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OFFICERS' PULSE



September 2026 (In Depth)

CURRENT AFFAIRS MONTHLY

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Foreword

Officers Pulse-In Depth provides detailed analyses of significant articles from a variety of sources including **The Hindu, Indian Express, Business Standard, Yojana, Kurukshetra, Down to Earth, and others.** These insights are extremely valuable for UPSC CSE Mains preparation. To ensure comprehensive preparation for both Prelims & Mains, we recommend studying **Officers Pulse-In depth** along with **Officers Pulse-Digest**.

Note: The keywords provided in the blue box below are crucial for Mains. They highlight essential themes and terminologies that can enhance the quality of answers.

Sample:

KEY WORDS

- **Monetary Policy Committee (MPC)** – Six-member RBI body deciding repo-rate to maintain inflation target ($4 \pm 2\%$).
- **Core Inflation** – Inflation rate excluding food and fuel, showing underlying price trends.
- **Headline Inflation** – Overall inflation measured by Consumer Price Index (CPI).
- **Tolerance Band** – Permissible inflation range around RBI's target for policy flexibility.
- **Section 45ZN, RBI Act 1934** – Mandates RBI to explain causes and remedies if inflation exceeds target for three quarters.
- **Fiscal-Monetary Coordination** – Synchronization of government spending and RBI policy for macro stability.
- **Financial Inclusion** – Ensuring affordable access to financial services for all sections, esp. vulnerable groups.

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UNIVERSAL HEALTH COVERAGE (UHC)

(GS-II: Issues Relating to Development and Management of Social Sector/Services relating to Health, Poverty, and Hunger; Governance and Social Justice)

Background

Universal Health Coverage (UHC) ensures that all individuals and communities receive the quality health services they need without facing financial hardship. It embraces a full spectrum of essential, quality health services—from health promotion to prevention, treatment, rehabilitation, and palliative care. Rooted in the principle of equity, UHC aims to eliminate out-of-pocket health expenditures that drive millions into poverty annually.

Evolution

- **Global Health Frameworks:** Transitioned from vertical, disease-specific eradication campaigns (e.g., smallpox) in the mid-20th century to comprehensive primary healthcare systems.
- **WHO Alma-Ata Declaration (1978):** Formally introduced primary health care as the key to achieving global health equity.
- **SDG Target 3.8 (2015):** Established UHC as a core global target, focusing on financial risk protection and access to quality essential services.
- **National Policy Shifts:** India evolved from early post-independence curative models (Bhore Committee report) to community health worker programs (NRHM/NHM) and modern insurance-led frameworks.
- **Digital Health Integration:** Contemporary evolution incorporates digital health IDs, telemedicine, and electronic health records to bridge last-mile delivery gaps.

Key Schemes

- **Ayushman Bharat - Pradhan Mantri Jan Arogya Yojana (AB-PMJAY):** The world's largest government-funded health assurance scheme providing health cover of INR 5 lakh per family per year for secondary and tertiary care hospitalization.
- **Ayushman Bharat Digital Mission (ABDM):** Creates a seamless digital healthcare ecosystem linking patients, hospitals, and diagnostic centers through unique health IDs.
- **National Health Mission (NHM):** Focuses on strengthening public health infrastructure, maternal-child health, and rural primary healthcare networks through Sub-Health Centres and primary health centers.
- **Ayushman Arogya Mandirs (Health and Wellness Centres):** Upgraded primary care centers delivering comprehensive primary healthcare closer to communities, including screening for non-communicable diseases.
- **Pradhan Mantri National Dialysis Programme:** Offers free dialysis services to poor patients across district hospitals under public-private partnerships.

Significance

- **Financial Risk Protection:** Shields vulnerable households from catastrophic out-of-pocket health expenditures that cause impoverishment.
 - **Ex: Ayushman Bharat-PMJAY** has saved crores of rupees for poor families by providing cashless coverage of up to INR 5 lakh for major surgeries.
- **Human Capital Development:** Enhances workforce productivity, reduces infant and maternal mortality, and improves overall life expectancy.

- **Ex:** Programs targeting institutional deliveries like **Janani Suraksha Yojana** have drastically reduced maternal and neonatal mortality rates across states.
- **Health Security:** Strengthens national disease surveillance and outbreak response mechanisms, protecting populations against epidemiological shocks.
 - **Ex:** Robust primary public health networks successfully tracked and managed localized disease outbreaks such as Nipah and COVID-19.
- **Social Equity:** Ensures that marginalized, rural, and economically weaker sections have equal access to advanced medical treatments.
 - **Ex:** Specialized care packages under government insurance ensure tribal and remote populations receive critical oncology and cardiology care.
- **Economic Growth:** Reduces the economic burden of chronic illness, attracting investments in human resource potential and national stability.
 - **Ex:** Healthy populations exhibit lower absenteeism and higher productivity in industrial and agricultural sectors.

Challenges

- **Infrastructure Deficits:** Severe shortages of doctors, specialists, and modern medical infrastructure in rural and remote areas.
 - **Ex:** Rural public health statistics frequently highlight high vacancy rates for specialists (like pediatricians and surgeons) in Community Health Centres (CHCs).
- **High Out-of-Pocket Expenditure (OOPE):** Despite public schemes, high spending on outpatient care, diagnostics, and medicines persists.
 - **Ex:** A major portion of household health spending goes toward private doctor consultations and expensive out-patient pharmaceutical purchases not covered by insurance.
- **Public Health Underfunding:** Public healthcare expenditure remains lower than desired targets, straining existing government facilities.
 - **Ex:** India's total public health expenditure hovers around 1.5% to 2% of GDP, falling short of the recommended 2.5% target.
- **Quality Disparities:** A distinct quality divide exists between heavily overcrowded public hospitals and expensive private healthcare institutions.
 - **Ex:** Government tertiary hospitals routinely face massive patient queues, delayed procedures, and overburdened bed capacities.
- **Socio-Economic Barriers:** Lack of health literacy, gender disparities, and digital divides prevent marginalized groups from accessing entitlements.
 - **Ex:** Women in patriarchal households often delay seeking medical care for chronic illnesses due to a lack of decision-making power and awareness.

Way Forward

- **Boost Public Health Spending:** Incrementally raise public health expenditure to 2.5% to 3% of India's GDP to fortify public infrastructure.
 - **Ex:** Allocating higher budgets explicitly for building state-of-the-art district hospitals and medical colleges in aspirational districts.
- **Strengthen Primary Healthcare:** Prioritize preventive care and grass-root screening through well-resourced Health and Wellness Centres.

- **Ex:** Scaling up the conversion of rural sub-centres into **Ayushman Arogya Mandirs** equipped with essential diagnostics and medicines.
- **Leverage Technology:** Expand telemedicine networks and AI-driven diagnostics to overcome specialist shortages in remote areas.
 - **Ex:** Utilizing the **e-Sanjeevani platform** to connect rural patients with urban specialists for real-time virtual consultations.
- **Enhance Public-Private Partnerships (PPPs):** Engage reliable private providers under transparent regulatory frameworks to expand tertiary care capacity in underserved regions.
 - **Ex:** Contracting private diagnostic centers to offer free MRI and CT scan services to public hospital patients via voucher schemes.
- **Focus on Preventive Health & Hygiene:** Integrate sanitation, nutrition programs, and clean water initiatives with core health policies to reduce disease burdens proactively.
 - **Ex:** Combining the objectives of **Jal Jeevan Mission** and **Poshan Abhiyaan** with grassroots health campaigns to lower water-borne and malnutrition-related illnesses.

