areas.
  - **5G-enabled smartphones are still expensive**, limiting adoption among lower-income users.
    - Telecom operators have not significantly reduced **5G data prices**, further discouraging mass adoption.
  - **Network congestion and lack of indigenous 5G infrastructure** add to cost inefficiencies.
  - GSMA Intelligence reports over 40% 5G penetration in China, the US, Japan, and parts of Europe, **while India remains below 20%**.
    - Despite affordable data, limited sub-Rs 10,000 devices hinder 2G and 4G users from **upgrading to 5G.**
- **Cybersecurity and Data Privacy Risks:** With growing telecom penetration, cyber threats, **hacking, and data breaches** are rising, posing risks to national security.
  - The presence of **untrusted foreign telecom equipment**, especially from China, increases vulnerabilities.
    - **OTT services remain largely unregulated**, raising concerns about data misuse.
  - The Digital Personal Data Protection Act (DPDPA) 2023 was introduced to address privacy concerns but lacks strict enforcement.
  - The Telecom Regulatory Authority of India (TRAI) has been alerted to fraudulent WhatsApp messages, SMS, and calls impersonating TRAI officials, with perpetrators using forged notices resembling official communications.
    - In 2024, the Telecom Ministry plans to disconnect **21.7 million fraudulently obtained mobile connections** and block 2.26 lakh handsets linked to cybercrime
- **Regulatory Uncertainty and OTT-ISP Conflict: OTT platforms (like WhatsApp, Zoom, and Netflix)** use telecom networks but do not contribute to network infrastructure costs.
  - Telecom companies argue this creates an **unfair playing field**, affecting revenue models.
  - The government is considering **OTT regulation**, but balancing industry interests remains a challenge.
  - Global comparisons suggest that unregulated OTT services impact telecom sustainability.
  - Telecom operators demand a **"fair share" mechanism**, similar to **EU's digital tax proposals** on OTTs.
- **Import Dependence and Lack of Indigenous Manufacturing:** Despite **Make in India** efforts, India remains **heavily reliant on telecom equipment imports**, mainly from China.

- Lack of **domestic semiconductor manufacturing** and reliance on **foreign telecom software** limit self-reliance.
- Production Linked Incentive (PLI) schemes have attracted investment, but challenges remain in building a robust supply chain.
- India's telecom equipment imports stood at **₹1.53 lakh crore in FY 2023-24.** with a significant share from China.

➢ **Foreign Investment Challenges and Geopolitical Risks:** The Indian telecom sector requires **large-scale foreign investments** for 5G, AI, and satellite connectivity.

- However, **policy unpredictability, bureaucratic delays, and geopolitical concerns** discourage potential investors.
- The government's **security concerns regarding Chinese telecom firms (Huawei, ZTE)** have also led to restrictions, impacting supply chains.
  - Indian telecom companies depend on foreign satellites, which could become a point of contention, as seen recently when **Starlink blocked Russia's use of Starlink satellites in the Ukrainian War.**

➢ **Sustainability and E-Waste Management Issues:** The rapid expansion of telecom infrastructure has **increased energy consumption and e-waste generation**.

- **5G networks consume 2-3 times more energy** than 4G, raising sustainability concerns.
- Lack of robust e-waste **recycling mechanisms** exacerbates environmental degradation.
- India's e-waste generation surged by **73% in 5 years**, reaching 1.751 million MT in 2023-24, with telecom equipment being a major contributor.

What Measures can India Adopt to Reform and Revamp India's Telecom Sector?

➢ **Enhancing Rural Connectivity and Digital Inclusion:** Expanding **fiber-optic networks, satellite-based internet, and mobile tower infrastructure** in underserved areas is crucial to bridge the rural-urban digital divide.

- The government should incentivize **private telecom players** to invest in remote regions through **subsidies and viability gap funding**.
- Strengthening **public-private partnerships (PPPs)** can accelerate last-mile connectivity.
- Initiatives like BharatNet **and universal service obligations (**Digital Bharat Nidhi**)** must be fast-tracked with a clear implementation roadmap.
- Ensuring **affordable 5G smartphones and low-cost data plans** will further drive digital inclusion.

➢ **Rationalizing Spectrum Pricing and Licensing Norms:** India's **high spectrum costs and complex licensing framework** burden telecom operators, affecting financial sustainability.

- The government should adopt a **graded pricing mechanism** and introduce **long-term payment flexibility** to ease financial pressure.
- Spectrum allocation should prioritize **usage efficiency** over revenue maximization.
- Simplifying regulatory approvals and ensuring **uniform right-of-way (RoW) policies** across states can accelerate infrastructure rollout.
  - Moving towards a **light-touch regulatory framework** will encourage investments and innovation.

➢ **Strengthening Cybersecurity and Data Protection:** As telecom networks handle sensitive personal and national security data, a **robust cybersecurity framework** is essential.

- The government should mandate **end-to-end encryption, AI-driven fraud detection, and regular cybersecurity audits** for telecom operators.
- Implementing a **zero-trust security model** will mitigate risks from foreign telecom vendors and cyber threats.
- The **Digital Personal Data Protection Act (DPDPA)** must be effectively enforced with clear **data localization and privacy safeguards**.
  - Collaboration between **government, telecom firms, and cybersecurity experts** is necessary to build resilient telecom networks.

➢ **Regulating OTT Services and Ensuring Fair Revenue Sharing:** OTT platforms like **WhatsApp, Zoom, and Netflix** use telecom networks but do not contribute to infrastructure costs, creating an **imbalance in the digital ecosystem**.

- India should introduce a **fair revenue-sharing mechanism** where OTTs contribute to telecom infrastructure development.
- Ensuring **regulatory parity between OTTs and telecom service providers** can create a level playing field.
- A **transparent policy framework** should govern net neutrality while allowing reasonable network usage fees.
  - Encouraging **telecom-OTT collaborations** can drive innovation while ensuring sustainable revenues for both sectors.

➢ **Boosting Indigenous Telecom Manufacturing and R&D:** Reducing dependence on foreign telecom equipment requires a strong **domestic manufacturing ecosystem** for **5G gear, semiconductors, and network infrastructure**.

- The government should **expand Production-Linked Incentive (PLI) schemes**, offer tax benefits, and provide **low-interest credit for telecom startups**.
- Strengthening **indigenous 5G and 6G research** through collaborations with **IITs, NITs, and private research labs** can drive innovation.
  - Encouraging **Open RAN (O-RAN) deployment** will foster a **self-reliant telecom ecosystem** and enhance global competitiveness.

➢ **Addressing Financial Distress and Telecom Sector Viability:** The government should create a **long-term financial restructuring plan**, including relief on **adjusted gross revenue (AGR) dues**.

- Encouraging **consolidation and strategic mergers** can improve financial stability while ensuring competition.
- Introducing **floor pricing for telecom tariffs** will help sustain revenues without hurting consumers.
  - Facilitating **long-term foreign direct investment (FDI) inflows** through transparent policies will strengthen capital infusion.

➢ **Accelerating Fiberization and 5G Infrastructure Expansion:** The government must incentivize **fiber deployment across rural and urban areas** by reducing **RoW charges and bureaucratic hurdles**.

- Encouraging **municipal-level infrastructure sharing** can optimize resources and reduce costs.
- Telecom operators should integrate **energy-efficient and AI-driven network management systems** for smart infrastructure growth.
  - Strengthening **public-sector and private-sector collaboration** can fast-track India's digital transformation.

➢ **Promoting Satellite-Based Internet and Last-Mile Connectivity:** Satellite broadband can revolutionize **telecom access in remote areas, disaster-prone regions, and high-altitude terrains**.

- The government should create a **dedicated policy framework for satellite-based communication**, ensuring smooth spectrum allocation and regulatory approvals.
- Integrating **satellite and fiber-optic networks** can create a **hybrid telecom model for nationwide digital inclusion**.
  - Partnerships between **ISRO, private firms, and global satellite operators** will ensure seamless deployment.

➢ **Leveraging AI, Blockchain, and Emerging Technologies:** AI-driven solutions can enhance **network efficiency, predictive maintenance, and fraud detection** in telecom.

- Implementing **blockchain-based subscriber verification systems** can curb SIM-related fraud and identity theft.
- Encouraging telecom firms to deploy **AI-powered chatbots and automated customer service** will improve user experience.
- AI-enabled network optimization can **reduce downtime and enhance bandwidth allocation**.
  - Creating a **regulatory sandbox** for testing new telecom innovations can accelerate **5G and 6G deployment**.

Conclusion:

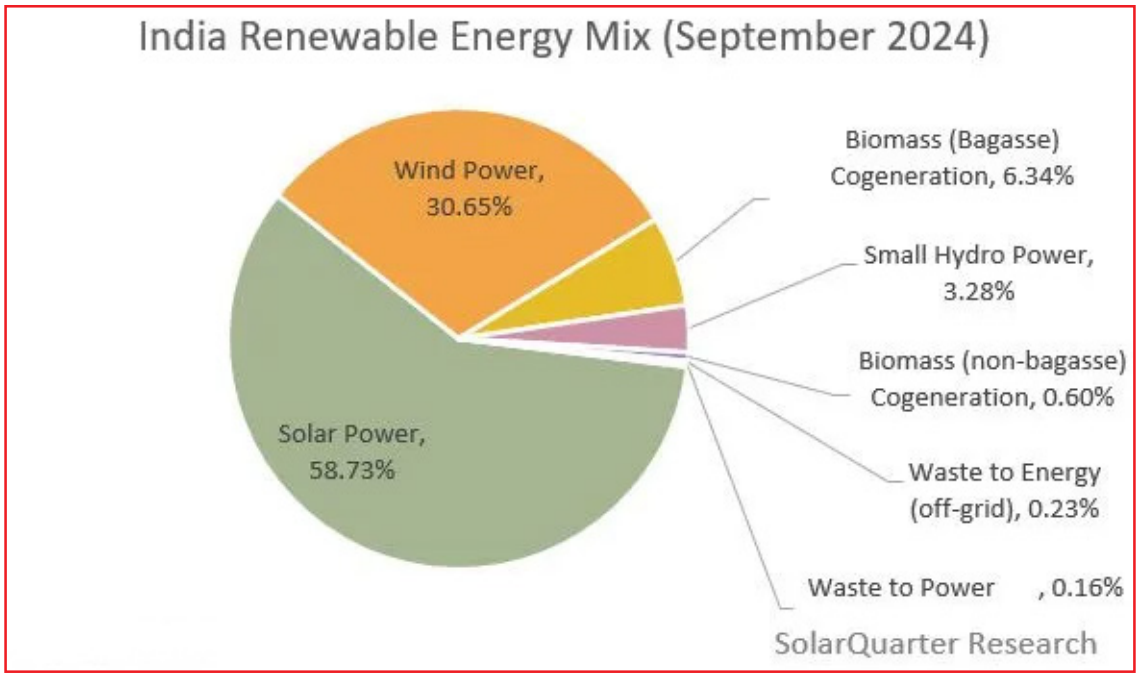
India's telecom sector stands at a critical juncture, balancing **rapid expansion with regulatory, financial, and technological challenges**. Strengthening **indigenous telecom manufacturing and ensuring fair revenue sharing between OTT platforms** and telecom operators will be key. With strategic reforms and investments, India can solidify its position as a **global telecom powerhouse** while ensuring **digital inclusion for all.**

Clean Energy: India'S Path to Sustainability

This editorial is based on "Get the transition right: How govt is pushing for a clean-energy shift" which was published in Business Standard on 03/03/2025. The article brings into picture the critical need for India's clean energy transition, highlighting its role in economic growth and climate resilience.

Tag: GS Paper - 2, GS Paper - 3, Renewable Energy, Government Policies & Interventions

India's clean energy transition is both an **economic necessity and an environmental imperative,** ensuring electricity access for millions while mitigating climate risks. However, global pushback against climate action**, compounded by rising costs and insurance challenges,** threatens progress. As climate impacts intensify, **prioritizing solutions that balance sustainability with livelihood security is crucial.** The challenge lies in accelerating this transition while addressing economic vulnerabilities.



Why Clean Energy Transition is Crucial for India?

- **Energy Security and Reduced Import Dependence: India imports nearly 85% of its crude oil and 50% of its natural gas,** making it highly vulnerable to global price shocks and supply disruptions.
  - Expanding domestic renewable energy can enhance energy independence and reduce the burden of a high import bill.
  - The International Energy Agency (IEA) reported **India was the world's second-largest crude oil net importer in 2023,** while the Russia-Ukraine war exposed risks of fossil fuel dependence.
    - Increasing renewable capacity to **500 GW by 2030**, as per **India's COP26 pledge**, can mitigate these vulnerabilities.
- **Economic Growth and Job Creation:** A transition to clean energy can drive industrial **expansion, innovation, and employment,** particularly in solar, wind, and green hydrogen sectors.
  - The **Council on Energy, Environment, and Water (CEEW**) estimates that India's renewable sector could create **one million people by 2030**.

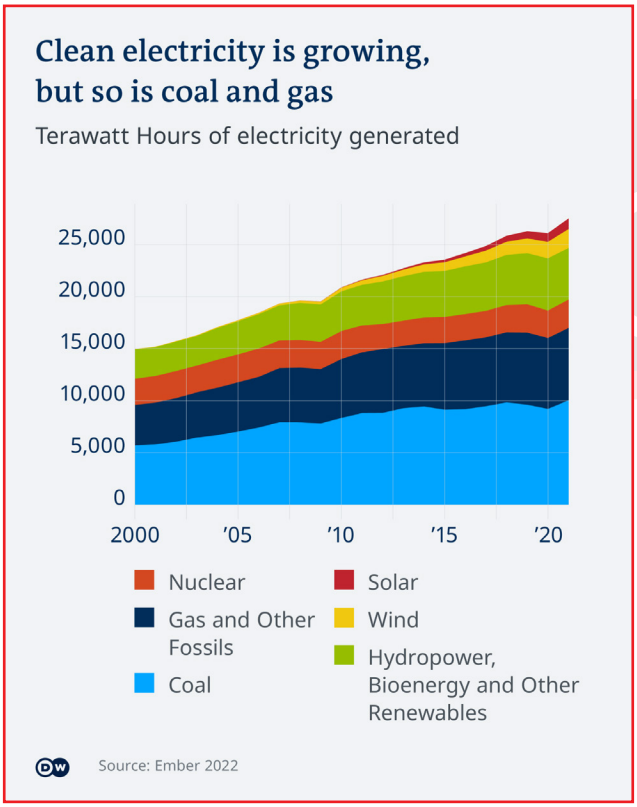
- This shift will **open new opportunities in manufacturing and grid infrastructure,** reducing economic disparities.

- **Climate Resilience and Pollution Control:** India is one of the **most climate-vulnerable nations**, facing frequent **heat waves, floods, and rising sea levels.**
  - A clean energy transition can significantly **cut carbon emissions and reduce air pollution,** which is responsible for millions of deaths annually.
  - Air pollution has caused 8.1 million deaths around the world in 2021 with China and India accounting for more than half of the global burden.
    - For instance, **Delhi in 2024 recorded a three-year high in terms of annual PM2.5** (particulate matter having a diameter of 2.5 microns or less) concentration, highlighting the urgent need for clean energy adoption.
- **Rural Electrification and Energy Access:** Renewable energy, especially **decentralized solar and wind solutions**, can provide reliable power to remote areas, reducing energy poverty.
  - This will boost education, healthcare, and economic activities in underserved regions.
  - In 2024, India added **24.5 GW of solar installations,** an over two-fold increase compared to 2023. Utility-scale installations reached **18.5 GW capacity,** up 2.8 times from 2023.
- **Investment and Global Leadership in Green Energy:** India has positioned itself as a leader in renewable energy, attracting global investments and strengthening diplomatic ties through clean energy initiatives.
  - Expanding the sector can boost **foreign direct investment (FDI)** and technological collaborations.
  - Investment in renewable energy in India reached a record **US$14.5 billion** in the financial year-2021-22. While initiatives like the **Global Biofuels Alliance (GBA) and the International Solar Alliance (ISA)** showcase India's leadership in global climate diplomacy.
- **Green Hydrogen and Industrial Decarbonization:** India's heavy industries, such as **steel and cement**, rely on **coal-based energy,** but green hydrogen offers a sustainable alternative.
  - Scaling up hydrogen production can help India become a global exporter while reducing industrial emissions.
  - The **National Green Hydrogen Mission**, launched in 2023 with an outlay of ₹19,744 crore, **aims to produce 5 MMT of green hydrogen annually by 2030.**
- **Sustainable Urbanization and EV Transition:** India's rapid urbanization demands a **clean energy-driven transport and infrastructure ecosystem.**
  - Expanding electric vehicles (EVs) and smart grids can make cities more sustainable while cutting oil dependency.
  - The **PM e-Drive Scheme** has a **₹10,900 crore** outlay for two years (April 2024 – March 2026) to boost EV adoption.
- **International Climate Commitments and Carbon Markets:** India has committed to achieving **net-zero emissions by 2070**, requiring a major clean energy shift.
  - Participation in **carbon trading and emissions reduction schemes** can provide financial incentives and global credibility.
  - The **Carbon Credit Trading Scheme (2023)** launched under the **Energy Conservation (Amendment) Act, 2022**, allows industries to trade carbon credits, while India's updated **Nationally Determined Contributions (NDCs)** target a 45% emissions reduction by 2030

What are the Key Issues Hindering India's Clean Energy Transition?

- **Inadequate Grid Infrastructure and Storage Limitations**: India's **electricity grid is currently not equipped to handle the variability of renewable energy**, leading to frequent curtailments and inefficiencies.
  - The lack of **large-scale energy storage solutions** makes integrating solar and wind power challenging, especially during peak demand.
  - The National Electricity Plan-II of the Central Electricity Authority (CEA) estimates that **India will require over lakh crore investment in transmission infrastructure to meet its power demand by 2032.**
- **Fossil Fuel Lobby and Policy Inconsistencies:** India's energy mix is currently dominated by coal for about **70% of its power generation**.

- And in turn, **Coal and oil industries continue to receive significant subsidies** and policy backing, slowing the transition to cleaner alternatives.
- In FY 2023, both clean energy and fossil fuel subsidies grew by around 40%. The **Ministry of Coal** has set a goal to produce **1.3 billion tonnes** of domestic coal by **FY 2027.**
  - Millions of workers depend on coal mining and fossil fuel-based industries, and a rapid shift to clean energy could lead to job losses and economic distress in these regions.
- A just transition plan is needed to reskill workers and develop alternative industries.



- **Financial Stress on DISCOMs (Distribution Companies):** India's power distribution companies (DISCOMs) are deeply in **debt,** limiting their ability to invest in clean energy infrastructure.
  - **High transmission losses, poor tariff collection, and subsidies** for fossil fuel-based power add to their financial distress.
  - RBI's report highlights that state DISCOMs remain a burden on finances, with accumulated losses reaching **₹6.5 lakh crore (2.4% of GDP) by 2022-23.**
- **Slow Progress in Domestic Manufacturing and Supply Chain Gaps:** India remains dependent on imports for **solar modules, wind turbines, and lithium-ion batteries,** making clean energy transition vulnerable to global supply chain disruptions.
  - Domestic production is still in its infancy despite government incentives.
  - For instance, in 2023-24, India imported **$7 billion worth of solar equipment,** with China supplying **62.6%**
    - The **PLI scheme for solar PV manufacturing has a budget of ₹24,000 crore** but will take time to scale up production.
- **Land Acquisition and Environmental Clearances:** Large-scale renewable energy projects require **vast land areas,** often leading to conflicts with farmers, displacement, and environmental concerns.
  - For instance, **Rewari villagers in Rajasthan's Jaisalmer** have been protesting against the state government's move to transfer land to the Adani Group for setting up a **450 MW solar power plant.**
  - Delays in land approvals and concerns over biodiversity impact slow down project implementation.
    - For insurance, the **Great Indian Bustard conservation case** led to Supreme Court restrictions on overhead power lines. (though recently reversed its blanket ban on overhead power transmission cables)
- **Intermittency and Reliability of Renewable Energy:** Unlike coal and gas-based power, renewables like solar and wind are **variable** and **cannot provide round-the-clock electricity without costly storage solutions.**
  - This raises concerns about grid stability and meeting peak-hour demand. In **June 2024**, power demand in India peaked at 243.3 GW, but solar and wind contribution was not up to the mark, **forcing the government to extend coal plant operations** despite its clean energy targets.
- **Slow Adoption of Electric Vehicles (EVs) and Charging Infrastructure**: The EV transition is essential for reducing

oil dependence, but challenges like **inadequate charging stations, high battery costs,** and slow consumer adoption hinder progress.

- A weak charging network outside metro cities limits expansion. As of February 2024, India has **only 12,146 public EV charging stations** against the requirement of a total of **3.9 million public and semi-public charging stations,** maintaining a ratio of **1 station for every 20 vehicles.**

What Measures can India Adopt to Accelerate India's Clean Energy Transition?

- **Strengthening Grid Infrastructure and Energy Storage:** India must modernize its power grid to integrate variable renewable energy sources seamlessly while investing in large-scale battery storage.
  - Developing **smart grids, pumped hydro storage, and hybrid renewable power** projects can enhance grid reliability.
  - **Decentralized renewable energy solutions**, including rooftop solar and microgrids, should be promoted to reduce transmission losses.
  - The synergy between the **Green Energy Corridor** and the **Revamped Distribution Sector Scheme (RDSS)** can ensure efficient power evacuation and distribution.
- **Financial Reforms for DISCOMs and Renewable Investments:** Revitalizing power distribution companies (DISCOMs) by improving **revenue collection, reducing losses,** and ensuring timely payments to renewable energy producers is essential.
  - Innovative financing mechanisms like green bonds, viability gap funding, and concessional loans can attract private investment.
  - Expanding **risk-sharing mechanisms** for renewable projects will build investor confidence.
- **Boosting Domestic Manufacturing and Supply Chain Resilience:** Reducing dependence on **imported solar modules, wind turbines, and lithium-ion batteries** by strengthening domestic production is critical.
  - Expanding the **Production-Linked Incentive (PLI) scheme** for solar PV and battery storage will encourage local manufacturing.
  - Creating **special renewable energy zones** with tax incentives can attract global investors.
  - Promoting **research and development (R&D) in alternative battery chemistries like sodium-ion and solid-state batteries** will enhance energy security.
- **Accelerating Land Acquisition and Environmental Approvals:** Streamlining land acquisition for renewable energy projects while **ensuring minimal ecological impact can fast-track implementation.**
  - Digitizing land records, adopting a single-window clearance system, and integrating local communities in decision-making can reduce conflicts.
  - Renewable energy parks should be **set up on degraded land and wastelands** to avoid competition with agriculture.
  - Expediting approvals under the **Environmental Impact Assessment (EIA) framework** will enhance investor confidence.
- **Expanding Electric Vehicle (EV) Ecosystem and Green Mobility:** Developing an extensive EV charging network, incentivizing battery swapping infrastructure, and promoting indigenous battery manufacturing can accelerate EV adoption.
  - Strengthening **urban public transport through electrification** and integrating EVs with renewable energy will reduce fossil fuel reliance.
  - Encouraging electric freight and long-haul transport will lower emissions in the logistics sector.
    - The convergence of **PM E-Drive** and the **National Electric Mobility Mission Plan (NEMMP)** can create a holistic green mobility ecosystem.
- **Diversifying Energy Mix with Green Hydrogen and Bioenergy:** Scaling up green hydrogen production for **industrial decarbonization** and energy storage can drive long-term sustainability.
  - Developing a **domestic electrolyzer manufacturing ecosystem** and leveraging offshore wind energy for hydrogen production will reduce costs.
  - Promoting **biomass-based power, biofuels, and waste-to-energy solutions** can enhance rural employment and energy security.
  - Linking the **National Green Hydrogen Mission** with the **Global Biofuels Alliance (GBA)** will strengthen India's position in alternative fuels.
- **Strengthening Policy Stability and Regulatory Framework:** Ensuring long-term policy stability, reducing

frequent tariff changes, and **creating enforceable renewable purchase obligations (RPOs)** can provide clarity to investors.

- Implementing a robust carbon pricing mechanism and expanding the **Carbon Credit Trading Scheme** will create market-driven incentives for emissions reduction.
- Strengthening compliance mechanisms for **Renewable Energy Certificates (REC)** and **Green Open Access policies** will promote private-sector participation.

- **Ensuring a Just Transition for Coal-Dependent Regions:** A **structured transition plan for coal-dependent states** must include reskilling programs, economic diversification, and social security measures.
  - Establishing a **Just Transition Fund** to support alternative livelihoods in coal mining regions can mitigate economic disruptions.
  - Promoting clean energy parks, green industries, and sustainable tourism in affected areas can create employment opportunities.
    - The **District Mineral Foundation (DMF) funds** can be repurposed to facilitate community-led clean energy projects.
- **Decentralized Renewable Energy for Rural and Agricultural Growth:** Expanding **off-grid solar, microgrids, and solar pumps** can enhance energy access and agricultural productivity in rural areas.
  - Promoting **agri voltaics (solar farming)** can ensure dual land use without affecting food security.
  - Strengthening financing mechanisms for small-scale renewable projects through microfinance institutions can encourage community participation.
    - Synergizing PM-KUSUM with the Rooftop Solar Programme will accelerate decentralized solar adoption.
- **Enhancing International Cooperation and Climate Financing:** Leveraging global climate funds, bilateral agreements, and technology transfer mechanisms can boost India's clean energy transition.
  - Strengthening collaboration with **G20 nations, the International Solar Alliance (ISA), and the UNFCCC** can secure concessional financing and advanced technologies.
  - Expanding participation in global carbon markets can create new revenue streams for renewable projects.
  - India must push for greater access to the Loss and Damage Fund and the **Global Environment Facility (GEF)** to support climate adaptation and mitigation.

Conclusion:

India's clean energy transition is essential for energy security, economic growth, and environmental sustainability. Addressing challenges like **grid infrastructure, financial constraints, and policy inconsistencies** will accelerate this shift. A balanced approach ensuring both sustainability and livelihood security is crucial for long-term success. This aligns with **SDG 7 (Affordable and Clean Energy), SDG 8 (Decent Work and Economic Growth), and SDG 13 (Climate Action).**

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Navigating India'S Economic Growth Outlook

This editorial is based on "Battle for growth: On India's economic trajectory" which was published in The Hindu on 04/03/2025. The article brings into picture the 6.2% GDP growth in Q3 FY 24-25, falling short of the 6.5% target, with primary sectors leading while manufacturing and services face challenges.

Tag: GS Paper-3, Growth & Development, GS Paper-2, Government Policies & Interventions

India's economic growth in Q3 FY 24-25 registered a modest **6.2%**, falling short of the **government's full-year 6.5% target,** with primary sectors driving performance while **manufacturing and services sectors show vulnerability.** Also, global headwinds like **potential U.S. tariffs on steel and pharmaceuticals** pose significant challenges, particularly for India's export-oriented sectors. Despite these challenges, the economy demonstrates potential for adaptive growth amid complex global economic uncertainties.

What are the Key Drivers Shaping India's Economic Growth Outlook?

- **Strong Domestic Demand and Consumption Resilience:** India's **large consumer base, rising middle-class wealth, and urbanization** continue to fuel demand, especially in sectors like **FMCG, e-commerce, and automobiles.**
  - Rural consumption is strengthening due to higher agricultural output and government support schemes, while urban demand benefits from increasing disposable incomes.
  - For instance, private consumption expenditure grew by **6.9% in Q3FY25 (Deloitte Report),** while rural demand surged, **as FMCG sales rose 4% in April-June 2024**
- **Government-Led Infrastructure Push and Capital Expenditure:** Massive public infrastructure projects under the **National Infrastructure Pipeline (NIP), Gati Shakti, and Bharatmala** are driving economic activity, employment, and private sector participation.
  - **Increased capex allocations in the budget (₹11.21 lakh crore)** have improved logistics, transportation, and urban infrastructure, crowding in private investments.
    - Capital expenditure grew at 38.8% CAGR between FY20-FY24, **(Economic Survey 2024-25).**
  - **Budget 2025-26 move of no income tax till 12 lacs** income will also increase people's net disposable income allowing them to create more demand.
    - Schemes like **Ayushman Bharat ---> decrease in healthcare expenditure ---> more money in people's pocket** to create more demand.
- **Rising Digital Economy and Fintech Expansion:** India's rapid adoption of **digital payments, fintech innovations, and e-governance** is enhancing financial inclusion, business efficiency, and tax compliance.
  - The **Unified Payments Interface (UPI), ONDC, and Digital Public Infrastructure (DPI)** have expanded access to financial services, reducing cash dependency.
  - India's digital economy has emerged as a significant contributor to its economic growth, accounting for **11.74% of the GDP in 2022-23.**
    - UPI transactions hit record high in January 2025, with over **16.99 billion transactions** and ₹23.48 lakh crore value.
- **Manufacturing and Global Supply Chain Realignment:** The **production-linked incentive (PLI) schemes,** and a focus on high-value manufacturing (electronics, semiconductors, EVs) are boosting India's manufacturing sector.
  - Large multinational firms are diversifying supply chains, making India a hub for electronics, pharmaceuticals, and automotive production.
    - PLI scheme has attracted Rs 1.46 lakh crore investment, creating 9.5 lakh jobs.
    - In FY23, electronics exports stood at **$23.6 billion,** of which mobile phones comprised $11.1 billion or **43%**.
  - Geopolitical realignments and trade disruptions in the **Red Sea and Suez Canal are prompting firms to de-risk their supply chains**, favoring India as an alternative. (**China+1 strategy**)
- **Services Sector Dominance and IT Resilience:** The services sector remains India's growth engine, led by IT, finance, tourism, and real estate.
  - The rise of **AI, digital services, and fintech innovations** has increased global demand for Indian IT expertise.
  - India's dominance in global services exports, particularly in **software and business process outsourcing (BPO),** ensures steady forex inflows and employment.
    - India's services exports grew **12.8%** during April–November FY25, rising from **5.7% in FY24**, according to the **Economic Survey 2024-25**
- **Energy Transition and Green Growth Initiatives:** India's **push for renewable energy, electric mobility, and green hydrogen** is reshaping its economic trajectory.
  - With **record solar and wind energy capacity additions, EV adoption, and net-zero commitments**, the green economy is becoming a key driver of industrial and technological transformation.
  - As of October 2024, renewable energy-based electricity generation capacity stands at **203.18 GW,** accounting for more than **46.3% of the country's total installed capacity.**

- Also, India aims for a $8 billion green hydrogen market by 2030.

➢ **Fiscal and Monetary Stability: India's prudent fiscal policies, targeted social spending, and inflation control measures** ensure macroeconomic stability.
  - ❍ The **RBI's stable monetary stance,** along with improved tax compliance through **GST and digitization**, has strengthened the fiscal outlook.
  - ❍ Lower fiscal deficits, rising tax revenues, and better public finance management have enhanced investor confidence.
    - The **fiscal deficit** is expected to decline to **4.9% of GDP in FY25**, down from the previous estimate of **5.1%**
    - **Retail inflation eased to 4.9% in FY25**, with food inflation remaining a challenge at **8.4%.**

➢ **Tax Reforms:** Tax reforms, particularly the Goods and Services Tax (GST), which has simplified the indirect tax structure and reduced costs.
  - ❍ For instance, the **tax rates on automobiles, which earlier ranged between 28% and 45%**, has now come down to **18-28% by GST**, making vehicles more affordable.
  - ❍ Additionally, GST has **eliminated the cascading effect of taxation**, further reducing the overall cost of commodities.
  - ❍ These reforms have boosted **consumer demand and improved business efficiency,** contributing to India's economic momentum.

What Are the Major Challenges Hindering India's Sustained Economic Growth?

➢ **Global Trade Disruptions and Export Dependency Risks:** India's export growth faces risks due to **geopolitical tensions, shifting trade policies, and protectionist measures by major economies like the US and EU.**
  - ❍ Disruptions in key shipping routes **(Suez Canal, Red Sea)** and increasing tariffs on Indian goods could reduce trade competitiveness.
  - ❍ **For instance,** the **US plans a 25% import tariff on Indian pharmaceuticals,** affecting billions in annual exports.
    - **Suez Canal disruptions** forced rerouting via the Cape of Good Hope, raising freight costs by 20% **(imported inflation).**

➢ **Sluggish Private Investment and Capital Formation:** Despite government-led infrastructure spending, private sector investment remains tepid due to **policy uncertainty, global economic slowdown, and cautious investor sentiment**.
  - ❍ **Gross Fixed Capital Formation (GFCF) growth has slowed**, indicating weaker business confidence.
  - ❍ The **manufacturing sector's reliance on government incentives** rather than **organic expansion** highlights the need for a more stable investment climate.
    - GFCF growth slowed to 5.4% in Q2FY25.

➢ **Inflationary Pressures and Food Price Volatility:** While core inflation has eased, **volatile food prices continue to pose a challenge,** driven by erratic monsoons, supply chain bottlenecks, and geopolitical uncertainties.
  - ❍ Rising global energy and commodity prices further complicate inflation control efforts.
  - ❍ **Unstable food inflation could** impact consumer confidence, and limit monetary policy flexibility.
    - Food inflation remained high at 8.4%, led by onion, tomato, and pulse shortages **(Economic Survey 2024-25). Higher logistics costs further increase the prices.**

➢ **High Unemployment and Jobless Growth:** Despite economic expansion, employment generation remains **insufficient**, especially in **manufacturing and formal sectors.**
  - ❍ The **rising adoption of automation and AI** is leading to **job losses** in traditional industries, while a **significant portion of the workforce remains in low-paying informal jobs.**
  - ❍ Without skill development and labor market reforms, India's demographic dividend could become a liability.
    - **India's unemployment rate** has dropped to **3.2% in 2023-24** but labor force participation is still below global averages.
  - ❍ The **Economic Survey 2023-24** highlights that **65% of India's rapidly growing population is under 35 years old,** but many lack essential skills for a modern economy.
    - It also estimates that **only 51.25%** of the **youth is considered employable).**

- **Weak Industrial Growth and Manufacturing Bottlenecks:** India's manufacturing sector faces structural challenges such as **low productivity, high logistics costs, and reliance on imports for critical components.**
  - The slowdown in global demand, coupled with domestic bottlenecks in land acquisition, labor laws, and infrastructure, limits industrial expansion.
    - While PLI schemes have boosted specific sectors, broader industrial growth remains uneven.
  - Manufacturing growth **slowed to 2.2% in Q2FY25**. India's logistics costs remain at 13-14% of GDP.
- **Financial Sector Vulnerabilities and Credit Risks:** While India's banking sector has improved, **high unsecured lending, fintech risks, and potential asset quality issues in NBFCs remain concerns.**
  - **Unsecured personal loans and credit card borrowing** grew at a CAGR of **22% and 25%, respectively**, in the three years to FY24, raising concerns about defaults.
- **Digital Divide and Uneven Technology Penetration:** Despite rapid digital growth, **access to digital infrastructure remains unequal, particularly in rural areas.**
  - Limited digital literacy, inadequate internet connectivity, and cybersecurity threats hinder the benefits of fintech and digital governance.
  - NSSO (National Sample Survey Office) data reveals a staggering disparity: only 24% of rural households have internet access, compared to 66% in cities.
    - Also, Cyber fraud cases like **Unified Payments Interface fraud surged by 85% in FY24,** highlighting security concerns.
- **Missing Middle:** Credit penetration remains low in critical sectors like MSMEs, while excessive consumer credit growth raises concerns about financial stability.
  - Despite government initiatives like Mudra loans, **many small businesses lack access to affordable financing,** while large corporations and consumer credit see better lending opportunities.
  - The MSMEs in the country currently face a credit gap of **$530 billion,** and **only 14% of the 63 million small businesses in India have access to credit**, as per a recent report by investment bank Avendus Capital.
- **Climate Change and Environmental Challenges:** India is highly vulnerable to **climate risks such as extreme weather, water shortages, and rising pollution levels.**
  - Frequent droughts and floods impact agriculture, while energy transition efforts face hurdles due to high dependency on coal.
    - Balancing economic growth with sustainability is a critical challenge.
  - India's coal dependency remains high, with **65,290 MW of supercritical coal plants in operation**.
    - Climate adaptation spending rose from **3.7% to 5.6% of GDP between FY16-FY22**, highly critical diversion of resources.

What Steps Can India Take to Sustain Its Economic Growth Outlook?

- **Strengthening Domestic Demand and Consumption:** Enhancing disposable income through **targeted tax reliefs, rural employment programs, and direct benefit transfers** can sustain domestic consumption.
  - Expanding **credit access to MSMEs and households** will boost purchasing power and demand-led growth.
  - Promoting **value-added sectors like processed food, textiles, and electronics** will create jobs and expand the consumer base.
    - Strengthening **agricultural supply chains, cold storage infrastructure, and warehousing** will reduce food inflation volatility.
  - Strengthening **consumer protection laws and digital literacy** can improve confidence in e-commerce and fintech.
- **Boosting Private Investment and Industrial Growth:** Simplifying **land acquisition laws, labor codes, and environmental clearances** will reduce compliance burdens and improve ease of doing business.
  - Expanding **Production-Linked Incentive (PLI) schemes** beyond electronics and pharmaceuticals to cover emerging sectors like **green hydrogen, semiconductors, and precision manufacturing** will drive industrial expansion.
  - Encouraging **foreign direct investment (FDI) in high-tech and capital-intensive industries** will strengthen domestic manufacturing capabilities.

- **Strengthening Infrastructure and Logistics Efficiency:** Accelerating the National Infrastructure Pipeline (NIP), **Gati Shakti, and Bharatmala** will enhance multimodal connectivity and reduce logistics costs.
  - Expanding **urban transport networks, high-speed rail corridors, and port modernization** will improve trade competitiveness.
  - Strengthening **renewable energy infrastructure** through incentives for green projects and decentralized energy grids will ensure sustainable power supply.
  - Ensuring **better utilization of capex allocations at the state level** will fast-track project implementation.
- **Promoting Digital Transformation and Innovation:** Scaling up **5G rollout, AI-driven automation, and cloud computing infrastructure** will boost efficiency in services and manufacturing.
  - Expanding the **Open Network for Digital Commerce (ONDC) and Digital Public Infrastructure (DPI)** will create a level playing field for small businesses and startups.
  - Encouraging **R&D in AI, quantum computing, and biotech** through tax incentives and university-industry partnerships will drive technological leadership.
- **Enhancing Trade Competitiveness and Export Diversification:** Negotiating **free trade agreements (FTAs) with key economies like the EU, UK, and ASEAN** will improve market access and reduce tariff barriers.
  - Strengthening **export incentives for high-value sectors like electronics, pharmaceuticals, and precision engineering** will enhance India's global trade footprint.
  - Improving **port efficiency, customs digitization, and reducing logistics costs** will reduce transaction costs and trade delays.
  - Expanding **rupee trade mechanisms with strategic partners** will mitigate forex risks and strengthen economic diplomacy.
- **Addressing Employment and Skill Development Gaps:** Expanding **apprenticeship programs, vocational training, and industry-academia collaboration** will align workforce skills with emerging industry demands.
  - Strengthening **Skill India and National Education Policy (NEP) 2020 initiatives** will improve the employability of graduates and reduce structural unemployment.
  - Promoting **labor-intensive sectors like textiles, tourism, and construction** will create sustainable job opportunities.
  - Encouraging **entrepreneurship and startup incubation in Tier-2 and Tier-3 cities** will create decentralized employment hubs.
- **Strengthening Governance and Institutional Reforms:** Enhancing **transparency, accountability, and ease of doing business** will attract investments and improve investor confidence.
  - Streamlining **regulatory frameworks in banking, taxation, and corporate governance** will reduce compliance burdens on businesses.
  - Expanding **decentralized governance and fiscal autonomy to states** will improve policy implementation at the grassroots level.