Conclusion

Universal Health Coverage is not merely a policy goal, but a moral imperative and foundational block for a resilient nation. Achieving it requires unwavering political will, robust public investment, and synergistic collaboration between the state, private sector, and communities. Ultimately, transforming healthcare into a guaranteed right ensures that no citizen is denied life or dignity due to poverty.

KEYWORDS

- **Universal Health Coverage (UHC)** – Equitable access to quality healthcare without financial hardship.
- **Financial Risk Protection** – Protection from catastrophic out-of-pocket health expenditure.
- **Primary Healthcare** – First point of contact focusing on preventive and basic healthcare.
- **Ayushman Bharat** – Integrated approach combining health assurance and comprehensive primary healthcare.
- **Digital Health** – Use of digital health IDs, telemedicine and electronic health records to improve accessibility.

UPSC PYQs

- *“Appropriate local community-level healthcare intervention is a prerequisite to achieve ‘Health for All’ in India. Explain.” (UPSC 2018)*
- *“Besides being a moral imperative of a Welfare State, primary health structure is a necessary pre-condition for sustainable development.” Analyse. (UPSC 2021)*
- *“The expansion of digital healthcare can transform healthcare delivery in India. Discuss the opportunities and challenges involved.” (UPSC 2023)*
- *“How far do you think cooperation among the public and private sectors can help in providing healthcare services to the people?” (UPSC 2015)*

CENSUS 2027

(GS-II: Governance, Constitution, Polity, Social Justice and International Relations - Issues Relating to Census, Demography, and Data Governance)

Background

Census 2027 represents India's decennial demographic stocktaking exercise, uniquely positioned as a digital-first, technologically integrated enumeration process. It serves as an authoritative anchor for mapping population shifts, social structures, and economic footprints across the country. By transforming data collection methodologies, this upcoming exercise aims to bridge administrative blind spots and realign national development planning with contemporary realities.

Evolution

- **From Manual to Digital Enumeration:** Transitioned from exhaustive paper-based schedules to self-enumeration portals, mobile apps, and digital data collection pads.
- **Geospatial Integration:** Shifted from traditional hand-drawn village maps to advanced Geographic Information Systems (GIS) and digital boundary demarcation.
- **Socio-Economic Expansion:** Evolved from simple headcounts of age and sex to capturing complex parameters like migration patterns, housing conditions, and asset ownership.
- **Integration with Civil Registration:** Moving toward a synchronized system linking vital statistics (births and deaths) directly with population databases.
- **Technological Architecture:** Incorporation of cloud-based data management systems to ensure faster processing, tabulation, and public dissemination.

Significance

- **Targeted Welfare Delivery:** Provides empirical data required to ensure government subsidies and social security benefits reach the intended marginalized populations.
 - **Ex:** Accurate demographic counts ensure precise allocation of food grains under the **Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY)**.
- **Evidence-Based Policy Making:** Enables central and state governments to design long-term socio-economic policies backed by real population trends.
 - **Ex:** Projecting workforce entry rates to design targeted employment and skill-development frameworks like **Skill India**.
- **Democratic Delimitation:** Forms the constitutional bedrock for redrawing parliamentary and assembly constituencies to ensure equal political representation.
 - **Ex:** Re-adjusting seat boundaries based on population shifts recorded over preceding decades to uphold democratic equity.
- **Epidemiological and Health Planning:** Helps public health planners track disease burdens, maternal-child ratios, and healthcare infrastructure requirements.
 - **Ex:** Deploying localized vaccination drives and maternal health schemes using district-level demographic vulnerability indicators.
- **Economic Forecasting and Investment:** Equips both public and private sectors with crucial data on consumer markets, labor pools, and urbanization rates.
 - **Ex:** Private retail and telecom corporations utilize population density maps to strategize expansion into tier-2 and tier-3 cities.

Challenges

- **Logistical Complexity:** Managing millions of enumerators, diverse regional languages, and difficult terrains poses an immense administrative test.
 - **Ex:** Enumerating nomadic communities, remote tribal belts in Left-Wing Extremism areas, and high-altitude Himalayan regions presents severe physical hurdles.
- **Digital Divide and Tech Glitches:** Unequal smartphone penetration and digital literacy among field enumerators can delay data entry and verification.
 - **Ex:** Technical glitches or server crashes during peak digital uploading from remote rural clusters with poor network connectivity.
- **Data Privacy and Security Concerns:** Managing massive volumes of citizen data raises critical cyber security risks and fears of unauthorized profiling.
 - **Ex:** Public apprehension regarding the safety of sensitive personal and housing information stored in centralized digital repositories.
- **Population Mobility and Migration:** High rates of internal and seasonal migration make tracking individuals accurately without double-counting difficult.
 - **Ex:** Capturing transient migrant labor populations residing in informal urban settlements and construction sites.
- **Political and Social Sensitivities:** Complex demands regarding caste categorizations, socio-economic indicators, and identity markers can spark intense political debate.
 - **Ex:** Navigating diverse domestic demands surrounding specific sub-caste enumeration and minority data parameters.

Way Forward

- **Robust Cybersecurity Architecture:** Implement end-to-end encryption, multi-factor authentication, and stringent data protection protocols compliant with privacy laws.
 - **Ex:** Partnering with premier national technical institutions and agencies like CERT-In to audit digital census software before rollout.
- **Comprehensive Training Programs:** Conduct extensive, multi-tier capacity-building workshops for teachers and field enumerators handling digital tools.
 - **Ex:** Organizing simulation drills and hands-on tablet training modules for primary school teachers assigned as census enumerators.
- **Intensive Public Awareness Campaigns:** Launch multi-lingual media campaigns to educate citizens on data security, privacy rights, and the civic necessity of participation.
 - **Ex:** Utilizing radio, television, and social media platforms to dispel rumors and encourage active self-enumeration.
- **Seamless Inter-Ministerial Coordination:** Bridge data silos between different government departments to cross-verify information and reduce administrative duplication.
 - **Ex:** Integrating civil registration systems with the census framework to automatically update birth and death statistics.
- **Flexible Enumeration Strategies:** Deploy specialized teams and offline-first software solutions to capture marginalized or mobile populations effectively.
 - **Ex:** Utilizing localized community leaders and NGOs to help enumerate homeless populations, seasonal migrant workers, and remote tribal groups.

Conclusion

Census 2027 is far more than a statistical exercise; it is the fundamental blueprint for India's future growth, social justice, and democratic health. By successfully harnessing digital innovation while safeguarding data privacy, the exercise can unlock unprecedented precision in governance. Ultimately, a modern and inclusive census ensures that no citizen remains invisible in the nation's march toward inclusive development.

KEYWORDS

- **Demographic Data** – Foundation for evidence-based governance and policy planning.
- **Digital Census** – Use of mobile applications, digital enumeration and online self-enumeration.
- **Delimitation** – Census data forms the basis for readjustment of electoral constituencies.
- **Data Privacy** – Protection of sensitive demographic and personal information collected during enumeration.
- **Inclusive Governance** – Ensuring accurate representation of migrants, tribal groups, homeless persons and other vulnerable sections.

UPSC PYQs

- *"Discuss the changes in the working of the Election Commission of India since the 1990s."* (UPSC 2017)
- *"How far do you agree that the Indian Constitution is a living document?"* (UPSC 2016)
- *"Discuss the role of the Election Commission of India in ensuring free and fair elections in the country."* (UPSC 2017)

INDIA-RUSSIA RELATIONS

GS-II Bilateral, Regional and Global Groupings and Agreements involving India and/or affecting India's interests.

Background

The India-Russia Strategic Partnership is grounded in decades of ideological, military, and diplomatic cooperation. Formally elevated to a "Special and Privileged Strategic Partnership" in 2010, the relationship rests on political trust, energy security, and defence ties, even as both nations navigate evolving global dynamics.

Historical Evolution

- **1947–1950s:** Diplomatic ties were established in 1947. Early relations were modest under Stalin but deepened significantly by the mid-1950s.
- **Cold War & Non-Alignment:** While India co-founded the Non-Aligned Movement (NAM), the Soviet Union became its primary counterweight against Western geopolitical pressures.
- **1971 Watershed:** The **Indo-Soviet Treaty of Peace, Friendship, and Cooperation** was pivotal during the 1971 Bangladesh Liberation War.
- **Post-2000 Structure:** President Vladimir Putin's visit to India in 2000 established the **Annual Summit mechanism** and the formal *Declaration on Strategic Partnership*. The **2+2 Dialogue** (Foreign and Defence Ministers) was added in 2021.

Pillars of Cooperation

Defence & Security

- **Hardware Share:** Russia accounts for roughly 60–70% of India's legacy military inventory.
- **Joint Ventures:** Strategic initiatives include the **BrahMos missile**, Sukhoi Su-30MKI assembly, and AK-203 rifle manufacturing.
- **Acquisitions:** Key acquisitions feature the **S-400 Triumf** air defence system and T-90S tanks.
- **Exercises:** Regular joint tri-service military exercises (**INDRA**).

Trade & Energy Dynamics

- **Trade Volumes:** Bilateral trade reached roughly **65 –68 billion**, heavily driven by discounted Russian crude oil imports. Both nations target **\$100 billion by 2030**.
- **Energy Flagships:** Key projects include the **Kudankulam Nuclear Power Plant** in Tamil Nadu and investments in the **Sakhalin-1** oilfield.
- **Multilateral Integration:** Active coordination within **BRICS, SCO, G20**, and the **UN**, with Moscow supporting India's bid for a permanent UN Security Council seat.

Technology & Culture

- **Space Exploration:** Historical cooperation (launching *Aryabhata*) continues with astronaut training for India's **Gaganyaan** human spaceflight program.
- **People-to-People Ties:** Expanded cultural exchanges through the Jawaharlal Nehru Cultural Centre (JNCC) in Moscow, Indian cinema popularity, and Yoga.

Significance

- **Strategic Leverage & Autonomy:** Provides India with multi-alignment flexibility, balancing Western partnerships without compromising national strategic autonomy.
- **Defence Reliability:** Russian-origin equipment accounts for **over 60%** of India's military hardware inventory, forming the backbone of key defense systems (S-400, BrahMos, Su-30MKI).
- **Geopolitical Backing:** Moscow consistently supports India's bid for a **permanent UN Security Council seat** and aligns with India's official stance on Kashmir.
- **Energy Security & Trade:** Driven by discounted crude oil imports, bilateral trade reached **~\$65 billion**, with a mutual target of **\$100 billion by 2030**.
- **Eurasian Balancing:** Softens regional security friction and provides a diplomatic counter-channel during high-tension standoffs with China.

Challenges

- **Severe Trade Deficit:** Out of \$65+ billion in trade, Indian exports account for **under \$5 billion**, resulting in massive trade imbalances and payment settlement hurdles (Rupee-Ruble mechanism).
- **Russia-China Proximity:** Deepening Moscow-Beijing ties—driven by Western sanctions—creates strategic discomfort for New Delhi, alongside Russian criticism of the **Quad** and **Indo-Pacific** frameworks.
- **Defence Import Diversification:** India's shift toward Western vendors (US, France) and domestic manufacturing (*Atmanirbhar Bharat*) has steadily reduced Russia's share of arms imports.
- **Geopolitical Friction & CAATSA:** Western sanctions and secondary US sanctions (CAATSA) complicate military and financial transactions with Moscow.
- **Diplomatic Tightrope on Ukraine:** India faces persistent Western pressure over its neutral stance, refusal to condemn Moscow explicitly, and continued energy purchases.

Way Forward

- **Trade Diversification:** Expand non-energy exports to Russia in pharmaceuticals, agriculture, machinery, IT, and green technology to correct trade imbalances.
- **Connectivity Corridors:** Expedite the **International North-South Transport Corridor (INSTC)** and the **Chennai-Vladivostok Maritime Corridor**, while advancing the India-Eurasian Economic Union (EaEU) Free Trade Agreement.
- **Defense Co-Development:** Shift from direct buyer-seller purchases to joint R&D, local assembly (*Make in India*), and component manufacturing.
- **Multilateral Engagement:** Utilize **BRICS, SCO, and G20** platforms to pursue shared multipolar goals while preserving independent strategic priorities in Eurasia.

KEYWORDS

- **Defence & Energy Security:** Russia remains a major partner for India in defence equipment, nuclear energy and crude oil supplies.
- **Eurasian Connectivity:** Initiatives such as **INSTC** and the **Chennai-Vladivostok Maritime Corridor** strengthen India's access to Eurasian markets and strategic spaces.

UPSC PYQs

- *What is the significance of Indo-US deals over Indo-Russian defence deals? Discuss with reference to stability in the Indo-Pacific region. (UPSC Mains 2020)*
- *Recently, India signed a deal known as 'Action Plan for Prioritization and Implementation of Cooperation Areas in the Nuclear Field' with which of the following countries? (UPSC Prelims 2019)*

LEGAL METROLOGY (INDIAN STANDARD TIME) RULES, 2026- ONE NATION ONE TIME

(GS Paper II Government Policies and Interventions, GS Paper III (Science and Technology and Internal Security)).

The **Legal Metrology (Indian Standard Time) Rules, 2026** seek to establish **Indian Standard Time (IST)** as the common, legally recognised and traceable time reference for civil, commercial, legal and official purposes across India. The Rules were notified by the **Department of Consumer Affairs on 27 August 2026** under the **Legal Metrology Act, 2009**, and form part of the broader “**One Nation, One Time**” initiative.

What do the Rules provide?

The Rules create a legal framework for establishing, maintaining and using **IST as the authoritative time reference** in India. They cover:

- **Generation and maintenance of IST** — ensuring that the national time scale remains accurate and reliable.
- **Dissemination of IST** — making the national time standard available to different regions, sectors and systems.
- **Traceability of time** — ensuring that the time maintained by a system can ultimately be linked to an authoritative reference.
- **Synchronisation of systems** — enabling computers, communication networks, financial systems and other infrastructure to operate using a common time reference.
- **Civil, commercial and legal use of IST** — providing a common time reference for activities such as financial transactions, contracts, official records and regulatory processes.