Conclusion:

India's economic growth outlook remains **promising despite short-term challenges**. **Strong domestic demand, infrastructure expansion, digital transformation, and manufacturing growth** continue to drive progress. By implementing targeted reforms, strengthening private investment, and fostering innovation**, India can achieve sustainable and inclusive economic growth amid global uncertainties.**

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Safeguarding Wildlife, Securing Harmony

This editorial is based on "Living with animals – the challenges and the solution" which was published in The Indian Express on 05/03/2025. The article brings into picture the PM's announcement of a center for managing human-wildlife conflict.

Tag: GS Paper - 3, Conservation, GS Paper - 2, Government Policies & Interventions

At a recent National Board for Wildlife **meeting,** the Indian Prime Minister announced the establishment of **a center dedicated to managing** human-wildlife conflict. While population growth has traditionally been seen as a key indicator of conservation progress, it now presents new challenges as wildlife increasingly competes with humans for space and resources. India must proactively address these evolving challenges to ensure a **harmonious coexistence between humans and wildlife.**

Why Wildlife Conservation is Crucial for India's Ecological and Economic Sustainability?

- **Ensuring Ecological Balance and Climate Resilience:** Wildlife plays a critical role in maintaining **ecosystem stability, ensuring biodiversity, and regulating climate patterns.**
  - The **loss of** keystone species **like tigers and elephants** disrupts food chains, leading to overpopulation of herbivores and habitat degradation.
  - **Forests and wetlands,** sustained by wildlife activity, act as carbon sinks and buffers against climate change.
  - Protecting species ensures **natural pollination, seed dispersal, and disease control,** which are essential for ecosystem health.
  - For instance, the Kaziranga National Park**'s rhinos** help maintain grassland health, supporting herbivore populations and preventing soil erosion.
- **Securing Water Resources and Preventing Desertification:** Forests, wetlands, and grasslands, supported by diverse wildlife, **regulate hydrological cycles and groundwater recharge.**
  - Conservation of forests helps maintain river flows, prevent siltation, and reduce the severity of floods and landslides.
    - Wildlife also plays a role in maintaining soil fertility and preventing desert spread in regions like Rajasthan.
  - For instance, **Blackbucks** play a role in seed dispersal, especially for **Khejri trees (Prosopis cineraria),** which are crucial for preventing desertification in the Thar Desert.
- **Boosting Sustainable Livelihoods and Eco-Tourism:** Wildlife-based tourism provides employment to millions and **generates revenue for conservation efforts,** benefiting local economies.
  - **National parks, tiger reserves, and bird sanctuaries** attract international and domestic tourists, creating opportunities for sustainable livelihoods.
  - Well-managed eco-tourism ensures that local communities benefit financially, reducing dependency on poaching and illegal logging.
  - For instance, Ranthambore Tiger Reserve revenue increases from 45 crore to 60 crore as visitor influx grows.
    - As per recent reports, wildlife tourism is a major driver for the broader tourism sector, which contributes roughly **5-6.5% to India's GDP.**
- **Preventing Zoonotic Diseases and Ensuring One Health Approach:** Conservation reduces the chance of viral spillovers by maintaining natural buffers between humans and wild species.
  - Illegal wildlife trade **and deforestation** expose populations to unknown pathogens, making strong wildlife laws essential for health security.
  - For instance, the Nipah virus outbreak **in Kerala (2021)** was linked to habitat destruction affecting bat populations.
    - Strengthening conservation ensures biodiversity remains intact and reduces the emergence of deadly diseases.
- **Supporting Agricultural Productivity and Food Security:** Wildlife conservation ensures the survival of pollinators like bees, butterflies, and birds, which are essential for agricultural yield.
  - **Natural predators like owls, snakes, and big cats** control pest populations, reducing the need for chemical pesticides.
  - Forest biodiversity enhances soil fertility and water retention, contributing to sustainable farming practices.
    - The **decline in vulture populations** led to an increase in stray dog populations, spreading diseases like rabies.
- **Fulfilling Constitutional and Global Environmental Commitments:** It fulfills the **constitutional duty** under **Article 48A and Article 51A(g)** to protect and improve the environment and wildlife.

- As a signatory to international agreements like **CITES, United Nations Convention on Biological Diversity (CBD) and the Paris Agreement**, India is bound to conserve its biodiversity.
- Strengthening wildlife conservation aligns with the **United Nations Sustainable Development Goals (SDGs), particularly SDG 13 (Climate Action) and SDG 15 (Life on Land)**.

➢ **Safeguarding Indigenous and Cultural Heritage:** Wildlife conservation is deeply linked to India's indigenous communities, whose livelihoods and traditions depend on nature.

- Many tribes, such as the **Soligas of Karnataka** and the **Bishnois of Rajasthan**, have historically played a crucial role in protecting biodiversity.
- Conservation also preserves **sacred groves,** religious sites, and traditional knowledge systems related to sustainable resource management.

What are the Key Issues Associated with India's Current Wildlife Protection Measures?

➢ **Escalating Human-Wildlife Conflict (HWC):** Rapid urbanization, infrastructure expansion, and farmland encroachment have fragmented habitats, pushing wildlife into human settlements.

- This increases **crop damage, livestock predation, and human casualties,** leading to **retaliatory killings.**
- For instance, over **300 lions in Gujarat now live outside Gir's Protected Area** (PA), increasing human-lion conflicts (Lion Census 2020).
  - In the past **5 years,** India has recorded **52 human casualties** from elephant attacks and unnatural deaths of **552 elephants** due to electrocution, train accidents, poaching, and poisoning.

➢ **Poor Habitat Management and Carrying Capacity Issues:** Wildlife policies focus on **increasing population numbers** and to an extent miss in ensuring **sufficient habitat, food, and water availability.**

- Many species, such as elephants and tigers, require large territories, but shrinking forests restrict their natural dispersal.
- The **Sundarbans tiger population** has grown, but **habitat loss due to climate change has forced tigers into villages.**
- For instance, **Mrugavani National Park** extent was reduced by 22% to 280.29 hectares.
  - And a vital wetland, **Pallikaranai** has shrunk dramatically due to urbanisation, threatening biodiversity and vulnerable communities in **Chennai**

➢ **Lack of Scientific Approach in Wildlife Relocation and Conservation:** Political and regional interests often override scientific recommendations in translocation efforts.

- **Gujarat's refusal to relocate Gir lions to Madhya Pradesh**, despite Supreme Court orders, highlights this issue.
- Unplanned relocations can also fail if ecological factors like prey base and disease control are not considered.
  - **Cheetahs were reintroduced to India from Namibia**, but multiple deaths in **Kuno National Park** raise concerns over habitat suitability.

➢ **Climate Change Impact on Wildlife and Ecosystems: Rising temperatures, erratic rainfall, and extreme weather events** are altering animal migration patterns and degrading habitats.

- **Wetland shrinkage and glacial retreat** threaten species dependent on specific ecosystems.
- Marine and coastal biodiversity, including mangroves and coral reefs, are also at risk from rising sea levels.
- For instance, more than 150 animals, nine of them rare one-horned rhinoceros, have drowned in floods at the **Kaziranga National Park in Assam.**
  - Extreme heat in India impacts all aspects of life and is increasingly causing **birds to collapse mid-flight due to sunstroke-related conditions.**
  - Also, **33.6% of India's coastline faces erosion**, threatening coastal biodiversity.

➢ **Inadequate Wildlife Corridors and Fragmented Connectivity:** Many Protected Areas **exist as isolated patches**, disrupting natural movement patterns and genetic exchange among animal populations.

- Infrastructure projects such as **highways, railways, and power lines** further fragment habitats, increasing animal mortality.
  - Despite efforts to create **green corridors**, land-use conflicts hinder seamless connectivity.

- According to railway data, over **32,000 animals**, including cattle, lions, and leopards, were killed on railway tracks in the three years leading up to 2019.

- **Underfunding and Ineffective Utilization of Resources:** Despite ambitious projects like **Project Tiger and Project Lion**, funding remains insufficient to meet conservation needs.
  - Many state forest departments struggle with staff shortages and outdated equipment, limiting anti-poaching and habitat management efforts.
    - Private sector and community-led funding models remain underutilized.
  - The **Compensatory Afforestation Fund Management and Planning Authority (CAMPA)** funds remain underutilized, delaying afforestation projects and ecosystem rejuvenation for wildlife.
- **Increasing Poaching and Illegal Wildlife Trade:** Despite stricter laws, organized poaching networks and illicit wildlife trade continue to thrive due to high demand for animal parts.
  - Smuggling routes between **India, Nepal, Myanmar, and China** remain active, facilitating black-market sales of **tiger skins, rhino horns, and pangolin scales.**
    - Digital platforms have also become new marketplaces for illegal wildlife trade.
  - In 2024, a **rhino horn smuggling racket** was busted in **Kaziranga National Park in Assam**, exposing links to international crime syndicates.
    - Also, as many as **1,203 pangolins**, the most trafficked wild mammal in the world, were poached for illegal wildlife trade in India from 2018-2022.
- **Conflicts Between Development and Conservation Goals:** Balancing economic growth with environmental protection remains a key challenge, as several projects receive clearances despite ecological concerns.
  - **Mining, dam construction, and industrial expansion** often take precedence over wildlife protection.
  - Weak enforcement of Environmental Impact Assessments **(EIA)** allows many projects to proceed with inadequate safeguards.
  - For instance, the **Great Nicobar Development Project** has raised concerns over habitat destruction for indigenous species like the **Nicobar megapode.**
- **Weak Community Involvement and Benefit-Sharing Mechanisms:** While local communities play a crucial role in conservation, many policies fail to include them as stakeholders.
  - **Lack of economic incentives for communities living near PAs** leads to resentment and occasional involvement in poaching or deforestation.
  - Successful models, like eco-tourism-driven conservation, remain underutilized in many states.
    - The **Maldhari pastoralists in Gir** have historically coexisted with lions, but growing human-wildlife conflict threatens this relationship.
  - **North-East Indian states** such as **Meghalaya, Arunachal Pradesh, Nagaland, and Assam** have become the frontrunners for community led conservation projects, but other states significantly lag behind.
- **Lack of Technology Adoption in Wildlife Protection:** India has been slow to integrate modern technologies like **Artificial Intelligence (AI), drones, and satellite tracking into conservation efforts.**
  - Advanced surveillance can help curb poaching, monitor habitat changes, and **track animal movements**, but implementation remains limited due to funding and training gaps.
  - Technology-driven solutions, such as early warning systems for HWC, need wider adoption.
  - **TrailGuard** is an **advanced camera trap** designed to detect specific species, such as tigers, and instantly transmit their images.
    - However**, its implementation and adoption remain minimal.**

What Measures can India Adopt for Enhancing Wildlife Conservation Efforts?

- **Strengthening Human-Wildlife Conflict (HWC) Mitigation Strategies:** India must adopt proactive measures such as **early warning systems, better compensation for affected communities, and habitat restoration** to reduce HWC.
  - Relocation of vulnerable communities from **high-conflict zones should be done with their consent and proper rehabilitation**.

- **Safe wildlife corridors, eco-bridges, and buffer zones around protected areas (PAs)** can facilitate animal movement without disturbing human settlements.
- Community-led initiatives, like controlled grazing programs, can minimize livestock predation.
  - **Suraksha Mitr** developed by C-DAC should be effectively utilised.

➢ **Expanding and Strengthening Protected Areas:** Many of India's national parks and sanctuaries are too **small to support growing wildlife populations,** requiring their expansion and better connectivity.
- State governments should identify and designate more **eco-sensitive zones** and **community reserves while enforcing strict protection in core areas.**
- **Buffer zones around PAs** should be developed with sustainable livelihoods to prevent illegal encroachment.
  - For instance, the **Terai Arc Landscape (TAL)** project in Uttarakhand and UP successfully links fragmented tiger habitats **across India and Nepal.**

➢ **Implementing Scientific and Transparent Wildlife Relocation Policies:** Translocation of species must be based on **ecological viability with a science-backed approach ensuring prey base**, disease control, and genetic diversity.
- A dedicated **National Wildlife Translocation Board** should oversee such efforts to avoid failures like Kuno's cheetah deaths.
- The **successful translocation of rhinos** from **Kaziranga to Manas National Park** has revived rhino populations in Manas.

➢ **Strengthening Anti-Poaching Mechanisms and Wildlife Crime Control:** Despite stronger laws, poaching and illegal wildlife trade remain rampant, requiring increased surveillance using technology like **drones, thermal cameras, and AI-powered tracking**.
- Strengthening the **Wildlife Crime Control Bureau (WCCB)** with more personnel and inter-agency coordination can improve enforcement.
- Strict penalties under the **Wildlife Protection (Amendment) Act 2022** should be enforced to deter poaching syndicates.
- India can learn from Bhutan in this regard that has embarked on the national roll out of **SMART (Spatial Monitoring and Reporting Tool)** patrolling.

➢ **Encouraging Community-Led Conservation Initiatives:** Local communities must be made stakeholders in conservation through incentives like eco-tourism, sustainable forest produce collection, and conservation-linked livelihood programs.
- **Joint Forest Management Committees (JFMCs)** should be empowered to take a leading role in protecting forests and preventing poaching.
- Initiatives like **Van Dhan Vikas Kendras** can provide alternative income sources to communities near protected areas, reducing their dependence on forests.

➢ **Adopting Technology for Better Wildlife Monitoring:** Leveraging AI, GIS mapping, and satellite imagery can help track animal populations, detect poaching attempts, and monitor habitat changes in real time.
- **Radio collars and GPS tracking** should be **expanded beyond flagship species** like tigers and elephants to other vulnerable animals.
- AI-powered models can predict climate impacts on species and suggest adaptive conservation strategies.
  - **Zoological Survey of India (ZSI)** has set up a pilot project to use eDNA **(environmental DNA),** to study and monitor wildlife, that is a significant step in the right direction.

➢ **Addressing Climate Change and Habitat Degradation:** Wildlife conservation must be integrated with climate resilience strategies to safeguard habitats from extreme weather events.
- **Afforestation drives using native species, wetland restoration, and reducing human-induced wildfires** can improve ecosystem stability.
- Coastal ecosystems like **mangroves and coral reefs** should be prioritized in conservation plans to protect marine biodiversity.
  - For instance, the **Miyawaki afforestation method in Chennai** is being used to rapidly restore degraded urban green spaces.

➢ **Reforming Land Use and Infrastructure Policies for Wildlife Protection:** Linear infrastructure projects like highways and railways should incorporate **eco-sensitive planning**, such as underpasses and overpasses for wildlife movement.

- The Environmental Impact Assessment (EIA) process should be strengthened to ensure that conservation concerns are not ignored for economic growth.
  - For instance, The **Nagpur-Mumbai Expressway** has included **wildlife overpasses** to reduce roadkill incidents.
- Land conversion regulations need stricter enforcement to prevent deforestation in ecologically fragile areas.

Conclusion:

India's wildlife conservation efforts are at a **crossroads**, where **proactive strategies are essential to balance ecological integrity with development needs.** Strengthening habitat connectivity, leveraging technology, and fostering community participation can ensure long-term sustainability. A holistic approach will not only safeguard India's rich wildlife but also secure its ecological and economic future.

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Bridging India'S Skill Gap

This editorial is based on "The employment paradox: Skilling schemes need more realistic streamlining" which was published in Business Standard on 04/03/2025. The article highlights India's paradox of rising youth unemployment and skill gaps, with employability falling to 42.6% in 2024. In response, the government is enhancing the Skill India Mission and launching a major internship initiative.

Tag: GS Paper-2, Human Resource, Government Policies & Interventions, GS Paper-3, Skill Development, Growth & Development

India confronts a critical paradox: escalating youth unemployment amidst persistent skills deficiencies. The **Graduate Skill Index** indicates a troubling decline in employability to **42.6% in 2024.** In response, the government has launched strategic interventions, **notably the Skill India Mission** and an ambitious internship initiative targeting 10 million youth over five years. These programs represent crucial efforts to align educational outcomes with industry requirements, though **substantial enhancements remain imperative if India is to successfully convert its demographic dividend into sustainable economic prosperity.**

What are the Key Government Initiatives Related to Skill Development in India?

- **Skill India Mission**: It was formalised in 2015, serves as an umbrella initiative to deliver comprehensive skill training through ITIs, polytechnics, and vocational centers.
  - It focuses on industry-driven training and entrepreneurship development.
  - **Skill India Digital Hub** is a digital platform to synergize India's skill development, education, employment and entrepreneurship landscape
- **Pradhan Mantri Kaushal Vikas Yojana (PMKVY):** It was initiated in 2015 as a flagship scheme offering short-term training and certification across various trades.
  - It targets **school dropouts, unemployed youth, and underprivileged groups to boost employability**.
  - The 2023 upgrade, PMKVY 4.0, emphasizes industry-aligned courses, **digital skills, and green jobs.**
- **National Apprenticeship Promotion Scheme (NAPS):** It was launched in 2016, promotes on-the-job training via apprenticeships in industries and MSMEs.
  - It provides financial incentives to employers who hire and train apprentices.
- **National Skill Development Corporation (NSDC):** Established in 2008, this public-private collaboration plays a key role in executing nationwide skilling inittiatives.
  - Operating under the **Ministry of Skill Development & Entrepreneurship,** its mission is to bolster vocational training across diverse sectors.
  - By engaging the private sector, it drives innovative efforts to enhance overall skill development.
- **Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY)**: It is a skill development program for rural youth in India.
  - The program is implemented by the Ministry of Rural Development (MoRD).
- **SANKALP (Skills Acquisition and Knowledge Awareness for Livelihood Promotion)**: It is a program launched by the Indian government for improving the quality and

quantity of short-term skill training by strengthening institutions, enhancing market connectivity, and including marginalized sections of society in skill development initiatives,

- **STRIVE (Skill Strengthening for Industrial Value Enhancement)**: It is aimed at improving the quality and relevance of skill training provided through Industrial Training Institutes (ITIs) and apprenticeships, thereby enhancing the industrial workforce's capabilities and value within the market also.
- **PM Vishwakarma Yojana**, launched in 2023, focuses on **Skill Upgradation** for traditional artisans and craftsmen such as carpenters, weavers, and blacksmiths.
  - It offers financial assistance, toolkits, and entrepreneurship training to preserve and enhance heritage skills.

What are the Key Issues Associated with India's Skilling Initiatives?

- **Mismatch Between Skills and Industry Demand:** India's skilling programs often do not align with industry requirements, leading to a significant employability gap.
  - Many courses under **Skill India Mission** focus on traditional trades, while demand for **automation and green jobs** is growing.
  - **Lack of real-world exposure** and outdated curricula further reduce the market relevance of skilled workers.
  - **Over 50% of graduates** and **44% of postgraduates are underemployed** in **low-skill jobs**, with the gap attributed to **inadequate vocational training**
  - Nearly half of India's graduates are unemployable while people with **formal vocational training** make up just **4% of population.**
- **Low Participation of Women in Skilling Programs:** Women face barriers to accessing skilling programs due to **socio-cultural norms, mobility constraints, and lack of childcare support**.
  - **Many courses remain male-dominated,** failing to equip women for high-paying jobs in technology, manufacturing, and digital sectors.
  - The absence of **gender-sensitive skilling policies** limits workforce diversity and economic empowerment.
  - Increasing female participation in skilling is crucial for **India's goal of 50% female workforce participation by 2047**.
  - About 43% of STEM graduates in India are women, which is the highest in the world, but their share in STEM jobs in India is a mere 14%.
    - Female Labor Force Participation (FLFP) in India **is 37% (PLFS 2023)**,
- **Poor Apprenticeship and On-the-Job Training Culture:** Unlike countries like Germany and Japan, India lacks a strong **apprenticeship and dual-learning model**, reducing hands-on experience for workers.
  - Many employers hesitate to invest in skill training, fearing attrition and high costs.
  - Despite the **Apprenticeship Act**, industries remain reluctant to engage trainees, limiting workplace learning opportunities.
  - Expanding work-integrated skills can bridge the gap between theoretical learning and job-readiness.
  - Only **27.73 lakh apprentices** have been engaged in the last 5 years under the **National Apprenticeship Promotion Scheme**
- **Fragmented and Overlapping Skilling Programs:** Multiple skilling initiatives across **different ministries** create inefficiencies, leading to duplication of efforts and poor coordination.
  - Programs like **Pradhan Mantri Kaushal Vikas Yojana 4.0, Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY), and National Apprenticeship Promotion Scheme** often operate in silos, reducing their impact.
  - The absence of a **unified skills database** makes tracking progress and workforce planning difficult.
  - A centralized, tech-driven skilling ecosystem can improve resource allocation and policy outcomes.
  - Despite **many skilling schemes** running under different ministries, only 16% young slum residents are aware of job roles available per qualifications.
    - Also, the **Pradhan Mantri Kaushal Vikas Yojana (PMKVY)** has trained **13.7 million candidates,** but **only 18% or 2.4 million were successfully placed in jobs.**

- **Insufficient Private Sector Participation and Investment:** Private sector involvement in skilling remains weak due to **limited incentives, bureaucratic hurdles, and lack of industry-academia linkages**.
  - Companies are hesitant to fund large-scale upskilling programs, relying instead on **government schemes like PMKVY**.
  - Unlike countries where industries lead skilling initiatives, India's model remains **government-driven**, affecting sustainability.
  - The Skill India Digital Hub (SIDH) is a comprehensive digital platform designed to synergize and transform the skills, education, employment, and entrepreneurship landscape in India**, but the participation remains low.**
- **Skilling Challenges in Rural and Informal Sectors:** India's skilling ecosystem is largely **urban-centric**, leaving out a **significant portion of the workforce in informal and rural sectors**.
  - Many rural workers lack access to formal skilling institutions, and **migration challenges** make consistent training difficult.
    - According to a report by the **World Economic Forum, only 10%** of the rural workforce in India has received formal skills training
  - The informal economy, which employs **over 90% of the workforce**, remains largely outside structured skilling programs.
- **Low Recognition and Certification of Skills:** A large section of India's workforce is **informally skilled**, but lacks **formal recognition and certification**, limiting job mobility.
  - The **Recognition of Prior Learning (RPL) under PMKVY** aims to certify existing skills, but outreach remains low.
  - Employers often prefer **degree holders over skilled workers**, reducing the impact of vocational education.
  - Bridging the gap between **traditional skills and formal accreditation** is crucial for workforce competitiveness.
  - In the **construction sector**, **the majority of workers** are skilled informally but lack certification, reducing wages and job security.

What Strategic Measures can India Implement to Enhance and reform its Skilling Ecosystem?

- **Skilling for Informal and Rural Workforce Inclusion:** A **Rural Skilling and Livelihood Mission** should focus on **agri-tech, food processing and sustainable crafts** is needed to integrate rural populations into the formal economy.
  - Mobile skill training centers, **village-level skilling hubs, and digital literacy programs** should cater to remote areas.
  - Collaboration with **FPOs (Farmer Producer Organizations), SHGs (Self-Help Groups), and Krishi Vigyan Kendras (KVKs)** can provide **agriculture-based skills in organic farming, precision agriculture, and supply chain management**.
- **Industry-Aligned and Future-Ready Curriculum Development:** The skilling ecosystem must shift from a **supply-driven approach to a demand-driven model** by aligning courses with **Industry 4.0, automation, green jobs, and digital economy skills**.
  - Sector Skill Councils (SSCs) should collaborate with **tech companies, MSMEs, and gig economy platforms** to co-design skilling modules.
  - **Work-integrated learning** should be promoted through industry apprenticeships and immersive internship models.
- **Strengthening the Apprenticeship and Work-Based Learning Model:** A **dual-learning approach** combining classroom training with hands-on experience should be institutionalized across all skilling programs.
  - The **Apprenticeship Act** should be revised to incentivize private sector participation through tax breaks and wage support for trainees.
  - Expanding **National Apprenticeship Promotion Scheme (NAPS)** and integrating it with **Startups, MSMEs, and Manufacturing 4.0 sectors** can boost workforce employability.
    - **Gig economy-based apprenticeships** should be promoted to provide flexible skill-learning pathways.
- **Enhancing Digital Skilling and Online Learning Infrastructure:** A **nationwide digital skilling framework** should be developed to equip the workforce with **AI, blockchain, fintech, cloud computing, and cybersecurity** skills.

- **Skill India Digital Hub** should be expanded to offer **multi-language, AI-driven adaptive learning** for urban and rural populations.
  - **5G-enabled skilling hubs** should be set up in tier-2 and tier-3 cities for remote training access.

➢ **Integrating Skilling with School and Higher Education System:** A **National Vocational Education Framework** should mandate **early exposure to technical and soft skills** from **secondary school onwards**.
- Introducing **modular vocational courses** under **New Education Policy (NEP 2020)** can create a seamless transition between academia and industry.
- Skilling and degree programs should be **credit-linked** under the National Credit Framework (NCrF), allowing students to **combine academic and skill-based learning**.

➢ **Gender-Inclusive Skilling and Workforce Participation Enhancement:** Vocational Training Programme for Women should focus on increasing **female participation in STEM, gig economy, financial services, and digital entrepreneurship**.
- Gender-responsive skilling hubs, flexible training schedules, remote learning options, and childcare support can improve accessibility for women.
- **Financial incentives, startup grants, and mentorship programs** should be introduced for women-led enterprises in skilling.

➢ **Recognition of Prior Learning (RPL) and Upskilling for Workforce Mobility:** A **nationwide RPL framework** should formally recognize **informal sector skills** through certification, enabling **job mobility and wage enhancement**.
- Existing workers should have access to **stackable micro-credentials**, allowing them to gain qualifications progressively.
- **Flexible upskilling modules in regional languages** should be made available through **Skill India Digital Hub**.

➢ **Strengthening Private Sector Participation and PPP Models:** Public-private partnerships (PPP) should be expanded to integrate skilling programs into **corporate CSR initiatives, startup ecosystems, and industrial clusters**.
- **Tax incentives and financial grants** should be provided to companies investing in skilling
- **Co-certification models**, where industries certify skill courses along with government agencies, can enhance employability.

➢ **Addressing Soft Skills, Professional Ethics, and Workplace Readiness:** Soft skills training in **communication, problem-solving, adaptability, and teamwork** should be **embedded into all vocational programs**.
- **Industry-oriented soft skill boot camps** should be introduced to improve **job readiness, leadership skills, and professional ethics**.
- **English proficiency and digital literacy courses** should be integrated with ITI and polytechnic training.

➢ **Strengthening Monitoring, Evaluation, and Accountability Mechanisms:** A **real-time, AI-driven skilling dashboard** should be developed to track **enrollment, completion, employment rates, and industry feedback**.
- **Outcome-based funding mechanisms** should be implemented to ensure that **skilling programs translate into actual employment opportunities**.
- Skilling centers should undergo **third-party audits**, and **industry advisory boards should provide periodic recommendations**.
- **Geo-tagging of skilling centers and biometric attendance systems** can curb inefficiencies and ensure quality training delivery.

Conclusion:

To harness its demographic dividend**, India must bridge the skill gap through agile, industry-aligned training.** Strengthening apprenticeships, digital skilling, and rural workforce inclusion is crucial. A unified, demand-driven skilling ecosystem with strong private-sector collaboration can enhance employability. **Only then can India transform its youth potential into sustainable economic growth.**

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India'S Space Strategy

This editorial is based on "ISRO's space launch foray" which was published in The Financial Express on

27/02/2025. The article brings into picture ISRO's growing role in the global satellite market with the launch of a US-based AST Space Mobile satellite, highlighting its commercial expansion toward self-reliance and profitability in the space economy.

Tag: GS Paper - 3, Space Technology, Achievements of Indians in Science & Technology, 2nd ARC

ISRO's upcoming launch of a **US-based AST Space Mobile communication satellite** marks a pivotal moment in India's emergence as a global player in the **satellite launch industry**. Already distinguished by achievements like the SpaDeX mission, **Chandrayaan-3's lunar landing**, and **cryogenic engine development,** ISRO is now breaking into the lucrative commercial satellite market. This commercial expansion represents a crucial step toward India becoming **self-reliant and profitable in the international space economy.**

What are the Key Recent Developments Related to India's Space Sector?

- **Advancing Solar Research:** India's first solar observatory, Aditya-L1, successfully reached its **halo orbit at Lagrange Point-1 (L1)** in January, 2024.
  - The data from Aditya-L1 will enhance **India's space weather forecasting**, crucial for satellite protection and communication systems.
  - This marks a major step in India's deep-space research, putting it in league with NASA and ESA.
  - India is now **one of only four countries** to have a dedicated solar mission, alongside the **US, Europe, and China** (ISRO, 2024).
- **Advancements in Reusable Launch Vehicles (RLV):** ISRO conducted two successful Reusable Launch Vehicle (RLV) **Landing Experiments—RLV-LEX-02 (March 2024) and RLV-LEX-03 (June 2024)**.
  - **Reusability can cut launch costs by 80%**, making space more accessible for **commercial and scientific missions** (ISRO, 2024).
  - The **winged prototype 'Pushpak'** was dropped from a **Chinook helicopter at 4.5 km altitude** before autonomously landing, proving the feasibility of future **reusable rocket technology**.
  - The RLV tests bring ISRO closer to **developing a fully reusable spaceplane, similar to SpaceX's Starship and NASA's Dream Chaser**.
- **India's First Space Docking Experiment (SpaDeX) and Future Space Station Plans:** India achieved a **breakthrough in space docking technology** with the SpaDeX (Space Docking Experiment) mission **in December 2024**.
  - Mastering space docking is critical for **long-duration space missions, in-orbit refueling, and space habitat construction**.
    - This milestone strengthens India's future in **deep-space exploration and interplanetary logistics**.
  - India is now **the fourth country globally** (after the US, Russia, and China) to achieve space docking independently.
    - ISRO plans to **launch the Bharatiya Antariksh Station (BAS-1) by 2035**, starting with an initial **modular space station segment**.
- **Progress in the Gaganyaan Human Spaceflight Mission:** Significant advancements have been made in **India's first crewed spaceflight mission,** Gaganyaan, scheduled for **2025**.
  - This mission aims to send **a three-member crew to low-Earth orbit (LEO) for three days**, marking a historic milestone for India's space program.
  - The **Test Vehicle Abort Demonstration-1 (TV-D1)** successfully tested crew escape systems in case of launch failure.
  - ISRO has trained **four Indian astronauts at Russia's Gagarin Cosmonaut Training Center** and is setting up a **crew training facility in Bengaluru**.
- **Strengthening India's Weather and Disaster Monitoring Capabilities:** The launch of **INSAT-3DS** has significantly improved **weather forecasting, cyclone tracking, and disaster management**.
  - Designed for a **10-year operational lifespan**, the satellite provides **real-time weather data, including temperature, humidity, and atmospheric conditions**.
  - This enhances India's ability to **predict extreme weather events**, mitigating damage from **cyclones, floods, and heatwaves**.
  - INSAT-3DS played a key role in **tracking Cyclone Michaung in December 2023**, enabling early evacuations.

- **India's Growing Role in International Space Collaborations:** ISRO launched **ESA's Proba-3 mission**, strengthening its reputation as a **trusted global launch partner**.
  - This mission, designed to simulate a **total solar eclipse using precision formation flying**, demonstrates India's expertise in **small satellite launches and scientific missions**.
  - India is working with **NASA for the NISAR mission (2024)**, a satellite to monitor **climate change and natural disasters**.
- **Expansion of India's Private Space Sector:** With the introduction of **IN-SPACe and the New Space Policy (2023)**, India's private space sector has seen a rapid rise in **startups, satellite manufacturing, and launch services**.
  - Companies like **Skyroot Aerospace, Agnikul Cosmos, and Pixxel** are developing indigenous launch vehicles and advanced payloads.
  - **Skyroot's Vikram-S (November 2022)** became **India's first private rocket launch**, marking a shift towards commercial space activities.
- **Green Propulsion and Sustainable Space Technologies:** ISRO is actively developing **eco-friendly propulsion systems**, including **liquid methane-LOX engines and solar-electric thrusters** for deep-space missions.
  - The **Vikram-1 rocket (by Skyroot Aerospace) and ISRO's future missions** aim to use **green propellants** to minimize environmental impact.
  - The **Chandrayaan-3 lander used non-toxic propulsion**, aligning with ISRO's commitment to **green space technologies**.
- **Approval of Chandrayaan-4 and India's Upcoming Lunar Ambitions:** Following the **success of Chandrayaan-3**, ISRO has **secured approval for Chandrayaan-4**, a **sample return mission to the Moon**.
  - This mission aims to **leverage India's expertise in precision landing and in-situ lunar studies**, contributing to global lunar science.
  - Chandrayaan-4 will be **India's first robotic mission to return samples from the Moon**, similar to China's **Chang'e-5**.

What are the Key Issues Associated with India's Space Sector?

- **Limited Budget Allocation:** Despite ISRO's achievements, India's space sector operates on a **relatively small budget compared to global counterparts**, limiting the scale of deep-space missions and technology development.
  - Most funding still comes from the government, restricting private sector-led innovation and commercialization.
  - ISRO's budget for 2024-25 **is Rs 13,042.75 crore (about $1.95 billion)**. In contrast, NASA operates with a much larger budget of around **$25 billion**, without any reductions.
  - India's space economy is **only 2% of the global space market**.
- **Slow Development of Reusable and Cost-Effective Launch Technologies:** While ISRO has made progress with **Reusable Launch Vehicle (RLV) experiments**, it lags behind private companies like **SpaceX (Falcon 9) and Blue Origin (New Shepard)** in operational reusable rockets.
  - **High launch costs** limit India's ability to compete in the **global commercial satellite launch market**, which demands **low-cost, frequent, and reusable launch systems**.
  - Accelerating the development of **fully reusable rockets** is crucial to maintaining global competitiveness.
- **Rising Space Debris and Orbital Congestion:** With increasing satellite launches, **space debris management** has become a critical challenge, posing risks to operational satellites and future missions.
  - India lacks an **independent space traffic management system**, making it reliant on international organizations for debris tracking.
  - With **thousands of satellites planned for Low Earth Orbit (LEO) mega constellations**, **collision risks and orbital congestion will intensify**, requiring urgent regulatory and technological interventions.
  - A total of 3143 objects originating from **212 launches and on-orbit break-up events** were added to the space object population in 2023, highlighting the growing threat of space debris.

- **Delayed Implementation of Space Policy and Regulatory Frameworks:** India's **New Space Policy 2023** was a major step in opening the sector to private players, but **implementation delays and bureaucratic hurdles** have slowed its impact.
  - **IN-SPACe**, meant to regulate and facilitate private sector participation, is still evolving its framework, leading to uncertainty for startups and investors.
  - A **clear legal framework on space activities, satellite licensing, and liability in case of damages** is necessary to attract global investments.
  - India has **over 150 space startups**, but most struggle with **funding, regulatory approvals, and global market access**
- **Cybersecurity Threats and Space Asset Protection:** With growing reliance on satellites for **communication, defense, and navigation**, cyber threats targeting space assets pose **national security risks**.
  - India lacks an **independent Space Cybersecurity Command** to protect against **satellite hacking, GPS spoofing, and space-based espionage**.
  - ISRO currently lacks an autonomous cybersecurity division, making its satellites **potential targets for hostile cyber intrusions**.
- **Climate Change Impact on Space Infrastructure:** Extreme weather events, rising temperatures, and increasing humidity levels are **posing risks to ISRO's launch sites and ground stations**.
  - Coastal launch sites like **Sriharikota (SHAR) and Thumba** are vulnerable to **cyclones and sea-level rise**, potentially affecting **future launch schedules and infrastructure durability**.
  - Climate adaptation strategies, including **hardened launch complexes and alternative inland launch sites**, are needed to mitigate these risks.
- **Growing Competition from Emerging Space Powers:** India faces increasing competition from **China, UAE, and South Korea**, which are advancing in **lunar exploration, deep-space missions, and private sector growth**.
  - **China's Chang'e program is targeting lunar colonization by 2035**, while the UAE's **Mars and Moon missions** are attracting global partnerships.
  - To maintain leadership, India must **accelerate Chandrayaan-4, Venus missions, and interplanetary exploration projects**.
- **Delays in Strategic Military Space Capabilities:** India has been slow in **developing dedicated military space assets**, lagging behind China's **Space Force and weaponized satellite capabilities**.
  - While India has **anti-satellite (ASAT) capabilities**, it lacks **dedicated space-based missile defense and electronic warfare satellites**.
  - Establishing an **integrated space command and defense satellite constellation** is critical for national security.
  - China has over **300 military satellites,** while **India operates with fewer for defense and surveillance**.

What Strategic Measures can India Adopt to Enhance the Space Sector?

- **Increasing Budget Allocation and Sustainable Funding Models:** India must **increase public investment in space technology** while promoting **private and foreign investments** through **Public-Private Partnerships (PPP)**.
  - Establishing a **dedicated Space Development Fund (SDF)** can ensure continuous financing for **deep-space missions, satellite manufacturing, and human spaceflight programs**.
  - Expanding **ISRO's commercial wing, NSIL (NewSpace India Limited)**, can drive revenue generation through global satellite launches.
- **Accelerating Reusable Launch Vehicle (RLV) and Cost-Effective Launch Technologies:** India must **prioritize RLV development** to reduce **launch costs, increase frequency, and compete with private players like SpaceX**.
  - Strengthening **Pushpak RLV technology,** integrating **AI-driven autonomous landing systems**, and developing **Methane-LOX propulsion systems** can improve reusability.
  - Enhancing **hypersonic flight research and scramjet engine testing** will enable cost-effective space travel. A **dedicated RLV test center** should be established for **high-speed aerodynamic research**.
- **Expanding Private Sector and Startup Participation in Space Economy:** India must **fully implement the New Space Policy 2023** to enable **private players to develop launch vehicles, satellites, and deep-space technologies**.

- Strengthening **IN-SPACe (Indian National Space Promotion and Authorization Center)** will streamline approvals and reduce bureaucratic delays.
- Tax incentives, regulatory ease, and venture capital support can encourage more startups to enter the **space manufacturing, propulsion systems, and AI-driven satellite services** sectors.
- Fast-tracking licensing processes for private satellite launches will boost India's competitiveness.

➢ **Strengthening Space Traffic Management and Space Debris Mitigation:** India should establish an independent Space Traffic Management (STM) system to monitor, track, and mitigate space debris following the **Convention on International Liability for Damage Caused by Space Objects**.
- Deploying **active debris removal (ADR) satellites**, using laser ablation and robotic arms, can help clear defunct satellites from orbit.
- **AI-powered collision avoidance systems** should be integrated into India's growing satellite fleet.
- Strengthening international cooperation under **UNOOSA and IADC (Inter-Agency Space Debris Coordination Committee)** will enhance India's role in **global space sustainability**.

➢ **Fast-Tracking Space Infrastructure for Human Spaceflight Missions:** To sustain **long-term human spaceflight programs**, India must develop space habitats, advanced crew modules, and deep-space life support systems.
- Establishing a **dedicated Human Spaceflight Research Center (HSRC)** will drive innovations in **space medicine, astronaut training, and microgravity research**.
- The **Bhartiya Antriksh Station (BAS-1) roadmap should be fast-tracked** for operational readiness by **2035**.

➢ **Enhancing Cybersecurity and Space Asset Protection:** India must create a **dedicated Space Cybersecurity Command** under **ISRO and DRDO** to **protect satellites, GPS systems, and defense space assets from cyber threats**.
- Strengthening **quantum encryption, AI-driven anomaly detection, and satellite firewalls** will safeguard critical infrastructure.
- Implementing **real-time threat monitoring systems** for space-based assets will reduce vulnerabilities to **hacking, GPS spoofing, and electromagnetic attacks**.

➢ **Strengthening Deep-Space and Interplanetary Exploration Capability:** India must **expedite missions to the Moon, Mars, and Venus**, enhancing its global space leadership.
- **Chandrayaan-4 (Lunar Sample Return Mission) and Mangalyaan-2 (Mars Orbiter Mission-2)** should be prioritized with **advanced robotic rovers, AI-driven navigation, and in-situ resource utilization (ISRU) experiments**.
- Establishing an **Interplanetary Research Center (IRC)** will boost scientific collaboration and innovation.