IST is the official time scale for these purposes and is realised and maintained by **CSIR–National Physical Laboratory (NPL)** through **UTC(NPLI) + 5 hours 30 minutes**.

Institutional Architecture

- **CSIR–National Physical Laboratory (NPL)** - CSIR–NPL is India's National Metrology Institute and provides the scientific foundation for IST. It maintains the national atomic time scale and ensures traceability to international **Coordinated Universal Time (UTC)**.
- **Regional Reference Standard Laboratories (RRSLs)** - Five **Regional Reference Standard Laboratories (RRSLs)** located at Ahmedabad, Bengaluru, Bhubaneswar, Faridabad and Guwahati. It provides a distributed infrastructure for disseminating traceable IST across India.
- **ISRO and NavIC** - NavIC (**Navigation with Indian Constellation**) can serve as an Indian source for secure dissemination of accurate timing information. This gives the initiative an important **strategic-autonomy and space-technology dimension**.
- **Legal Metrology Department** - The **Department of Legal Metrology**, under the Ministry of Consumer Affairs, provides the regulatory and enforcement framework for implementing requirements relating to the use and dissemination of IST.

Significance

- **Digital Economy** - Accurate timestamps help record, order and verify digital transactions. IST supports **banking, UPI and digital payments, stock-market transactions, e-commerce, cloud computing and digital governance**.
 - **Ex:** In UPI, timestamps show when a payment was initiated, processed and completed; in stock markets, synchronised systems establish the sequence of transactions.

- **Critical Infrastructure** - Precise time synchronisation is essential for **telecommunications, power grids, railways, airports and digital networks**.
 - **Ex:** Power grids use precise timing for monitoring and protection, while railway signalling and telecom networks depend on synchronised clocks.
- **Cybersecurity** - Accurate timestamps support **system logs, authentication, incident investigation, cyber-forensics and detection of anomalous activity**.
 - **Ex:** During a cyberattack, reliable timestamps help investigators reconstruct the sequence of events and identify the systems affected.
- **Strategic Autonomy** - Indigenous timing infrastructure through **CSIR-NPL, RRSLs and NavIC** can reduce dependence on foreign satellite-based timing sources, supporting **Atmanirbhar Bharat, technological sovereignty and strategic autonomy**.
 - **Ex:** Multiple Indian timing sources provide greater resilience if an external satellite-navigation timing source becomes unavailable.
- **Scientific and Technological Advancement** - Precision time is essential for **satellite navigation, deep-space missions, telecommunications, radio astronomy, power-grid synchronisation and scientific experiments**.
 - **Ex:** Space missions require precise timing for communication, navigation and measurements, while radio astronomy requires synchronised observations across locations.

Challenges

- **Legacy infrastructure:** Existing systems may use different time sources and require technological upgrades.
 - **Ex:** An old industrial control system may lack the hardware or software needed for IST-traceable synchronisation.
- **High implementation cost:** Upgrading clocks, servers, network equipment and software can be expensive, especially for smaller organisations.
 - **Ex:** A small bank or telecom operator may face significant costs in replacing outdated timing equipment and upgrading its IT systems.
- **Last-mile dissemination:** Delivering accurate IST across India's large and diverse geography is technically challenging.
 - **Ex:** Providing reliable IST signals to remote areas, islands or rural infrastructure may require additional communication and timing facilities.
- **Multiple stakeholders:** Implementation requires coordination among CSIR-NPL, Legal Metrology authorities, ISRO, RRSLs, banks, telecom operators, power companies and other sectors.
 - **Ex:** Synchronising a national payment network may require cooperation between regulators, banks, telecom providers and technology companies.
- **Private-sector compliance:** Banks, telecom companies and technology firms will need to adapt their systems to IST-traceable timing.
 - **Ex:** Banks may need to modify transaction servers and logging systems to maintain IST-traceable timestamps.

Way Forward

- **Phased implementation** – Prioritise critical sectors such as banking, digital payments, telecom, power grids, transport and defence before wider adoption.

- **Ex:** Banks and **UPI-based digital payment systems** can first synchronise their transaction timestamps with IST, followed by telecom networks and electricity grids, before extending mandatory compliance to other sectors.
- **Strengthen indigenous timing infrastructure** – Expand the network of **CSIR-NPL, Regional Reference Standard Laboratories (RRSLs) and NavIC** to create a robust domestic timing ecosystem.
 - **Ex: NavIC-based timing signals** can provide an indigenous backup for critical infrastructure instead of relying entirely on foreign satellite navigation systems such as GPS.
- **Enhance cybersecurity** – Protect timing infrastructure against spoofing, jamming and cyberattacks through authentication, encryption and continuous monitoring.
 - **Ex:** A malicious actor could **spoof a timing signal** and cause systems to record incorrect timestamps. Authentication mechanisms and multiple independent timing sources can help detect and prevent such attacks.
- **Public-private partnership** – Involve banks, telecom operators, power companies, technology firms and other stakeholders in developing interoperable IST-based systems.
 - **Ex: Telecom operators and financial institutions** can work with CSIR-NPL.
- **Maintain global interoperability** – Ensure that India's IST infrastructure remains traceable to **Coordinated Universal Time (UTC)** and aligned with international metrology standards.
 - **Ex:** A transaction between an **Indian bank and an international financial institution** should have timestamps that can be reliably compared because India's IST remains traceable to the international UTC system.

KEY WORDS

- **UTC (Coordinated Universal Time):** Internationally accepted **global time standard**, maintained using highly precise atomic clocks.
- **CSIR-NPL:** CSIR–National Physical Laboratory, India’s national institute responsible for maintaining the country’s **primary standards of measurement and time**.
- **NavIC:** India’s **regional satellite navigation system**, providing Position, Navigation and Timing (PNT) services.
- **RRSL: Regional Reference Standards Laboratories**, which help maintain and disseminate measurement standards across different regions of India.
- **White Rabbit Technology:** A **high-precision time-synchronisation technology** capable of achieving sub-nanosecond accuracy, useful for critical networks and scientific systems.
- **PNT (Positioning, Navigation and Timing):** Technologies and services that provide **location, navigation and precise time**, essential for transport, telecom, finance and defence.

FOREIGN CONTRIBUTION (REGULATION) AMENDMENT BILL, 2026

GS Paper II – Governance, Government Policies and Interventions, NGOs, SHGs and Civil Society

Background

The Foreign Contribution (Regulation) Amendment Bill, 2026 was introduced in the Lok Sabha on **25 March 2026** to strengthen the framework for managing foreign funds and assets when an organisation's FCRA registration is cancelled, surrendered or ceases to remain valid. The Bill proposes a Designated Authority to supervise, manage and dispose of such funds and assets. It was referred to a Joint Parliamentary Committee on 12 August 2026 for further examination.

Key Provisions of the Bill

- **Cessation of Registration:** An FCRA certificate will be deemed to have ceased if it expires without renewal, no renewal application is submitted, or renewal is denied.
- **Creation of a Designated Authority:** A Designated Authority will take custody of, supervise and manage foreign contributions and assets in cases of cancellation, surrender or cessation of registration.
- **Provisional and Permanent Vesting of Assets:** Foreign contributions and assets created wholly or partly from such contributions will vest provisionally in the Authority. The vesting may become permanent if the organisation fails to obtain fresh registration, renewal or restoration within the prescribed period.
- **Return of Assets:** If registration is renewed, restored or granted afresh, the Authority will return the assets and unutilised foreign contributions in accordance with the proposed provisions.
- **Disposal of Permanently Vested Assets:** Assets permanently vested in the Authority may be transferred to government ministries, departments or agencies, or disposed of through sale or other prescribed processes. The proceeds and unutilised foreign contributions will be credited to the Consolidated Fund of India.
- **Protection of Places of Worship:** Where permanently vested assets include a place of worship, the Authority must ensure that its religious character is maintained.
- **Time Limits for Foreign Contributions:** Organisations receiving funds through prior permission will be required to receive and utilise such contributions within the prescribed period.
- **Accountability of Key Functionaries:** Directors, trustees, office-bearers and other persons responsible for an organisation's management may be held accountable for offences, subject to the defences provided under the Bill.
- **Rationalisation of Penalties:** The Bill proposes reducing the maximum imprisonment for violations from five years to one year, alongside a fine or both.
- **Central Government Approval for Investigations:** Prior approval of the Central Government will be required to initiate an investigation into offences under the Act.

Significance of the Amendment

- **Strengthens Financial Accountability:** A formal mechanism for managing foreign funds and assets can reduce administrative uncertainty and improve accountability when registration ends.
- **Prevents Misuse of Foreign Contributions:** Clearer rules governing custody and disposal can help ensure that foreign-funded assets are managed according to the law.
- **Improves Regulatory Clarity:** Specified procedures for provisional and permanent vesting can establish a more structured framework for handling assets of organisations that cease to operate or lose registration.

- **Promotes Responsible Use of Foreign Funds:** Time limits for receiving and utilising funds through prior permission can encourage better financial planning and compliance.
- **Supports Public Purpose:** The proposed use of permanently vested assets for public purposes may enable their continued use for public services, subject to the applicable provisions.
- **Maintains Religious Character:** The specific safeguard for places of worship seeks to preserve their religious character even when their management comes under the Designated Authority.

Key Challenges

- **Impact on Civil Society Organisations:** The transfer of assets following non-renewal or cessation of registration may affect NGOs, charitable institutions and other organisations that provide essential public services.
- **Concerns Regarding Due Process:** The absence of a specific appeal mechanism against denial of renewal, along with the lack of an explicit opportunity to be heard in such cases, raises concerns about procedural fairness.
- **Risk to Mixed-Funded Assets:** Assets created using both domestic and foreign contributions may vest entirely in the Authority, creating difficulties in identifying and protecting the domestic-funded portion.
- **Regulatory Burden:** Continued compliance with registration, renewal and reporting requirements may impose additional administrative and financial burdens on smaller organisations.
- **Impact on Service Delivery:** Uncertainty over the management of assets such as hospitals, schools and community facilities may disrupt services for vulnerable populations.
- **Centralisation of Administrative Powers:** The proposed powers of the Designated Authority and the requirement for prior Central Government approval for investigations raise questions about administrative discretion, institutional independence and accountability.
- **Balancing National Interest and Civil Liberties:** Regulation of foreign funding must protect national security without unnecessarily restricting legitimate charitable, educational, humanitarian and developmental activities.

Way Forward

- **Ensure Procedural Fairness:** Establish transparent procedures for renewal decisions, provide reasonable opportunities to respond, and clarify appropriate avenues for appeal and judicial review.
- **Adopt Proportionate Asset Management:** Distinguish between foreign-funded and domestic-funded portions of assets wherever objectively possible, ensuring that legitimate domestic contributions are protected.
- **Strengthen Transparency:** Publish clear guidelines on the appointment, functioning and decision-making processes of the Designated Authority.
- **Protect Essential Public Services:** Establish continuity arrangements for hospitals, schools, shelters and other facilities so that disputes over registration do not interrupt essential services.
- **Ensure Time-Bound Decisions:** Prescribe reasonable timelines for renewal, restoration and the return of assets to reduce uncertainty for organisations and beneficiaries.
- **Promote Stakeholder Consultation:** Engage NGOs, charitable institutions, legal experts and civil society representatives while framing rules and implementation procedures.

- **Maintain Proportionality:** Ensure that enforcement measures are proportionate to the nature of violations and that legitimate humanitarian and developmental work can continue within the legal framework.

Conclusion

The Foreign Contribution (Regulation) Amendment Bill, 2026 seeks to establish a clearer framework for the supervision and management of foreign-funded assets when an organisation's registration ceases. Its effective implementation will depend on balancing financial accountability and national interest with procedural fairness, institutional transparency and the continued functioning of legitimate civil society organisations

KEYWORDS

1. **FCRA (Foreign Contribution Regulation Act):** Law regulating the acceptance and utilisation of foreign contributions in India.
2. **Foreign Contribution:** Donation or transfer of currency, securities or specified articles from a foreign source.
3. **Designated Authority:** Proposed authority responsible for the vesting, supervision, management and disposal of foreign contributions and assets in specified circumstances.
4. **Provisional Vesting:** Temporary transfer of custody or control of funds and assets pending the outcome of registration-related processes.
5. **Permanent Vesting:** Transfer of funds and assets to the Designated Authority when the prescribed conditions for permanent vesting are met.
6. **Civil Society Organisations:** Non-governmental organisations and other voluntary institutions working in areas such as health, education, relief and social development.
7. **Procedural Fairness:** Transparent decision-making that provides appropriate safeguards against arbitrary administrative action.
8. **Consolidated Fund of India:** The constitutional fund into which government revenues and other specified receipts are credited.

UPSC PYQ

Examine critically the recent changes in the rules governing foreign funding of NGOs under the Foreign Contribution (Regulation) Act (FCRA), 1976.(2015)

18TH BRICS SUMMIT 2026

GS-II Bilateral, Regional and Global Groupings and Agreements involving India and/or affecting India's interests.

Background

The **18th BRICS Summit** was hosted by India under its chairship on **September 12–13, 2026**, at **Bharat Mandapam, New Delhi**. Organized under the overarching theme “**Building for Resilience, Innovation, Cooperation and Sustainability**,” the historic summit marked **20 years** since the establishment of the BRICS grouping. Leaders of member states, partner nations, and Global South outreach invitees gathered to adopt the landmark **New Delhi Declaration**, reinforcing multilateral reform and South-South economic integration.