➢ **Expanding India's Satellite-Based Applications and Digital Connectivity:** India must expand its satellite fleet for earth observation, navigation, and broadband internet to strengthen **disaster management, agriculture, and national security**.
- Deploying **next-generation NavIC satellites** will enhance **independent satellite navigation and geospatial intelligence**.
- Strengthening **satellite-based quantum communication** will enhance **secure data transmission and defense applications**.

➢ **Climate-Resilient Space Infrastructure and Alternate Launch Sites:** To mitigate risks from **climate change, sea-level rise, and extreme weather**, India must develop **inland launch sites** beyond Sriharikota.
- Establishing a **second launch complex in central India** will provide operational redundancy during adverse weather conditions.
- Strengthening **ISRO's weather monitoring satellites** with advanced **hyperspectral imaging and AI-driven climate modeling** will improve India's disaster response.
- Implementing **eco-friendly, non-toxic green propulsion technologies** will align India's space program with **global sustainability goals**.

Conclusion:

India's space sector is at a **transformative juncture,** with **ISRO making significant strides in commercial satellite launches, reusable launch vehicles, deep-space**

exploration, and human spaceflight. With sustained efforts, ISRO can drive **technological innovation, boost economic opportunities, and contribute to global space exploration**, ensuring India's long-term leadership in the space economy.

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Towards Effective Democratic Decentralisation

This editorial is based on "Decentralisation: Failures at the State level" which was published in The Hindu on 09/03/2025. The article brings into picture the severe financial constraints faced by Panchayats due to weak devolution, excessive dependence on central schemes, and poor fund utilization.

Tag: GS Paper - 2, Local Self Governance, Co-operative Federalism

Despite constitutional provisions, Panchayats face severe financial constraints due to **weak devolution**, excessive dependence on controlled central schemes, and **inefficient fund utilization.** Institutional weaknesses, including poor tax collection capacity, lack of borrowing power, and inadequate financial transparency, further cripple **Panchayat effectiveness.** The path forward requires reimagining our governance model beyond the **rural-urban binary to create systems that genuinely deliver services and move towards effective democratic decentralization.**

What is the History of Democratic Decentralisation in India?

- **About:** Democratic decentralisation in India has evolved over centuries, transitioning from colonial-era local administration to constitutionally mandated self-governance structures.
  - The **73rd and 74th Constitutional Amendments (1992)** marked a watershed moment, providing legal recognition to Panchayati Raj Institutions (PRIs) and Urban Local Bodies (ULBs).
- **Early Developments in Local Governance (Pre-Independence Era):** Even during British colonial rule, local self-governance was recognised as an administrative necessity, though in a highly **centralised and limited** manner.
  - **Key Milestones in Pre-Independence Decentralisation**
    - **1882 – Resolution on Local Self-Government:** Initiated by **Lord Ripon,** this resolution laid the foundation for municipal governance in India, advocating for more autonomy to local bodies.
    - **1907 – Royal Commission on Decentralisation:** Recommended **strengthening rural governance through village panchayats,** but implementation remained weak.
    - **Constitutional Debates on Decentralisation (1948):** While **Gandhi advocated Gram Swaraj (self-rule) as the foundation of democracy**, Ambedkar raised concerns over panchayats being controlled by dominant castes.
- The final Constitution only included local governance as a Directive Principle of State Policy **(Article 40)** rather than a mandatory provision.
- **Post-Independence Developments in Democratic Decentralisation**
  - Phase 1: Initial Reforms and the Three-Tier Panchayati Raj Model (1950s-1970s)
    - **1957 – Balwant Rai Mehta Committee:** Recommended a **three-tier Panchayati Raj system** with elected bodies at village, block, and district levels. This led to the establishment of PRIs across various states in 1959.
    - **1963 – K. Santhanam Committee:** Suggested that PRIs should have **limited taxation powers** and recommended setting up **State Panchayati Raj Finance Corporations** to enhance financial autonomy.
    - **1978 – Ashok Mehta Committee:** Highlighted issues such as **bureaucratic resistance, political interference, and elite capture** of PRIs. Recommended making **districts the primary administrative unit of governance**.
    - While some states like **Karnataka, Andhra Pradesh, and West Bengal** adopted reforms based on these recommendations, decentralisation remained **incomplete, with state governments retaining excessive control over local bodies**.

- **Phase 2: Strengthening Local Governance (1980s-1990s)**
  - **1985 – G.V.K. Rao Committee:** Recommended **greater autonomy to PRIs** and **empowering Block Development Offices (BDOs)** for rural development planning.
  - **1986 – L.M. Singhvi Committee:** Advocated **constitutional recognition** for PRIs and **Gram Sabha as the foundation of grassroots democracy**.
  - **1992 – The 73rd and 74th Constitutional Amendments:** Established **constitutional status** for rural and urban local governance.
  - These amendments marked a **turning point** by introducing **mandatory elections, reservations, fiscal devolution, and planning responsibilities for local bodies**.

What are the Key Issues Hindering Effective Democratic Decentralisation in India?

- **Fiscal Dependence and Weak Revenue Autonomy: Panchayats and Urban Local Bodies (ULBs)** lack financial independence, relying on unpredictable state and central transfers, limiting their ability to plan and execute projects effectively.
  - The absence of **robust own-source revenue generation,** poor tax collection mechanisms, and state control over key revenue streams further weaken their fiscal capacity.
  - Even **State Finance Commissions (SFCs),** mandated to recommend devolution every five years, are either delayed or their recommendations remain unimplemented.
  - The **2024 "Status of Devolution to Panchayats in States Index"** highlights that own-source revenue contributes only **5-10% of Panchayat expenditure.**
    - The RBI report highlights that while urban areas generate **60% of India's GDP**, municipal corporations receive **only 0.6% of GDP in revenue.**
- **Political and Bureaucratic Centralisation:** Despite constitutional recognition, real authority remains concentrated in state governments, with **local bodies often reduced to implementing agencies** for centrally and state-sponsored schemes.
  - The transfer of **29 subjects under the 11th Schedule remains inconsistent,** as State governments hesitate to cede control, restricting Panchayats' decision-making authority.
  - This creates a structural contradiction where local governments are held accountable for service delivery but lack the power to execute decisions effectively.
    - **District Planning Committees (DPCs)** exist but are not effectively implemented.
- **Excessive Reliance on Centrally Sponsored Schemes:** Local governments lack discretionary spending power as funds are largely tied to **centrally designed schemes, reducing flexibility in addressing local needs.**
  - The mismatch between local priorities and centrally dictated projects leads to inefficiencies and **underutilization of resources.**
    - For instance, PMAY-G was launched in 2016 aiming for housing for all in rural India, but only **41% of funds remain unutilized due to delays,** slow construction, and land availability issues.
- **Weak Accountability and Transparency Mechanism:** Local bodies suffer from **poor financial accountability, lack of independent audits**, and limited public participation in governance.
  - Corruption and the reluctance to **impose taxes for electoral gains weaken Panchayat finances** and opaque decision-making undermine democratic decentralization.
    - The recent RBI report highlights a performance gap in Panchayat finances, with tax revenue at just **1.1% and non-tax revenue at 3.3% of the total.**
- **Structural Weaknesses in State Finance Commissions:** State governments often delay constituting SFCs, and even when formed, their **recommendations are either ignored or not implemented in letter and spirit.**
  - Unlike the Central Finance Commission, most states **fail to adhere to the constitutional obligation of constituting State Finance Commissions** at regular intervals.
    - The failure to institutionalize a robust SFC framework has **weakened the financial independence of local governments.**

- The 15th Finance Commission (2021-26) highlighted that only **9 states** have constituted their 6th SFC, even though it was due in 2019-20 for all states.

- **Limited Representation of Marginalized Groups in Decision-Making:** While reservations exist for women, SCs, and STs in local bodies, **their representation remains largely symbolic**, with real decision-making power often controlled by dominant social groups.
  - **Women sarpanches and councilors** frequently face proxy representation **(Pradhan Pati)**, where male family members influence governance.
    - The lack of training, financial independence, and institutional support weakens their role in actual governance.
  - A **2023 government panel** proposed strict penalties for husband proxies in Panchayats, but the practice remains widespread.
- **Poor Human Resource Capacity in Local Governments:** Local bodies suffer from an **acute shortage of trained personnel,** with critical administrative functions still controlled by state-appointed officers.
  - The **absence of dedicated technical staff for planning, financial management, and service delivery** weakens their ability to function effectively.
    - Elected representatives often lack the necessary training and expertise to manage governance functions efficiently.
  - A 2020 report stated that **District Planning Committees are non-functional** in nine states, and failed to prepare integrated plans in 15 states.
    - It also found that in many of the cities staff vacancies against sanctioned strength is about **30%.**
- **Lack of Digital and Technological Integration in Local Governance:** Most local bodies have inadequate **digital infrastructure, limiting transparency, efficiency, and citizen engagement.**
  - While some states have adopted **e-Governance initiatives,** the uneven implementation of digital tools leads to a gap in service delivery.
  - Over **40% of gram panchayats** do not report digital attendance. A 2021 data shown in Lok Sabha reveals that over **25000 villages** in India are still unconnected to the internet.

What Measures can India Adopt to Revamp Democratic Decentralisation?

- **Ensuring Fiscal Autonomy through Strengthening State Finance Commissions (SFCs):** A predictable and transparent fiscal devolution mechanism is essential for effective local governance.
  - States must undertake **comprehensive activity mapping** for all **Eleventh and Twelfth Schedule subjects** and align financial devolution accordingly.
  - Local governments must be given **greater tax autonomy**, including better property tax assessment and professional tax collection mechanisms.
    - The **Second ARC** recommends broadening and deepening the revenue base of local governments to ensure financial sustainability.
- **Empowering Panchayats and Municipalities with Administrative Autonomy:** Local governments must have the **power to recruit personnel and regulate service conditions** to ensure efficiency and accountability.
  - The **practice of state governments approving local budgets** should be abolished, ensuring that locally elected bodies have full control over their financial planning.
    - Panchayats and ULBs should have **independent secretariats** with trained personnel dedicated to local governance.
- **Reforming Urban Governance through Mayor-in-Council System:** The current system of municipal governance, where executive powers are shared between **mayors and commissioners,** leads to inefficiencies and accountability gaps.
  - A **directly elected Mayor with a fixed tenure** and executive authority will improve governance and public accountability.
  - The **Mayor-in-Council system**, as **recommended by the 2nd ARC**, will help streamline decision-making and improve municipal efficiency.
  - Municipal bodies should also **leverage land banks for revenue generation** to reduce financial dependency on state governments.
    - The 2nd ARC recommends that municipalities must have full autonomy over their functions **and a transparent taxation mechanism.**

- **Strengthening Rural Governance with True Devolution of Powers:** A **mandatory activity mapping exercise** should ensure clear delineation of responsibilities at each level of governance.
  - Gram Panchayats should be of **appropriate size** to function effectively and deliver public services efficiently.
  - Tribal areas should see **full implementation of the Panchayats (Extension to Scheduled Areas) Act, 1996 (PESA)** to empower traditional governance structures.
- **Enhancing Local Revenue Generation through Transparent Taxation and Borrowing:** Local governments should be granted **greater borrowing powers** with regulatory safeguards to ensure fiscal discipline.
  - **Transparent property tax assessment** and **professional tax collection** should be streamlined to improve local revenue generation.
  - Municipal bonds and pooled financing mechanisms should be encouraged to **diversify revenue sources (e.g, Indore Model)** and fund urban infrastructure.
  - The 2nd ARC recommends that municipalities should have full financial autonomy and their borrowing capacity should be enhanced.
- **Bridging the Urban-Rural Governance Divide with Flexible Classification:** The **rigid urban-rural classification** leaves many peri-urban areas without proper governance structures.
  - A dynamic classification system, where **peri-urban areas transition smoothly from Panchayats to Municipalities**, should be developed.
    - Governance should be **service-centric rather than classification-centric**.
  - Special governance models, such as **Metropolitan Planning Committees (MPCs) and District Planning Committees (DPCs)**, should be strengthened to address cross-jurisdictional issues.
    - The Ashok Mehta Committee recommended a two-tier governance structure with stronger financial and functional autonomy for local bodies.
- **Institutionalizing Local Government Capacity-Building and Training:** Local representatives often lack the necessary training and expertise to handle governance functions.
  - Establishing **Local Governance Training Institutes (LGTIs)** in every state can provide continuous capacity-building for elected representatives and officials.
  - **E-Governance and digital tools** should be integrated into local administration to improve efficiency and transparency building upon the **G.V.K. Rao Committee** recommended that local governments must be **empowered with adequate administrative and technical expertise.**
- **Implementing Citizens' Charters and Participatory Governance Mechanism:** Citizens must be actively engaged in local governance through **mandatory public consultations, ward sabhas, and Gram Sabhas** for key policy decisions.
  - **Social audits and participatory budgeting** should be made compulsory to improve accountability in fund allocation and service delivery.
  - **Citizen Charters in all ULBs**, as recommended by the 2nd ARC, should be legally binding to ensure service delivery timelines.
    - The **Balwant Rai Mehta Committee** also emphasized community participation in decision-making for effective local governance.

Conclusion:

To ensure true democratic decentralization, India must focus on **Fiscal Strength, Functional Autonomy, and Fair Representation**. Strengthening local revenue generation, granting genuine administrative powers, and ensuring inclusive governance will empower Panchayats and municipalities. A forward-looking approach must integrate digital governance, financial independence, and citizen participation.

Sustaining the Himalayan Ecosystem

This editorial is based on "Himalayan tragedy: On avalanches in the Himalayan States" which was published in The Hindu on 08/03/2025. The article brings into picture the vulnerability of India's Himalayan region, which, despite its strategic and resource significance, remains environmentally fragile.

Tag: GS Paper - 3, Environmental Pollution & Degradation, Environmental Impact Assessment (EIA)

The recent **avalanche in Uttarakhand** serves as just one example of the **broader vulnerability facing India's Himalayan region**. These majestic mountains, while strategically crucial and resource-rich, **exist in a perpetual state of environmental fragility—prone to avalanches, landslides, flash floods, and seismic activity.** India needs to work harder in developing comprehensive **disaster management systems and ecologically sensitive development approaches** specific to the unique challenges of its **Himalayan frontier.**

What is the Significance of Himalayan Region of India?

- **Strategic and Geopolitical Importance:** The Himalayas form a **natural defense barrier,** crucial for India's security, **especially amid rising border tensions with China.**
  - With increasing **Chinese incursions along the LAC,** India has ramped up military infrastructure in Ladakh and Arunachal Pradesh.
  - The recent **India-China standoff in Eastern Ladakh** led to the expansion of the Border Roads Organisation (BRO) projects, including the strategic **Atal Tunnel and the Zoji La Tunnel.**
    - A 2022 report stated that **India has built 2,088 kilometers** of roads in areas bordering China in the last **5 years.**
- **Water Tower of India (Hydrological Significance):** The Himalayas are the source of major rivers like the **Ganga, Brahmaputra, and Indus**, supporting **agriculture, drinking water, and hydropower.**
  - The **Hindu Kush Himalayas** are called the **water towers of Asia** as they are the source of **10 major rivers** including **Ganges, Indus** and have the largest snow and ice deposits outside the two poles.
  - Approximately **1,20.00,000 million cubic meters of water** flows down the Himalayan rivers annually and nourishes the millions living in the plains.
- **Ecological and Biodiversity Hub:** The Himalayas are one of 36 biodiversity hotspots, with around 3,160 rare, endemic and sensitive plant varieties that hold special medicinal properties.
  - It is home to rare species like the **snow leopard, red panda, and medicinal plants.**
  - It has a number of climate types and ecological zones, from tropical to alpine ecosystems including ice and rocks in the uppermost zone, enriching the biodiversity of the region.
- **Cultural and Religious Significance:** The Himalaya mountain is a prominent geographical feature revered in various spiritual traditions, including **Tibetan Buddhism and Hinduism.**
  - They are deeply embedded in India's cultural and spiritual traditions, with sacred sites like **Kedarnath, Badrinath, Amarnath, and Hemkund Sahib.**
  - The region attracts millions of pilgrims annually, but unregulated tourism and poor waste management threaten its ecological balance.
- **Economic and Livelihood Significance:** The Himalayas support millions of livelihoods through **tourism, agriculture, and forest-based industries.**
  - **Organic farming, eco-tourism, and renewable energy** are driving sustainable economic growth.
  - In states like **Uttarakhand, West Bengal, Tripura, Assam, and Meghalaya**, the tourism sector has been contributing more than **10% to the GDP.**
  - The Sikkim organic farming model (though, recently facing issues), which made it **India's first organic state**, is a successful example of sustainable agriculture.
  - The **Dark Sky Reserve** will be located at Hanle village in Eastern Ladakh as a part of Changthang Wildlife Sanctuary. It will **boost Astro-tourism in India.**
- **Renewable Energy Potential (Hydropower & Solar Energy Hub):** The Himalayan rivers provide immense hydropower potential, crucial for India's energy security and green transition.
  - **India's Northeastern states**, with their mountainous topography and perennial streams, have the largest hydropower potential in all of India.
    - The **Arunachal Pradesh 13,000 MW hydropower project agreement (2023)** in Lohit Basin aims to boost clean energy.
- **Critical for Monsoon and Climate Regulation:** The Himalayas play a key role in influencing the **Indian monsoon** by acting **as a barrier to cold Central Asian winds and trapping moisture-laden monsoon winds.**
  - Without the Himalayas, **the region would have been a cold desert.** Any disruption in the Himalayan ecosystem, such as **glacial melting or deforestation, affects monsoon patterns**, leading to unpredictable weather and droughts.
  - While monsoon is considered the cleanest season, with relatively low air pollution, experts say air pollution is likely to reduce the southwest monsoon rainfall by **10%-15% for the entire country**

What are the Key Issues Associated with the Indian Himalayan Region?

- **Increasing Frequency of Climate-Induced Disasters:** The Himalayas are witnessing a surge in disasters like **avalanches, landslides, and flash floods** due to rising temperatures, glacier retreat, and erratic weather patterns.
  - It includes increasing **cloudbursts due to the rising frequency of orographic rainfall.**
  - **Rapid urbanization and deforestation** have further exacerbated the fragility of the region, making local communities highly vulnerable.
  - Between **2004 and 2017**, a total of 3,285 landslides worldwide were triggered by rainfall.
    - **In the Indian Himalayas alone, 580 landslides occurred** during this period, with 477 caused by rainfall, accounting for 14.52% of global landslides.
  - The **2025 Uttarakhand avalanche** and the **2023** Sikkim Glacial Lake Outburst Flood (GLOF) highlight the rising disaster threats in the region.
- **Unsustainable Infrastructure Development:** Massive infrastructure projects such as **highways, tunnels, and hydropower plants** are being developed without adequate environmental assessments.
  - The **cutting of slopes, deforestation, and blasting for roads** weaken mountain stability, triggering landslides and land subsidence.
    - While strategic connectivity is essential, development must balance ecological sensitivity with infrastructure needs.
  - **Heightened seismic activity** due to **ongoing continental collision (Indus–Tsangpo suture zone)** ties with unsustainable infrastructure development to give result to issues like **The** Joshimath land subsidence **crisis (2023)** was linked to excessive tunneling and road construction under the **Char Dham Project.**
- **Rapid Glacier Retreat and Water Security Threats:** Himalayan glaciers, crucial for sustaining India's major rivers, are melting at an alarming rate due to global warming.
  - This threatens long-term water availability for millions downstream, increasing risks of **droughts, reduced hydropower generation, and conflicts over water resources.**
  - A 2023 report stated that **glaciers in Asia's Hindu Kush Himalayas** are melting at unprecedented rates and could lose up to **75%** of their volume by century's end if global warming continues at current rates.
- **Biodiversity Loss and Wildlife Habitat Destruction:** Deforestation, human encroachment, and climate change have led to the loss of biodiversity in the Himalayas, home to unique species like the **snow leopard and red panda.**
  - A decline of **902 square kilometres** in forest cover was recorded in hill districts of the country as compared to 2019, found the **State of Forest Report, 2021.**
  - The **expansion of agriculture, tourism, and hydro projects** disrupts ecosystems, leading to human-wildlife conflicts and species extinction.
  - Human-caused climate warming and increasing deforestation have also fuelled an invasion of non-native species.
    - For example, the **crofton weed** poses a real risk to the native Himalayan **pine trees (Pinus roxburghii).**
- **Border Tensions and Security Challenges:** The Himalayan region is the frontline of India's border tensions with China and Pakistan, making it strategically vulnerable.
  - Frequent **skirmishes, encroachments, and militarization** have increased, leading to heavy infrastructure development that disrupts fragile ecosystems.
  - The **India-China clashes in Tawang (2022)** led to accelerated road and airbase construction in border areas.
    - Due to this, **India's defence budget for 2025-26 has been set at Rs 6.8 lakh crore ($79 billion),** reflecting a critical diversion of resources towards security rather than development.

- **Unregulated and Unsustainable Tourism:** Tourism in the Himalayas has increased exponentially, **leading to overcrowding, waste mismanagement, and ecosystem degradation.**
  - Unplanned hotel construction, road expansion, and pollution have severely impacted fragile zones, triggering land subsidence and biodiversity loss.
  - The Himalayan Clean-Up (2022) waste audit revealed that **92.7% of the trash was plastic**, with **72% consisting of non-recyclable plastic**.

What Measures can India Adopt for Sustainable Development and Resilience of the Himalayan Region?

- **Eco-Sensitive and Climate-Resilient Infrastructure:** Infrastructure development should follow strict Environmental Impact Assessments (EIA) and adopt **nature-based solutions** like bio-engineering and climate-resilient road designs.
  - **Zero-emission public transport** and **electric vehicle corridors** should be promoted in high-altitude towns to minimize air and noise pollution.
  - Integrating **disaster-resistant building codes** will enhance the safety of settlements in vulnerable zones.
    - A **scientific carrying capacity analysis** should be conducted before approving large-scale projects.
- **Sustainable Tourism and Waste Management Policies:** Tourism should be regulated through **carrying capacity limits**, eco-tourism models, and responsible visitor behavior frameworks.
  - A **permit-based entry system** in ecologically fragile areas can control overcrowding while promoting high-value, low-impact tourism.
  - **Decentralized waste management systems**, including biodegradable waste processing and plastic bans, should be strictly enforced in pilgrimage and trekking zones.
  - **Green certifications for hotels and homestays** can incentivize sustainable tourism practices.
    - Local communities should be empowered through **community-managed tourism models** to ensure economic benefits without ecological exploitation.
- **Integrated Water Management and Glacier and Wetland Conservation:** A **Himalayan River Basin Management Authority** should be established to coordinate transboundary river conservation and optimize hydropower usage without disrupting local ecology.
  - **Artificial glacier recharge techniques**, such as **ice stupas and designating more Ramsar sites in himalayan region** should be done to combat water issues and combat seasonal water shortages.
  - **Glacial lake monitoring and early warning systems (EWS)** should be strengthened to prevent Glacial Lake Outburst Floods (GLOFs).
  - River embankment projects should use **bioengineering solutions** instead of excessive concretization.
- **Reforestation and Biodiversity Conservation Strategies:** India needs to promote afforestation with **native species in himalayan region that enhance soil stability and carbon sequestration**.
  - **Eco-sensitive zones (ESZs)** must be strictly implemented around wildlife corridors to prevent habitat destruction.
  - Community-led conservation models, such as **Van Panchayats and eco-task forces**, should be expanded for participatory afforestation.
  - **Agroforestry and medicinal plant cultivation** can be promoted as sustainable livelihood alternatives to reduce pressure on forests.
- **Disaster Risk Reduction and Early Warning Systems:** A **Himalayan Disaster Resilience Framework** should integrate **real-time monitoring of landslides, earthquakes, and avalanches** through satellite-based remote sensing.
  - Local governance should be empowered with **disaster-resilient infrastructure plans and climate adaptation strategies**.
  - Expanding **community-based disaster preparedness programs** will improve response efficiency in remote villages.
  - **Cross-border cooperation with Nepal, Bhutan, and China** on disaster management should be strengthened for coordinated responses.

- **Sustainable Livelihood Promotion and Climate-Adaptive Agriculture:** Promoting **organic farming, permaculture, and high-altitude climate-resilient crops** can enhance food security and reduce soil degradation.
  - **Eco-friendly handicrafts, herbal products, and adventure tourism** should be incentivized to diversify local economies.
  - **Decentralized renewable energy solutions, such as micro-hydro and solar grids**, can provide sustainable energy access to remote villages.
  - **Skill development programs in green jobs** (such as **sustainable tourism, forest conservation, and eco-construction**) should be expanded.

Conclusion:

To ensure the long-term sustainability of India's Himalayan region, a multi-pronged approach integrating **ecological conservation, disaster resilience, and climate-adaptive development is essential.** Strengthening the National Mission on Himalayan Studies **(NMHS)** can play a pivotal role in fostering research-based solutions, promoting sustainable tourism, and enhancing local governance.

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Shaping India'S Tech Future

This editorial is based on "India's tech startup boom: Are policy tweaks needed to drive growth?" which was published in Business Standard on 09/03/2025. The article brings into picture the transformative role of technology in economic and social growth while highlighting India's challenges, such as regulatory hurdles and adoption barriers.

Tag: GS Paper-3, IT & Computers, Government Budgeting

As the world accelerates into the digital age, technology is no longer just an enabler—it is the backbone of **economic growth, governance, and social transformation**. India, with over 120,000 startups and **pioneering digital infrastructure** like **UPI**, stands at the forefront of this transformation. However, barriers such as regulatory complexities and low adoption rates threaten sustainable growth. To navigate this, India must craft a **strategic policy framework t**hat fosters innovation while ensuring scalability and **resilience of India's Tech Revolution.**

What are the Key Drivers of India's Tech Revolution?

- **Digital Public Infrastructure (DPI) as a Catalyst:** India's robust Digital Public Infrastructure (DPI), including UPI, Aadhaar, and ONDC, is driving financial inclusion, e-commerce expansion, and digital payments at an unprecedented scale.
  - These platforms lower transaction costs, enhance accessibility, and create a foundation for innovation in fintech**, health tech, and e-governance.**
    - The DPI model is now globally recognized, with India advocating its adoption at the G20.
  - For instance, in **January, 2025**, UPI transactions in India reached a record high of 16.99 billion, with a value exceeding Rs 23.48 lakh crore.
- **Startup Ecosystem & Deep Tech Advancements:** India's startup ecosystem, the world's **third-largest**, is diversifying beyond IT services to **AI, semiconductor design, space tech, and quantum computing**.
  - Increased investments, government incentives, and a culture of innovation are pushing India toward self-reliance in critical technologies.
  - The rise of Deep Tech Startups is evident in sectors like **defense, AI-driven healthcare, and blockchain applications**.
  - In the last 10 years, over 120,000 startups have been registered in India. Also, — deep tech start-ups in India raised about **10 billion U.S. dollars in funding in 2023.**
- **AI and Automation Driving Industrial Growth:** AI adoption in **manufacturing, banking, governance, and healthcare** is reshaping productivity and decision-making.
  - With India's IT giants heavily investing in AI, domestic businesses are leveraging automation to optimize costs and improve efficiency.
  - The government's IndiaAI Mission aims to democratize AI access, positioning India as a global leader in ethical AI development.

- Also, the **world's first government-funded multimodal LLM initiative, BharatGen** was launched in 2024.
  - It aims to **enhance public service delivery** and citizen engagement through foundational models in language, speech, and computer vision.

➢ **5G & Future Telecom Infrastructure:** India's **rapid 5G rollout** is unlocking new frontiers in IoT, smart cities, and high-speed internet penetration, particularly in rural areas.
- With **6G research** underway and the government pushing for **domestic telecom manufacturing**, India is set to lead in next-gen connectivity.
- Telecom giants like **Reliance Jio and Bharti Airtel** are aggressively expanding fiber-optic networks to boost digital access.
- The country's 5G adoption is gaining momentum, with projections indicating 330 million 5G subscribers by 2026.
  - **Bharat 6G Vision document** envisages India to be a frontline contributor in design, development and deployment of 6G technology by 2030.

➢ **Policy Reforms & Government Push for Self-Reliance:** India's policy ecosystem, through initiatives like **PLI (Production-Linked Incentive) schemes, Make in India, and the Digital India Act (tabled)**, is fostering an innovation-driven economy.
- Strategic trade policies aim to reduce dependency on Chinese imports while incentivizing domestic high-tech production.
- The **simplification of regulations for deep tech startups and EV manufacturing** is attracting global investors.
- For instance, **Apple** may move up to 18% of global iPhone production to India by FY2025 under the government's production-linked incentive scheme.

➢ **Green Technology & Sustainable Digital Growth:** India's **tech revolution is increasingly integrating sustainability**, with a push for **green data centers, renewable-powered AI, and eco-friendly digital solutions**.
- The government and private sector are investing in **energy-efficient chip manufacturing, sustainable cloud computing, and AI-driven climate solutions** to align tech growth with environmental goals.
  - For instance, Airtel's data centre arm Nxtra, one of India's leading data centre companies, has joined the RE100 initiative and committed to sourcing 100 per cent renewable electricity.
- With India's **commitment to net-zero by 2070**, digital expansion must also be energy-efficient.
- The **PLI scheme for selected solar PV module manufacturers and Green Hydrogen Mission** supports clean energy adoption in the tech sector.

What are the Key Issues Associated with India's Tech Revolution?

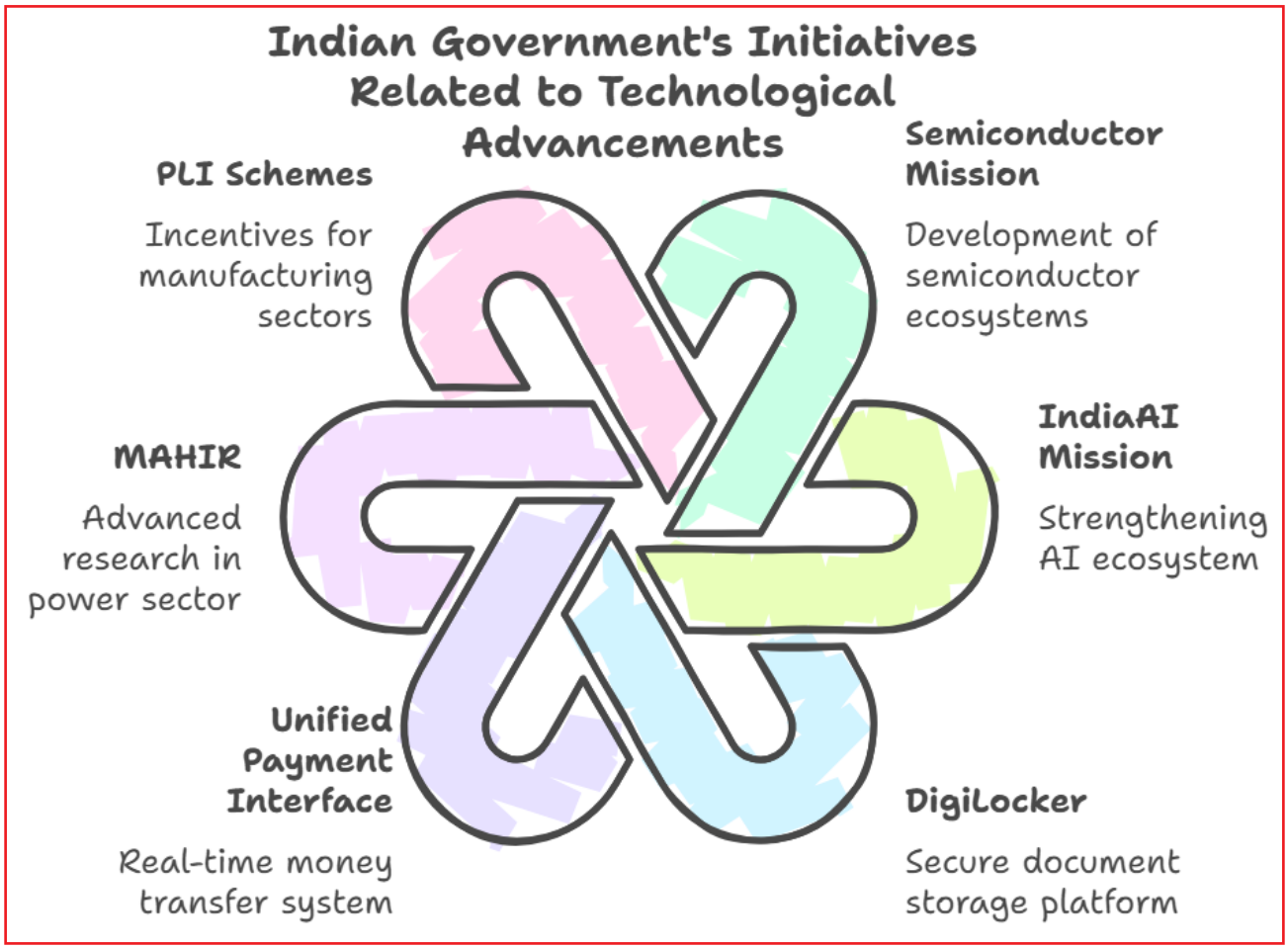
➢ **Regulatory Uncertainty & Compliance Burden:** Frequent policy shifts, delays in approvals, and compliance complexities hinder innovation and investments in India's tech ecosystem.
- For instance**, the Faster Adoption and Manufacturing of Electric Vehicles (FAME)** scheme was replaced by the **Prime Minister Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE)** scheme in 2024.
- The **Digital Personal Data Protection Act (2023)** provides a legal framework but **lacks clarity on cross-border data flows** and regulatory overlaps.
- India ranks 63rd in the World Bank's Doing Business Report (DBR), 2020, highlighting regulatory bottlenecks.
  - Also, SEBI's recent crackdown on unregistered financial influencers has led to a sharp **40-60% decline in brand deals.**

➢ **Digital Divide & Uneven Internet Penetration:** Despite digital expansion, **rural internet penetration remains low**, leading to an unequal tech revolution.
- High costs of digital infrastructure and device affordability gaps prevent uniform access, limiting fintech, e-learning, and e-governance adoption in **Tier-3 and rural areas**.
- The **urban-rural internet divide** exacerbates economic disparity and slows digital financial inclusion.
- 45% of the Indian population, or about 665 million citizens, do not access the internet as of 2023.
  - The **PM WANI Wi-Fi scheme** has seen slow implementation.

- Lack of Research Push and Skilled Workforce in Emerging Tech: India spent only 0.65% of its GDP on R&D in 2022.
  - Also, India stands 14th in AI research with a global share of just 1.4% (2018-2023) in terms of paper contribution.
  - India also faces a **talent crunch in AI, cybersecurity, quantum computing, and semiconductor design**, affecting tech-driven economic expansion.
    - While **STEM education is strong**, industry demand for skilled workers in **deep tech and R&D roles** far exceeds supply.
- **Cybersecurity Threats & Data Privacy Challenges:** As India's digital footprint grows, **cyberattacks, data breaches, and lack of cybersecurity awareness** pose severe risks to businesses and governance.
  - **Fintech, banking, and Aadhaar-linked databases** remain primary targets **(e.g, rise of digital arrests)**, with rising concerns over data localization and citizen privacy.
    - Weak encryption standards in small businesses and startups further expose vulnerabilities in the digital economy.
  - In 2023 alone, India saw more than 79 million cyber attacks, with the **AIIMS ransomware attack (2022)** exposing **millions of patient records**.
    - In 2024, India faced significant losses from digital arrest scams, with **₹1,777 crore** lost in the first four months alone.
- **Over-Reliance on Foreign Tech & Semiconductor Imports:** India's digital boom is largely dependent on **imported semiconductors, cloud infrastructure, and foreign AI models**, leading to vulnerability in global supply chains.
  - Delayed progress in domestic chip fabrication and lack of indigenous alternatives to **Nvidia AI chips, Google Cloud, and AWS** limit India's **tech self-reliance**.
    - Geopolitical tensions further raise concerns over supply disruptions.
  - For instance, according to the recent government data, the semiconductor imports in India rose 18.5% to Rs 1.71 lakh crore in 2023-24.
    - The **Micron semiconductor plant** aims to start local production, but gaps in fabrication remain.
- **Ethical & Social Implications of AI & Automation:** Unregulated AI adoption in governance, recruitment, and law enforcement risks **bias, job losses, and mass surveillance concerns**.
  - McKinsey Global Institute projections suggest automation could displace between **400 and 800 million jobs globally by 2030**
  - **Deepfake technology, misinformation, and algorithmic discrimination** threaten **public trust in AI-driven decision-making**.
    - For instance, several **deep fake political scandals** misled voters during General elections 2024, highlighting risks in AI governance.
- **Digital Monopolies & Lack of Platform Competition:** India's **digital economy is increasingly dominated by a few large corporations**, stifling competition and innovation among smaller tech players.
  - The rapid expansion of **Big Tech firms in cloud computing, e-commerce, and AI services** has led to concerns over data monopolization and anti-competitive practices.
  - Despite policies like **ONDC (Open Network for Digital Commerce)**, barriers remain for startups to challenge entrenched tech giants.
    - **Amazon and Flipkart control more than half of India's e-commerce market**, making small retailers struggle.
    - The **Competition Commission of India (CCI) fined Google ₹1,337 crore in 2023** for monopolizing the Android app ecosystem.

What Measures can India Implement to further Strengthen its Technological Capabilities?

- **Strengthening Digital Public Infrastructure (DPI) Beyond Finance:** Expand the **DPI model beyond UPI and Aadhaar** to sectors like **health, education, and agriculture**, ensuring seamless digital access to essential services.
  - Develop **AI-driven governance frameworks** to optimize welfare distribution, reduce leakages, and improve real-time policy implementation.



- Encourage interoperability between **health records, education credentials, and digital identity systems** to create an integrated ecosystem.
  - Establish **public-private partnerships (PPPs)** to co-develop scalable DPI solutions.

➢ **Boosting Indigenous Semiconductor & Electronics Manufacturing:** Accelerate domestic chip production under the **₹76,000 crore Semiconductor PLI scheme**, ensuring faster establishment of fabs and ecosystem development.

- Incentivize **chip design startups and R&D in high-end processors, sensors, and photonics** to reduce import dependency.
- Strengthen collaboration with **global semiconductor leaders while developing indigenous IP** to secure supply chains.
  - Scale **compound semiconductor and packaging units** to complement fabrication capacity.

➢ **Developing India-Centric AI & Cloud Infrastructure:** Invest in **sovereign AI models and cloud computing** to reduce dependency on foreign platforms like Google Cloud and AWS.

- Launch **AI supercomputing clusters** under a national AI computing initiative to support research, startups, and enterprises.
- Establish **data localization mandates with a balanced regulatory approach** that ensures security without stifling innovation.
  - Promote **open-source AI frameworks** tailored for Indian languages and governance needs.