Key Outcomes of the Summit

- **Adoption of the New Delhi Declaration:** The summit unanimously adopted a comprehensive roadmap advocating for **reformed multilateralism** and enhanced representation for emerging economies in global governance bodies.
 - **Ex:** Reaffirmed collective commitment to the historical **Bandung Principles of 1955** for non-intervention, equality, and mutual benefit.
- **Cross-Border Local Currency Settlements:** Leaders advanced institutional mechanisms for trading in **national currencies** and expanding cross-border payment interoperability.
 - **Ex:** Expanded testing under the **BRICS Payment Task Force** to link national UPI-style digital payment infrastructures.
- **Zero Tolerance on Global Terrorism:** The summit adopted a strict stance on security, calling for the expeditious finalization of global anti-terror treaties.
 - **Ex:** Strong condemnation of the **2025 Pahalgam terror attack** alongside an explicit push to finalize the UN **Comprehensive Convention on International Terrorism (CCIT)**.
- **Rejection of Unilateral Trade Barriers:** BRICS members opposed arbitrary **coercive trade policies** and unilateral tariff hikes that undermine developing nations.
 - **Ex:** Explicit criticism of carbon-border adjustment mechanisms (**CBAM**) and non-tariff trade barriers imposed without UNSC consensus.
- **Expansion of New Development Bank (NDB) Capacity:** Member states resolved to strengthen the funding capability of the **NDB** to support infrastructure development in local currencies.
 - **Ex:** Endorsed the discussion on creating a **BRICS New Investment Platform** to bypass traditional dollar-denominated loans.
- **Scaling Digital Public Infrastructure (DPI):** India's leadership enabled a consensus to leverage open-source **technological architecture** for inclusive growth across the Global South.
 - **Ex:** Creation of a shared digital knowledge repository modelled on India's **India Stack** for financial inclusion and e-governance.
- **Consensus on Middle East Peace & Sanction Reform:** Members backed joint diplomatic efforts to manage regional geopolitical flashpoints and support humanitarian relief.
 - **Ex:** Unanimous call for a peaceful settlement of the Gaza crisis while supporting uninterrupted operations of **UNRWA**.

Key Challenges of BRICS

- **Intra-Grouping Geopolitical Divergences:** The heterogeneous composition of BRICS creates conflicting strategic priorities among key member states.

- **Ex:** Divergent strategic alignment between **India and China** along border areas, alongside territorial friction between new members **Iran and UAE**.
- **Economic Asymmetry & Trade Dominance:** Economic power within BRICS remains heavily skewed, creating fears of unilateral economic leverage.
 - **Ex:** China accounts for over **60% of BRICS total GDP**, raising concerns among smaller member nations regarding asymmetric trade deficits.
- **Lack of Institutional Standardisation:** Operational friction persists due to differing financial regulations and absence of unified transaction protocols.
 - **Ex:** Delay in launching a **common BRICS currency** due to structural economic disparities and varying currency convertibility norms.
- **Western Polarization and Sanction Risks:** Deepening anti-Western rhetoric from select members risks alienating moderate partners who maintain strong Western ties.
 - **Ex:** Differing member stances on the **Ukraine crisis**, leading to deliberate omissions in the New Delhi Declaration to maintain consensus.

Way Forward

- **Consolidating De-dollarization via Local Currency Protocols:** Focus on establishing stable bilaterally linked payment clearing mechanisms rather than pushing for a single currency.
 - **Ex:** Expanding rupee-dirham and yuan-real trade settlement frameworks under the **BRICS Interbank Cooperation Mechanism**.
- **Institutionalizing Conflict Resolution Mechanisms:** Create internal mediation frameworks to address economic and territorial disputes among members quietly.
 - **Ex:** Establishing a **BRICS Dispute Settlement Mechanism** similar to the WTO's appellate body for trade disputes.
- **Strengthening Global South Partnership Models:** Leverage the new **BRICS Partner Country** tier to drive regional infrastructure development without formal membership strain.
 - **Ex:** Mobilizing funds through the **BRICS Outreach/Plus Dialogue** to target LDC energy transition projects.
- **Focusing on Non-Controversial Supply Chain Resilience:** Deepen integration in critical technologies, food security, and health infrastructure where strategic interests align.
 - **Ex:** Operationalizing the **BRICS Vaccine R&D Centre** and joint food security reserves to counter climate shocks.

The **18th BRICS Summit 2026** at New Delhi successfully consolidated the grouping's transition into a pivotal platform for the **Global South**. By focusing on practical deliverables like **digital infrastructure, local currency trade, and reformed multilateralism**, BRICS demonstrated its ability to bridge diverse geopolitical interests. Moving forward, its long-term success will depend on managing internal trade asymmetries while serving as an inclusive voice for global institutional reform.

KEY WORDS

- **BRICS Payment Task Force** – Works towards interoperability of national digital payment systems for easier cross-border transactions.
- **New Development Bank (NDB)** – BRICS-led multilateral bank that finances infrastructure and sustainable development projects in member and developing countries.
- **Digital Public Infrastructure (DPI)** – India-led approach using open and interoperable digital systems to promote financial inclusion and e-governance.

26TH SCO SUMMIT 2026

GS-II Bilateral, Regional and Global Groupings and Agreements involving India and/or affecting India's interests.

Background

The **26th SCO Summit** was hosted under the rotating chairship of **Kyrgyzstan** in **Bishkek** on **August 31 – September 1, 2026**. The high-level meeting convened heads of state and government from all **10 full member states**, alongside dialogue partners and observer nations. Focused on strengthening **regional security, sustainable connectivity, and counter-terrorism coordination**, the summit concluded with the adoption of the historic **Bishkek Declaration** and 27 additional sector-specific cooperation agreements.

Key Outcomes of the Summit

- **Adoption of the Landmark Bishkek Declaration:** Member states unanimously adopted the **Bishkek Declaration** as the overarching political framework to guide Eurasian security, economic trade, and environmental policy.
 - **Ex:** Reaffirmed explicit commitment to **reformed multilateralism** and non-interference in internal sovereign affairs.
- **Inclusion of English as an Official Working Language:** In a major institutional charter reform strongly advocated by India, **English** was formally adopted as an official working language alongside Russian and Chinese.
 - **Ex:** Amendments to the **SCO Charter** to expand participation for diplomats, think tanks, and academic bodies across non-Russian/Chinese speaking member states.
- **Rejection of Double Standards on Terrorism:** Leaders strengthened the counter-terrorism mandate, rejecting selective approaches toward terrorism, radicalization, and safe havens.
 - **Ex:** Institutionalized directives to expand intelligence-sharing databases managed by the **SCO Regional Anti-Terrorist Structure (RATS)**.
- **Launch of the SCO Green Technology Corridor (2026–2030):** The summit inked a dedicated program to promote joint transition toward **clean energy, climate resilience, and sustainable development**.
 - **Ex:** Adoption of shared frameworks for **renewable energy grid interconnections** and joint disaster risk reduction protocols across Central Asia.
- **Extension of International Information Security Plan:** Member states agreed to extend the **SCO Cyber Security Framework** through 2026–2028 to counter digital threats.
 - **Ex:** Joint protocols aimed at preventing the misuse of **artificial intelligence (AI) and dark-web networks** by extremist outfits.
- **Establishment of New Institutional Security Outlets:** The council approved formal regulations for establishing specialized **regional security centers** to tackle emerging transnational threats.
 - **Ex:** Regulations approved for setting up the **SCO Universal Centre for Countering Challenges and Threats** and the **Anti-Drug Centre**.
- **Focus on Sovereignty-Respecting Connectivity:** The outcome documents emphasized infrastructure expansion while explicitly upholding national territorial integrity.
 - **Ex:** India reiterated its principled stance against non-consensual corridors while backing sovereign multimodal routes like the **International North-South Transport Corridor (INSTC)**.

Key Challenges of SCO

- **Bilateral Frictions and Border Disputes:** Deep-seated territorial and political conflicts between key member states obstruct cohesive regional decision-making.
 - **Ex:** Persistent border standoffs between **India and China**, alongside recurring military skirmishes along the **Tajikistan–Kyrgyzstan border**.
- **China-Centric Economic Dominance:** China's massive economic footprint creates fears of asymmetric leverage and unilateral agenda-setting.
 - **Ex:** Over-reliance on China's **Belt and Road Initiative (BRI)**, which raises debt-sustainability concerns among smaller Central Asian republics.
- **Divergent Perspectives on Counter-Terrorism:** Lack of a consensus on defining terrorism leads to selective enforcement and double standards.
 - **Ex:** Pakistan's continued shelter to UN-proscribed terror outfits despite SCO **RATS anti-terror declarations**.
- **Geopolitical Polarization and Western Friction:** Deepening anti-Western alignments by select members risk turning the bloc into a anti-Western geopolitical coalition.
 - **Ex:** Strategic tensions arising from **Russia and Iran** utilizing SCO platforms to counter Western economic sanctions.

Way Forward

- **Institutionalizing Conflict Neutrality and Bilateral Exclusions:** The SCO must strictly enforce its founding principle of keeping bilateral disputes out of multilateral deliberations.
 - **Ex:** Adopting a binding protocol that prohibits members from raising **bilateral territorial claims** during summit agendas.
- **Leveraging Digital Public Infrastructure (DPI) for Eurasian Trade:** Shift focus toward non-controversial digital commerce and financial interoperability.
 - **Ex:** Exporting India's open-source architecture like **UPI and Digital Identity frameworks** to Central Asian economies.
- **Operationalizing Alternative Multimodal Corridors:** Accelerate non-aligned trade links that respect state sovereignty and bypass geopolitical chokepoints.
 - **Ex:** Operationalizing the **Chabahar Port** linked with the **INSTC network** to provide landlocked Central Asia direct oceanic access.
- **Promoting Cultural Diplomacy and Youth Initiatives:** Strengthen soft-power engagement to build grassroots connectivity across member populations.
 - **Ex:** Operationalizing the **SCO Civilisation Dialogue Forum** and regularizing the **SCO Young Scientists Forum**.

The **26th SCO Summit 2026** demonstrated the group's evolving role as a vital bridge for **Eurasian stability, counter-terrorism, and sustainable connectivity**. Key structural reforms—such as adopting **English as an official language**—mark a step toward broader inclusivity and institutional modernization. Moving forward, the SCO's long-term credibility will rely on balancing internal geopolitical differences while fostering genuine economic and security collaboration across Eurasia.

KEY WORDS

- **SCO-RATS** – The Regional Anti-Terrorist Structure that facilitates cooperation and intelligence-sharing against terrorism, extremism and separatism.
- **SCO Green Technology Corridor** – A framework promoting renewable energy, climate resilience and sustainable development among member states.
- **International North-South Transport Corridor (INSTC)** – A multimodal transport network connecting India with Iran, Central Asia, Russia and Europe through alternative trade routes.
- **SCO Cyber Security Framework** – A cooperative framework aimed at strengthening cybersecurity and addressing emerging digital threats among SCO members.

INDIA'S DATA CENTRE BOOM AND ENVIRONMENT

GS-III Achievements of Indians in Science & Technology; Indigenization of Technology and Developing New Technology.

Background

India's data centre expansion is creating a classic sustainable-development conflict: digital infrastructure is rising fast, but it is also intensifying stress on electricity, water and cooling systems in already vulnerable regions. The core exam value lies in linking a technology story to environmental governance, resource accounting and the energy transition.

Data Center

A data centre is a dedicated physical facility built to house servers, storage systems, and networking equipment that collectively store, process, and distribute enormous volumes of digital information. Think of it as the "engine room" of the internet economy — every UPI payment, Aadhaar authentication, streaming session, or AI query is ultimately processed inside one of these facilities.

Growth of Data Centres in India

- India's operational data-centre capacity was around **1.8 GW in H1 2026**, with a development pipeline of nearly **3.9 GW**.
- Major hubs include **Mumbai, Chennai, Hyderabad, Bengaluru and Delhi-NCR**.
- Emerging locations include **Visakhapatnam, Andhra Pradesh**, along with several other tier-II locations.
- **AI and high-performance computing** are major drivers because AI workloads require much greater computing and cooling capacity.
- Wood Mackenzie projects India's operational capacity could rise from **2.2 GW in 2025 to 12 GW by 2030**.

Energy Consumption

- Data centres require continuous electricity for **servers, storage, networking and cooling systems**.
- According to the Government, data centres currently account for **less than 1% of India's installed power capacity**, but their electricity demand is projected to reach about **17 GW by 2031-32**.
- Increasing dependence on fossil-fuel-based electricity can increase the **carbon footprint** of digital infrastructure.
- AI workloads intensify this challenge because of their high computational requirements.

Water Consumption

- Water is mainly required for **cooling data-centre equipment**, particularly in conventional cooling systems.
- The concern becomes greater when data centres are located in **water-stressed regions**.
- WRI India found that **more than half of India's data centres are located in water-stressed regions**, while 75% are concentrated in Maharashtra, Tamil Nadu, Karnataka, Telangana and Uttar Pradesh.
- Cooling technologies such as **direct-to-chip liquid cooling, immersion cooling and closed-loop cooling** can reduce water consumption.

Carbon Footprint

- Electricity consumption by servers.
- Energy used for cooling.
- Construction of large facilities.
- Backup diesel generators.
- Carbon intensity of the electricity grid.

Thus, the environmental impact depends not only on **how much electricity is consumed**, but also on **how that electricity is generated**.

Heat and Local Environmental Impacts

- Data centres generate substantial **waste heat** from servers and cooling systems.
- Large-scale facilities can contribute to **local heat-island effects**, particularly when concentrated in urban areas.
- Land requirements, construction activity and associated infrastructure can create additional ecological pressures.

Government Measures

- **Energy Conservation and Sustainable Building Code (ECSBC), 2024** for energy efficiency and water conservation.
- **Green Energy Open Access Rules** to facilitate renewable electricity procurement.
- **BIS standards** covering **Power Usage Effectiveness (PUE)**, **Carbon Usage Effectiveness (CUE)**, **Cooling Efficiency Ratio (CER)** and **Water Usage Effectiveness (WUE)**.
- Promotion of **renewable energy, green hydrogen and nuclear energy** as sources of cleaner electricity.
- Advanced cooling technologies such as **liquid cooling and immersion cooling**.
- Regulation of groundwater extraction under the **Ministry of Jal Shakti's guidelines**.

Environmental Clearance

AI data centres do **not automatically require environmental clearance merely because they are AI data centres**. However, where they form part of specified **Building and Construction Projects** or **Township and Area Development Projects** meeting the EIA Notification thresholds, prior environmental clearance may be required.