- **Enhancing Cybersecurity & Digital Resilience:** Strengthen the existing **National Cyber Coordination Centre (NCCC)** to proactively mitigate cyber threats in banking, governance, and defense.
  - Mandate **cyber hygiene education in schools and enterprises** to build a digitally secure workforce.
  - Scale up **indigenous cybersecurity startups** through dedicated funding and government procurement policies.
- **Strengthening India's Space-Tech & Satellite Capabilities:** Expand **low-cost satellite manufacturing and private-sector participation** under the IN-SPACe framework.
  - Expand **satellite-based broadband** to enhance rural connectivity, bridge the digital divide, and reduce reliance on foreign satellites for internet access.
  - Develop **geospatial intelligence tools** for secure navigation and defense applications.
    - Promote **AI-integrated remote sensing solutions** for climate monitoring, disaster management, and precision agriculture.
- **Fostering Deep-Tech R&D & Industry-Academia Collaboration:** Create **dedicated deep-tech research hubs** for quantum computing, biotech, and advanced materials under the **National Research Foundation.**
  - Incentivize **private sector R&D in frontier technologies** through tax breaks and funding support.
  - Strengthen **collaboration between IITs, IISc, and global tech giants** to co-develop next-gen solutions.
    - Implement **PhD-to-startup pathways** to commercialize research innovations.
- **Expanding the Scope of Fintech & Digital Financial Inclusion:** Enhance **cross-border UPI and CBDC adoption** to establish India as a leader in digital payments infrastructure.
  - Develop **AI-driven credit scoring models** for MSMEs and informal sector workers to improve financial access.
  - Strengthen **blockchain-based regulatory tech (RegTech)** for fraud prevention and transparent transactions.
    - Scale **embedded finance solutions in agriculture, healthcare, and micro-enterprise ecosystems**.
- **Reforming Tech Policy & Regulatory Landscape for Innovation:** Streamline **tech policy-making with a single-window digital clearance system** for startups and deep-tech projects.
  - Develop **sector-specific AI regulations** to address ethical concerns while fostering innovation.
  - Reduce compliance burdens on **Indian SaaS, fintech, and cloud startups** to promote global competitiveness.
    - Ensure **stable, long-term digital policies** that attract foreign investments while protecting national interests.
- **Developing a Future-Ready Workforce:** Strengthen science, technology, engineering, and mathematics programs in schools and universities.
- Offer courses in AI, cybersecurity, blockchain, and semiconductors.
- Implement large-scale digital skilling programs under **Skill India** to prepare for Industry 4.0.

Conclusion:

India's tech revolution must be driven by a **forward-looking policy framework that fosters innovation, strengthens digital resilience,** and bridges regulatory and infrastructural gaps. By scaling indigenous semiconductor production, expanding Digital Public Infrastructure, and ensuring ethical AI governance, India can achieve **sustainable and inclusive technological leadership.**

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India-Mauritius Partnership for Stability & Prosperity

This editorial is based on "India and the geopolitics of Mauritius: The 'Star and Key' to the Indian Ocean" which was published in The Indian Express on 12/03/2025. The article highlights how the Indian Prime Minister's Mauritius visit strengthens India's strategic, economic, and maritime ties amid rising geopolitical competition.

Tag: GS Paper-2, Important International Institutions, Government Policies & Interventions, International Treaties & Agreements, Effect of Policies & Politics of Countries on India's Interests.

India and Mauritius share a **historical, economic, and strategic bond**, shaped by **shared heritage, geopolitical interests, and economic cooperation**. Indian Prime Minister's **March 2025 visit** highlights **India's commitment to reinforcing bilateral ties amid shifting global dynamics**. As China's influence expands in the Indian Ocean, India's role in **maritime security, trade, and infrastructure development** is crucial. Strengthening defence collaboration, economic engagement, and cultural partnerships will ensure Mauritius remains a key pillar in India's SAGAR vision for regional stability and prosperity.

What is the History of India-Mauritius Relations?

- **Colonial Era and Indentured Labor System:** Mauritius was colonized by **French (1715-1810)** and later by **British (1810-1968)** rule.
  - French settlers first brought **Indian artisans and masons** from Puducherry in the 1700s.
  - The British introduced **Indian indentured laborers (1834-early 1900s)** for sugar plantations.
    - Nearly **500,000 Indians** arrived, with **two-thirds settling permanently** in Mauritius.
- **Indian Diaspora and Cultural Retention:** Today, **70% of Mauritius' population** is of Indian origin, with significant **Bhojpuri, Tamil, Telugu, and Marathi-speaking communities**.
  - Many Mauritians of Indian descent, primarily from Bihar and Uttar Pradesh, have preserved their **languages, cultural festivals, and traditions**.
- **Freedom Struggle and Diplomatic Ties:** Mauritius gained **independence in 1968**, led by a movement influenced by **India's independence struggle**.
  - Mahatma Gandhi briefly **visited Mauritius in 1901**, inspiring workers towards **education and political empowerment**.
  - Indian leaders played a role in **supporting the Mauritian freedom movement**, and established **diplomatic relations in 1948**.
- **Deepening Cultural Ties:** India inaugurated the **Mahatma Gandhi Institute (1976), Rabindranath Tagore Institute (2000), and World Hindi Secretariat (2018)**.
  - The **Indira Gandhi Centre for Indian Culture (1987)** is India's **largest cultural center abroad**.
  - These institutions promote **Indian languages, traditions, and heritage**.
- **India-Mauritius in Modern Diplomacy:** Relations have evolved beyond **historical and cultural ties**, expanding into **economic, security, and strategic partnerships**.
  - Mauritius' **geopolitical position** in the **Western Indian Ocean** enhances India's maritime security interests.

What is the Significance and Present Status of India-Mauritius Bilateral Relations?

- **Commercial Relations:** Mauritius is a **key economic partner** and a **gateway for Indian businesses into Africa**.
  - Bilateral trade **reached $851.13 million in FY 2023-24**, with India exporting **$778.03 million worth of goods**.
  - Key **exports include petroleum products, pharmaceuticals, and textiles**, while Mauritius exports **vanilla, medical devices, and aluminium alloys**.
  - Mauritius remains a top FDI source for India, investing **$177 billion since 2000**, accounting for **25% of India's total FDI inflows**.

- The Double Taxation Avoidance Agreement (DTAA) has enhanced Mauritius' role as a **financial hub**.

➢ **India-Assisted Projects:** India has funded **numerous infrastructure and socio-economic projects**, with **$1.1 billion in development assistance**.

- Major projects include the **Metro Express, Supreme Court Building, ENT Hospital, and Social Housing initiatives**.
- Recently, 20 India-funded projects, including the **Civil Services College ($4.75 million)** and community-linked infrastructure worth **₹7 crores** has been inaugurated
- A **$500 million** Line of Credit **(2017)** supports **critical infrastructure development**.
- India also provided **digital tablets for Mauritian students** and launched its **first overseas** Jan Aushadi Kendra **(2024)**.
- Under the Comprehensive Economic Cooperation and Partnership Agreement (CECPA) **2021, Indian exports to Mauritius** increased significantly.

➢ **First Responder in Crises:** India has consistently **assisted Mauritius in crises**, including the **COVID-19 pandemic**, Wakashio oil spill **(2020)** and Cyclone Chido **(2024)**.

- India provided **vaccines(**Vaccine Maitri**), oxygen concentrators, and medical aid**, reinforcing its **humanitarian role**.

➢ **Geopolitical Significance:** Mauritius is **strategically crucial** for India's **maritime security and balancing external powers in the Indian Ocean**, given its Exclusive Economic Zone **(2.3 million sq. km)**.

- India developed **Agaléga Island** for **maritime surveillance** and **set up coastal radar stations** to enhance security.
- India's support for **Mauritius' sovereignty over** Chagos ensures **regional security against external pressures**.
- Mauritius is integrated into **India's** Information Fusion Centre for the Indian Ocean Region (IFC-IOR) and actively participates in the Colombo Security Conclave **(India, Sri Lanka, Maldives, Bangladesh, Mauritius)**.
- Also, Mauritius is a vital partner in **India's SAGAR vision**.

- **A Bridge Between India and the Global South:** Mauritius acts as a **gateway for India's economic and diplomatic outreach** to **Africa and the Global South**.
  - Its **bilingual advantage** (English and French) facilitates **engagement with Francophone Africa and trade expansion**.
  - The island's **preferential trade agreements** with African nations enhance **India's global trade presence**.
- **Cultural Relations and People-to-People Ties:** Mauritius is a **major beneficiary of India's Indian Technical and Economic Cooperation (ITEC) program**, with **4,940 Mauritians trained since 2002**.
  - Mauritius hosts **26,357 Indian nationals**, 13,198 OCI cardholders, and around 2,316 Indian students.
  - The **e-Vidya Bharti & e-Arogya Bharti (e-VBAB) online learning program** had **229 enrollments in 2022** and **53 in 2023**.
  - Visa-free travel, shared religious practices, and growing **tourism** strengthen ties, while India supports **Mauritian Hindi, Bhojpuri, and Tamil** cultural preservation.

What Are the Challenges in India and Mauritius Bilateral Relations?

- **Geopolitical Competition:** Mauritius balances relations with **India, China, Europe, Gulf states, and Russia**, creating a **competitive diplomatic landscape** in the Indian Ocean.
  - China has **increased infrastructure investments**, including **port development and economic projects** in the region.
- **Dependency on Indian Assistance:** Mauritius benefits significantly from **India's development assistance, concessional credit, and grants**, raising concerns of over-reliance.
  - India has provided **$1.1 billion in aid**, including **Metro Express, Social Housing, and Supreme Court projects**.
  - Mauritius wants to **diversify partnerships** to avoid excessive dependence on a single country for economic and security needs.
- **Economic and Trade Barriers:** Despite **CECPA (2021)**, bilateral trade is **relatively low** compared to India's trade with other African nations.
  - Mauritius is India's **second-largest FDI source**, but investment **flows are declining** due to **revised tax treaties and global regulatory changes**.
- **Balancing Ethnic and Diplomatic Engagement:** Mauritius has a **diverse population**, including **Indian-origin, African, and European communities**.
  - While India shares strong ties with **Indian-origin Mauritians (70% of the population)**, it must engage **all ethnic groups** to maintain diplomatic balance.
- **Environmental and Climate Risks:** Mauritius faces **severe climate vulnerabilities**, including **rising sea levels, cyclones, and coastal degradation**.
  - The **Wakashio oil spill (2020)** and **Cyclone Chido (2024)** highlighted the **ecological risks** to Mauritius' **marine economy and tourism sector**.
- **Concerns Over Maritime Security and External Influence:** Mauritius' **Exclusive Economic Zone (EEZ) of 2.3 million sq. km** requires **enhanced security cooperation**.
  - India has developed **Agaléga Island for joint maritime surveillance** and **coastal radar stations**, but external actors, including **China, Gulf states, and Russia**, are also **expanding their naval presence**.
- **Need for Enhanced Private Sector Engagement:** Indian **public sector enterprises (PSUs) dominate economic engagement** in Mauritius, with **Bank of Baroda, LIC, SBI, and Indian Oil** having strong operations.
  - However, **Indian private sector participation remains low**, limiting business innovation and trade diversification.

What Should be the Way Forward to Strengthen Ties Between India and Mauritius?

- **Expanding Economic Partnership for Sustainable Growth:** India and Mauritius should **broaden the CECPA agreement**, incorporating **services, fintech, and digital trade** to maximize trade potential.
  - Mauritius is seeking **amendments to the Double Taxation Avoidance Convention (DTAC) and CECPA** to boost **FDI inflows**, which should be addressed bilaterally.
  - Strengthening **Mauritius' role as India's financial gateway to Africa** will attract **greater investments and economic collaboration**.

- **Deepening Maritime Security and Defence Cooperation:** India should **expand** naval exercises with Mauritius, reinforcing coastal security and anti-piracy operations.
  - The **Agaléga facility** must be further integrated into **regional security frameworks** like the **Colombo Security Conclave** to **counter growing foreign naval activity**.
- **Strengthening Resilience Against Climate Change:** Mauritius and India should **collaborate on climate adaptation programs**, particularly in **coastal resilience, green energy, and disaster management**.
  - Expanding India's support for **marine conservation and sustainable fisheries** will ensure **Mauritius' long-term economic stability**.
- **Encouraging Private Sector Investments and Digital Connectivity:** India should **encourage private sector involvement**, particularly in **technology, AI, and financial services**.
  - A **special economic zone (SEZ) for Indian startups in Mauritius** could create a regional innovation hub.
  - Expanding **digital connectivity and e-commerce partnerships** will further strengthen economic ties.
- **Boosting Bilateral Tourism and People-to-People Engagement:** Strengthening **air connectivity and tourism promotion** between India and Mauritius will enhance **cultural exchanges and economic opportunities**.
  - India should facilitate **heritage tourism initiatives**, highlighting **Mauritius' Indian-origin historical connections**.
  - India should increase scholarships under the ITEC program, promoting **higher education exchange and technical training**.
- **Promoting Mauritius as a Key Diplomatic Partner in Africa:** Mauritius' **strategic location** makes it an **ideal partner for India's Africa outreach**.
  - Strengthening **Mauritius' role in African Union engagements and Indo-Pacific security dialogues** will enhance **regional stability**.

Conclusio

India and Mauritius share **historical, economic, and strategic ties** that require **continuous adaptation to evolving global dynamics**. Strengthening **trade, security, environmental cooperation, and digital connectivity** will ensure **a robust, future-ready partnership**. As global geopolitical challenges grow, **India must reinforce its commitment to Mauritius as a stable and strategic ally**.

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Navigating the India- Sri Lanka Fisheries Dispute

This editorial is based on the article "Resolving the vexatious fishing dispute," *which was published in The Hindu on 13/03/2025. The article highlights the India-Sri Lanka Palk Bay fisheries dispute and stresses the need for sustainable solutions, government action, and renewed bilateral talks.*

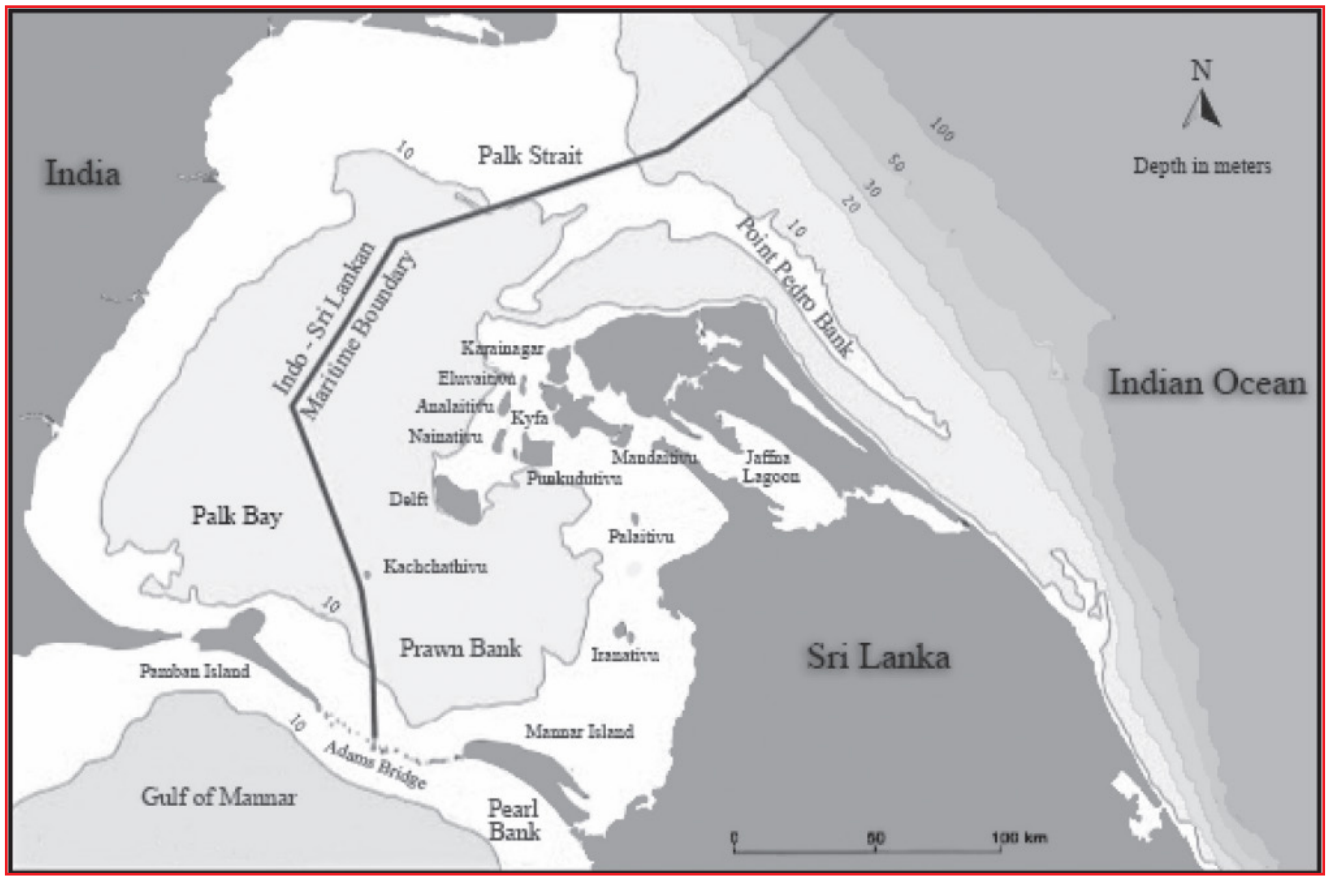
Tag: GS Paper-2, Important International Institutions, Government Policies & Interventions, International Treaties & Agreements, Effect of Policies & Politics of Countries on India's Interests.

The India-Sri Lanka fisheries dispute has been a long-standing issue that continues to strain diplomatic relations between the two neighboring nations. Recently, Sri Lankan Leader of the House, Bimal Rathnayake, called on India to take decisive action against illegal fishing in Sri Lankan waters. While acknowledging India's past support, he emphasized the urgent need to safeguard the livelihoods of Tamil-speaking fishermen in Sri Lanka's Northern Province, who are severely affected by this issue.

What are the Key Issues in the India-Sri Lanka Fishing Dispute ?

- **Recurrent Arrests:** Indian fishermen with their trawlers often in search of fishes stray into Sri Lankan waters due to engine failures or sudden weather changes.
  - The destruction of fishing vessels, continued boat confiscation after fishermen's release, and heavy fines by Sri Lankan authorities remain recurring issues between both nations.
- **Violation of IMBL:** Indian fishermen claim historical fishing rights beyond the **International Maritime Boundary Line (IMBL)** based on traditional practices that lead to arrests of Indian fishermen in areas close to the IMBL.

- The Palk bay is equally divided between India and Sri Lanka by the IMBL, but fishing rights remain contested.
- The IMBL (as per **UNCLOS**) is an official boundary separating territorial waters, defining maritime jurisdiction, and regulating fishing, resource use, and naval activities.



- **Depletion of Fish Stocks:** Overfishing on the Indian side of the IMBL forces Indian fishermen into Sri Lankan waters, which Sri Lanka views as "poaching," posing security risks and threatening local livelihoods.
- **Bottom-Trawling:** Sri Lanka opposes ecologically destructive **bottom trawling** employed by Indian fishermen, and seeks a sustainable solution to protect their waters from over-exploitation.
  - Bottom trawling drags weighted nets along the seabed, damaging marine habitats like coral reefs and sponges.
- **Sri Lanka's National Security Concerns:** Sri Lanka alleges that Indian trawlers intrude regularly in a coordinated manner and fears Tamil militant groups may re-emerge using fishing vessels.
- **Katchatheevu Island Dispute:** The **Katchatheevu** issue revolves around the ownership and usage rights of the uninhabited island of Katchatheevu, located in the Palk Strait between India and Sri Lanka.
  - In 1974, an agreement between the Prime Ministers of India and Sri Lanka recognized Katchatheevu as part of Sri Lanka's territory, altering its ownership.
  - Due to differing interpretation of the agreement by both sides, it failed to resolve the fishing rights issue, with Sri Lanka limiting Indian fishermen's access to activities such as resting, drying nets, and visiting the Catholic shrine without visa.

What are the Major Areas of Cooperation Between India and Sri Lanka?

- **Development Cooperation:** India is a significant provider of development aid to Sri Lanka.
  - Notable initiatives include the **Indian Housing Project**, which aims to build 50,000 homes for war-affected communities. Additional support includes electricity projects, railway development, and various community development initiatives.
    - In 2022, India agreed to set up **hybrid power projects** in northern Sri Lanka and initiated development projects at **Kankesanthurai and Trincomalee ports.**
- **Economic Cooperation:** India and Sri Lanka have strengthened economic ties through the **India-Sri Lanka Free Trade Agreement (ISFTA)**, with India being Sri Lanka's third-largest export destination and over 60% of exports benefiting from the agreement.
  - They are also exploring an **Economic and Technology Cooperation Agreement (ETCA)** to further strengthen their economies.
  - Sri Lanka's adoption of India's **Unified Payments Interface (UPI)** has improved fintech connections, and using the rupee for trade supports its economy.

- **Cultural Relations:** The 1977 Cultural Cooperation Agreement has enabled cultural exchanges, while the Indian Cultural Centre in Colombo promotes Indian arts and organizes International Yoga Day.
  - Additionally, the India-Sri Lanka Foundation, established in 1998, strengthens scientific and cultural collaboration
- **Defence and Security Cooperation:** Since 2012, India has been involved in the Indo-Sri Lankan Defence Dialogue, focusing on security partnerships. Both nations conduct joint military (Mitra Shakti) and naval (SLINEX) exercises to enhance their defence collaboration.
  - India is providing support through a free-floating dock facility, a Dornier reconnaissance aircraft, and a training team, all aimed at bolstering security in the Indian Ocean region.
- **Multilateral Cooperation:** Both countries actively participate in regional organisations such as BIMSTEC (Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation) and SAARC as well as international bodies like the United Nations and the World Trade Organization

What are the Implications of the Indo-Sri Lanka Fishing Conflict?

- **Livelihood Issues:** Sri Lanka Navy's arrests of Indian fishers distress their families, while sea conflicts have caused fatalities and missing fishers, heightening risks for fishing communities.
- **Enforcement Challenges:** The enforcement cost for patrolling the IMBL has risen, straining resources.
- **Smuggling Concerns:** The Indian Coast Guard and Sri Lanka Navy struggle to differentiate between genuine fishers and smugglers making IMBL vulnerable to smuggling.
- **Political Ramifications:** Allegations against the Sri Lanka Navy's actions in the Palk Bay have fueled diplomatic tensions between the two nations.
  - E.g., Political tensions have influenced India's support for UN resolutions on Sri Lanka's human rights record.
- **Environmental Impact:** Bottom trawling harms fish breeding, depletes stocks, and damages the seafloor, with recovery taking thousands of years.
- **Economic Consequences:** Overfishing has reduced fishery resources and fishers' income, with Sri Lanka losing an estimated USD 730 million annually due to Indian poaching.

What are International Laws on Freedom of Fishing?

- **UN Fish Stocks Agreement (UNFSA, 1995):** States should either become members, or they should agree to apply the conservation and management measures established by Regional Fisheries Management Organizations (RFMOs) to access fishery resources.
  - RFMOs are international bodies responsible for managing and conserving fish stocks in specific ocean regions.
- **UNCLOS, 1982:** Article 87 of UNCLOS limits fishing freedom on the high seas, making it illegal for vessels from States that fail to meet its conditions.
  - E.g., Considering due regard for the interests of other States in their exercise of the freedom of the high seas.

What should be the Way Forward to Resolve the Fisheries Dispute?

- **Joint Marine Resource Management:** A regional fisheries management authority should be established to regulate fishing activities and prevent overexploitation of marine ecosystems.
  - The **India-Sri Lanka Joint Working Group (JWG)** on Fisheries, established at the secretarial level in 2016, should be revitalized to seek a permanent resolution to the fishermen issue.
- **Promoting Deep-Sea Fishing and Alternative Livelihoods**
  - The Indian government must accelerate efforts to transition Tamil Nadu fishermen toward deep-sea fishing.
  - The **Palk Bay deep-sea fishing scheme**, part of the **Pradhan Mantri Matsya Sampada Yojana (PMMSY)**, aims to support traditional fishermen in Tamil Nadu, particularly those in the Palk Bay area, by providing deep-sea fishing vessels and promoting activities like **seaweed cultivation** and **sea-ranching** to reduce fishing pressure and cross-border fishing conflicts

- **Enforcing Regulations and Phasing Out Bottom Trawling**
  - Strict enforcement of the **Tamil Nadu Marine Fishing Regulation Act, 1983**, is necessary to curb bottom trawling.
  - India should gradually phase out this practice by providing incentives and financial assistance for sustainable fishing methods.
  - Sri Lanka, in turn, should establish clear guidelines and designated zones for joint fishing activities.
- **Enhancing Regional Cooperation and Technology Sharing**
  - Both countries must collaborate on marine conservation initiatives, scientific research, and technological advancements in sustainable fishing.
  - A model worth considering is the **Australia–Indonesia Joint Patrol Program**, which utilizes technology for real-time monitoring and cross-border cooperation to prevent illegal fishing..
- **Humanitarian Considerations and Legal Frameworks**
  - A framework for the humane treatment of detained fishermen should be established, ensuring timely repatriation and legal support.
  - Both nations could adopt a **dispute resolution mechanism** similar to the United Nations Convention on the Law of the Sea (UNCLOS) framework, which offers structured, neutral arbitration in maritime disputes

Conclusion

Resolving the India-Sri Lanka fisheries dispute is not just a matter of economic or environmental necessity; it is a diplomatic imperative for both countries in the evolving Indo-Pacific landscape. By leveraging their shared maritime interests, both nations can strengthen their bilateral ties, enhance regional stability, and contribute to the broader objectives of peace, security, and cooperation in the Indo-Pacific.

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Rethinking India'S Nutrition Strategy

This editorial is based on "Tackling the problem of nutrition" which was published in The Hindu on 17/03/2025. The article brings into focus India's nutrition challenge, which extends beyond food insecurity to cultural, gender, and health factors.

Tag: GS Paper-2, Issues Relating to Poverty & Hunger, GS Paper-3, Agricultural Resources

India's nutrition challenge extends beyond **food insecurity, encompassing cultural habits, gender relations, and diet-induced diseases** across all demographics. While Budget 2025 increases funding for Saksham Anganwadi and Poshan 2.0, these programs maintain a **narrow focus on maternal and child malnutrition,** overlooking other vulnerable groups. There is a need for a comprehensive nutrition agenda that recognizes diverse nutritional needs, leverages local food systems, and utilizes health and wellness centers as delivery mechanisms.

How Nutritional Security Programmes Evolved in India?

- **Post-Independence Era (1950s-1970s): Food Sufficiency & Basic Nutrition Support**
  - In the early years, India faced **severe food shortages, famine risks, and widespread malnutrition**, prompting a **food security-first approach**.
    - The government's priority was to **increase agricultural production and ensure minimum food availability** for the masses.
    - **Nutrition-specific policies were limited**, primarily focusing on targeted feeding programs for children and mothers.
  - Key Initiatives:
    - Public Distribution System **(PDS) (introduced around World War II, expanded post-1947)**: Provided subsidized staple grains to address food insecurity.

- **ICDS (1975)**: Integrated Child Development Services launched to provide **supplementary nutrition, immunization, and preschool education** to children under 6 and pregnant/ lactating mothers.
- **Balwadi Nutrition Programme (1970s)**: Provided **nutritional supplements** to preschool children in rural areas.

➢ **Green Revolution & Expansion of Food-Based Schemes (1980s-1990s)**

❍ With the Green Revolution **(1960s-70s)** ensuring **food self-sufficiency**, attention shifted to **expanding social welfare programs for nutrition**.

- The government **institutionalized nutrition programs within healthcare and education systems**, recognizing that malnutrition persisted despite food availability.

❍ **Key Initiatives:**

- **Mid-Day Meal Scheme (MDMS) (1995, formalized under Supreme Court directive in 2001)**: Provided **cooked meals** to schoolchildren, improving **nutrition and school enrollment**.
- **National Nutrition Policy (1993):** Introduced a **multi-sectoral approach**, integrating agriculture, health, and food distribution for better nutritional outcomes.
- **Universal Immunization Programme (1985)**: Helped combat **nutrient deficiencies linked to infections**.

➢ **Rights-Based Approach & Micronutrient Interventions (2000s-2010s)**

❍ The 2000s saw a **paradigm shift from welfare-based nutrition support to rights-based food security and micronutrient interventions**.

- The government **recognized hidden hunger (micronutrient deficiencies)** and the need for a legal framework to ensure universal food access.

❍ **Key Initiatives:**

- **National Food Security Act (NFSA) (2013)**: Made PDS as **legal entitlements**, ensuring food for upto 75% of the rural population and 50% of the urban population
- **Iron & Folic Acid Supplementation (2013)**: Addressed **widespread anaemia** among women and children.
- **Fortification Programs**: Launched **fortified rice, wheat, and milk** distribution to tackle hidden hunger.
- **POSHAN Abhiyaan (erstwhile National Nutrition Mission):** It was launched in March 2018 to achieve improvement in nutritional status of Children from 0-6 years.

➢ **Comprehensive Nutrition & Health Integration (2020s - Present)**

❍ India's latest approach **combines nutrition, healthcare, agriculture, and behavioral change**, recognizing that malnutrition is **not just about food availability but also quality, affordability, and awareness**.

- The government is now **leveraging digital technology, local food systems, and climate-resilient agriculture** for better nutritional outcomes.

❍ **Key Initiatives:**

- **Poshan 2.0 (2022)**: Merged **ICDS, Mid-Day Meal, and Poshan Abhiyaan** for a **life-cycle approach** to nutrition.
- **Millets Promotion under International Year of Millets (2023)** – Encouraged **nutrient-rich, climate-resilient crops** in **PDS, Mid-Day Meals, and ICDS**.
- **One Nation, One Ration Card (ONORC):** Ensured **migrant workers** could access **subsidized food** anywhere in India.
- **Health & Wellness Centres (Ayushman Bharat):** Integrated **nutrition counseling, non-communicable disease prevention, and lifestyle interventions** into primary healthcare.

Why does India Continue to Grapple with Nutritional Insecurity?

➢ **Persistent Child Malnutrition and Anaemia:** India's excessive focus on food security has not translated outcomes away from **nutritional security**, leading to **high child malnutrition and anemia**.

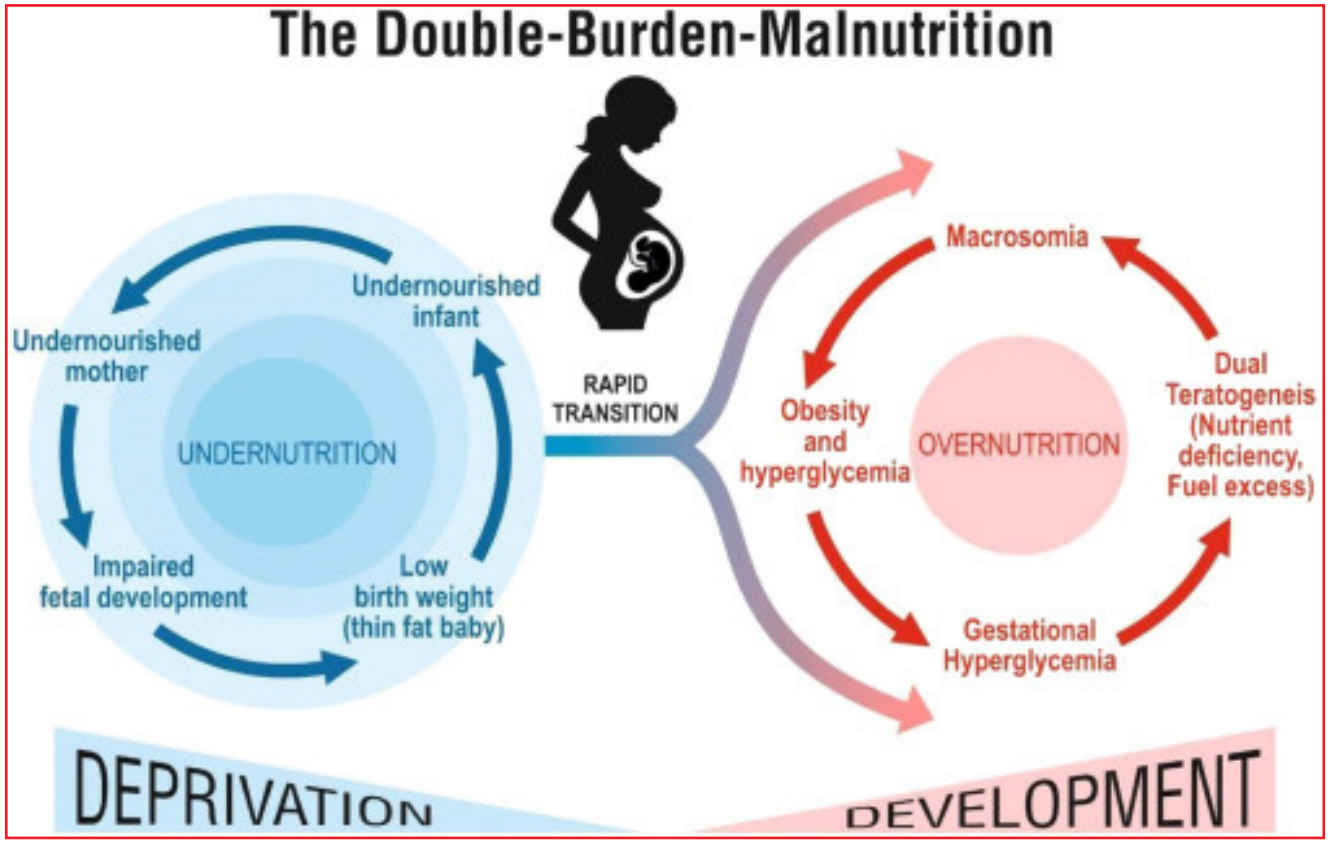
❍ Poverty, lack of dietary diversity, and poor maternal health continue to affect early childhood nutrition.

❍ **NFHS-5 (2019-21), 36% of children under five are stunted** and **57% of women (15-49) are anaemic**.

- Even in key hunger indicators like Global Hunger Index **(GHI) 2023,** India ranks 111 out of a total of 125 countries.

➢ **Double Burden of Malnutrition- Obesity & NCDs:** While undernutrition persists, urbanization and changing food habits have led to **rising obesity and diet-induced non-communicable diseases (NCDs)** like **diabetes and hypertension**.

- High consumption of **processed, sugar-laden foods** and a sedentary lifestyle have worsened the health crisis **(Economic Survey 2023-24).**
- Despite this, **nutrition policies remain focused on calorie intake rather than dietary quality**.
  - **Affordable, healthy food remains out of reach for many,** while junk food is cheap and accessible.
- Almost **one-fourth of our population (both men and women)** are currently either overweight or obese in India
  - In India, there are estimated **77 million people** above the age of **18 years** are suffering from **diabetes (type 2)** and nearly 25 million are prediabetics.



➢ **Gender and Social Disparities in Nutrition Access:** Nutrition security in India is deeply affected by **gender discrimination, caste hierarchies, and social inequalities**.

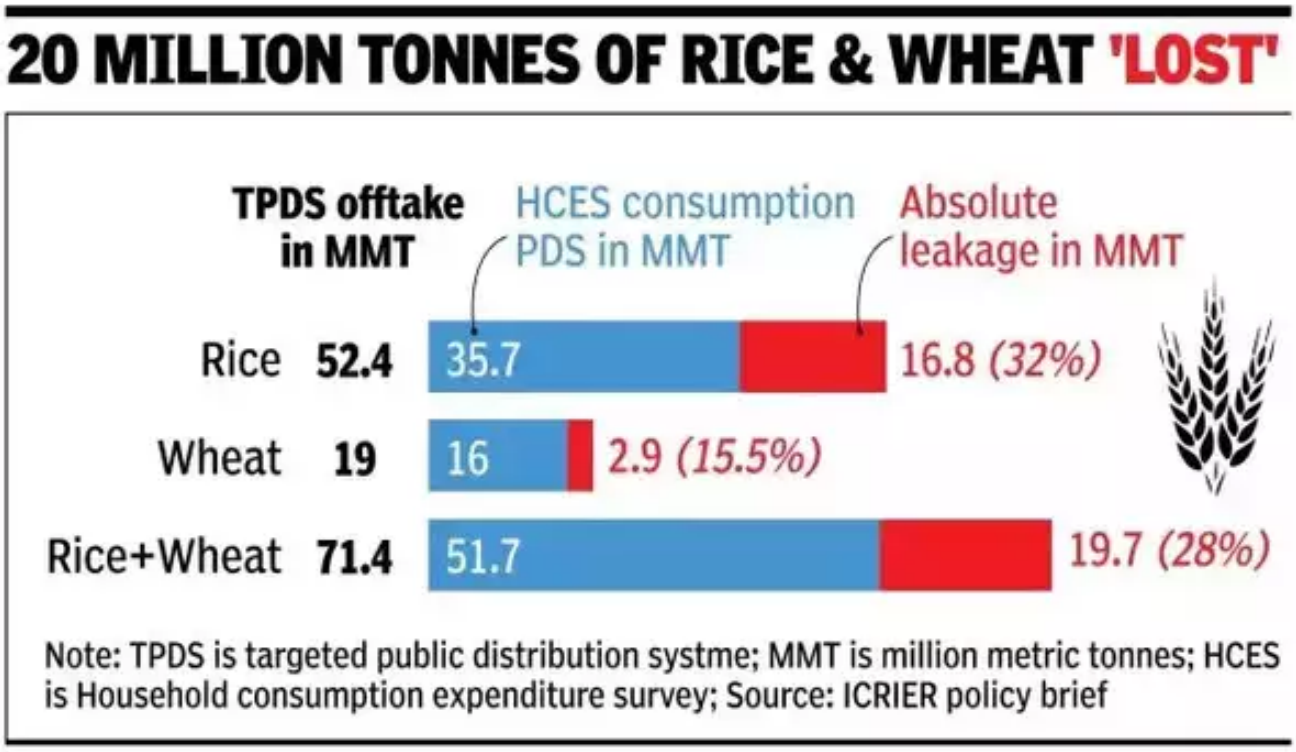
- Women, especially in rural areas, eat **last and least** in households, leading to widespread **micronutrient deficiencies**.
- **Government programs primarily target pregnant women** but ignore adolescent girls and elderly women.
  - According to the NFHS-5 report, there was no significant improvement in health and nutritional status among women in India

➢ **Climate Change and Agricultural Distress:** Extreme weather events like **heat waves, erratic monsoons, and droughts** have impacted **crop yields, food prices, and dietary diversity**.

- **Climate-induced food insecurity** is worsening in vulnerable regions like **Bihar, Odisha, and Madhya Pradesh**, exacerbating **hunger and undernutrition**.
  - India recorded its warmest February in **124 years this year,** affecting **rabi wheat yields**.
- Also, recent government data highlight that India's rice and wheat production is expected to decline by **6-10% due to climate change.**

➢ **Weak Implementation of Nutrition Programs:** Despite schemes like **Mid-Day Meal (PM POSHAN), Saksham Anganwadi, and Food Fortification**, **leakages, poor implementation, and exclusion errors** weaken their impact.

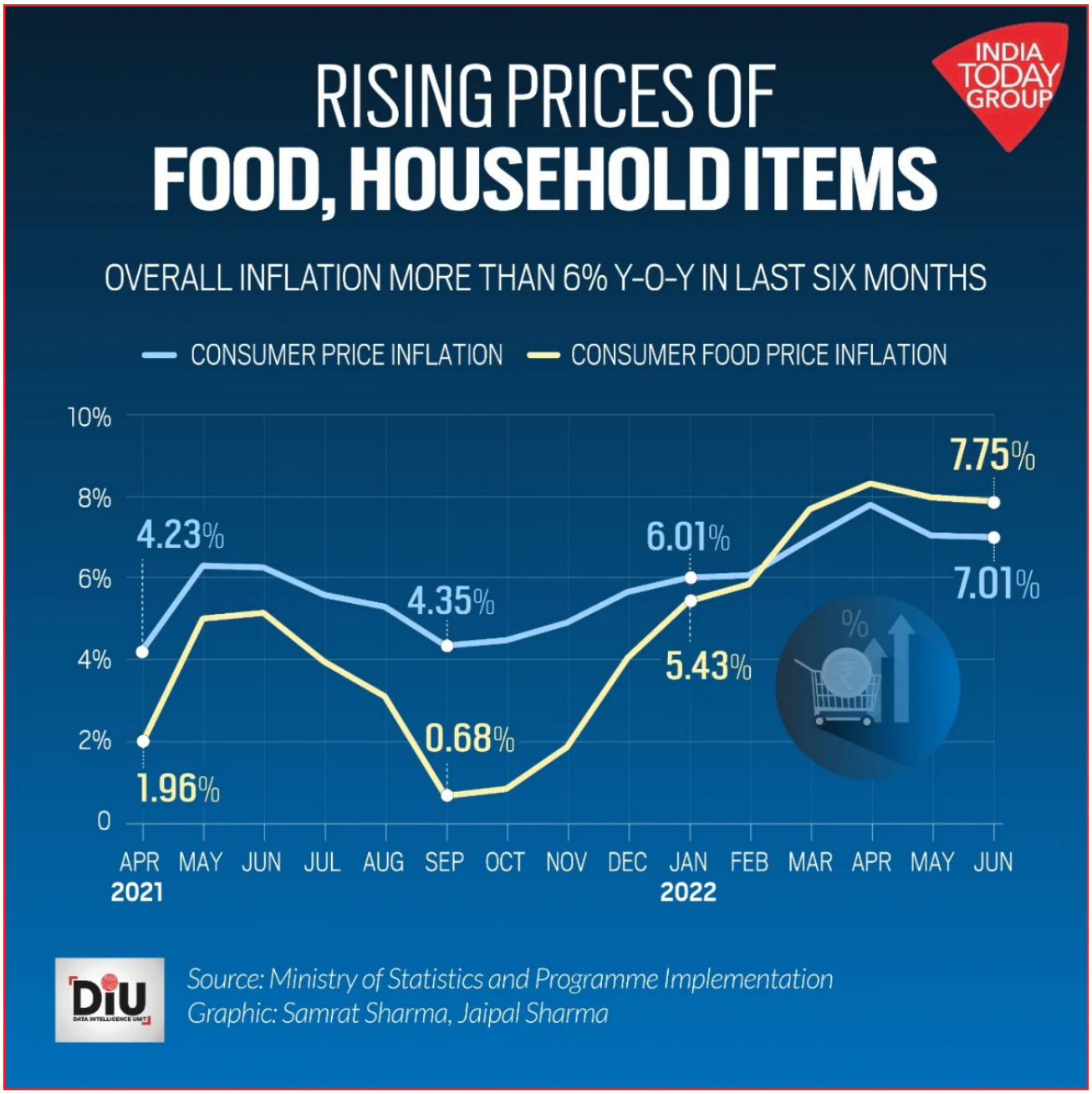
- Many Anganwadi Centres lack trained staff, and **take-home rations are often substandard.**
- The **urban poor and migrant workers remain outside formal nutrition safety nets**, leaving them vulnerable to **hidden hunger and food insecurity**.



- A new study reveals that nearly **28% of India's subsidized grains, intended for the poor, are lost to leakage,** costing the government an
  - A recent CAG report highlights the absence of basic amenities such as toilets and drinking water at many **Anganwadi Centres (AWCs)** that put the young children in unhygienic conditions.

➢ **Economic Inequality and Rising Food Prices:** The **economic slowdown, post-pandemic inflation, and global supply chain disruptions** have made **nutritious food expensive**, disproportionately impacting **low-income households**.

- While free grain distribution under PM Garib Kalyan Anna Yojana ensures **caloric sufficiency**, it does not address **protein, vitamin, and mineral deficiencies**.
- Many Indians are **full but malnourished** due to poor dietary choices and limited affordability of healthy foods.
  - **Retail food inflation** ruled above **8% from November 2023 to June 2024**, with pulses and vegetables great spikes.



- **Urban Food Deserts and Poor Dietary Diversity:** Rapid urbanization has created **"food deserts"**—areas where **affordable, nutritious food is scarce, but fast food is abundant**.
  - Low-income urban families, especially **migrant workers and daily wage laborers**, struggle to access **fresh fruits, vegetables, and proteins**, relying on **cheap, processed, and calorie-dense foods**.
    - This worsens both micronutrient deficiencies **and obesity**, increasing the burden of **non-communicable diseases (NCDs)**.
  - As much as **68% of food and beverage products currently available in the Indian food market** have excess amounts of at least one ingredient of concern like high sugar, high salt and trans fat.

- **Weak Public Awareness and Behavioral Challenges:** Despite government efforts, **nutritional awareness remains low**, and **food choices are often dictated by cultural preferences, misinformation, and marketing**.
  - Many households prioritize taste, tradition, and affordability over nutritional value.
    - School curriculums and public campaigns lack a strong focus on everyday nutrition education.
  - For instance, **85% of Indians are unaware of vegetarian sources of protein,** while more than **50%** are unaware of healthy fats.

What Measures India Can Adopt to Enhance Nutritional Security?

- **Strengthening HWCs for Community-Led Nutrition:** Health & Wellness Centres should be **upgraded into Nutrition Resource Centres**, providing **personalized diet counseling**, regular screenings for malnutrition and NCDs, and locally tailored meal plans.
  - By integrating **Poshan 2.0 with Ayushman Bharat HWCs**, nutrition services can be **expanded beyond maternal health** to include **adolescents, the elderly, and NCD patients**.
  - Dedicated **community nutrition officers** can bridge the gap between **healthcare and dietary interventions**, ensuring nutrition becomes a **core part of public health services**.
- **Revamping Mid-Day Meals with Local Food Systems:** The **Mid-Day Meal Scheme should emphasize regionally available, nutrient-rich foods** like **millets, pulses, and leafy greens**, reducing dependence on **staple grains like rice and wheat**.
  - A decentralized approach, involving **local SHGs (Self-Help Groups) and Farmer Producer Organizations (FPOs)**, can ensure **fresh, diverse, and culturally relevant meals** for children.
  - Integrating **PM-POSHAN with the Millets Mission** will help promote **nutritionally superior grains** while boosting **rural livelihoods**.
- **Mandatory Fortification with a Focus on Micronutrient Deficiency: Scaling up fortification of staple foods** like **rice, wheat, milk, and edible oils** can combat **hidden hunger** without altering eating habits.
  - **Linking the Public Distribution System (PDS) with fortified food distribution** will ensure even low-income groups receive **essential vitamins and minerals**.
  - However, **fortification should be complemented with dietary diversification**, ensuring that **natural sources of nutrients are not neglected**.
- **Making Urban Food Environments Healthier:** A **graded taxation system on ultra-processed, high-sugar, and trans-fat-laden foods** can curb unhealthy eating habits while promoting **affordable healthy alternatives**.
  - **Zoning laws can be introduced to restrict fast-food outlets near schools and healthcare facilities**, nudging people toward healthier choices.
  - **Linking the Eat Right India movement with the FSSAI Front-of-Pack Labeling (FOPL) initiative** will ensure consumers are well-informed about the **nutritional quality of their food choices**.
- **Climate-Smart Agriculture for Nutritionally Resilient Food Production:** India must **shift from calorie-heavy monoculture farming** (rice & wheat) toward **nutrient-dense, climate-resilient crops** like **millets, pulses, and biofortified varieties**.
  - Policies like the **National Food Security Act (NFSA) should be amended to include millets** in the PDS, incentivizing farmers to diversify crops.
  - **Watershed management, agroforestry, and regenerative farming** should be scaled up to **enhance soil health and ensure nutrient-rich food production** despite climate challenges.
- **Expanding Social Protection Schemes:** PDS should move beyond just providing **caloric sufficiency** and focus on **nutritional adequacy** by **including pulses, millets, and fortified dairy products**.
  - Expanding **Integrated Child Development Services (ICDS) to include adolescent girls and elderly women** will address **lifelong nutritional vulnerabilities**.
  - **Linking DBT (Direct Benefit Transfer) with nutrition support for vulnerable populations**, such as migrant workers and urban poor, will **ensure flexibility in dietary choices** while maintaining food security.

- **Mass Nutrition Literacy Campaigns:** A nationwide **"Right to Nutrition" campaign**, integrated into school curriculums, workplaces, and social media, can build **awareness about balanced diets, food labeling, and unhealthy food risks**.
  - **Engaging influencers, faith-based organizations, and community leaders** will help **counter myths about food choices**, especially among marginalized groups.
  - Expanding **Eat Right India** into a **year-round grassroots movement** will reinforce **healthy dietary habits from childhood**.

What are the Key Best Practices of Indian States Related to Nutrition?

- **Chhattisgarh:** Multi-Sectoral Approach for Stunting Reduction
  - Stunting declined from **52.9% to 37.6% (2006-2016)** due to improvements in **health services, sanitation, and household assets**.
  - Strong **political stability, bureaucratic efficiency, and community mobilization** helped scale up interventions.
- **Gujarat:** Strengthening Policy for Nutrition Outcomes
  - Stunting dropped from **51.7% to 38.5% (2006-2016)**, driven by an **enabling policy environment** and improved **maternal and child health interventions**.
  - Expanding **women's education, WASH (Water, Sanitation, and Hygiene), and rural development** played a crucial role.
- **Odisha:** Steady Progress Through Policy & Partnerships
  - Stunting fell from **45% to 34.1%**, with **strong political commitment and policy support** driving change.
  - Convergence of **state, development partners, and financial resources** helped scale up nutrition programs.
    - Challenges like **poor sanitation, early marriage, and education gaps** still need urgent attention.
- **Tamil Nadu:** A Long-Term Vision for Nutrition
  - Tamil Nadu achieved historic success in **reducing undernutrition between 1992-2016** through **investments in social welfare, health, and gender equality**.
  - The state's **focus on women's welfare and child development** remains a key success factor.

Conclusion:

India must move beyond food security to holistic nutritional well-being, aligning with **SDG 2 (Zero Hunger) and SDG 3 (Good Health & Well-being)**. Strengthening Health & Wellness Centres, promoting local food systems, and addressing malnutrition across all demographics can bridge policy gaps. A **community-driven, climate-smart, and inclusive approach** is key to achieving sustainable nutrition security for all.

Revamping India'S Police System

This editorial is based on "Law and disorder: States must spend more on adequate police forces" which was published in The Business Standard 18/03/2025. The article brings into picture the alarming 21% vacancy rate in India's police forces, resulting in severe understaffing that weakens law and order, endangers public safety, and hampers economic growth.

Tag: GS Paper-2, Executive, GS Paper-3, Various Security Forces & Agencies & Their Mandate

India's security-governance architecture faces critical challenges with **over 21% vacancies in state police forces,** making it severely under-policed. This shortfall is most pronounced in states notorious for poor law and order, with **West Bengal, Mizoram, and Haryana** reporting the highest vacancy rates. The **inadequate policing** not only endangers public safety, particularly for vulnerable populations, but also impedes economic growth by creating unfavorable conditions for small and medium enterprises that constitute the backbone of India's economy.

How has the Evolution of Policing and Police Reforms in India Taken Shape over Time?

- **Colonial Foundations and the Police Act of 1861:** The modern Indian police system was established under the Police Act of 1861, designed by the British to maintain colonial control rather than serve the public.
  - It created a **centralized and hierarchical force that prioritized law and order over community service**.
  - This framework remains dominant today, making police forces more accountable to the government than to citizens.
- **Post-Independence Reforms (1950s–1970s):**
  - After independence, India retained the colonial policing structure, leading to inefficiencies, corruption, and public distrust.
  - The **Gore Committee (1971)** recommended a shift towards professional, service-oriented policing.
  - The **National Police Commission (1977–1981)** proposed key reforms like separating law and order from investigation and ensuring fixed tenures for officers.
    - However, these recommendations faced political and bureaucratic resistance, limiting their implementation.
- **1990s–2000s- Supreme Court Interventions & Major Committees**:
  - With rising crime, communal violence, and political interference, calls for police reforms intensified.
  - The **Ribeiro Committee (1998) and the Padmanabhaiah Committee (2000)** reinforced earlier recommendations, advocating for independent oversight bodies, modern training, and community policing.
  - The **Malimath Committee (2002–2003)** pushed for specialized forensic capabilities and a Central Law Enforcement Agency for federal crimes, but most reforms remained unimplemented.
  - The **Supreme Court's Prakash Singh judgment (2006)** directed states to implement crucial reforms, including the establishment of State Security Commissions, fixed tenures for senior officers, and the separation of investigation from law and order.
- **Recent Developments and Need for Modernization (2010s–Present)**
  - As policing challenges evolve with **cybercrime, terrorism, and organized crime, modernization efforts have gained momentum.**
  - Initiatives like **Smart Policing (2015)** leverage AI, data analytics, and community engagement.
  - The **Modernization of Police Forces (MPF) Scheme** aims to improve weaponry, forensic labs, and cybercrime units.
    - The **Model Police Act (2006) and NHRC recommendations (2021)** emphasize autonomy, accountability, and surveillance measures.
    - However, the absence of deep structural reforms continues to hinder policing efficiency.

What are the Key Issues Associated with Policing in India?

- **Acute Shortage of Personnel:** India faces a severe shortage of police personnel, leading to excessive workloads and poor law enforcement.
  - The UN recommends **222 police officers per 100,000 people**, but India has only **154.84 per 100,000**, far below global standards.
  - High vacancies further exacerbate this issue—**West Bengal (39.42%), Mizoram (35.06%), and Haryana (32%)** have some of the worst vacancy rates.
  - This affects not just crime prevention but also response time, investigation quality, and public trust.
- **Overburdened and Underpaid Police Force:** The shortage of personnel forces existing officers to work **16–18 hours a day**, leading to stress, inefficiency, and compromised policing.
  - Many officers **juggle multiple roles—from law enforcement to election duties—**without adequate rest or fair compensation.
  - **Low pay** discourages professionalism and increases susceptibility to corruption, affecting public trust.
    - Also a recent survey showcased that the **majority of the police personnel had high and very high levels of stress (83.8%)**, affecting performance and mental health.
- **Politicization and External Influence:** Political interference in police operations has eroded professionalism and independence.

- **Frequent transfers, pressure to act against political opponents**, and misuse of investigative agencies have weakened law enforcement credibility.
- The **arbitrary use of sedition laws** and **targeted arrests of activists and journalists** highlight how policing is often dictated by political interests rather than the rule of law.
- For instance, **a 2019 report in Delhi stated that 72% of police officers have experienced political pressure** while investigating cases .

➢ **Militarization of the Police and Excessive Use of Force:** The police often resort to excessive force, especially in handling protests and civil unrest.

- The use of **tear gas, rubber bullets, and baton charges** on protesters has drawn criticism, particularly during farmers' protests and CAA-NRC demonstrations.
  - This **undermines public confidence** and raises concerns over human rights violations.
- The **2023 wrestlers' protest saw forceful removal of peaceful demonstrators,** drawing national and international condemnation.
  - A total of **669 cases of death** in police custody were registered across the country in the last five years from **April, 2017, to March, 2022,** highlighting a significant issue.

➢ **Inadequate Training and Outdated Policing Methods:** Many police personnel lack proper training in **modern crime-solving techniques, forensic science, and cybercrime investigation**.

- This results in poor investigations, wrongful arrests, and case backlogs. There is also insufficient training on **handling gender-sensitive cases**, affecting justice for victims of domestic violence, sexual assault, and trafficking.
- According to the CAG, **most states have a very low percentage of trained police officers.**
  - The audit also noted flaws in weapon training as well as a lack of adequate training infrastructure.
  - Also, even with so many opportunities in the field of criminalistics in India, **there are only 0.33 forensic scientists per 0.1 million population whereas** the foreign countries have 20 to 50 scientists per 0.1 million population, coupled with inadequate training of police officials, make the issue even more severe.

➢ **Weak Community Policing and Public Trust Deficit:** There is a **lack of proactive community engagement**, making the police force seem distant, intimidating, and unapproachable.

- Many marginalized communities—**Dalits, Adivasis, and minorities**—often **fear** rather than trust the police due to past experiences of discrimination and brutality.
- Without stronger community ties, intelligence gathering and crime prevention remain weak.
- Despite rising urbanization, **community policing initiatives like "Janamaithri" in Kerala** or **"Mohalla Committees" in Maharashtra** remain exceptions rather than norms.

➢ **Slow Modernization and Outdated Equipment:** Many police stations lack **basic forensic tools, surveillance technology, and cybercrime tracking mechanisms**, making it hard to tackle modern crimes.

- Even in large cities, **outdated weapons and inadequate protective gear** make police vulnerable in critical situations, including terror threats.
- **Many police stations** still rely on manual paperwork instead of digital case management systems.
- A recent report found that **there was just one computer/laptop for 11 state police personnel** in the country, with some large states having just one system for 30 or more personnel in 2022.

➢ **Underrepresentation of Women in Police Forces:** Despite rising crimes against women, gender representation in policing remains dismal.

- There are just **11.75% women in the police forces in the country** despite the central government's repeated efforts to enhance the strength of the women
- This lack of representation discourages women from reporting crimes and leads to inadequate handling of gender-based violence cases.

What Measures can be Adopted to Enhance Policing in India?

- **Addressing Manpower Shortage and Workload Reduction:** The acute shortage of police personnel must be tackled through **fast-track recruitment**, better working conditions, and increased budgetary allocations.

- Implementing **a two-year minimum tenure for police officers**, as directed in the **Prakash Singh case**, can reduce political interference and improve efficiency.

➢ **Depoliticization and Ensuring Police Autonomy:** Implementing the **State Security Commission (SSC)**, as recommended by the **National Police Commission (NPC)**, can insulate police forces from undue political interference.

- The **Police Establishment Board (PEB)**, as suggested by the **Ribeiro Committee**, should be empowered to handle transfers and promotions independently.
- Amending the **Police Act, 1861**, in line with the **Model Police Act (2006)**, can legally establish these reforms.

➢ **Modernizing Police Infrastructure and Equipment:** Police forces must transition from **outdated weaponry and paper-based systems** to **tech-driven policing**, including AI-based predictive policing, big data analytics, and drone surveillance.

- The **Modernization of Police Forces (MPF) scheme** should be expanded with targeted spending on **CCTV surveillance, forensic labs, body cameras, and GPS-enabled patrol vehicles**.
- **Upgrading cybercrime cells**, in line with the **Padmanabhaiah Committee's recommendation**, is crucial to tackle increasing online frauds and digital crimes.
- Implementing **the NHRC's 2021 directive** to install **CCTV cameras with night vision in all police stations** will enhance accountability and reduce custodial torture.

➢ **Specialization and Separation of Investigation from Law & Order:** In line with the **Malimath Committee's recommendations**, police stations should have **separate wings for investigation and law-and-order management** to improve efficiency.

- The creation of a **specialized crime investigation cadre** can help officers focus on complex cases like financial frauds, organized crime, and cybercrimes.
- Training modules should be **updated to incorporate forensic science, legal procedures, and digital investigation techniques**.
- **Reviving the beat policing system**, as suggested by the **Padmanabhaiah Committee**, can improve grassroots intelligence gathering and crime prevention.

➢ **Community Policing and Public Trust Building:** Bridging the trust deficit between police and citizens requires **community policing models**, as suggested by the **Model Police Act (2006)** and **NHRC recommendations (2021)**.

- Initiatives like **Kerala's Janamaithri Suraksha Project** and Maharashtra's **Mohalla Committees** should be expanded nationwide.
- **Recruiting social workers and psychologists** in police stations can aid in handling sensitive cases, such as domestic violence and juvenile crimes.
- Regular **public-police dialogues and outreach programs** can improve relations and enhance trust among marginalized communities.

➢ **Gender Sensitization and Increasing Women in Policing:** Enhancing **women's representation** in police forces to the **33% target**, as recommended by the **Padmanabhaiah Committee**, is critical for ensuring gender-sensitive policing.

- Establishing **all-women police stations in every district** and mandating the presence of female officers in every police station will improve crime reporting by women.
- **Mandatory gender sensitization training**, as suggested by the **NHRC**, should be part of police education. Providing **childcare facilities, flexible working hours, and separate restroom facilities** can improve retention rates among female officers.

➢ **Judicial-Police Coordination and Reducing Undertrials:** Poor coordination between police and judiciary leads to **case backlogs, delays, and wrongful detentions**.

- In line with the **Malimath Committee's recommendations**, **digitization of FIRs, e-court integration, and fast-tracking undertrial cases** should be prioritized.
- Establishing **police-judiciary liaison officers** in every district can facilitate better case tracking and evidence management.
- **Expanding plea bargaining mechanisms** can help reduce undertrial populations and ensure faster justice delivery.

- **Reforming Police Training and Capacity Building:** A **national-level Police Training Advisory Council (PTAC)**, as suggested by the **Padmanabhaiah Committee**, should oversee training curricula to ensure **modern crime-fighting techniques, forensic science, human rights laws, and technology-driven policing**.
  - Police academies should incorporate **soft skills training** to improve public interaction and sensitivity towards marginalized communities.
  - **Incentivizing higher education and specialization in policing**, through **scholarships for advanced criminology and forensic courses**, can improve professional standards.
  - **Cross-agency training with CBI, NIA, and IB** can help state police improve their counterterrorism and intelligence-gathering capabilities.

Conclusion:

Addressing India's policing crisis requires urgent **structural reforms, improved recruitment, and depoliticization to ensure efficiency and public trust**. Strengthening **technological capabilities, modernizing training, and implementing community policing** can bridge gaps in law enforcement. **Gender inclusivity, accountability mechanisms, and autonomy** are critical for a people-centric policing model.

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Future Of Carbon Trading in India

This editorial is based on "Designing a carbon market" which was published in The Financial Express on 12/03/2025. The article brings into the picture India's Carbon Credit Trading Scheme (CCTS), set to launch in mid-2026, replacing the Perform, Achieve, and Trade scheme by shifting from energy efficiency to greenhouse gas-based emissions trading.

Tag: GS Paper - 3, Conservation, Renewable Energy, Government Policies & Interventions, Achievements of Indians in Science & Technology

India's upcoming Carbon Credit Trading Scheme **(CCTS)**, set to launch **mid-2026**, represents a significant shift in the **nation's climate policy framework.** Replacing the existing Perform, Achieve, and Trade scheme, this emissions trading system will transition from energy efficiency metrics to greenhouse gas equivalents, initially targeting major industrial sectors that account for **16% of India's emissions**.

What is the Carbon Market and Carbon Credit Trading Scheme (CCTS)?

- **Carbon Market and its Component:** According to the UNEP, Carbon markets are carbon pricing mechanisms enabling governments and non-state actors to trade greenhouse gas emission credits.
  - The Indian Carbon Market framework has two key mechanisms:
    - **Compliance Mechanism** – Addresses emissions from energy use and industrial sectors, ensuring mandatory reductions. Example: Power plants meeting renewable energy obligations.
    - **Offset Mechanism** – Incentivizes voluntary actions by entities not covered under the compliance mechanism to reduce GHG emissions. Example: IT companies investing in afforestation projects.
- **The CCTS:** To meet the country's ambitious climate goals, a robust National Framework for the Indian Carbon Market (ICM) is being developed through a reliable national carbon credit electronic platform.
  - **Regulatory Framework:** The **Energy Conservation (Amendment) Act, 2022** empowers the Central Government to specify a **Carbon Trading Scheme**. This amendment also allows a designated agency to issue **carbon credit certificates**, each representing **one ton of CO_2 equivalent (tCO_2e) reduction or removal** from the atmosphere.
    - Under this act, the **Central Government has notified the Carbon Credit Trading Scheme**.
  - **Institutional Framework:** The **Central Government** has established the **National Steering Committee for the Indian Carbon Market (NSCICM)** under the **Carbon Credit Trading Scheme (CCTS)** to oversee the functioning of the **Indian Carbon Market (ICM)**. Key institutional roles include:

- **National Steering Committee (NSCICM)** – Chaired by the Secretary, Ministry of Power, with the Secretary, Ministry of Environment, Forest, and Climate Change as Co-Chair.
- **Bureau of Energy Efficiency (BEE)** – Acts as the **administrator** of the ICM.
- **Grid Controller of India (GCI)** – Serves as the **registry operator**, managing and operating the ICM registry.
- **Central Electricity Regulatory Commission (CERC)** – Functions as the **regulator** for trading activities under the ICM.

What are the Key Advantages of the Carbon Market for India?

- **Boosts Industrial Competitiveness and Green Innovation:** A well-designed **Carbon Credit Trading Scheme (CCTS)** incentivizes industries to adopt **clean technologies** and improve **energy efficiency**, reducing long-term operational costs.
  - Companies investing in **low-carbon processes** gain a **competitive edge** in global markets, especially in sectors like steel, cement, and chemicals.
  - India's push for Green Hydrogen Mission aligns with this shift, helping industries transition to sustainable models.
  - During the year **2022-23**, the above units under PAT have saved **25.77 Million Ton of Oil Equivalent (MTOE).**
    - **Tata Steel** has pledged net-zero emissions **by 2045**, investing in carbon capture, propelling green innovation.
- **Facilitates Compliance with Global Carbon Border Regulations:** With the EU implementing the Carbon Border Adjustment Mechanism **(CBAM)** from 2026, Indian exporters—especially in iron, steel, and aluminium—will face higher tariffs unless emissions are controlled.
  - A robust domestic carbon market can **prepare Indian industries for compliance**, reducing financial losses and ensuring continued access to key markets.
  - Indian firms must integrate carbon pricing to **remain competitive in global trade**.
  - The EU's **CBAM** will impose a **CO_2 tax** on imports from carbon-intensive industries.
    - In 2022, 27% of India's exports of iron, steel and aluminum products worth **$8.2 billion went to the EU, sectors directly affected by CBAM (Commerce Ministry, 2024).**
- **Strengthens India's Position in Climate Diplomacy:** As India aims for **Net Zero by 2070**, an effective carbon market enhances its **credibility in climate negotiations** and attracts climate finance from global investors.
  - Participation in **carbon trading aligns India with international best practices**, can help secure funding from mechanisms like the Green Climate Fund **(GCF)** and align with **World Bank Engagement Roadmap for Carbon Markets**
  - This also improves India's diplomatic leverage in COP summits.India committed to reducing **emissions intensity by 45% by 2030** under its updated Nationally Determined Contributions **(NDCs).**
- **Generates Revenue and Economic Growth:** A functional **carbon trading market** creates a **new revenue stream** for both industries and the government.
  - Companies that cut emissions below their targets can **sell surplus carbon credits**, promoting circular revenue generation.
  - The government can also **auction carbon credits**, generating funds for green infrastructure and R&D in sustainable technologies.
  - For instance, the EU ETS (Emissions Trading System) generated **€43,6 billion in 2023 in revenues** in 2023, reinvested in clean energy projects (IEA, 2024).
  - India's Renewable Energy Certificates (REC) market saw a **65% surge in trading volume** in 2023, indicating rising investor interest (IEX, 2023).
- **Encourages Renewable Energy Adoption and Decarbonization:** By making carbon-intensive energy sources **financially unviable**, a carbon market pushes industries to **shift towards renewables** like **solar, wind, and green hydrogen**.
  - This aligns with India's **Energy Transition Roadmap** and accelerates its commitment to achieving **500 GW of non-fossil fuel capacity by 2030**.

- In 2023, **India added 9.7 GW of solar PV capacity,** ranking fifth globally for new installations and cumulative capacity. The government's **Green Hydrogen Mission)** aims to produce **5 million metric tonnes** of hydrogen annually by 2030.

➢ **Attracts Foreign Investment and Green Finance:** A transparent and well-regulated **carbon market** makes India an attractive destination for **foreign investors** looking to fund low-carbon projects.

- Institutional investors, **sovereign wealth funds**, and multinational corporations prefer economies with **stable carbon pricing mechanisms** for long-term sustainability-linked investments.
- This also facilitates India's access to **green bonds and ESG (Environmental, Social, and Governance) funds**, which are rapidly growing in global markets.
- In 2023-24, the government has issued sovereign green bonds worth Rs 200 billion in four tranches of Rs 50 billion
  - In 2023, the **World Bank's Board of Executive Directors** approved **$1.5 billion** in financing to accelerate India's development of low-carbon energy.

What are the Roadblocks in the Effective Functioning of the Carbon Market in India?

➢ **Lack of Stringent Emission Reduction Targets:** India's carbon credit system primarily focuses on **reducing emissions intensity**, not absolute emissions, leading to **excess supply of credits and low trading prices**.

- Weak targets, as seen in the **Perform, Achieve, and Trade (PAT) scheme**, have resulted in **minimal financial incentives** for industries to adopt green technology.
- Only **51% of the total ESCerts** mandated to be purchased in the **Perform, Achieve and Trade program's** cycle II were actually purchased.
- The price of an ESCert fell from **Rs 1,200 to Rs 200** in 2022. The divergence between the sellers and buyers of ESCerts, however, varied across sectors**, far below the cost required to drive clean tech adoption.**

➢ **Inadequate Compliance and Enforcement Mechanism:** Despite existing carbon pricing mechanisms, **non-compliance remains high due to weak penalties and enforcement gaps**.

- Many companies do not purchase mandatory carbon credits, and **penalties for non-compliance are either not levied or too low to be a deterrent**.
- Without **strict regulatory oversight**, industries will continue to **evade obligations**, undermining the credibility of the carbon market.

➢ **Limited Sectoral Coverage and Exclusion of Key Polluters:** The initial phase of India's **Carbon Credit Trading Scheme (CCTS)** excludes major polluting sectors like **thermal power plants**, which contribute **significantly to India's GHG emissions**.

- Additionally, key transport and agriculture sectors—significant emission contributors—are **not yet part of the trading framework**, leading to **limited market impact**.
  - A partial approach weakens the **market depth and price discovery**.
- The **EU's Emissions Trading System (ETS)** covers **45% of its total emissions**, while India's scheme **currently lags behind.**

➢ **Lack of Reliable Carbon Measurement and Verification Systems:**For an efficient carbon market, emissions must be **accurately measured, verified, and transparently reported**.

- However, India lacks **a robust monitoring framework**, leading to concerns about **double counting of carbon credits, over-reporting of emission reductions, and fraud**.
- Without strong third-party verification, **investor confidence and global credibility remain weak**.
- Some sectors, **such as agriculture and land use,** have complex emission pathways and multiple sources.
  - Gathering data on emissions from these sectors requires extensive research, monitoring, and the integration of remote sensing technologies.

➢ **Absence of a Well-Defined Secondary Market for Carbon Credits:** A liquid and efficient secondary market is **crucial for price discovery and encouraging participation from industries and investors.**

- However, India's carbon market lacks a structured mechanism for the resale of carbon credits, leading to low market activity and volatility in credit prices.

- The **absence of institutional investors and speculative trading** further limits the scalability and attractiveness of the market.

➢ **Insufficient Integration with Global Carbon Markets:** India's carbon market is largely domestic and not yet aligned with international carbon trading mechanisms, **such as the EU Emissions Trading System (EU ETS) or voluntary carbon markets**.

- ❍ This restricts the participation of global investors and industries in India's carbon credit system.
- ❍ **Without harmonization with global standards, Indian carbon credits risk being undervalued**, limiting the financial incentives for companies to engage in emissions reduction actively.

What Measures can India Adopt to Deploy an Effective and Efficient Carbon Market?

➢ **Strengthening Emission Reduction Targets with a Dynamic Carbon Price Floor:** India must **set ambitious yet realistic emission reduction targets** to ensure a robust carbon market.

- ❍ A **carbon price floor** should be introduced to prevent the oversupply of credits and maintain economic incentives for industries to cut emissions.
- ❍ The government should also establish a **progressive reduction trajectory**, ensuring industries transition to cleaner alternatives over time.
  - A **dynamic pricing mechanism**, linked to global carbon markets, can help stabilize credit values and prevent market crashes.

➢ **Expanding Sectoral Coverage to Maximize Market Depth:** The carbon market should **gradually expand beyond industrial sectors** to include **power generation, transport, and agriculture**, which are major emission contributors.

- ❍ A phased approach can ensure **seamless integration** of these sectors while minimizing disruptions.
- ❍ Power plants should be brought under the **Carbon Credit Trading Scheme (CCTS)** to align with global best practices.
  - The government can also incentivize **low-carbon farming practices** by integrating carbon markets with the **National Mission for Sustainable Agriculture (NMSA)**.

➢ **Integrating Carbon Market with Renewable Energy Certificate (REC) Trading:** A **unified trading platform** combining **Carbon Credits, Renewable Energy Certificates (RECs), and Green Hydrogen Certificates** can enhance market efficiency.

- ❍ This will encourage industries to invest in **renewable energy projects** while fulfilling their carbon reduction obligations.
- ❍ The **International Solar Alliance (ISA) and India's Green Hydrogen Mission** can play a critical role in expanding the renewable credit market.
  - A **cross-sectoral credit system** will prevent duplication and create a more holistic decarbonization strategy.

➢ **Strengthening Carbon Monitoring, Reporting, and Verification (MRV) Framework:** A **transparent and tamper-proof MRV system** is essential to prevent fraudulent carbon credit claims.

- ❍ **Blockchain-based registries** and **AI-driven carbon auditing tools** can be deployed to track emissions accurately.
- ❍ Third-party verification agencies must be **accredited and regulated** to enhance accountability.
  - The **Bureau of Energy Efficiency (BEE)** should collaborate with **global carbon standards like Verra and Gold Standard** to align India's framework with international norms.

➢ **Enhancing Private Sector Participation through Carbon Trading Incentives:** A well-functioning carbon market requires **active private sector participation**, which can be boosted through **tax incentives, concessional loans, and priority lending** for companies investing in clean technologies.

- ❍ The government should encourage **carbon offset projects** in industries like **steel, cement, and transport** by linking them with **Corporate Social Responsibility (CSR) obligations**.
- ❍ A clear **carbon pricing roadmap** will provide businesses with **policy certainty**, encouraging long-term investments.

➢ **Creating a National Carbon Trading Exchange for Market Stability:** A **centralized carbon trading exchange**, similar to **the EU's Emissions Trading System (ETS)**, should be established to ensure **liquidity, price stability, and transparency**.

- This exchange can integrate with **existing electricity markets and commodity exchanges** to provide a **seamless trading experience**.
- Leveraging **India's expertise in digital finance** (like UPI and ONDC), a digital-first carbon market platform can improve accessibility and participation.

➢ **Aligning Carbon Market with Global Trade Regulations:** With the EU's **Carbon Border Adjustment Mechanism (CBAM)** and similar policies in the US, India must **align its carbon pricing system with global standards** to ensure trade competitiveness.

- A **bilateral carbon credit recognition mechanism** can be established with major trading partners.
- Additionally, Indian exporters should be supported through **CBAM-readiness funds**, helping them transition to low-carbon production processes without suffering economic disadvantages.

➢ **Promoting Carbon Credit Awareness and Capacity Building:** A **well-informed industry and workforce** are essential for the carbon market to function effectively.

- **Capacity-building programs** should be launched for industries, MSMEs, and policymakers to understand **carbon trading mechanisms**.
- Business schools and research institutions should be encouraged to develop **specialized courses on carbon finance and carbon market operations**.

Conclusion:

India's Carbon Credit Trading Scheme (CCTS) holds immense potential to **drive emissions reductions, enhance industrial competitiveness, and align with global carbon markets.** Strengthening regulatory mechanisms, **expanding market participation, and integrating with international carbon trading systems will be crucial for its success.** A well-functioning carbon market can position India as a global leader in climate action while fostering sustainable economic growth.

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India'S Push for Natural Farming

This editorial is based on "Farming naturally" which was published in The Hindu Business Line on 19/03/2025. The article brings into picture the potential of natural farming as a sustainable alternative to chemical-intensive agriculture while highlighting India's efforts through the National Mission on Natural Farming.

Tag: GS Paper-3, Direct & Indirect Farm Subsidies, Public Distribution System (PDS), Buffer Stocks & Food Security, Agricultural Marketing

Natural farming has emerged as a promising alternative to **chemical-intensive agriculture,** which despite ensuring food security through the Green Revolution, has degraded soil health and increased costs for small farmers. The Indian government's National Mission on Natural Farming aims to support **1 crore farmers across 7.5 lakh hectares,** establishing bio-resource centers. India needs to work hard to address **certification challenges, gather conclusive evidence on environmental benefits, and ensure economic viability for farmers** transitioning to natural farming practices.

What is Natural Farming?

➢ **About**: **Natural farming** is a **sustainable agricultural method** that **avoids chemical fertilizers, pesticides, and intensive tillage,** relying on ecological processes and indigenous resources for soil fertility and crop growth.

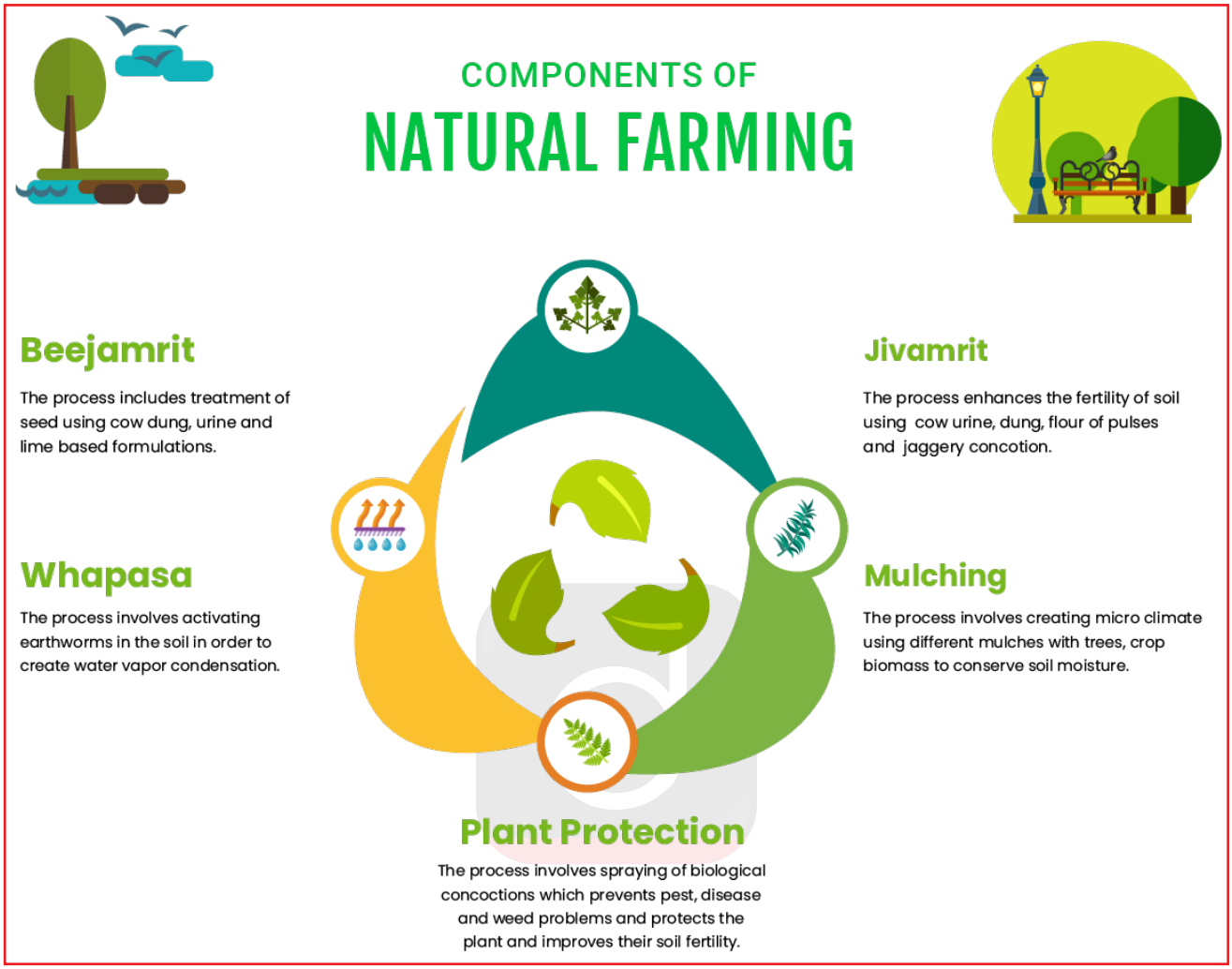
Key Principles

- **No Chemical Inputs**: Avoids synthetic fertilizers and pesticides.
- **Use of Bio-Inputs**: Utilizes **Jeevamrut, Beejamrut, and Panchagavya for soil enrichment.**
- **Minimal Soil Disturbance**: No plowing or tilling to maintain soil biodiversity.
- **Intercropping & Crop Rotation**: Enhances soil fertility and pest control.
- **Mulching & Cover Cropping**: Retains soil moisture and prevents erosion.

What are the Key Benefits of Natural Farming for India?

➢ **Enhances Soil Health and Reduces Land Degradation:** Natural farming eliminates synthetic fertilizers and pesticides, promoting **microbial activity, improving soil structure, and enhancing nutrient availability.**

- It prevents land degradation, which is critical as **30% of India's land is already degraded** due to intensive chemical use.



- By restoring organic matter, natural farming ensures **long-term soil fertility**, reducing dependence on external inputs.
- **For instance, Andhra Pradesh Community-Managed Natural Farming (APCNF)** has shown **improvement in soil organic carbon** in just 3-5 years.

➢ **Reduces Water Consumption and Enhances Drought Resilience:** By promoting techniques like **mulching, cover cropping, and microbial soil conditioning**, natural farming reduces irrigation needs and enhances water retention.

- Given **India's over-extraction of groundwater (25% of global groundwater usage)**, water-efficient farming is crucial for sustainability.
- Rainfed farmers practicing **Pre-Monsoon Dry Sowing (PMDS) in Andhra Pradesh** reported **significant reduction in irrigation needs**
- According to the **Central Groundwater Board (2023)**, groundwater levels are critical in **256 out of 700 districts**, making water-efficient farming urgent.

➢ **Lowers Cost of Cultivation and Improves Farmers' Profitability:** Natural farming significantly reduces input costs as farmers rely on on-farm resources like **Jeevamrit, Beejamrit, and mulching** instead of expensive chemical fertilizers and pesticides.

- This is crucial for small and marginal farmers, who make up **86% of India's farming population** and struggle with rising input costs.
- For instance, Zero Budget Natural Farming processes require **50–60% less water and less electricity (than non-ZBNF) for all the selected crops.**

➢ **Enhances Climate Resilience and Reduces Greenhouse Gas Emissions:** Natural farming minimizes methane and nitrous oxide emissions by maintaining **aerobic soil conditions** and avoiding synthetic fertilizers.

- Also, they are significant for climate adaptation. For instance, **in Andhra Pradesh, during the Pethai and Titli cyclones in 2018,** the crops cultivated through natural farming showed greater resilience to heavy winds than conventional crops.
- At the **Indian Agricultural Research Institute site in New Delhi,** SRI methods were found to reduce CHy emissions by **62%.**

➢ **Promotes Food and Nutritional Security with Diverse Cropping:** Unlike monoculture-based chemical farming, natural farming encourages **multi-cropping, agroforestry, and intercropping**, enhancing food diversity and nutritional security.

- This is crucial as the **FAO report** finds **74.1%** of Indians unable to afford a healthy diet; **16.6% of population undernourished.**
- By 2025 the Indian Organic food business is likely to be Rs 75,000 crores, a manyfold growth from the current level.
  - Additionally, e-commerce platforms like **Amazon and BigBasket** have started dedicated natural farming sections, expanding market access for farmers.

➢ **Strengthens Rural Livelihoods and Generates Employment:** Natural farming is **knowledge- and labor-intensive**, requiring farmers to engage in techniques like composting, mulching, and crop rotation, generating rural employment.

- As farm mechanization grows, leading to **job losses for agricultural laborers (casual farm labour shrinks by 40% since 2011-12, total job loss nearly 3 crore: NSSO)**, NF offers an alternative livelihood.
- The National Mission on Natural Farming (**2023)** is deploying **30,000 Krishi Sakhis** to train rural women farmers, creating **direct employment opportunities**.

What are the Key Issues Associated with Natural Farming in India?

➢ **Lack of Scientific Validation and Long-Term Studies:** Despite its environmental benefits, NF lacks **large-scale, long-term scientific studies** proving its sustainability across different agro-climatic zones.

- Most studies focus on small-scale pilots, creating skepticism about its viability for **large-scale food production**.
- Without rigorous research, NF remains an **alternative practice rather than a mainstream solution**.
- The **Food and Land Use Coalition (FOLU, 2023)** highlights that only **5 out of 16 Sustainable Agriculture Practices (SAPs)** have scaled beyond **5% of India's net sown area**.
  - The **Indian Council of Agricultural Research** has urged for **more empirical research** before large-scale promotion.

➢ **Uncertainty in Crop Yields and Productivity Risks:** Natural farming often faces **initial yield declines**, especially in **high-input crops like rice, wheat, and sugarcane**, leading to lower short-term returns for farmers.

- Unlike conventional farming, which ensures higher output with chemical inputs, NF depends on **biological soil enhancement**, which takes time to show results.
- This uncertainty discourages farmers from transitioning, particularly in **food security-dependent regions**.

➢ **Absence of Well-Defined Certification Standards:** Unlike organic farming, which has **clear certification mechanisms (PGS-India, NPOP)**, NF lacks standardized certification, making it difficult to differentiate NF produce in the market.

- This limits farmers' access to **premium pricing** and consumer trust in naturally grown food.
- Without proper labeling, NF products often compete with **chemically grown produce** without any price advantage.
  - Himachal Pradesh's CETARA-NF certification model **(2023)** offers a possible self-certification framework, **but it is yet to be adopted nationally.**

- **Limited Market Linkages and Value Chain Development:** NF lacks **organized value chains**, making it difficult for farmers to sell their produce at fair prices.
  - The prices of organic food are the real price reflecting the **true cost without subsidies,** which **farmers struggle to sell in the market.**
  - A recent report also raised concerns about high commissions on organic products, suggesting that reducing margins to normal levels could lower prices **by 25-30% or more.**
- **High Labor Requirements and Limited Mechanization:** Natural farming is **labor-intensive**, requiring manual weed removal, compost preparation, and mulching, which increases workload and costs for farmers.
  - Mechanized solutions for large-scale NF are **still underdeveloped**, making it **less attractive for medium and large farmers.**
  - This discourages adoption, especially as rural labor availability declines due to **urban migration**.
  - A recent report stated that **labor costs were significantly higher (7–13%) with organic farming practices.**
- **Climate Sensitivity and Regional Suitability Issues:** NF's success depends heavily on **local agro-climatic conditions**, making it unsuitable for certain regions with extreme weather variability or fragile ecosystems.
  - Farmers in **low-rainfall areas** may struggle with compost-based soil improvement, while **humid regions** face pest and disease challenges without chemical interventions.
  - While natural farming offers benefits, it can be less effective in semi-arid regions due to water scarcity, unreliable rainfall, and other climate-related challenges.
  - In contrast, **Himachal Pradesh's NF** project under **Prakritik Kheti Khushhal Kisan Yojana** showed an **increase in farm incomes**, **highlighting regional disparities.**

What are the Key Global and Indian Best Practices in Natural Farming?

- **Global Best Practices**
  - **Agroecology - Latin America (Brazil, Mexico, Cuba)**
    - Integrates traditional farming with scientific approaches.
    - Emphasizes biodiversity, crop rotation, and natural pest control.
  - **Permaculture - Australia**
    - A sustainable land-use system combining agriculture with natural ecosystems.
    - Focuses on soil regeneration, rainwater harvesting, and companion planting.
  - **SRI (System of Rice Intensification) - Madagascar & All over Asia**
    - Enhances water efficiency and plant spacing to improve yields with minimal inputs.
  - **Organic and Biodynamic Farming - Europe (Germany, Switzerland)**
    - Uses composting, crop diversification, and lunar cycles to enhance soil fertility.
- **Indian Best Practices**
  - **Zero Budget Natural Farming (ZBNF) - Andhra Pradesh, Karnataka**
    - Promoted by **Subhash Palekar**, based on Jeevamrut, Beejamrut, and intercropping.
  - **Rishi Krishi & Vedic Farming - Maharashtra**
    - Uses **Panchagavya, Amrutpani, cow-based products, and Ayurvedic formulations** for soil health.
  - **Community-Led Natural Farming - Sikkim (Fully Organic State)**
    - Sikkim became the first fully organic state, focusing on policy-driven natural farming (though recently facing concerns due to low yields).
  - **Watershed Support Services and Activities Network in Tribal Areas - Odisha**
    - Combines multi-layer cropping, agroforestry, and indigenous seed use.

What Measures can India Adopt to Integrate Natural Farming into India's Agricultural Landscape?

- **Strengthening Research and Evidence-Based Scaling:** India must invest in **long-term, multi-location trials** to establish the economic, environmental, and yield impacts of natural farming across diverse agro-climatic zones.

- **ICAR and Krishi Vigyan Kendras (KVKs)** should collaborate with farmers to document real-world results and create **location-specific NF models**.
- Integrating **geo-spatial mapping and AI-driven soil health monitoring** can optimize practices for different regions.
- Encouraging **agroecology-based universities** to specialize in natural farming research will ensure scientific validation.

➢ **Reforming Agricultural Subsidies to Support NF Adoption:** The existing **₹71,309 crore fertilizer subsidy** needs gradual reallocation towards **bio-input production, soil health enhancement, and NF extension services**.

- A **Direct Benefit Transfer (DBT) model** can provide farmers with financial incentives for **Jeevamrit, Beejamrit, and compost production** instead of subsidizing chemical inputs.
- The **National Mission on Natural Farming (NMNF)** should be linked with the **Soil Health Card Scheme** to track improvements and incentivize farmers accordingly.
  - Transition funds, in the form of **interest-free credit lines**, can help small farmers overcome initial yield fluctuations.

➢ **Developing Market Linkages and Certification Framework:** A **national-level Natural Farming Certification System (NFCS)** should be established to differentiate NF produce in domestic and global markets.

- **E-NAM and Agri-Export Promotion Schemes** should introduce dedicated NF categories to integrate farmers into high-value supply chains.
- Public-private partnerships (PPPs) can help set up **Farmer Producer Organizations (FPOs) specializing in NF**, ensuring collective bargaining power.
- Encouraging **contract farming models** with retail giants and online platforms can create assured demand for NF produce.
  - Dedicated **farm-to-fork channels, including NF-exclusive mandis and organic bazaars,** can improve accessibility.

➢ **Strengthening Farmer Training and Capacity Building:** A structured **Farmer-to-Farmer Learning Model (F2F-LM)** should be developed, where trained farmers act as **Natural Farming Ambassadors** in their communities.

- **Bio-Resource Centers** under NMNF should serve as hands-on learning hubs for composting, mulching, and microbial soil enhancement.
- Leveraging **Krishi Sakhis under Deendayal Antyodaya Yojana (DAY-NRLM)** can ensure women farmers actively participate in NF adoption.
  - Expanding **mobile-based advisory services**, such as through the **Kisan Suvidha App**, will provide real-time guidance on NF techniques.

➢ **Integrating Natural Farming with Watershed and Agroforestry Programs:** To improve resilience, NF should be blended with **Watershed Management Programs like PMKSY** to enhance soil moisture retention.

- Promoting **Silvo-Pastoral and Agroforestry Systems** under **National Agroforestry Policy** will diversify farmer incomes while ensuring soil regeneration.
- **Catchment-based rainwater harvesting models** can be integrated with NF to mitigate irrigation risks in water-scarce regions.
- Linking **Jal Shakti Abhiyan** with NF adoption in rainfed areas can ensure better resource efficiency.
  - Encouraging plantation of **Nitrogen-fixing trees (e.g., Gliricidia, Subabul)** within NF plots can naturally replenish soil fertility.

➢ **Promoting Mechanization and Technology for NF Practices:** Given the labor-intensive nature of NF, **customized mechanization** solutions like **low-cost weeders, microbial sprayers, and bio-fertilizer applicators** should be developed.

- **Startup incubators under the Agri-Tech Innovation Fund** can support innovations for NF-specific mechanization tools.
- The **Sub-Mission on Agricultural Mechanization (SMAM)** should be expanded to include NF-friendly implements, ensuring accessibility for small and marginal farmers.
  - Leveraging **AI and IoT-based soil health monitoring** will further optimize input use in NF systems.

➢ **Enhancing Institutional Support through State-Level Policies:** States should develop **region-specific NF policies**, similar to **Himachal Pradesh's PK3Y and Andhra Pradesh's APCNF**, ensuring localized adoption strategies.

- Strengthening **Gram Panchayat-level NF committees** will create decentralized decision-making and farmer participation.
- Incentivizing **Panchayats to allocate land for community composting and bio-resource centers** will build local self-sufficiency in NF inputs.
  - Aligning state procurement policies to source NF-grown produce for **mid-day meals and PDS** can provide institutional market support.

Conclusion:

Natural farming presents a sustainable alternative to chemical-intensive agriculture, offering benefits such as improved soil health, reduced input costs, and climate resilience. Strengthening research, policy support, and farmer incentives will be crucial in making natural farming economically viable. A balanced approach **integrating scientific validation and institutional backing can ensure its long-term success in India's agricultural landscape.**

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Transforming India'S Urban Landscape

This editorial is based on "India's green buildings thrive, but its cities remain unsustainable" which was published in Business Standard on 19/03/2025. The article brings into picture the paradox of India's urban development—while cities flaunt green buildings as a marker of progress, they remain "two-hour cities," where residents endure exhausting commutes and persistent pollution.

Tag: GS-Paper-1, Urbanization, GS Paper - 2, Urban Local Government

India's urban cities present a striking contradiction- while celebrating green-certified buildings and sustainability achievements, they have evolved into **"two-hour cities"** where daily commutes become tests of endurance and pollution chambers. True sustainability must extend beyond building walls to encompass entire urban ecosystems, **requiring India to work significantly harder in reimagining its metropolitan fabric**.

What is the Urban Governance Framework in India?

- **Constitutional Basis:** 74th Constitutional Amendment Act (1992)
  - Provides constitutional status to **Urban Local Bodies (ULBs).**
  - Mandates the formation of three types of ULBs based on population:
    - **Municipal Corporations** (for large cities)
    - **Municipal Councils** (for smaller urban areas)
    - **Nagar Panchayats** (for transitional/rural-urban areas)
  - Adds the 12th Schedule with **18 functional areas** to be devolved to ULBs.
- Three-Tier Institutional Structure
  - **Elected Wing**: Mayor and Municipal Council (elected by the people).
  - **Executive Wing**: Municipal Commissioner or CEO (appointed by the state government).
  - **Deliberative Bodies**: Ward Committees and Standing Committees for specific functions.
- Functional Domains (12th Schedule)
  - Includes urban planning, water supply, solid waste management, public health, slum improvement, urban forestry, etc.
  - Functions to be devolved by state governments as per state legislation.
- Administrative and Planning Institutions
  - **Parastatal agencies**: **Development Authorities, Water Supply Boards, Transport Corporations (usually state-controlled).**
  - **State Town and Country Planning Departments**: Often prepare Master Plans.
  - **Urban Development Authorities (UDAs)**: For metropolitan and regional planning.

What are the Key Issues Associated with India's Urban Areas?

- **Urban Inequality and Segregation:** Despite the urban prosperity narrative, Indian cities are increasingly becoming enclaves of affluence surrounded by deprivation.

- **Gated communities, luxury towers, and SEZs** exist alongside slums, informal settlements, and homeless populations.
  - Urban planning is increasingly tailored to elite interests, leaving basic services out of reach for many.
- **Urban poverty in India is over 25%**; some 81 million people live in urban areas on incomes that are below the poverty line.

➢ **Climate Vulnerability and Heat Stress:** Indian cities are becoming **urban heat islands**, with rising temperatures, extreme weather events, and poor climate resilience.
- **Glass-facade buildings, vanishing green cover,** and over-reliance on air conditioning intensify heat stress.
- A recent study found that the magnitude of heat stress has risen by almost **30% in India** over the past 40 years.
  - Also, approximately **34 million people in India** will experience job losses due to reduced productivity caused by heat stress.
- Also, infrastructure remains **unprepared for flash floods, cloudbursts, and prolonged dry spells.**

➢ **Inadequate Urban Governance and Institutional Fragmentation:** Indian **urban local bodies (ULBs)** are politically and financially disempowered, despite the **74th Constitutional Amendment.**
- Planning is often outsourced to parastatal agencies or private consultants, with little citizen engagement or accountability.
  - Functions are fragmented across departments, leading to overlaps and inefficiency.
- For instance, according to a recent CAG report. **Only 22.2% functions (four out of 18 functions) have been fully developed.**
  - The intergovernmental transfers (IGT) for city governments in India remains at **0.5% of the GDP.**

➢ **Unsustainable Urban Mobility and Congestion:** Urban mobility in India is **car-centric, polluting, and inefficient**.
- **Poor last-mile connectivity,** unsafe pedestrian infrastructure, and inadequate public transport make cities dependent on private vehicles.
  - The **"two-hour city" model,** where long commutes dominate daily life, **hurts productivity and well-being**.

➢ The shift toward electric mobility is welcome but remains uneven and infrastructure-starved.
- **In Metropolitan cities, commuters spend an average of 1.5–2 hours** daily in traffic. Though Metro networks now cover **1,000 km of metro network across 17 cities**, walkability **and cycle lanes remain weak**, limiting accessibility.

➢ **Informality in Employment and Housing:** Urbanisation in India has **not translated into secure jobs or housing for the majority.**
- Most city dwellers work in the **informal sector,** lacking job security, benefits, or protections.
- **Housing markets remain unaffordable**, pushing millions into slums or informal settlements.
  - The economic recovery **post-Covid remains K-shaped,** favouring formal and high-income segments.
- **Over 90% of employment** in India is informal. Also, India's slum population in 2020 is estimated at **236 million** suggesting that nearly half of its urban population lives in slums **(UN-Habitat 2021).**

➢ **Environmental Degradation and Poor Urban Resilience:** Rapid urbanisation has led to a **sharp decline in green cover, loss of wetlands, and pollution of water bodies.**
- Construction-driven development ignores ecological planning, causing flash floods, drainage failures, and poor air quality.
  - **Cities are increasingly unable to absorb environmental shocks,** and building regulations continue to favour high-energy designs.
- **13 Indian cities** made it to the list of the world's top 20 most **polluted cities** by IQAir, that include **Byrnihat (Assam), Delhi, Mullanpur (Punjab), Faridabad, Loni.**

➢ **Weak Mayoral Leadership and Political Disempowerment:** Mayors in India have **largely ceremonial roles** with limited executive powers.
- In many states, the **Municipal Commissioner (a state-appointed IAS officer)** wields greater authority than elected representatives.

- **Unlike global cities where mayors lead urban policy,** Indian city leaders often lack decision-making autonomy.

- This mismatch undermines local democracy and leads to **a top-down, bureaucratic approach to urban governance**.

What are the International Best Practises for Urban Development?

- **15-Minute City (Paris, France)**
  - **Concept:** Urban model where residents can access work, education, healthcare, and recreation within a 15-minute walk or bike ride.
  - **Relevance for India:** Can inspire **zonal planning**, **mixed-use development**, and **last-mile mobility improvements** in cities like Delhi and Bengaluru.
- **Transit-Oriented Development (Tokyo, Japan)**
  - **Concept:** Integrates high-density housing, commercial areas, and public services around mass transit hubs.
    - **Relevance for India:** Aligns with India's **Metro Rail Policy** and helps cities reduce congestion and pollution.
- **Green Infrastructure & Sponge Cities (China)**
  - **Concept:** Urban design that absorbs rainwater using wetlands, green roofs, permeable surfaces.
    - **Relevance for India:** Cities like Mumbai and Chennai can replicate these to combat **urban flooding**.
- **Affordable Housing with Inclusionary Zoning (Vienna, Austria)**
  - **Concept:** Mandating a percentage of affordable housing in all new real estate projects.
    - **Relevance for India:** Can strengthen **PMAY-U** by integrating it with private development regulations.
- **Citizen Participation & Participatory Budgeting (Porto Alegre, Brazil)**
  - **Concept:** Citizens are directly involved in deciding how to allocate municipal budgets.
    - **Relevance for India:** Supports the **74th Amendment** and efforts to empower **ward committees** and local planning.
- **Integrated Digital Urban Governance (Tallinn, Estonia)**
  - **Concept:** E-governance platforms that integrate city services—property, permits, utilities—into a single digital interface.
    - **Relevance for India:** Can be scaled under **Smart Cities Mission** and **Urban Digital Public Infrastructure (DPI)** models.
- **Vertical Greening and Bioclimatic Architecture (Singapore)**
  - **Concept:** Use of vertical gardens, green roofs, and climate-responsive building design.
    - **Relevance for India:** Encourages a shift away from **glass façades** and supports **passive cooling architecture**.

What Measures can India Adopt for Sustainable Urban Development?

- **Adopt a Place-Based, Tiered Urban Governance Model:** Indian cities must move beyond one-size-fits-all frameworks and adopt **tiered governance models** for metropolitan, mid-sized, and small towns.
  - **Metropolitan regions need empowered planning authorities** for integrated land use, mobility, and resource management.
  - For emerging and peri-urban centres, **District Urban Development Authorities (DUDAs)** and **State Urban Development Authorities (SUDAs)** should anchor local planning.
    - This enables **bottom-up, locally adapted planning** while supporting rural-urban convergence.
- **Shift from Car-Centric to Human-Centric Urban Mobility:** Cities must prioritise **public transport, walkability, and cycling infrastructure** to reduce emissions and improve accessibility.
  - Integrating **metro networks (under Metro Rail Policy)** with **bus systems (under PM-eBus Sewa)** and last-mile options can make public transport seamless.
  - Upgrading pedestrian paths and creating **non-motorised zones** in business districts can reclaim urban space for people.
    - City mobility plans should adopt **transit-oriented development (TOD)** and **multi-modal integration** strategies.

- **Decongesting Urban Landscape:** Decongesting urban cities requires a **strategic shift towards strengthening rural infrastructure and opportunities.**
  - By expanding **healthcare, education, digital connectivity, and employment hubs in rural areas**, developing **counter magnet cities** and building upon PURA initiative, migration to overcrowded cities can be reduced.
  - This balanced urban-rural development will enhance overall quality of life and ease pressure on city resources.
- **Reorient Building Codes Toward Climate-Responsive Architecture:** India must revise the National Building Code to enforce **climate-sensitive design** using passive cooling, natural ventilation, and local materials.
  - Glass façades and deep-plan buildings should be discouraged, especially in hot tropical zones. Incentivising developers through **Green Building ratings (IGBC, GRIHA)** linked with **property tax rebates** can nudge better practices.
  - Mandating **energy audits** and passive design in commercial and institutional projects will reduce energy load.
    - This shifts architecture from being aesthetic-driven to **ecology-aligned and occupant-focused**.
- **Integrate Smart City Components with Urban Housing:** Urban transformation must bridge the divide between digital infrastructure and basic shelter.
  - Linking **PMAY-Urban** (affordable housing) with **Smart Cities Mission** (technology, sensors, public services) can create **inclusive smart neighbourhoods**.
  - Housing clusters should be equipped with solar panels, greywater systems, and smart metering to optimise resource use.
  - Using **Geospatial and AI tools** for slum mapping and redevelopment will improve targeting and monitoring.
- **Mainstream Urban Blue-Green Infrastructure for Climate Resilience:** Indian cities need to restore and integrate **urban water bodies, wetlands, and green corridors** into core planning for resilience against floods and heatwaves.
  - Urban planning must reserve land for **urban forests, bioswales, and rain gardens** under a **Green Master Plan**.
  - Cities like **Ahmedabad and Pune** can be models where **city lakes and parks** were revived to reduce temperature and improve groundwater.
    - **Urban greening and watershed restoration** must be linked with **AMRUT 2.0 and SBM-U 2.0**.
- **Build City-Level Climate Action Plans with Fiscal Empowerment:** Each city must formulate and implement Climate Action Plans (CAPs) aligned with **India's Net Zero vision.**
  - CAPs should include **emission inventories, climate risk mapping, energy transition targets, and nature-based solutions.**
    - For effective implementation, urban local bodies should receive **performance-linked grants** under the Finance Commission.
  - Capacity-building for climate budgeting, data systems, and monitoring must accompany decentralised funds.
- **Institutionalise Community Participation and Participatory Planning:** Sustainable cities cannot be built without the people they serve.
  - Institutionalising **ward committees, mohalla sabhas, and citizen report cards** can bridge planning and lived realities.
    - Municipal budgeting should be made participatory, with citizens deciding local infrastructure priorities.
  - Tools like **digital grievance redressal, social audits, and area sabhas** must be mandated under state municipal laws.
    - This builds a culture of **urban citizenship and accountability**.
- **Enable Data-Driven, Interoperable Urban Platforms:** India must invest in **urban** digital public infrastructure **(DPI)** for real-time monitoring, service delivery, and urban planning.
  - Platforms like **Integrated Command and Control Centres (ICCCs)** under the Smart Cities Mission can be scaled and made interoperable across cities.
  - Linking property records, utility billing, mobility data, and GIS layers can unlock urban efficiencies.
    - This ensures that **digitalisation enhances governance rather than just visibility**.

Conclusion:

India's urban transformation must move **beyond fragmented governance and elite-centric planning to embrace inclusive, climate-resilient, and people-friendly cities**. Linking urban development with **SDG 11 (Sustainable Cities and Communities)** is crucial to ensuring livability, resilience, and equitable access to resources. Only then can India's cities evolve from **"two-hour commutes" to thriving, sustainable ecosystems for all.**

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Towards Effective Water Management in India

This editorial is based on "Jal Jeevan Mission: Hits and misses" which was published in The Hindu on 07/05/2024. The article brings into picture the slowed progress of the Jal Jeevan Mission, now extended to 2028, and highlights the risk of neglecting traditional water conservation methods amid India's growing water crisis.

Tag: GS Paper - 2, Government Policies & Interventions, GS Paper - 3, Agricultural Resources, Water Resources, Conservation of Resources

India's ambitious Jal Jeevan Mission promised functional tap connections to every rural household by **2024**, but despite covering nearly **80% of rural homes**, progress has slowed significantly, prompting a four-year extension to 2028. The mission's single-minded focus on tap connections risks **neglecting traditional water conservation methods, as evidenced in Kerala where only 20% have piped water but 60% access sustainable traditional sources.** India must work diligently and urgently to address its multifaceted water crisis before it becomes an insurmountable national emergency.

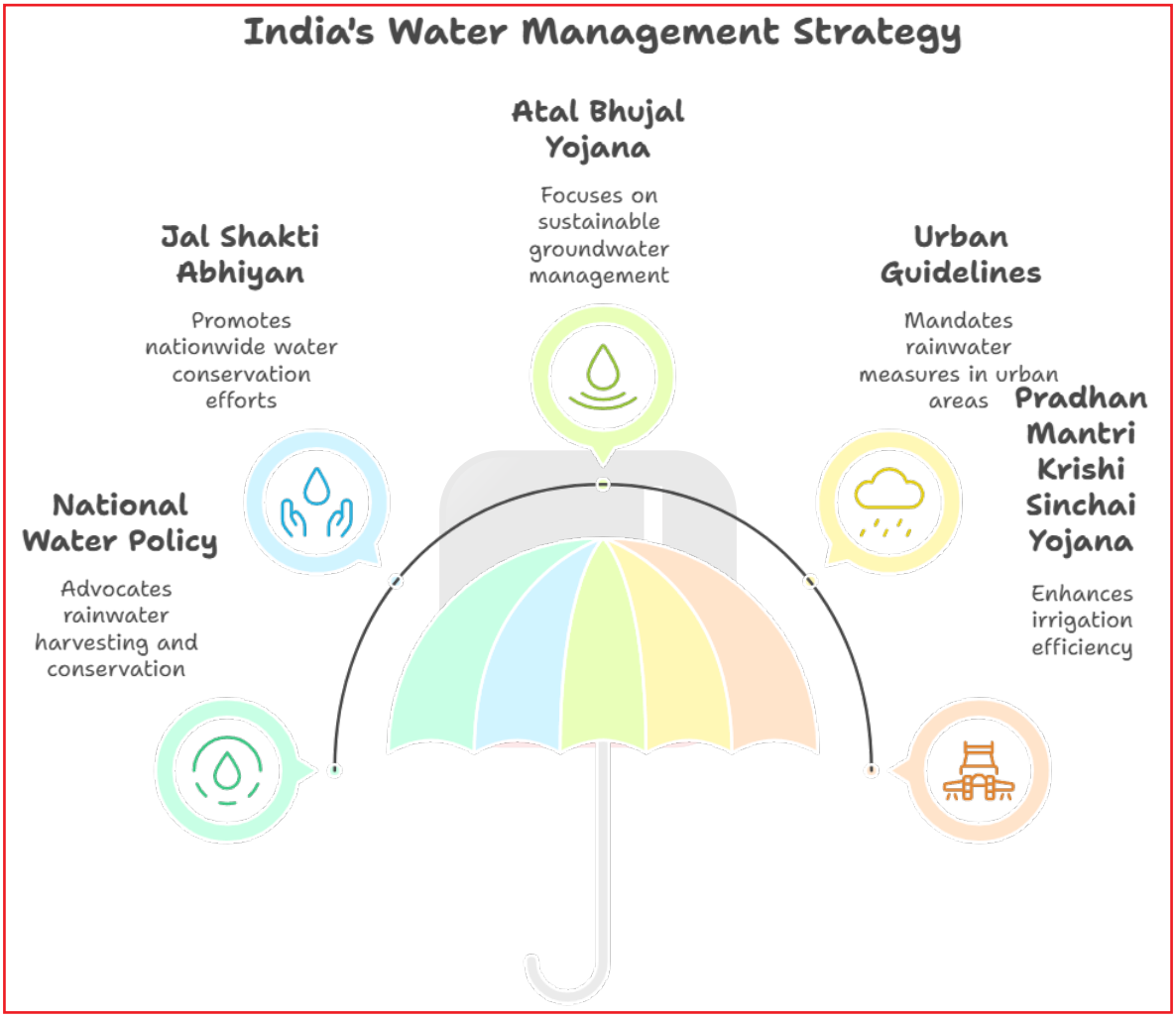
What is the Current Water Governance Framework in India?

- **Constitutional Provisions**
  - **Water as a State Subject**: Entry 17 of the State List (List II, Seventh Schedule) Water falls under the jurisdiction of state governments.
  - **Inter-State River Waters**: Entry 56 of the Union List allows the **Centre to regulate inter-state rivers** and river valleys.
  - **Environmental Protection**: **Article 48A (Directive Principle) and Article 51A(g) (Fundamental Duty)** promote the protection and improvement of the environment, including water bodies.
- **Institutional Framework**

Level	Key Institutions
Central	Ministry of Jal Shakti (formed in 2019 by merging Ministry of Water Resources & Ministry of Drinking Water and Sanitation)
State	State Water Resource Departments, Jal Boards, Groundwater Authorities
Local	Panchayati Raj Institutions (Gram Panchayats, Jal Samitis), Urban Local Bodies

- **Specialised Agencies**:
  - **Central Ground Water Board (CGWB)**: Monitors and manages groundwater.
  - **Central Water Commission (CWC)**: Designs and coordinates surface water resource projects.
  - **National Water Development Agency (NWDA)**: Works on river interlinking and water planning.
- **Legal Framework**
  - **Inter-State River Water Disputes Act, 1956**: Mechanism to resolve disputes (e.g., Cauvery, Krishna).
  - **Environment (Protection) Act, 1986**: Overarching legislation for pollution control of water bodies.
  - **Water (Prevention and Control of Pollution) Act, 1974**: Governs discharge standards and monitoring of polluted water.
  - **Model Groundwater (Control and Regulation) Bill** – Proposed to regulate groundwater use (adoption by states varies).
- **Policy Framework**
  - **National Water Policy, 2012** (Under Revision):
    - Water as an economic good
    - Participatory and integrated water management
    - Focus on sustainability and conservation

- **Draft National Water Policy, 2020** (Proposed but not adopted):
  - Prioritises climate-resilient infrastructure
  - Suggests Water Regulatory Authorities in all states
  - Emphasises wastewater reuse and groundwater pricing



What are the Key Issues Associated with Water Management in India?

- **Overexploitation of Groundwater and Policy-Induced Depletion:** India's groundwater crisis is largely policy-driven, with **free electricity and lack of regulation** encouraging **indiscriminate extraction**, especially in agriculture.
  - States like **Punjab, Haryana, and parts of Rajasthan** are already experiencing severe groundwater stress.
    - The absence of metering or incentives for conservation worsens the situation.
  - India is the largest user of groundwater globally, extracting more than the **United States and China** put together.
    - The **rate of depletion of groundwater** in India during **2041-2080** will be thrice the current rate with global warming
- **Fragmented Institutional Framework and Poor Data Synchronisation:** Water governance is fragmented across **multiple ministries, leading to coordination failures and inconsistent implementation.**

- Definitions and indicators of water access vary across **JJM, NFHS, NSS, and Census,** making tracking progress unreliable.
- Without integrated databases, targeted policy making becomes ineffective.
- **Only 36.6% of Indian households** had access to piped drinking water, **as of 2020-21**, data from the Multiple Indicator Survey **(NSS round 78), though JJM dashboard claims different data.**
  - The difference illustrates data incomparability and verification gaps.

➢ **Inadequate Urban Water Infrastructure and Rising Demand:** Urban India is facing a silent water crisis due to **aging infrastructure, rapid population growth, and unplanned urbanization.**

- Most cities supply water only a few hours a day and fail to recycle wastewater at scale. Demand outpaces supply, affecting households and industries alike.
- **No Indian city provides continuous piped water;** even metros like **Bengaluru and Delhi face summer shortages.**

➢ **Concerning Quality and Safety of Drinking Water:** Access to water does not guarantee its safety—many households receive contaminated or chemically unsafe water. Fluoride, arsenic, and iron contamination affects millions, especially in eastern and central India.

- Monitoring mechanisms under JJM are still evolving and not uniformly implemented.
- **163 million Indians lack access to safe drinking water (World Bank).** Around **21% of communicable diseases are linked to unsafe water.**

➢ **Neglect of Traditional and Sustainable Water Sources:** In the rush to meet **Functional Household Tap Connection Targets** under JJM, many traditional water systems—**wells, tanks, stepwells—are being overlooked.**

- This affects long-term water security, especially in water-abundant but infrastructure-poor states like Kerala.
  - Ignoring these systems also weakens community-led conservation.
- For instance, the proportion of total rural habitations fully covered with drink- ing water supply in Kerala i**s only 28%.**
  - Excessive focus on infrastructure risks sidelining low-cost, sustainable water solutions.

➢ **Climate Change and Increasing Hydrological Extremes:** Erratic rainfall patterns, frequent droughts, and devastating floods due to climate change are destabilising India's water regime.

- Monsoon dependence makes both drinking water access and irrigation highly vulnerable.
  - Climate-resilient water management remains underdeveloped.
- Moody's report stated that the **heat wave in June 2024,** with temperature hitting **50 degrees Celsius in Delhi** and the northern Indian States, strained water supply.
  - India's per capita annual water availability is expected to fall to **1,367 m³ by 2031 (Ministry of Water Resources).**

What Measures can India Adopt for Effective Water Management?

➢ **Integrating JJM with Atal Bhujal Yojana for Source Sustainability:** The success of Jal Jeevan Mission depends **not just on infrastructure but on the long-term sustainability of water sources.**

- Integrating it with Atal Bhujal Yojana can **help ensure that functional household tap connections are backed by stable groundwater tables.**
  - A community-led water budgeting approach should be institutionalised in villages.
- Such convergence ensures that water supply expansion is matched with groundwater conservation efforts for lasting impact.

➢ **Promoting Urban Water Security through Circular Economy:** India's urban water stress demands a shift from linear to circular water use models.

- Cities must invest in **wastewater recycling, greywater reuse, and rainwater harvesting** at both household and institutional levels.
- Linking **Smart Cities Mission with AMRUT 2.0** can ensure tech-driven urban water infrastructure with sustainability focus.
  - Mandating **water-sensitive urban design (WSUD) in building bylaws** can mainstream conservation in urban growth.

- **Strengthening Decentralised Water Governance through Panchayati Raj Institutions:** Decentralised planning through Gram Panchayats and Jal Samitis must be empowered with financial and technical autonomy.
  - Local bodies should manage water infrastructure **O&M (Operation and Maintenance)** and monitor quality through community-based systems.
    - Decentralised governance fosters accountability, context-specific solutions, and a sense of ownership among communities.
- **Modernising Irrigation through Technology and Incentive-Based Models:** India needs a radical overhaul of irrigation practices to reduce inefficiency and groundwater depletion.
  - Expanding **micro-irrigation under PM Krishi Sinchai Yojana** and integrating it with **Direct Benefit Transfer** for power subsidies can incentivise farmers to adopt precision techniques.
  - Technologies like soil moisture sensors and AI-enabled irrigation scheduling should be scaled.
    - This measure addresses both water use efficiency and energy-water-agriculture nexus simultaneously.
- **Institutional Convergence and Unified Water Data Architecture:** Fragmentation across ministries (Jal Shakti, Agriculture, Urban Affairs) weakens coordination and accountability in water policy.
  - **A National Integrated Water Data Platform** should be established to harmonise definitions, indicators, and progress tracking across JJM, NFHS, NSSO, and Census.
  - Real-time data transparency can improve inter-agency coordination and public trust.
    - **Institutional synergy and unified monitoring systems** will enable evidence-based and outcome-driven water management.
- **Embedding Climate Resilience in All Water Infrastructure Projects:** With climate change intensifying droughts and floods, resilience must become a non-negotiable criterion in project planning.
  - Water infrastructure—**dams, canals, urban drains**—should be designed using climate risk assessments and nature-based solutions.
  - Linking **National Adaptation Fund with Jal Shakti Abhiyan** can fund localised climate-resilient interventions.
    - **Embedding resilience** ensures that infrastructure is not just built to last, but also to adapt.
- **Reviving Traditional Water Bodies through Community-Led Initiatives:** India has a rich heritage of traditional water harvesting systems—**stepwells, tanks, johads**—which have fallen into neglect.
  - Reviving these through convergence of schemes like **MGNREGS and Jal Shakti Abhiyan** can create water storage capacity while generating rural employment.
  - Community ownership must be incentivised through reward-based models for upkeep.
    - **Blending cultural knowledge with modern planning** offers both sustainability and social capital enhancement.
- **Promote Usage of Recycled Water:** To encourage residential societies to adopt treated water for non-potable purposes, the government can introduce subsidized dual plumbing systems that separate potable and recycled water.
  - Additionally, a tiered volumetric pricing structure can be implemented, charging higher rates for excessive use of fresh water while offering incentives for using recycled water.
  - Strict enforcement of the **Central Pollution Control Board's (CPCB) Zero Liquid Discharge (ZLD) guidelines** is essential to ensure wastewater is effectively treated and reused.
  - Furthermore, industries should be mandated to use treated water, following the example of the Power Tariff Policy 2016, which requires thermal power plants within a **50 km radius of sewage treatment plants (STPs)** to utilize treated sewage water for non-potable purposes.
- **Implementing Mihir Shah Committee's Recommendation:** The **Mihir Shah Committee** recommends a One Water Approach for integrated water management, merging CGWB and CWC into a **National Water Commission (NWC)** for **better governance, and strengthening decentralized water management.** Some of the other Recommendations made by the committee are:

- **Broadening Disciplinary Scope:**
  - Current dominance of civil engineers (CWC) and hydrogeologists (CGWB) is inadequate.
  - Emphasized inclusion of:

➢ Social scientists and management experts – for participatory models.

➢ Agronomists – for crop water budgeting and WUE.

➢ Ecological economists – to value ecosystem services.

➢ River ecologists – essential for river rejuvenation projects.

- **Holistic and Participatory Water Governance:**
  - Advocated breaking groundwater-surface water silos.
  - Encouraged community involvement and decentralised decision-making.
  - Stressed that water's value is not just economic, but ecological, social, and cultural.
- **Governance Overhaul:**
  - **Redesign existing organisations** into a **progressive, agile, and compact structure** that can effectively tackle current and future water governance challenges.
  - **Simplify and rationalise the bureaucratic setup** of the existing bodies by addressing issues like numerous overlapping designations and lack of accountability.
- **Participatory and Inclusive Water Management**
  - **Promote participatory irrigation and groundwater management**, which require engagement with local communities and multi-disciplinary expertise.
  - **Shift focus from purely economic valuation of water** to include **social, ecological, and cultural values** in water conservation and management strategies.
  - **Make water governance more inclusive**, participatory, and transparent with active stakeholder engagement at all levels.

Conclusion:

India's water management must go beyond infrastructure expansion to ensure long-term sustainability. **Integrating traditional conservation methods with modern solutions** is crucial for resilience against climate change and resource depletion. Strengthening decentralized governance, data transparency, and community participation will enhance efficiency

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Strengthening India'S Indo-Pacific Strategy

This editorial is based on "Charting a route for IORA under India's chairship" which was published in The Hindu on 22/03/2025. The article brings into picture the funding and governance challenges of IORA. As India prepares to chair in 2025, it has a crucial opportunity to enhance regional cooperation and its Indo-Pacific influence.

Tag: Look East to Act East, Regional Groupings, Effect of Policies & Politics of Countries on India's Interests

The Indian Ocean Rim Association **(IORA),** a crucial regional body connecting **Asia, Africa, and Australia,** faces funding constraints and governance challenges despite its strategic importance. The Indian Ocean Region holds immense geostrategic value—facilitating 75% of global trade and housing two-thirds of humanity. As India prepares to **chair IORA from November 2025,** it represents a critical moment for India to strengthen **regional cooperation and advance its strategic interests within the broader** Indo-Pacific framework where great power competition increasingly shapes maritime governance and security.

What is the Significance of the Indo-Pacific Region for India?

➢ **Maritime Security & Strategic Autonomy:** India's maritime security hinges on the Indo-Pacific, which hosts vital **Sea Lines of Communication (SLOCs)** through which most of India's trade and energy flow.

- With increasing Chinese assertiveness, especially in the **South China Sea** and Indian Ocean, securing these waters is essential for national sovereignty and economic resilience**.** India's SAGAR doctrine reflects this maritime-first strategic outlook.

- Over **95% of India's trade by volume** passes through the Indian Ocean. India has increased patrols near the Strait of Hormuz and **Malacca**, both critical Indo-Pacific chokepoints.

- **Economic Growth & Trade Diversification:** The Indo-Pacific is central to India's growth via economic partnership and integrated supply chains.
  - In an era of China+1 strategies, India is leveraging this region to attract manufacturing, diversify trade, and deepen digital and green economy linkages.
    - Initiatives like IPEF and **FTAs with Australia and UAE** are part of this push.
  - India joined the Indo-Pacific Economic Framework **(IPEF)** in 2022, focusing on resilient supply chains.
- **Technology & Infrastructure Connectivity:** India is using the **Indo-Pacific** to promote infrastructure and digital connectivity aligned with its **Digital Public Infrastructure model.**
  - India has launched the Global Digital Public Infrastructure Repository **(GDPIR)**, a virtual platform under its G20 presidency**,** to facilitate the exchange of information and best practices on developing digital public infrastructure (DPI) at scale
  - The India-Middle East-Europe Economic Corridor **(IMEC)**, launched in **September 2023**, passes through the Indo-Pacific, linking India to Europe via the Gulf.
- **Climate Change & Blue Economy Leadership:** The Indo-Pacific is vulnerable to climate-induced disasters like **cyclones, sea-level rise, and coral loss.**
  - India is spearheading climate resilience efforts via IORA, the Coalition for Disaster Resilient Infrastructure, and its leadership in the blue economy space.

- This enhances **India's soft power and creates opportunities for sustainable maritime development** and green finance.

➢ **Diplomatic & Normative Leadership:** The Indo-Pacific helps India position itself as a civilizational and democratic leader of the Global South.

- Through **IORA chairmanship (2025–27)**, India is shaping regional norms around inclusivity, development, and sovereignty.
  - This also supports **India's UNSC and multilateral reform agenda.**
- India hosted the **Voice of Global South Summit** in **2024** and **championed the New Delhi Leader's Declaration** under the G20 presidency, despite apprehensions about failure.

What are the Key Issues Hindering India's Active Engagements in the Indo-Pacific?

➢ **Strategic Resource Constraints:** India's capacity to project power across the Indo-Pacific is hampered by **limited naval resources, budgetary constraints, and logistical limitations**, especially compared to China and the US.

- Despite growing ambitions, India lacks overseas military bases, long-range deployment capacity, and sustained funding for maritime dominance.
  - This restricts its **presence beyond the Indian Ocean.**
- In 2023-24, the capital expenditure allocated to the armed forces closely matched their projected requirements. However, at the revised estimate stage, spending by the Army, Navy, and Air Force was 4% lower than the budget estimate.
  - In contrast, China's defence budget exceeded **7% in 2025** with active deployment in **Djibouti and Cambodia**.

➢ **Absence of Coherent Indo-Pacific Doctrine:** India lacks a singular, institutionalised Indo-Pacific policy framework to guide its strategic choices and alliances.

- While the **SAGAR, Act East, and Indo-Pacific Oceans Initiative exist**, the absence of a unified doctrine reduces clarity for partners and leads to fragmented regional messaging.
  - This weakens India's leadership perception in multilateral forums.
- Unlike the **US Indo-Pacific Strategy (2022)** or **Japan's Free and Open Indo-Pacific vision**, India's approach remains a **patchwork of initiatives**.

➢ **Geopolitical Balancing Dilemma:** India's quest for strategic autonomy limits its ability to fully align with like-minded coalitions (**e.g., Quad, Indo-Pacific Economic Framework for Prosperity**) against China's assertiveness.

- Simultaneously engaging China diplomatically in forums like SCO and BRICS leads to ambiguity and slows decision-making. This **reduces India's reliability in high-stakes security alignments.**
- India's strategic autonomy creates ambiguity in security alignments. Its cautious stance on **AUKUS** and continued defense ties with **Russia (S-400 deal despite CAATSA concerns)** show its balancing act.

➢ **Economic Hesitancy and Trade Reticence:** India's cautious trade posture—**seen in its RCEP withdrawal and limited FTA depth (data localisation clauses)**—has undermined its economic integration in the Indo-Pacific.

- This **weakens India's credibility as a long-term trade partner** and reduces its leverage in regional economic diplomacy, especially compared to **ASEAN, China, and Japan.**
- India pulled out of **RCEP in 2019**, and as of 2024, it has only **13 active FTAs**, far fewer than ASEAN.
  - On the other hand, **trade between ASEAN and China has more than doubled since 2010,** from USD 235.5 billion to USD 507.9 billion in 2019.

➢ **Limited Institutional Capacity in Regional Forums:** India's influence in Indo-Pacific institutions like **IORA, BIMSTEC, and IPOI** is undermined by **weak secretariats,** lack of dedicated funding, and bureaucratic sluggishness.

- Despite having **visionary goals,** India often struggles with follow-through and operational delivery in regional capacity-building.
  - For instance, the budget of the Indian Ocean Rim Association happens to be just a few million. Incidentally, the **Indian Ocean Commission,** which has only five Indian ocean countries, has a **$1.3 billion budget for the 2020-25 time frame.**

➢ **Vulnerability to Domestic and Regional Disruptions:** India's Indo-Pacific focus is frequently disrupted by urgent domestic issues (e.g., border conflicts,

economic downturns) and regional instability (e.g., in West Asia or Nepal). These limit sustained attention, dilute diplomatic bandwidth, and hinder consistent regional engagement.

- The Gaza conflict **(2023–25)** and **Houthi disruptions in the** Red Sea directly impacted India's energy supply lines and cargo, forcing naval redeployments.
  - Meanwhile, tensions with **Canada and Maldives** in 2024 diverted diplomatic focus.

- **Inadequate Maritime Infrastructure and Connectivity:** India's **port infrastructure, coastal logistics, and shipbuilding capacity** remain underdeveloped compared to its Indo-Pacific peers, limiting both economic and strategic outreach.
  - Delays in **executing projects like** Sagarmala **and lack of deep-sea port** capabilities affect India's maritime trade and naval access.
    - This undercuts India's blue economy and connectivity ambitions.
  - India ranks **38th in the** World Bank's Logistics Performance Index (2023). Chabahar Port, India's key strategic project, saw only partial operationalisation, while China's Gwadar Port received over **$2.5 billion in fresh investment** under CPEC.

What are the Key Groupings of the Indo-Pacific that India is Part of?

- **Quad (Quadrilateral Security Dialogue)**
  - **Members**: India, USA, Japan, Australia
  - **Focus**: Strategic coordination, maritime security, supply chains, technology, climate, health
- **Indo-Pacific Economic Framework for Prosperity (IPEF)**
  - **Members**: 14 countries including India, US, Japan, Australia, South Korea, ASEAN nations
  - **Focus**: Trade, supply chain resilience, clean economy, fair economy **(India opted out of trade pillar)**
- **Indian Ocean Rim Association (IORA)**
  - **Members**: 23 member states across **Asia, Africa, Australia**
  - **Focus**: Maritime cooperation, blue economy, disaster management, capacity building
- **BIMSTEC (Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation)**
  - **Members**: Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka, and Thailand
  - **Focus**: Regional connectivity, security cooperation, economic and technical collaboration
- Indo-Pacific Oceans Initiative **(IPOI)** ***(India-led)***
  - **Partners**: Voluntary partnership – **Australia, France, Japan and Indonesia have joined pillars**
  - **Focus**: Maritime ecology, connectivity, security, disaster risk reduction, blue economy

What Measures can India Adopt to Enhance its Engagement in the Indo-Pacific Region?

- **Formulate a Comprehensive Indo-Pacific Grand Strategy:** India must integrate its multiple policy threads—SAGAR, Act East, IPOI, Indo-Pacific Economic Framework **(IPEF)**—into a unified **National Indo-Pacific Strategy**.
  - This strategy should clearly define India's interests, red lines, engagement tools, and sectoral priorities across the **maritime, economic, and normative spheres.**
  - A single, government-mandated doctrine would enhance internal coherence and external clarity.
    - This will also help **India project itself as a net security provider and regional stabiliser**.
- **Expand India's Naval Reach and Maritime Infrastructure:** To assert its maritime leadership, India must expand its **naval operational footprint** across the Indo-Pacific by entering logistics-sharing agreements, establishing forward presence facilities, and modernising its fleet.
  - Strengthening **Mission-Based Deployments**, enhancing underwater domain awareness, and securing access to island territories are essential for sea lane security.
  - India should prioritise projects like **deep-sea ports, MDA networks**, and **coastal radar chains** in the Indian Ocean littorals.
    - Such steps will **shift India from a coastal to a fully Indo-Pacific maritime power.**
- **Institutionalise Mini-lateral and Multilateral Leadership:** India should deepen its role in **Quad, IORA, IPOI, BIMSTEC**, and trilaterals like **India-**

France-Australia by driving focused cooperation on maritime security, connectivity, critical technologies, and disaster response.

- **Mini-lateral formats offer agility** without the rigidity of formal alliances and allow India to shape regional norms.
- **India must also build coordination mechanisms** among these groupings to reduce duplication.
  - Institutional depth multiplies India's diplomatic capital.

➢ **Deliver Strategic Infrastructure and Connectivity Initiatives:** India must scale up execution of strategic connectivity projects such as the **Chabahar Port, Kaladan Multi-Modal Project and India-Middle East-Europe Economic Corridor (IMEC)**.

- These should be time-bound, quality-driven, and built around **local ownership and sustainability**.
- India should also expand **Project Preparation and Delivery Units (PPDUs)** to fast-track infrastructure diplomacy.
  - Infrastructure delivery is the new currency of strategic influence.

➢ **Champion a People-Centric Blue Economy and Climate Agenda:** India should take the lead in shaping an inclusive **Blue Economy architecture**, focusing on sustainable fisheries, marine conservation, ocean energy, and island livelihoods.

- It should embed **climate adaptation and coastal resilience** into regional cooperation, especially through IORA and IPOI.
- India's leadership in the **CDRI and International Solar Alliance (ISA)** can be linked to this regional agenda.
  - This aligns **maritime diplomacy with climate justice** and sustainable development.

➢ **Reinvent Trade Diplomacy and Economic Integration:** India must take a calibrated but forward-leaning approach to economic integration in the Indo-Pacific.

- This includes deepening FTAs with ASEAN, Australia, UAE, and actively engaging in **IPEF's trade, digital, and supply chain pillars**.
- Strengthening value chains in **semiconductors, rare earths, green technologies,** and pharmaceuticals can position India as a trusted alternative to China.
- Institutional trade capacity, customs reforms, and trade facilitation should accompany these efforts.

➢ **Operationalise IPOI into a Flagship Regional Platform:** The **Indo-Pacific Oceans Initiative (IPOI)** must transition from conceptual vision to operational platform with **defined roadmaps, anchor countries, and project pipelines** for each thematic pillar.

- India should establish a **secretariat, funding mechanism, and expert task forces** under IPOI to coordinate policy, research, and training.
- **Structure turns intent into impact.** This will institutionalise India's leadership on maritime governance and environmental norms.
  - As **India's foreign affairs minister** stated in Raisina Dialogue 2025: "If you don't have an order, then you are looking at a very anarchic world'.

➢ **Leverage Cultural, Educational, and Diaspora Diplomacy:** India must invest in long-term **soft power** tools by building educational, cultural, and digital linkages with Indo-Pacific nations.

- Creating **maritime-focused research hubs**, offering scholarships on Blue Economy and strategic studies, and promoting cultural exchanges can deepen trust.
- **India's diaspora in Southeast Asia, Australia, and Gulf countries** should be mobilised as strategic assets.
  - Launching **"Indo-Pacific Chairs"** at universities and think tanks can internationalise India's worldview.

Conclusion:

India's Indo-Pacific engagement is at a **critical juncture, requiring a coherent strategy, enhanced maritime capacity, and deeper regional integration.** As IORA chair (2025–27), India must lead on **security, trade, and connectivity** while balancing strategic autonomy with effective partnerships. Strengthening institutional frameworks and economic diplomacy will solidify India's role as a key Indo-Pacific power.

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Reinvigorating India'S MSMEs Sector

This editorial is based on "ISID backs MSMEs, startups to drive manufacturing-led Viksit Bharat" which was published in The Business Standard on 24/03/2025.The article brings into picture the critical role of MSMEs in India's industrial growth, contributing 30% to GDP yet struggling with market challenges.

Tag: GS Paper-2, Government Policies & Interventions, GS Paper-3, Mobilization of Resources

India's industrial landscape stands at a critical juncture, with the **potential to transform its economic trajectory through strategic manufacturing development**. Despite contributing **30% to GDP and generating 109 million jobs,** MSMEs remain vulnerable, **with 99.5% classified as micro enterprises** struggling against import surges and market challenges. The **India Industrial Development Report 2024-25** underscores the urgent need for systemic reforms, advocating for strengthening small businesses through **government procurement, affordable credit, and technological adoption.**

What is the Significance of the MSME Sector in the Indian Economy?

- **Employment Generation and Inclusive Growth:** MSMEs are India's **largest source of non-farm employment,** enabling inclusive growth by **providing jobs across rural and semi-urban areas.**
  - They **absorb surplus labour, promote entrepreneurship, and reduce migration** by creating localized economic opportunities.
    - Their **decentralized nature makes them vital for equitable development,** especially among SC/ST/OBC and women entrepreneurs.
  - Over **100 million people** are employed across **65 million MSMEs**. Also, as per the Udyam Registration Portal (URP) of the Ministry of MSME, **women-owned MSMEs constitute 20.5% of the total number of MSMEs** registered on the Portal.
- **Boost to Exports and Foreign Exchange Earnings:** MSMEs play a crucial role in India's export economy by **contributing significantly to sectors like textiles, handicrafts, engineering goods, and pharma.**
  - They **help India diversify its export base**, build niche products, and integrate with global value chains.
    - As tariff barriers rise globally, **MSMEs help India remain agile in international markets**
  - MSMEs contribute **45% of India's total exports**. In 2023, India's **engineering MSME exports** grew by **11%**, despite global slowdown.
- **Supply Chain Resilience and Domestic Value Addition:** By acting as suppliers to large industries, **MSMEs strengthen domestic supply chains** and **reduce over-dependence on imports.**
  - They **support large-scale production in auto, defence, electronics, and textile sectors,** enabling backward linkages and value addition.
    - In a post-Covid world, they are critical to building resilient, self-reliant manufacturing ecosystems.
  - For instance, the government data stated that under the food processing PLI scheme, **MSMEs play a key role,** with **70 directly enrolled and 40 supporting as contract manufacturers.**
- **Catalysts of Innovation and Tech-Driven Industrialization:** MSMEs are emerging hubs of innovation, particularly in areas like Clean tech, AgriTech, **health-tech, and industrial automation.**
  - Their agility allows them to adapt quickly to **new technologies, pilot solutions, and drive bottom-up industrialization.** With proper policy support, they can **lead India's IR4.0 transformation.**
  - India's **start-up ecosystem**, 3rd largest globally, has over **many registered startups as MSMEs**.
    - Also, the Indian government has **proposed a dedicated fund of Rs 5,000 crore** for the export capacity development, promotion, and marketing of MSMEs.
- **Drivers of Women and Marginalized Entrepreneurship:** MSMEs empower women and marginalized communities by offering low-entry-barrier platforms for enterprise.\
  - Schemes like the Prime Minister's Employment Generation Programme, MUDRA, and SVANidhi have boosted entrepreneurship at the grassroots level.
    - This social empowerment via economic means also supports SDG targets on gender equality and decent work.

- As of March 2024, **₹25 lakh crore in loans** sanctioned under **MUDRA Yojana**, with **68% to women borrowers** (DFS Annual Review). **PM SVANidhi** has supported **3.2 million street vendors**, many from vulnerable groups.

➢ **Regional Economic Development and Urban-Rural Balance:** MSMEs help reduce regional disparities by promoting industrial activity in **tier-2, tier-3 cities and rural clusters.**

- **Cluster-based development in leather, textiles, handlooms, and food processing** helps uplift backward regions.
  - They are key to achieving spatially balanced growth envisioned under initiatives like **PM Gati Shakti.**
- **One District One Product (ODOP)** initiative now covers **over 760 districts**, promoting localized value chains.

➢ **Sustainability and Green Transition Enablers:** MSMEs are poised to be the leaders in India's green economy shift by **adopting energy-efficient practices and circular economy models.**

- They are crucial for India's climate goals, but need hand holding in tech adoption and financing. **Emerging green start-ups in MSME space** are innovating around waste, energy, and water efficiency.
- The **Centre of Green Policy for MSMEs** will serve as a dedicated hub for innovation and capacity building, providing knowledge, tools, and support to help MSMEs adopt sustainable practices across sectors and regions in a tailored manner.

What are the Key Issues Associated with MSME Sector in India?

➢ **Credit Access and Financial Exclusion:** Access to timely and affordable credit remains the most persistent bottleneck for MSMEs.

- Despite several schemes, **high collateral requirements, delayed payments, and risk aversion** among banks limit formal credit flow.
  - This **leads many MSMEs to depend on informal sources** with high-interest rates, affecting their sustainability and growth potential.
- **For instance, only 16% of MSMEs get access to loans from banks**, while the rest have to rely on informal sources. MSMEs currently need around Rs 25.8 lakh crore in formal credit.

➢ **Delayed Payments and Working Capital Crunch:** Chronic delays in payments from government departments, PSUs, and large private buyers hurt MSMEs' cash flow and working capital.

- This leads to a **vicious cycle of credit dependency,** stalled production, and layoffs.
  - A 2021 report highlighted poor case disposal rates on the **Samadhaan portal, with only 20% of applications resolved or mutually settled**, while 39% remained unattended
- As per **RBI Report (2023), over ₹10,000 crore in delayed payments** are pending with government buyers. **MSME Samadhaan portal** has resolved only **33% of complaints** filed since its inception in 2017.

➢ **Technological Obsolescence and Low IR4.0 Adoption:** Most MSMEs **continue to operate with outdated machinery** and minimal digital integration, which limits productivity, quality, and scalability.

- **Their low digital literacy and lack of R&D investments** prevent them from transitioning to **Industry 4.0 standards.**
  - This **widens the competitiveness gap, especially in global markets.**
- India's spending on R&D in terms of percentage of GDP has been stagnant at **0.6 to 0.7% in the last two decades,** much lower than the **US, China.**
  - In 2024, a branchless banking and digital network, **reported that 36% of MSMEs cite resistance to adopting new technology,** and 18% struggle with the high costs associated with its implementation.

➢ **Regulatory Burden and Compliance Complexity:** MSMEs often face a disproportionate regulatory burden compared to their capacity.

- **Multiplicity of laws, frequent compliance filings, and inspections** increase cost of doing business. Despite the push for **"ease of doing business,"** the reforms have not translated well to the smallest players.

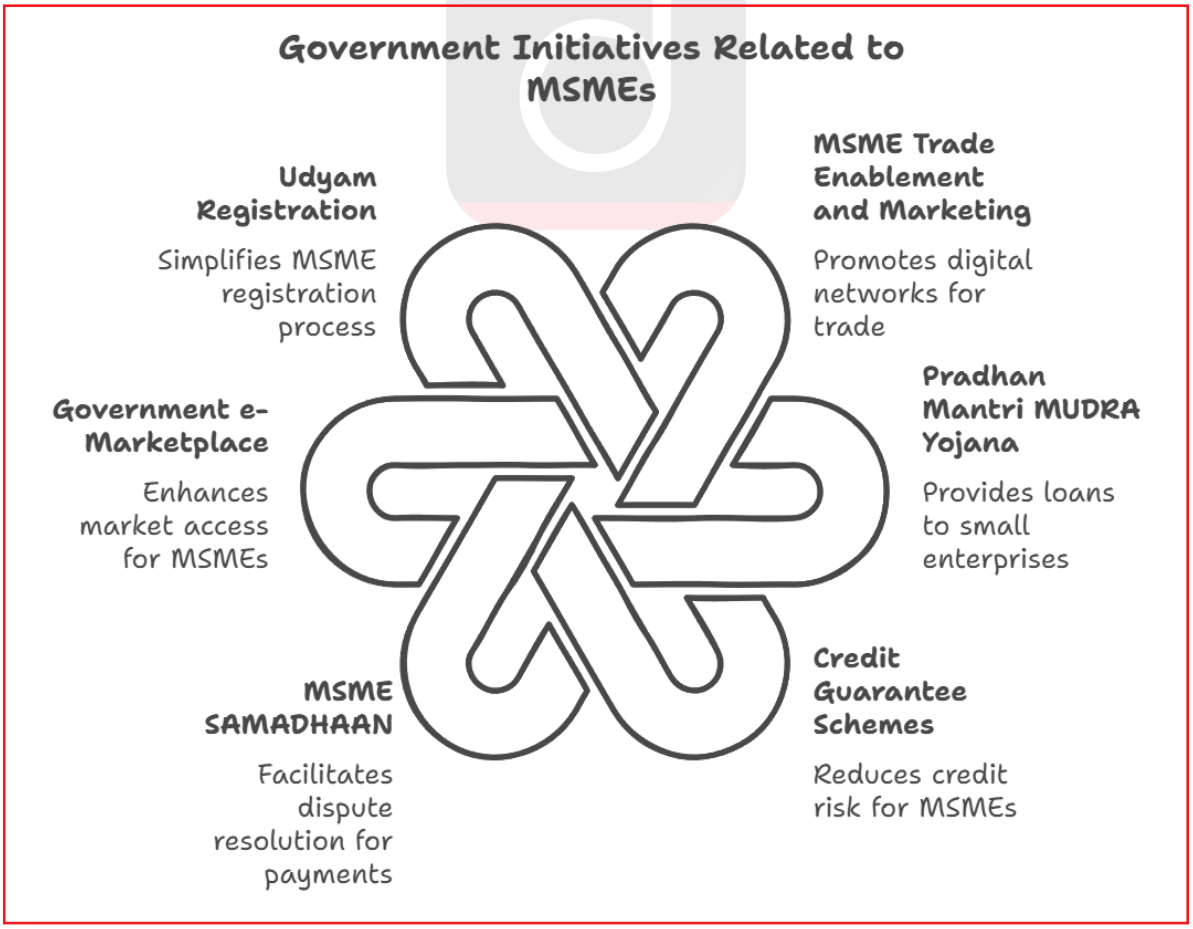
- MSMEs must comply with various regulations, including the **Shops & Establishment Act for registration**, the Factories Act **for labor and safety (if applicable)**, and the Companies Act for reporting and governance.

➢ **Market Access and Value Chain Exclusion:** Many MSMEs, especially micro and rural enterprises, struggle to access markets beyond their locality.

- A large chunk of MSMEs operate informally, outside the tax net, labour regulations, and formal financing systems.
  - This **makes them invisible in policymaking and excluded from formal support schemes**. Informality also leads to poor productivity and weak social security for workers.
- **They lack branding, digital marketing skills, and linkages** with larger value chains. This limits revenue, scalability, and integration with global trade flows.
  - MSMEs presence on e-commerce platforms **remains low**. ODOP and GEM initiatives are helping, but uptake remains low.

➢ **Vulnerability to External Shocks and Global Disruptions:** MSMEs are disproportionately affected by economic disruptions, supply chain shocks, and geopolitical tensions due to their limited buffers and narrow margins.

- Events like **Covid-19, EU's** Carbon Border Adjustment Mechanism **(CBAM),** and fluctuating import prices have exposed their fragility.
- Post-Covid, **over 35,000 MSMEs have ceased operations**, highlighting the sector's ongoing challenges and the need for sustained support and resilience-building measures.
  - Also, The EU's CBAM may affect **textile MSME**.



What Measures can be Adopted to Enhance the Effectiveness of MSME in India?

- **Integrated Credit Framework with Risk-Based Lending Models:** To improve financial access, there must be a unified digital credit ecosystem that integrates **UDYAM**, **GST**, **TReDS**, and **Account Aggregator** platforms.
  - Credit assessment should shift from collateral-based to cash-flow and risk-based models tailored for MSMEs.
  - Public credit guarantee mechanisms like **CGTMSE** can be expanded with higher coverage and faster claims.
    - Linking these platforms can ensure seamless, real-time credit disbursal.
- **Cluster-Based Technology Upgradation with IR4.0 Focus:** Create regional **Technology Upgradation Hubs** in major MSME clusters with **plug-and-play** infrastructure, tech labs, and design centers.
  - These should be co-developed under **MSE-CDP** and **Digital India** initiatives with support from state governments.
  - **Focus must be on AI/IoT adoption,** energy efficiency, and process automation relevant to each cluster's domain.
    - Capacity-building programs should ensure tech absorption by micro units. **Partnering with CSIR, IITs, and private R&D labs** can drive grassroots innovation.
- **Streamlined Compliance through Unified MSME Portal:** Establish a **single-window digital MSME Compliance Portal** that integrates all state and central regulatory filings **— labour, GST, environment, factory, and licensing** — into one simplified dashboard.
  - Introduce graded compliance norms based on size and sector to reduce burden on micro units.
  - Embed real-time grievance redressal and chatbot-based advisory tools. Link it with **Ease of Doing Business 2.0** and **Vivad se Vishwas for MSMEs** for time-bound dispute resolution.
- **Digital Market Linkages through Scheme Convergence:** Strengthen digital access by merging **ODOP**, **GEM**, and **Open Network for Digital Commerce (ONDC)** to create a seamless marketing platform for MSMEs.
  - This convergence should **offer branding, logistics support, B2B connections, and multilingual digital literacy.**
  - **Hand Holding for cataloguing, pricing, and payment systems** is essential, especially for first-time sellers.
    - Dedicated e-commerce zones in districts can act as incubation centers. This approach will help MSMEs tap both domestic and export markets efficiently.
- **Decentralised Skilling with MSME-Industry-Academia Interface:** Set up **District Skill Labs** in MSME clusters under **Skill India 2.0**, co-managed by industry bodies, ITIs, and local polytechnics.
  - Focus should be on demand-driven, modular skilling tailored to cluster needs — **textile in Surat, machine tools in Rajkot, auto components in Coimbatore.**
  - Launch apprenticeship-linked incentives to encourage on-the-job learning.
    - **Promote women's participation via flexible training models** and creche facilities in industrial parks.
- **Formalization Push with Incentivised Transition Package:** Offer a **3-year Formalization Transition Package** for informal MSMEs registering on UDYAM, providing graded incentives like utility subsidies, tax rebates, marketing support, and simplified inspections.
  - Combine it with **PM Vishwakarma Yojana** and **SVANidhi** to bring artisans and nano-enterprises into the fold.
  - Provide digital onboarding kits and mentoring through industry chambers. **Emphasize ease, not enforcement, to nudge voluntary formalization** without overwhelming small entrepreneurs.
- **Green MSME Mission for Sustainable Manufacturing:** Launch a dedicated **Green MSME Mission** that provides technical and financial assistance for eco-friendly manufacturing — energy-efficient machinery, solar adoption, waste reduction.
  - Align it with **ZED Certification**, **SIDBI's green finance**, and **carbon credit trading**.
  - **Make ESG compliance aspirational**, **not mandatory**, using tiered recognition models. Promote green clusters in pollution-prone areas with incentives for cleaner production. This will **prepare MSMEs for future export standards like the EU's CBAM.**

Conclusion:

A resilient MSME sector is **key to India's industrial transformation, job creation, and economic self-reliance.** Addressing credit constraints, technology adoption, and regulatory hurdles will enable MSMEs to compete globally and integrate into value chains. **Strengthening market access, digital linkages, and sustainability initiatives** can unlock their full potential.

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Boosting Indigenisation & Innovation in Defence

This editorial is based on "Defence moves to strengthen indigenous production with major procurement approvals" which was published in The Financial Express on 25/03/2025. The article brings into picture the rapid defense modernization under Atma Nirbhar Bharat, with $138 billion in expected orders, rising production, and exports, while highlighting challenges in critical technologies

Tag: GS Paper - 2, Government Policies & Interventions, GS Paper - 3, Defence Technology, Indigenization of Technology

India is **actively pursuing defence innovation and modernization** through its **Atma Nirbhar Bharat Initiative, targeting indigenous production and reducing foreign dependence**. The defence sector anticipates massive orders totaling **$138 billion over the next decade,** with significant investments in **aerospace, missiles, and artillery.** While **defence production has more than doubled from Rs 46,429 crore** and exports have grown nearly tenfold, challenges remain in developing critical technologies and increasing private sector participation.

What is the Significance of Defence Indigenisation and Modernisation for India?

- **Strategic Autonomy and National Security:** Reducing dependence on foreign arms enhances India's ability to **respond swiftly during crises without being hostage to external suppliers or geopolitical shifts.**
  - Indigenisation ensures that critical platforms are available even during **sanctions** or **supply-chain disruptions.**
  - Modernisation also helps the **armed forces remain combat-ready** and technologically superior in a volatile neighbourhood.
  - **65% of defence equipment is domestically manufactured.** The **₹7,000 crore order for indigenous ATAGS guns in 2025** reflects this shift toward strategic self-reliance.
- **Economic Growth and Industrial Capability:** **Defence indigenisation** catalyses economic development by creating a robust **industrial base,** boosting **local manufacturing, MSMEs, and start-ups.**
  - It has large **multiplier effects through job creation, skill development, and spurring innovation** across sectors like **aerospace, metallurgy, electronics, and AI.**
  - **Defence production rose to ₹1.27 lakh crore in FY24** — a 174% jump from FY15.
    - **Over 16,000 MSMEs and 430 licensed companies** are currently engaged in India's defence production ecosystem.
- **Export Potential and Global Defence Diplomacy:** India's defence exports are emerging as a key pillar of its strategic influence, improving soft power and bilateral defence cooperation.
  - Indigenous platforms like the **Tejas, Akash missile system, and fast interceptor boats** are attracting global interest, supporting economic and strategic ambitions.
  - **Defence exports hit an all-time high of ₹21,083 crore in FY24**, up from ₹686 crore in FY14- **a 30-fold increase.**
    - India now exports to **100+ countries,** with the **USA and Armenia.**
- **Resilience Against Supply Chain Shocks:** Building indigenous capabilities reduces vulnerability to global supply chain disruptions, sanctions, or political uncertainty — as seen during the **Russia-Ukraine war.**
  - This resilience is vital for **uninterrupted military readiness and spares support.**
  - **India's Positive Indigenisation Lists** now cover over **5,500 items,** of which **3,000+ have been indigenised**.
- **Technological Innovation and R&D Ecosystem:** Indigenisation fosters a homegrown defence R&D ecosystem, helping India become a producer of cutting-edge tech rather than a passive consumer.

- Platforms like **iDEX** and **ADITI** bridge military needs with start-up and academic innovation, driving breakthroughs in AI, autonomous systems, and quantum tech.
- As of **Feb 2025, 619 startups/MSMEs are engaged through iDEX,** with **₹449.62 crore allocated**.
  - Innovations like the **RudraM-II missile**, **Naval Anti-Ship Missile, and QKD systems** were showcased at **SAMARTHYA 2025.**

➢ **Inclusive Development and Regional Industrialisation: Defence corridors and manufacturing clusters** drive domino effect and decentralised growth, especially in underdeveloped regions.
- This spurs regional employment, local entrepreneurship, and investment in **Tier-2 and Tier-3 cities.**
- **Over ₹8,658 crore invested in UP and TN Defence Corridors;** 253 MoUs signed worth ₹53,439 crore. Key nodes like **Lucknow, Coimbatore, and Hosur** are fast emerging as defence hubs.

What are the Key Roadblocks Associated with India's Defence Modernisation and Indigenisation?

➢ **Technological Gaps in Critical Defence Components:** India continues to face significant shortfalls in developing core technologies such as engines, semiconductors, and precision electronics, making it reliant on foreign suppliers for key subsystems.
- Despite growing domestic capabilities, **strategic platforms like fighter jet engines, AESA radars, and heavy-lift transport systems** still require foreign collaboration.
  - This **hampers full-spectrum indigenisation** and delays complex defence projects.
- **India still lacks indigenous aero-engine technology for fighter aircraft**; jet engines for **Tejas are sourced from GE Aerospace(USA)**.

➢ **Low Private Sector Participation and Scale:** Private industry's involvement in defence production remains limited in scale and scope, especially in high-value or complex systems.
- Barriers include **long gestation periods, uncertainty in procurement pipelines,** limited access to R&D support, and risk-averse bureaucratic processes.
  - This undermines innovation and competition.
- **Private firms contributed only 21% to total defence production and innovation.** Of the ₹1.27 lakh crore of defence production, DPSUs dominate the major share.

➢ **Bureaucratic Delays and Complex Procurement Procedures:** Cumbersome acquisition processes**, multiple approval layers,** and lack of time-bound decision-making often derail or delay modernisation efforts.
- This affects operational readiness and erodes industry confidence in investing in long-term capability development.
- Despite reforms, **capital acquisition timelines remain long; the new DAC guidelines** aim to reduce procurement timelines but its implementation, however, will be tested by time.
  - For instance, the **LCA program was sanctioned in 1983**, **but the aircraft's first prototype took flight only in 2001,** and it has taken until now to take full shape.

➢ **Inadequate Defence R&D Investment and Absorption:** Though DRDO and other agencies have developed indigenous platforms, **R&D spending remains low as a percentage of GDP**, and there's a disconnect between lab-level innovation and large-scale production.
- India spends around **0.7% of GDP on R&D overall,** and much less on defence R&D compared to countries like the US.
- **Technology Development Fund scheme funds** were increased to **₹50 crore per project only recently in FY25**, showing earlier underfunding.

➢ **Import Dependency for Strategic Equipment:** Despite improvements, India still imports crucial systems such as submarines, fighter jets, air defence systems, and drones.
- This exposes vulnerabilities during geopolitical crises and contradicts the Atma Nirbhar Bharat objective.
- According to a recent report by **SIPRI**, India remains the **world's top arms importer,** with a **4.7%** increase in imports. **Russia is its main supplier**

➢ **Testing Infrastructure and Certification Bottlenecks:** Lack of **adequate testing and certification facilities** slows down the production and fielding of indigenously developed systems.

- **New technologies need faster validation cycles**, which are limited by the current testing infrastructure.
- The Defence Testing Infrastructure Scheme **(DTIS)** envisaged setting up of **6-8 Greenfield Defence Testing Infrastructure facilities**, despite the growing need in areas like **UAVs, EW, and electro-optics**. The pace of testing does not match the rise in **iDEX or Make-I projects.**

What are the Key Government Initiatives Related to Defence Modernisation and Indigenisation?

- **Make in India (Defence):** Launched in 2014 to promote domestic manufacturing of defence equipment.
  - Focuses on reducing import dependency and encouraging indigenous production.
- **Defence Acquisition Procedure (DAP) 2020:** Introduced categories like Buy Indian (IDDM) and Buy Global–Manufacture in India.
  - Prioritises domestic procurement with mandatory indigenous content thresholds.
- **Defence Production and Export Promotion Policy (DPEPP) 2020:** Targets ₹1.75 lakh crore turnover and ₹35,000 crore exports by 2025.
  - Aims to develop a robust defence industrial ecosystem, including exports.
- **Innovations for Defence Excellence (iDEX):** Encourages start-ups and MSMEs to innovate for defence needs.
  - Offers grants and procurement support; over 600 startups engaged as of 2025.
- **Technology Development Fund (TDF):** Run by DRDO to support MSMEs and startups for developing defence technologies.
  - Funding limit raised to ₹50 crore per project in FY25.
- **SRIJAN Portal:** Online platform listing imported items for indigenisation by Indian industry.
  - Over 14,000 items indigenised till February 2025.
- **Positive Indigenisation Lists (PILs):** Five lists issued banning import of over 5,500 items beyond set deadlines.
  - Enforced to ensure procurement only from domestic sources.
- **Defence Industrial Corridors (UP & Tamil Nadu):** Special manufacturing zones with infrastructure and incentives for defence firms.
  - ₹53,439 crore investment potential; over ₹8,600 crore already invested.

What Measures can India Adopt to Enhance Defence Indigeniston and Modernisation?

- **Strengthen Defence R&D and Technology Ecosystem:** India must substantially boost investment in defence R&D by **incentivising joint research between DRDO, private firms, academia, and start-ups.**
  - Establishing **dedicated Defence Technology Incubation Hubs** across industrial corridors can nurture innovation.
  - Focus should **shift towards cutting-edge domains like AI, hypersonics, directed energy weapons, and stealth tech.**
  - Faster commercialisation of lab-developed technologies through public-private partnerships is essential.
    - This will **bridge the gap between innovation and deployment** in battlefield conditions.
- **Deepen Private Sector and MSME Integration:** There is a need to **streamline defence procurement frameworks** to ensure greater predictability and visibility of orders for private players and MSMEs.
  - Earmarking procurement quotas specifically for indigenous private firms, especially in **Tier-2 and Tier-3 cities**, will decentralize manufacturing.
  - **Ensuring faster payments, single-window clearances, and simpler compliance** will enhance MSME participation.
  - **Dedicated support cells within MoD should assist MSMEs in certification and technical processes.** This will unlock grassroots innovation and build a wider supply chain network.
- **Accelerate Defence Acquisition Reforms:** Procurement timelines must be drastically compressed through integrated project teams and digital monitoring tools under the **Defence Acquisition Procedure (DAP)**.

- DAC and CCS approvals should **follow a fixed calendar to avoid strategic delays.** Strengthening l**ifecycle costing, indigenisation index, and Make-I/ II/III categories** will improve procurement quality.
- Institutionalising feedback loops between users, developers, and decision-makers can ensure outcome-driven modernisation.

➢ **Enhance Testing, Trials, and Certification Infrastructure:** India must rapidly scale up and modernise testing and certification facilities, **especially for UAVs, AI-driven platforms, electronic warfare,** and high-end communication systems.
- A public-private partnership model can be adopted to create dual-use testing facilities in **Defence Corridors.**
- Fast-track certification mechanisms, guided by realistic military requirements, should replace the one-size-fits-all approach.

➢ **Create Long-Term Strategic Partnerships with Global Original Equipment Manufacturers:** Rather than stopgap technology transfers, **India should pursue strategic co-development and joint production partnerships** in emerging domains.
- Defence diplomacy must integrate technology tie-ups with like-minded nations under **Quad, I2U2, or bilateral formats.**
- India can leverage its large defence market as a **strategic bargaining chip for ToT and IP sharing.**
  - This approach will indigenise technology, not just assembly lines.

➢ **Institutionalise Indigenisation through Monitoring and Indices:** A real-time Defence Indigenisation Dashboard should track targets, localisation levels, and bottlenecks across all major procurement contracts.
- Ministries must be held **accountable to periodic indigenisation targets** under the **Defence Production and Export Promotion Policy (DPEPP).**
- An **Indigenisation Performance Index (IPI)** can incentivise stakeholders across services and industry. This will introduce **transparency, accountability, and measurable outcomes** into the indigenisation process.

Conclusion:

India's push for defence indigenisation and modernisation is vital for achieving **strategic autonomy, economic growth, and global defence leadership**. Addressing underlying issues through e**nhanced R&D, streamlined acquisition, and deeper industry collaboration will be key to sustaining momentum**. A robust, self-reliant defence ecosystem will not only strengthen national security but also position India as a global hub for military innovation and exports.

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Unleashing India'S Solar Power Potential

This editorial is based on "Mandating storage for rooftop solar may backfire without clarity" which was published in Business Standard on 26/03/2025. The article brings into picture the rapid growth of India's solar sector, with 5.21 GW rooftop solar added in a year, while highlighting challenges in grid stability, storage, and financial viability.

Tag: GS Paper - 3, Mineral & Energy Resources, GS Paper - 2, Government Policies & Interventions

India's solar sector is experiencing rapid growth, with 5.21 GW of rooftop solar added in just one year through the PM Surya Ghar Muft Bijli Yojana. However, the sector faces critical challenges in **grid stability, storage integration, and financial viability**. Technical hurdles with hybrid inverters and battery storage, coupled with complex electricity pricing structures, threaten to slow down solar adoption. The path forward requires **innovative policy frameworks that address technical standards, financial feasibility, and grid support mechanisms.**

What are India's Current Advancements in the Solar Energy Sector?

➢ **Surge in Solar Capacity and Global Positioning:** India has emerged as a global solar leader, ranking **4th worldwide** in solar power capacity.
- The country has rapidly expanded its solar base, aligning with its energy transition goals. It is a vital part of India's pledge to reach **500 GW of non-fossil fuel capacity by 2030**.
- Solar capacity **rose from 21.6 GW in 2018 to 70.10 GW as of June 2023.** India aims for **280 GW of solar capacity by 2030**, forming the backbone of its 500 GW renewable goal.

- **Rooftop Solar Revolution:** The launch of **PM Surya Ghar: Muft Bijli Yojana** in 2024 has catalyzed residential **solar adoption, targeting middle- and lower-income households.**
  - By subsidising installations, it addresses affordability and boosts energy self-reliance at the household level. This **decentralized push improves energy access** while reducing grid load and emissions.
  - **₹75,021 crore allocated** to install rooftop solar on **1 crore homes**. Households can receive **up to 300 units free/month** and earn **₹17,000–18,000/year** from surplus power sales.
- **PLI Scheme Boosting Domestic Solar Manufacturing:** India is reducing import dependency through the **Production Linked Incentive (PLI) scheme**, fostering large-scale manufacturing of **high-efficiency solar PV modules.**
  - This initiative supports **India's Atma Nirbhar Bharat vision** and strengthens the solar supply chain. It has also spurred job creation and long-term investment in the clean energy sector.
  - **₹24,000 crore PLI outlay**, supporting **47 GW+ of module manufacturing**. **Tranche-II alone attracted ₹93,041 crore investment**, generating more than **1 lakh jobs**.
- **Solar Parks Scaling Utility-Scale Capacity:** India is expanding its solar parks to achieve grid-scale deployment through economies of scale and efficient land use.
  - These **parks serve as hubs for mega solar projects,** attracting investment and facilitating quick capacity addition. They also reduce project risk by ensuring pre-developed infrastructure.
  - **50** solar parks with 38 GW capacity targeted by **2025–26. 10,237 MW capacity** already commissioned across **11 completed parks**.
- **Innovation in Technology – Floating Solar and Smart Panels:** India is adopting advanced technologies such as **floating solar**, **bifacial modules**, and **smart inverters** to increase efficiency and diversify deployment locations.
  - Floating solar reduces land burden while smart tech enhances grid integration. These innovations are key to overcoming spatial and technical constraints.
  - For instance, **the 100 MW Ramagundam Floating Solar Plant (Telangana)** is one of India's largest.
    - Adoption of **bifacial panels and hybrid inverters** is accelerating in large projects and pilot rooftops.
- **Global Leadership and Diplomacy through International Solar Alliance (ISA):** India's leadership in launching the **International Solar Alliance (ISA)** reflects its strategic role in global energy transition.
  - ISA promotes solar deployment in developing countries, especially in Africa, supporting India's diplomatic and climate leadership goals. It also helps attract international finance and innovation partnerships.
  - **111 countries joined ISA**, aiming for **450 GW RE by 2030**. **SolarX Challenge – Africa Chapter** promotes scalable, affordable solar innovations.

What are the Key Issues Related to India's Solar Sector?

- **High Cost and Limited Viability of Storage Integration:** With growing solar capacity, ensuring **round-the-clock power supply through storage is becoming critical.**
  - However, **battery storage remains expensive, especially for residential users** under **net metering, making hybrid RTS systems financially unviable.**
    - A mandatory storage requirement, as recently advised by the **Ministry of Power**, may slow rooftop adoption instead of accelerating it.
  - For instance, **a 1 kWp RTS system costs ₹65,000–75,000,** but adding 2-hour storage **nearly doubles the cost**.
    - **Payback periods double** with storage; in some states, **it becomes financially unviable**.
- **Grid Stability and Over-Generation Challenges:** As solar penetration increases, especially in **peak sunlight hours**, distribution networks are facing issues of **localised over-injection and voltage instability.**
  - Without real-time visibility and control systems, **Discoms are struggling to absorb decentralized solar efficiently.** This may lead to **curtailment and discourage solar investment.**
    - For instance, despite five bailouts, DISCOMs (distribution companies accumulated losses reached approximately ₹6.77 lakh crores (€74.4 billion) by 2022- 2023. Solar inefficiency will further exacerbate this.

- The Central Electricity Authority advisory urges 2-hour storage to mitigate over-injection and ensure grid reliability, but implementation remains sluggish.

➢ **Policy Uncertainty and Frequent Regulatory Changes:** Frequent shifts in **net metering regulations, state-level tariff rules,** and uncertainty around subsidy disbursement have created instability in the sector.

- Investors and consumers hesitate due to policy unpredictability and delayed payments from Discoms. This affects both project viability and sectoral confidence.
- **Several states (e.g., Maharashtra, Gujarat)** revised net metering caps **within a year**. Late Payment Surcharge Rules 2022 were introduced to address Discom delays, still persistent.

➢ **Domestic Manufacturing Constraints and Import Dependence:** Despite PLI incentives, India's solar manufacturing ecosystem is **still nascent,** especially in **upstream segments like polysilicon and wafers.**

- Heavy dependence on Chinese imports for key components poses a supply chain risk and undermines Atmanirbhar Bharat goals.
- **China remains India's top supplier of solar cells and modules,** providing $3.89 billion worth of imports **(62.6%).**
  - To reduce dependency on Chinese imports, India imposed a **40% customs duty on solar modules and a 25% duty on solar cells**, but full self-reliance in the value chain is **still distant**.

➢ **Technical Gaps in Hybrid Systems and Lack of Standards:** The integration of battery storage with rooftop solar requires **efficient hybrid inverters and system communication, which remains fragmented.**

- The absence of **uniform BIS standards for hybrid inverters** has led to market inconsistency and performance inefficiencies, especially in high-capacity systems.
- Most inverters operate **below 60V**, causing **thermal losses and lower efficiency** in >3kW systems. **No unified standard** yet exists for hybrid inverters' voltage or communication protocols.

➢ **Land and Transmission Infrastructure Constraints:** Utility-scale solar projects require vast land and robust transmission networks, both of which face constraints.

- **Land acquisition delays and lack of last-mile transmission access** stall project commissioning and increase costs.
  - Solar parks in some states remain under-utilized due to evacuation bottlenecks.
- And due to this, utility-scale solar projects are experiencing an **average delay of 17 months from their scheduled completion date,** with extreme cases seeing delays of up to 34 months.
  - **Inter-State Transmission System (ISTS) charges are waived till June 2025**, but infrastructure gaps persist in several solar-rich states.

➢ **Ecological Disruption and Impact on Biodiversity:** Large-scale solar installations, especially in arid and semi-arid ecosystems, often lead to habitat fragmentation and biodiversity loss.

- While some studies show that solar farms can be managed to enhance pollinator habitats and even support bee populations.
  - But **clearing land for solar parks disrupts native flora and fauna, affecting ecological balance.** Pollinators like honeybees, critical to agriculture and biodiversity, are particularly impacted by heat islands and vegetation loss.
- This affects **75% of India's food crops that rely on insect pollination,** risking agricultural productivity.

What Strategic Measures can India Implement to Strengthen its Solar Sector?

➢ **Time-of-Day (ToD) Tariffs and Grid-Linked Storage Incentives:** India should adopt dynamic pricing through **Time-of-Day tariffs** to incentivise storage-linked solar adoption and shift consumption to periods of solar surplus.

- Coupling this with **performance-linked incentives for grid-interactive battery** systems can ease pressure during evening peaks.
- This would also support **grid balancing and smoothen intermittency challenges.**

➢ **Hybrid Solar Systems and Mandate Smart Inverters:** Establishing **national BIS standards for hybrid inverters**, battery voltage ranges, and communication protocols is essential for interoperability and efficiency.

- Simultaneously, **mandating smart inverters** in all new rooftop solar systems can enhance **grid visibility, enable real-time reactive power control,** and strengthen last-mile grid management.

- **Integrate PM-KUSUM with Rooftop Solar (RTS) Schemes:** Converging **PM-KUSUM** with the **PM Surya Ghar Muft Bijli Yojana** can amplify decentralised solar penetration across rural and semi-urban India.
  - By **combining agricultural solar pump solarisation** with household RTS infrastructure, states can create solar villages with self-sufficient microgrids, enhancing both energy security and rural livelihoods.
- **National Solar Ecosystem Platform for Financing and Services:** A **one-stop digital portal** for RTS applications, subsidies, bank loan integration, vendor accreditation, and O&M services will streamline adoption.
  - Integrating **UPI, Aadhaar-based verification, and standardised loan schemes** through public-sector banks can help especially in semi-urban and rural areas where uptake is slower.
- **Strengthen Domestic Manufacturing Beyond Modules:** While PLI schemes have boosted module production, upstream segments like **polysilicon, ingots, and wafers** must be prioritised to create full solar supply chain resilience.
  - Dedicated **clusters, technology-transfer tie-ups,** and long-term procurement contracts from SECI can support vertical integration and reduce import dependency.
- **Utilise Wastelands and Canal Tops for Solar:** Government should promote solar deployment on **wastelands, canal tops, and industrial rooftops** using designs that **minimise ecological impact**.
  - Solar projects must adopt biodiversity-sensitive layouts like elevated structures, pollinator-friendly vegetation, and **no-fencing zones in sensitive areas** to protect ecosystems while enhancing land-use efficiency.
- **Institutionalise Net-Zero Targets at Urban Local Body Level:** Empowering **Urban Local Bodies (ULBs)** and **panchayats** with budgeted **net-zero targets and linking them to performance grants can drive grassroots solar adoption.**
  - Solar mandates in **municipal buildings, street lighting, and water pumping** infrastructure will mainstream renewables in urban governance and service delivery.

Conclusion:

India's solar sector has made **remarkable progress,** but overcoming challenges in **grid stability, storage, and policy consistency is crucial for sustained growth.** Strengthening domestic manufacturing, promoting hybrid systems, and integrating solar with innovative financing models will accelerate adoption. A strategic focus on smart regulations, decentralized deployment, and ecological sustainability will enhance resilience.

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Advancing Sustainable Tourism in India

This editorial is based on "Lessons from Turkey in sustainable tourism" which was published in Hindustan Times on 27/03/2024. The article brings into picture Turkey's balanced approach to cultural tourism, where strong institutional frameworks ensure both heritage preservation and sustainable growth.

Tag: GS Paper - 3, Mobilization of Resources, Employment, Inclusive Growth

Turkey's approach to **cultural tourism exemplifies a holistic model of heritage preservation and sustainable development.** By implementing robust institutional frameworks, Turkey has successfully balanced the protection of historical sites with tourism growth, increasing archaeological excavations from **670 to 720 in recent years.** For India, this serves as a critical blueprint: **while rich in cultural heritage, India must develop more structured, community-centric approaches to cultural tourism**, investing in **institutional frameworks, professional training, and sustainable visitor management** to truly unlock its immense tourism potential.

What Role does the Tourism Sector Play in the Indian Economy?

- **Economic Engine and Employment Multiplier:** Tourism plays a crucial role in India's service sector by generating income, jobs, and foreign exchange.
  - It has strong forward and backward linkages with sectors like hospitality, transport, handicrafts, and

agriculture. **Being labor-intensive, it absorbs a wide range of skills, from informal workers to specialized professionals.**

- Tourism also **spurs MSME and startup growth, particularly in tier-2 and tier-3 cities.**

- India's travel and tourism sector contributed **US$ 199.6 billion** to GDP in 2022 and is projected to reach **US$ 512 billion by 2028**. It is expected to support **53 million jobs** by **2029 (WTTC).**

- **Soft Power and Cultural Diplomacy:** Tourism is a **vital tool of soft power,** enhancing India's image globally by s**howcasing its cultural depth, spiritual diversity, and civilizational ethos.** It fosters **people-to-people contact** and builds goodwill with other countries.
  - Events, cultural festivals, and film tourism strengthen India's diplomatic engagements. The diaspora and religious circuits act as cultural bridges.
  - In 2023, **26.52% of foreign tourists visited India for diaspora connection**. Film shoots and tourism tie-ups with countries like **UAE, Vietnam**, and **Kazakhstan** are growing rapidly.
- **Tool for Regional Development and Social Inclusion:** Tourism enables balanced regional development by bringing investment and infrastructure to remote, rural, and tribal areas.
  - It creates income opportunities for marginalized communities through homestays, local cuisine, and cultural crafts. Schemes like PRASHAD and Swadesh Darshan help mainstream backward regions into national development narratives.
  - Under Swadesh Darshan and PRASHAD, **76 projects** and **46 religious sites** have been sanctioned, including projects in **northeast India** and **rural Andhra Pradesh**.
- **Catalyst for Infrastructure Development:** Tourism demand **drives improvements in roads, airports, digital connectivity, sanitation, and urban mobility.** These developments, **in turn, benefit local populations and businesses.**
  - **Private investment and PPP models** are growing in **hospitality, transport, and cultural preservation.** Iconic tourist hubs are becoming nuclei of integrated development.
  - States like **Uttarakhand and Ayodhya** have seen rapid tourism-driven infrastructure upgrades.
- **Driver of Innovation and Entrepreneurship:** Tourism has unlocked a surge in tech-driven startups offering **curated experiences, AI-based travel planning, and digital booking platforms**.
  - It fosters grassroots innovation in areas like eco-tourism, rural stays, and experiential travel. Youth, **especially in tier-2/3 cities**, are entering the sector through government-supported incubators and accelerators.
    - Platforms like **Villotale** and **Highway Delite** are enabling rural and highway tourism.
- **Accelerator of Sustainable Development Goals:** Tourism intersects with multiple SDGs—**poverty alleviation, gender equality, sustainable communities, and environmental conservation.**
  - It enables economic growth with low ecological footprints when planned sustainably. **Conscious luxury, eco-resorts, and community-based tourism** are on the rise.
  - The National Strategy for Sustainable Tourism and schemes like SAATHI promote eco-certification and hygiene compliance. Domestic tourist spending grew **20.4%** in 2022, reflecting green recovery.
- **Resilience and Recovery Driver Post-Pandemic:** Tourism has demonstrated adaptability **post-Covid** through **digital transformation, wellness-based travel, and rising domestic footfall.** It has supported livelihood recovery in informal sectors and revived local economies.
  - India's domestic tourism boom shows high potential for internal demand-driven growth.
  - **Domestic travel grew rapidly in 2022**, with **domestic visitor spending up 20.4%**. Wellness and spiritual tourism like **yoga retreats in Kerala** and **Ayodhya's hotel boom** signal resilient demand.

What are the Key Issues Associated with Tourism in India?

- **Slow Recovery in Inbound Tourism Post-Pandemic**: Despite a global rebound, I**ndia's inbound tourism recovery has been sluggish due to health safety concerns,** complex visa rules, and lack of aggressive branding.

- Many potential travelers shifted to destinations perceived as safer and more accessible. The inconsistent messaging and outdated digital visa systems added to the hesitancy.
  - This undermines India's position as a competitive global tourism hub.
- For instance, **India's Medical Value Tourism (MVT) sector** faced a steep decline in November and December 2024, with a drop of **43%**.
  - **While Qatar**, **Dubai** and **Vietnam** have exceeded pre-pandemic benchmarks.

➢ **Weak Infrastructure and Destination Readiness:** Many tourist destinations suffer from poor physical infrastructure—**bad roads, sanitation gaps, unreliable electricity, and lack of last-mile connectivity.**
- Even major sites often **lack tourist information centers, multilingual signage, and emergency services**. This degrades the visitor experience and disincentivizes high-value international travelers.
- Only **48,775 accommodation units** are registered under NIDHI and **11,220** are SAATHI-certified. Infrastructure gaps persist in **rural, coastal, and northeastern circuits**, despite potential.

➢ **Low Global Visibility and Ineffective Branding:** India's tourism promotion has **not kept pace with global competitors who invest heavily in aggressive marketing** and **destination branding.** While **'Incredible India'** remains iconic, its momentum has waned.
- Lack of sustained digital and event-based marketing hurts India's perception as a modern, safe, and vibrant destination.
- Nations like **Georgia**, **Azerbaijan**, and **Kazakhstan** have surged in popularity by using digital campaigns, easing visas, and hosting events, while India's **global marketing spend remains modest**.

➢ **Environmental Degradation and Over-Tourism:** Unchecked tourist flows in ecologically sensitive areas have led to **biodiversity loss, pollution, and stress on local communities.**
- Hill stations and pilgrimage sites face water shortages and waste mismanagement. Lack of carrying capacity studies and regulatory enforcement worsens the crisis.
- **Manali**, **Shimla**, and **Joshimath** witnessed severe pressure due to tourist influx. The **National Strategy for Sustainable Tourism** is in place, but **implementation remains patchy**.

➢ **Skilling Deficit and Service Quality Gaps:** The hospitality and travel workforce often lacks adequate training in languages, customer service, and tech tools. This impacts tourist satisfaction and brand India.
- **Tourism as a profession is still informal and fragmented in many states,** with few structured skilling pipelines.
- The **Tourism Ministry** has trained **12,187 candidates** at **145 destinations**, but demand far outpaces supply. **Tier-2 and 3** city service standards remain inconsistent, affecting repeat tourism potential.

➢ **Regulatory Hurdles and Lack of Ease of Doing Tourism:** Red tape in approvals, licensing, and tax policies acts as a barrier for **tourism startups, hotel chains, and foreign investors.**
- **Complex permit systems and inter-state travel regulations** frustrate both operators and travelers. These issues weaken India's potential as a seamless travel destination.
- **While Rs. 17.26 billion FDI flowed into the sector (2000–2024)**. Despite **ample tourism startups**, many cite **compliance issues and poor ease of doing business** in the sector.

What are the International Case Studies in Sustainable Tourism?

➢ **Turkey – Community-Centric Heritage Preservation**
- Turkey has developed a **holistic cultural tourism model** by integrating heritage preservation with local community engagement.
- Projects around Cappadocia and Ephesus involve locals in site management and offer eco-friendly tourism experiences.
  - Institutional backing has helped increase archaeological excavations and protect cultural landscapes.

➢ **Costa Rica – Ecotourism Pioneer**
- Eco-lodges, community-run forest tours, and carbon-neutral travel options support both the environment and rural livelihoods. Tourism revenue is reinvested into conservation.

- **Bhutan – High Value, Low Impact Tourism**
  - Bhutan follows a "**High Value, Low Volume**" tourism strategy that limits tourist numbers through minimum daily tariffs.
  - This ensures ecological balance, cultural preservation, and equitable revenue distribution.
- **New Zealand – Maori Partnership in Sustainable Tourism**
  - New Zealand integrates **indigenous Māori values** (like kaitiakitanga or guardianship of nature) into its tourism policies.
  - Visitors are educated about respecting local culture and environment, while tribal communities co-own and co-manage ecotourism ventures.
- **Slovenia – Green Tourism Model**
  - Slovenia has positioned itself as a **"Green Destination"**, promoting slow travel, waste-free practices, and eco-certification for tourism businesses.

What Measures can India Adopt to Enhance the Sustainability of the Tourism Sector in India?

- **Develop Destination Management Plans with Carrying Capacity Norms:** India must move from site-based tourism to **destination-based planning**, focusing on environmental thresholds, local resource limits, and seasonality.
  - Integrating **carrying capacity studies**, zoning, and crowd regulation mechanisms (like timed entry or ticket capping) can prevent over-tourism.
  - Public-private partnerships can support infrastructure upgrades without ecological disruption.
    - This approach is essential for sites like **hill stations, wildlife parks, and spiritual circuits.**
- **Converge Swadesh Darshan 2.0 with National Strategy for Sustainable Tourism (NSST): Swadesh Darshan 2.0** promotes theme-based tourism circuits while **NSST** offers a roadmap for green certifications, low-impact infrastructure, and community benefits.
  - Integrating both can ensure **eco-sensitive destination development** with a focus on **climate resilience**, **local livelihoods**, and **nature-based solutions**.
  - The **joint implementation of circuit-level planning** and national-level sustainability indicators can foster long-term ecological stewardship.
    - This will also align with **India's SDG targets and G20 sustainability goals.**
- **Promote Community-Based and Rural Experiential Tourism:** Empowering local communities as **stakeholders and beneficiaries** through training, micro-enterprise support, and participatory governance can ensure inclusive tourism.
  - **Homestays, agro-tourism, and craft-based experiences** reduce tourist pressure on urban hubs and diversify visitor options.
  - This bottom-up approach enhances ownership, reduces leakages, and encourages cultural preservation.
- **Mainstream Green Building Norms and Eco-Certification for Hospitality Units:** Mandating eco-certification standards **(such as SAATHI)** for all new tourism infrastructure can reduce energy, water, and waste footprints.
  - Government incentives like tax breaks, expedited clearances, or recognition under GRIHA norms can nudge adoption.
  - Hotels, resorts, and even government tourism facilities should be benchmarked for **sustainability indices**.
    - A push for **conscious luxury**, **digital detox** retreats, and **zero-waste tourism** will build a resilient and future-ready hospitality sector.
- **Leverage Digital Technology for Responsible Visitor Engagement:** Adoption of **AI-based visitor flow management**, **virtual tourism**, **contactless check-ins**, and **smart signage** can minimize resource usage and enable real-time monitoring. Virtual walkthroughs and app-based guided tours can also decongest peak-hour traffic.
  - Expanding the **'Dekho Apna Desh'** initiative into an immersive digital tourism ecosystem can offer low-carbon alternatives.
  - Real-time data analytics should be used for decision-making and emergency preparedness.
- **Create Sustainable Coastal and Island Tourism Models:** India's long coastline and island ecosystems require

fragile zone management with focus on coral reef protection, plastic-free zones, and regulated cruise tourism.

- Integrating policies under the Blue **Economy framework** with tourism planning will ensure marine ecosystem conservation.
- Coastal states should adopt eco-tourism **codes of conduct**, community vigilance systems, and green transport options **(like e-boats).**
  - Island destinations like **Andaman & Lakshadweep** must prioritize **zero-waste tourism policies.**

➢ **Institutionalize Sustainability Training in Tourism Skill Development Missions:** Tourism sustainability must be embedded into curricula of **hospitality, tour operations, and local guide training programs**.

- The Ministry of Tourism should partner with institutes like IHMs and private platforms to build modules on **responsible tourism, biodiversity ethics, and green practices**.
- Linking this with the **Destination-Based Skill Development Program** will make it regionally tailored and employment-relevant.

Conclusion:

India's tourism sector holds immense potential as an economic driver, cultural ambassador, and sustainability enabler. Learning from global models like **Turkey, India must integrate community participation, institutional frameworks, and sustainable planning.** By adopting innovative policies and digital solutions, India can unlock the full potential of its tourism industry while preserving its rich heritage.

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Driving Electric Mobility in India

This editorial is based on "Going electric: On India and the electric vehicle space" which was published in The Hindu on 27/03/2025. The article brings into picture the import duty exemption on key EV battery components, boosting domestic manufacturing.

Tag: GS Paper - 3, Achievements of Indians in Science & Technology, Mobilization of Resources, GS Paper - 2, Government Policies & Interventions

India's recent move to exempt import duties on critical EV battery components signals a strategic pivot towards domestic electric vehicle manufacturing and clean technology adoption. Despite EVs constituting **only 2% of passenger car sales in 2024,** the country has shown promising momentum in electric two-wheelers. To truly revolutionize its transportation sector, **India must not only leverage favorable trade policies but also invest substantially in research, development, and integration into the global battery value chain,** transforming from a technology importer to a competitive manufacturer.

What are the Recent Advancements in India's Electric Vehicle Sector?

➢ **Surge in EV Adoption and Consumer Interest**: India is witnessing an exponential surge in **EV adoption, driven by supportive policies, rising environmental awareness**, and improved product availability.

- The **growing preference for electric mobility** is evident across both urban and rural consumers, signaling a behavioural shift. This reflects not just an environmental drive but also rising confidence in EV technology and affordability.
- **EV sales in India grew by 49.25% in 2023,** reaching 1.52 million units. In May 2024 alone, sales rose **20.88% year-on-year to 1.39 million units.**

➢ **Private and Commercial Segment Electrification Targets:** Government's sector-wise EV penetration targets reflect a structured roadmap for both private and commercial vehicles, showing strategic intent across segments.

- These ambitious targets align with **India's net-zero and energy transition commitments,** while incentivizing industry innovation. The push also ensures sectoral balance in demand creation.
- **By 2030, India targets 30% EV sales in private cars**, 70% in commercial vehicles, 40% in buses, and 80% in two- and three-wheelers, aiming for 80 million EVs.

➢ **Battery Manufacturing and Component Localization:** India has made clear strides toward localising **EV battery production, reducing import dependence and strengthening strategic supply chains.**

- The budget's customs duty exemption on battery-related capital goods encourages domestic manufacturing. This aligns with **'Make in India' and improves economic competitiveness in the EV space.**
- The Indian EV battery market is projected to grow from US$ 16.77 billion in 2023 to US$ 27.70 billion by 2028.

➢ **Rising Investments by Domestic and Global Players:** The EV sector has become a magnet for **both Indian conglomerates and foreign firms**, boosting innovation and job creation.

- These investments signal market maturity and potential for long-term growth. Capital inflow also supports ecosystem development—**R&D, manufacturing, and charging networks.**
- **Tata Motors-JLR (US$ 1.07 billion), VinFast (US$ 2 billion), and Stellantis (US$ 238.7 million)** are among key 2024 investments. Ather Energy raised Rs. 600 crore, becoming a unicorn.

➢ **State-Level Push for EV Ecosystem Development:** States are innovating with their own EV policies and targets, creating a competitive and decentralised approach to EV adoption.

- These efforts complement national goals and cater to regional mobility needs. State support also accelerates infrastructure, registration, and EV ecosystem incentives.
- **Maharashtra targets 10% EV share in new registrations by Dec 2025; Karnataka aims for 100% electrification of cargo 3W/4W by 2030**.

➢ **Charging Infrastructure Expansion and Innovation**: Robust EV infrastructure is critical, and India is rapidly scaling up its charging networks, including ultra-fast and battery-swapping models. Partnerships between **OEMs, PSUs, and energy firms** are pivotal in ensuring EV convenience and last-mile viability.

- As of **Feb 2024, India has 12,146 public charging stations**. Hyundai expanded fast charging across six metro cities and highways.

➢ **Financing Ecosystem and Affordability Push:** A healthy EV finance ecosystem is evolving with NBFCs and dedicated platforms, improving affordability and accelerating adoption.

- Financing mechanisms are crucial for scaling small EVs and commercial fleet conversions, especially for MSMEs and last-mile users.
- **EV financing in India is projected to reach US$ 50 billion (Rs. 3.7 lakh crore) by 2030. Macquarie Group launched 'Vertelo' platform in June 2024** to support EV financing and fleet management.

➢ **Green Defence and Institutional EV Use:** The adoption of EVs by defence and institutional bodies signals credibility and early-stage trust in clean mobility. It also helps in awareness, pilot-scale innovations, and green energy integration within official fleets.

- **Indian Army announced phased EV deployment at peace stations in Feb 2024.** IOC launched its first EV battery swapping station in Kolkata in Dec 2023 in collaboration with **Sun Mobility.**

What are the Key Issues Associated with EV Adoption in India?

➢ **Inadequate Charging Infrastructure and Interoperability Issues:** The slow rollout of public charging stations remains a major roadblock**, especially in tier-2 and tier-3 cities.**

- Additionally, **lack of standardisation across chargers and connectors** causes fragmentation and user inconvenience. Interoperability and access parity are essential for building confidence among consumers.
- As of **February 2024, India has only 12,146 public EV charging stations**. CII estimates that **to achieve a ratio of 1:40 charging infra to EVs**, India will need to install more than **400,000 chargers** annually with a total of **1.32 million chargers till 2030.**

➢ **High Upfront Cost and Limited Financing Access:** Despite falling battery prices, the initial cost of EVs remains higher than their ICE counterparts.

- **Inadequate consumer financing options** further restrict access, especially for informal sector buyers. This cost challenge persists despite long-term savings in fuel and maintenance.
- And due to high upfront cost as well as limited charging infrastructure, ICRA expects electric vehicle penetration to remain low **(3-5%) till 2025**

➢ **Supply Chain Dependence and Battery Raw Material Vulnerability:** India remains heavily reliant on global supply chains for critical raw materials like **lithium, cobalt, and nickel.**

- This raises vulnerabilities due to **geopolitical tensions, import costs, and lack of domestic reserves.** Strategic autonomy in battery production is yet to be fully realised.
  - For instance, **India imported 70% of its lithium-ion cells in 2023**.

- **Disparities in State-Level EV Ecosystem Development:** While some states like **Delhi, Maharashtra, and Karnataka** lead in EV policy and infrastructure, others lag behind in planning and execution.
  - The **absence of a uniform nationwide EV strategy** causes uneven adoption and slows down the creation of a national market.
  - **Goa leads in EV penetration at 14.2%,** while many large states like Uttar Pradesh have sub-5% adoption.
    - **Maharashtra targets 10% EV share in new registrations by Dec 2025;** many others have no clear targets.
- **Incomplete Domestic Manufacturing and Innovation Ecosystem:** India's EV manufacturing ecosystem still relies on s**ignificant imports of components, with limited domestic R&D in advanced technologies**.
  - This **hampers value addition, affects job creation potential, and exposes the sector to global supply shocks**. Indigenous innovation is growing but not yet mature.
  - **Budget 2025-26** proposes to fully exempt Basic Customs Duty on cobalt powder and waste, the scrap of lithium-ion battery, Lead, Zinc and 12 more critical minerals, **signalling need for domestic capacity.**
- **Low Consumer Awareness and Range Anxiety**: A large section of potential EV buyers lacks understanding of **EV benefits, total cost of ownership, and maintenance models.**
  - Concerns over **vehicle range, battery life, and lack of nearby service centres** persist, especially outside metros. This perception gap deters first-time adopters.
  - According to a recent survey, **83% of Indian consumers are open to NEVs by 2030**, but **only a small fraction understands charging tech and subsidy schemes** fully. **Rural adoption remains nascent.**
- **Policy Volatility and Uncertain Subsidy Continuity:** Frequent changes and lack of clarity around central and state subsidies, GST rates, and registration benefits make investors and buyers hesitant.
  - The phase-wise uncertainty around **FAME II** and transition to newer schemes like the **Electric Mobility Promotion Scheme** creates confusion.
  - **FAME II (US$ 1.43 billion) ends in March 2024;** the **PM E-DRIVE scheme** has replaced it. Industry demands a **long-term incentive framework to ensure business continuity.**

What Measures can India Adopt for Enhancing EV Adoption?

- **Develop a Unified National EV Charging Infrastructure Mission:** India must establish a **single-window EV Charging Infrastructure Mission** to standardise charger types, enable interoperability, and ensure equitable deployment across urban and rural areas.
  - This mission should involve coordination between state **DISCOMs, ULBs, and private players.** A push for smart-grid-enabled charging with renewable energy integration is critical.
  - A **common public data portal for real-time availability** and uptime of stations can enhance consumer trust.
- **Rationalise and Stabilise EV Subsidy Architecture:** India needs a long-term, stable subsidy framework under a **revamped FAME III that synchronises with state-level EV policies.**
  - This should adopt a demand-linked dynamic incentive model and phase-wise tapering based on market maturity.
  - **Linking this with the Electric Mobility Promotion Scheme** ensures smoother transitions. Stability in policy timelines boosts investor and consumer confidence.
- **Prioritise Domestic Battery Manufacturing under PLI 2.0:** An enhanced PLI scheme focused specifically on advanced battery chemistries, solid-state storage, and battery recycling ecosystems can future-proof India's EV value chain.
  - It should prioritise **circular economy models and incentivise deep-tech R&D.** Strengthening this under the **'Atmanirbhar Bharat'** framework ensures long-term resilience in strategic materials and cell-to-pack innovation.

- **Integrate EV Mobility with Smart Cities and PM Gati Shakti:** EV planning should be embedded into Smart Cities Mission and logistics planning under PM Gati Shakti for seamless **urban mobility and green freight corridors.**
  - **EV-ready zones**, battery swapping hubs, and green parking infrastructure can be co-developed.
  - This integrated planning approach reduces duplication and enables effective fund convergence.
- **Launch Targeted EV Financing Schemes for MSMEs and Informal Sector**: Special credit guarantee and interest subvention schemes must be created for small fleet operators, gig workers, and MSMEs to adopt EVs for commercial use.
  - A **dedicated NBFC-led green financing platform like 'Vertelo'** should be expanded with central support.
  - Priority lending tag for EVs under RBI guidelines would further boost institutional funding.
- **Mandate EV Inclusion in Government and PSU Procurement:** All government departments, PSUs, and defence establishments should adopt a minimum **30% EV fleet replacement mandate within a set time frame.**
  - This will catalyse volumes, set examples, and create demand visibility. Linking this with the Government e-Marketplace **(GeM)** ensures procedural ease and price discovery.
- **Strengthen Skill Development under Skill India + EV Industry Partnerships:** A tailored EV workforce strategy must be implemented under the Skill India Mission in collaboration with EV startups and auto giants.
  - Courses on battery maintenance, charger servicing, **BMS (battery management systems),** and **EV software diagnostics** should be launched across ITIs. This enhances employability and supports industry readiness.
- **Promote Local Innovation through Startup India + FAME Synergy**: A cross-scheme synergy should be created where startups solving EV-related issues, **thermal management, AI-based energy routing, or rural EV charging—**are fast-tracked for incentives under both **FAME and** Startup India.
  - This encourages frugal innovation and localisation of advanced components and software layers.
- **Establish a National EV Awareness and Behavioural Shift Campaign:** A large-scale national campaign like **"Har Ghar EV, Har Rasta Green**" can be launched using mass media, schools, and community-based events.
  - This should **demystify range anxiety, charging myths, cost comparisons, and highlight successful users.** Citizen-centric outreach bridges the perception gap in tier-2/3 markets.

Conclusion:

India's electric vehicle sector is at a **pivotal juncture, driven by policy support, rising investments, and growing consumer acceptance**. While significant strides have been made in manufacturing, infrastructure, and financing, challenges like charging gaps, supply chain dependencies, and cost barriers remain. By **integrating EV adoption with broader sustainability** goals, India can transition from an emerging market to a global leader in clean mobility.

Drishti Mains Questions

1. Discuss the role of FTAs in enhancing India's trade competitiveness. How can India mitigate the risks posed by protectionist measures in its partner economies?
2. The rise of OTT platforms has sparked debates over fair revenue-sharing with telecom service providers. Discuss the challenges and suggest a balanced regulatory framework.
3. Discuss the significance of clean energy transition for India in the context of energy security, economic growth, and climate resilience. What are the key challenges hindering this transition, and suggest viable policy measures to accelerate it.
4. Discuss the key drivers and challenges shaping India's economic growth outlook. How can policy interventions ensure sustainable and inclusive growth in the face of global and domestic uncertainties?
5. Human-wildlife conflict is a growing challenge in India, exacerbated by habitat fragmentation and climate change. Discuss the key factors driving this conflict and suggest effective strategies for sustainable coexistence.
6. Despite various government initiatives, India faces a persistent skill gap in its workforce. Critically analyze the factors responsible and suggest measures to enhance skilling efforts.
7. India's space sector has witnessed remarkable advancements in recent years, from deep-space exploration to reusable launch vehicle technology. Discuss how these developments enhance India's strategic and economic position in the global space economy.
8. Critically assess the effectiveness of the 73rd and 74th Constitutional Amendments in achieving true democratic decentralization in India.
9. The Indian Himalayan Region (IHR) is ecologically fragile yet developmentally important. How can infrastructure development in the region be balanced with environmental sustainability? Suggest a strategic roadmap.
10. India is witnessing a rapid technological revolution, driven by digital infrastructure, artificial intelligence, and indigenous innovation. Discuss key challenges in ensuring inclusive and sustainable technological growth.
11. India-Mauritius relations have evolved beyond historical and cultural ties to strategic and economic cooperation. Analyze the key areas of engagement and challenges in this partnership.
12. Examine the key issues in the India- Sri Lanka fisheries dispute and suggest measures to achieve a sustainable and equitable resolution.
13. Despite various government initiatives, India's nutritional security remains a challenge due to systemic gaps beyond food availability. Analyze the key issues and suggest a multi-pronged strategy to ensure holistic nutritional well-being?
14. "Police reforms in India have been a long-pending necessity, yet implementation has remained slow due to political, bureaucratic, and structural challenges". Suggest measures to ensure a more accountable and efficient police system.
15. India's carbon market is a key instrument in achieving its net-zero targets while promoting sustainable industrial growth. Examine the potential and challenges of India's carbon market in ensuring an effective transition to a low-carbon economy.

Drishti Mains Questions

16. "Natural farming is seen as a sustainable alternative to chemical-intensive agriculture, yet challenges related to certification, economic viability, and market accessibility persist." Discuss the potential of natural farming in India and suggest measures to overcome these challenges.
17. Indian cities are at the crossroads of rapid urbanization and sustainability. Discuss the key issues and suggest measures for their holistic development.
18. Effective water management in India requires a holistic approach that balances infrastructure development with traditional conservation practices. Discuss the challenges in achieving this balance and suggest sustainable solutions.
19. Discuss the strategic significance of the Indo-Pacific region for India. What challenges hinder India's proactive engagement in the region, and how can India enhance its role as a key player in Indo-Pacific geopolitics?
20. Discuss the challenges faced by MSMEs in India and evaluate the effectiveness of recent government initiatives in addressing them.
21. Discuss the significance of India's growing defence exports in shaping its strategic autonomy and global influence.
22. Solar energy is often regarded as a key pillar of sustainable development. Discuss its significance for India, along with the challenges and opportunities in scaling up solar power in the country.
23. India has immense cultural and natural tourism potential, yet it lags behind in global tourism competitiveness. Discuss the key challenges and suggest measures for sustainable tourism growth.
24. Analyze the recent advancements and challenges in India's electric vehicle (EV) sector. How can policy interventions, domestic manufacturing, and infrastructure development accelerate EV adoption while ensuring long-term sustainability?