Significance

- **Digital Economy:** Supports the rapid growth of AI, cloud computing, fintech, e-commerce and digital public infrastructure.
- **Economic Growth:** Attracts domestic and foreign investment, creates skilled employment and strengthens India's position as a digital services hub.
- **Data Sovereignty:** Domestic data centres strengthen data localisation, cybersecurity and control over critical digital infrastructure.
- **AI Development:** Provides the computing infrastructure required for AI, machine learning and high-performance computing.
- **Renewable Energy Transition:** Rising energy demand can accelerate investments in renewable power, energy storage and green data centres.

- **Infrastructure Development:** Promotes expansion of power grids, fibre-optic networks, cloud infrastructure and related urban infrastructure.
- **Regional Development:** New data-centre clusters beyond major metros can support decentralised digital and economic development.
- **Environmental Innovation:** Drives adoption of energy-efficient servers, liquid cooling, treated wastewater and renewable energy, promoting sustainable digitalisation.

Way Forward

- Increase the share of **renewable electricity** used by data centres.
- Promote **24×7 clean power** through solar, wind, storage and other low-carbon sources.
- Shift from freshwater-intensive cooling to **closed-loop, liquid and immersion cooling**.
- Use **treated wastewater** instead of freshwater wherever feasible.
- Locate new data centres after considering **water availability, grid capacity and climate risks**.
- Improve **PUE, WUE and CUE** standards and disclosure.
- Encourage **waste-heat recovery** and circular management of electronic equipment.
- Diversify data-centre clusters away from severely **water-stressed regions**.

KEYWORDS

Digital Infrastructure: Data centres provide the physical backbone for AI, cloud computing, fintech and digital public infrastructure.

Resource Sustainability: Rapid expansion increases pressure on electricity and water, requiring energy-efficient and water-efficient cooling systems.

Green Transition: Greater use of renewable energy, treated wastewater, efficient cooling and circular practices can reduce the environmental footprint of data centres.

LETHAL AUTONOMOUS WEAPONS AND AI IN WARFARE

(GS-III: Science & Technology, Defence Technology, Cybersecurity and Internal Security; GS-II: International Relations and Global Governance)

Introduction

Artificial Intelligence (AI) is transforming warfare through **autonomous weapons, drone swarms, intelligent surveillance and cyber warfare**. **Lethal Autonomous Weapons Systems (LAWS)** can identify, select and engage targets with limited or no human intervention. On **5 September 2026, 128 High Contracting Parties to the Convention on Certain Conventional Weapons (CCW)** agreed on a **non-binding common descriptive framework for LAWS**, highlighting the growing need for global governance of emerging military technologies.

Role of AI in Warfare

- **Enhanced Intelligence, Surveillance and Reconnaissance (ISR):** AI integrates satellite, radar, Unmanned Aerial Vehicle (UAV) and sensor data for real-time battlefield awareness.
 - **Ex:** AI-enabled **Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR)** systems.
- **Autonomous Targeting:** AI enables weapons to identify, track and engage targets with limited human intervention.
 - **Ex:** **LAWS and AI-enabled loitering munitions.**
- **Drone Swarms:** AI allows multiple drones to coordinate surveillance, attack and electronic warfare operations.
 - **Ex:** AI-driven swarms capable of locating and jamming enemy radars.
- **Cyber and Electronic Warfare:** AI can detect hostile signals, identify cyber threats and adapt responses rapidly.
 - **Ex:** **Cognitive Electronic Warfare** systems that respond dynamically to changing enemy signals.
- **Military Logistics:** AI improves operational efficiency by predicting equipment failures and optimising supply chains.
 - **Ex:** AI-based **predictive maintenance** for military platforms.

Concerns Associated with LAWS

- **Humanitarian and Legal Risks:** Autonomous systems may find it difficult to distinguish civilians from combatants and assess proportionality or precaution in complex situations.
 - **Ex:** Misidentification of civilians or surrendering soldiers as legitimate targets.
- **Accountability Deficit:** When an autonomous system causes unlawful harm, determining responsibility among commanders, operators, developers and States can become difficult.
 - **Ex:** Disputes over responsibility following an autonomous attack.
- **Technological Unpredictability:** Sensor failures, flawed training data, algorithmic bias and adversarial manipulation can lead to unintended targeting decisions.
 - **Ex:** Data poisoning causing an AI system to classify a non-combatant as a hostile target.
- **Cybersecurity Risks:** Autonomous weapons connected to digital networks can themselves become targets of hacking or manipulation.
 - **Ex:** An adversary compromising an autonomous system to alter its target-selection parameters.
- **Strategic Instability:** Faster machine-driven decision-making can compress crisis-response time

and encourage rapid military competition.

- **Ex:** Autonomous weapons proliferation increasing the possibility of unintended escalation.

Way Forward

- **Establish Human Responsibility:** Lethal operations should retain appropriate human supervision, judgement and intervention, particularly where civilian harm is possible.
 - **Ex:** India supports the principle of **human judgement and accountability** in the use of LAWS.
- **Develop International Norms:** States should use the **CCW and Group of Governmental Experts (GGE) on LAWS** to establish internationally accepted rules for development and deployment.
 - **Ex:** The **2026 Geneva Consensus** provides a common descriptive framework, although it is non-binding.
- **Adopt a Risk-Based Regulatory Framework:** Systems that cannot comply with International Humanitarian Law (IHL) should be prohibited, while other autonomous capabilities can be subject to appropriate restrictions and oversight.
 - **Ex: India's two-tier approach** distinguishes between systems requiring prohibition and those requiring regulation.
- **Strengthen Testing and Cybersecurity:** Defence AI should undergo rigorous validation, red-teaming, auditing, fail-safe testing and cybersecurity assessments before deployment.
 - **Ex:** India's **Defence Artificial Intelligence Council (DAIC)** and **Defence Artificial Intelligence Project Agency (DAIPA)** support responsible defence-AI development.
- **Promote Indigenous Innovation:** India should develop secure domestic capabilities while supporting responsible private-sector participation in defence technology.
 - **Ex: Innovations for Defence Excellence (iDEX)** promotes indigenous defence technologies, including AI and autonomous systems.

Conclusion

AI can enhance **situational awareness, operational efficiency and precision**, but autonomous lethal decision-making raises serious humanitarian, legal and strategic concerns. The **November 2026 CCW Review Conference** can build upon the emerging international consensus and advance practical safeguards. India should pursue a **human-in-control approach**, ensuring that technological advancement strengthens military capability while **human responsibility remains indispensable in decisions involving life and death**.

KEY WORDS

- **Lethal Autonomous Weapons Systems (LAWS)** - Weapon systems capable of selecting and engaging targets with limited or no direct human intervention.
- **Meaningful Human Control** - Ensuring human judgement, supervision and intervention remain central to decisions involving the use of lethal force.
- **International Humanitarian Law (IHL)** - Legal framework governing armed conflict, particularly the principles of distinction, proportionality and precaution.
- **C4ISR** - Integrated military framework combining Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance for enhanced battlefield awareness.
- **2026 Geneva Consensus** - A non-binding common descriptive framework agreed by 128 CCW High Contracting Parties to advance discussions on LAWS and their regulation.

ARMED FORCES SPECIAL POWERS ACT (AFSPA), 1958

(GS-III: Internal Security; GS-II: Governance, Fundamental Rights and Centre-State Relations)

Introduction

The **Armed Forces (Special Powers) Act (AFSPA), 1958** empowers the armed forces to operate with special powers in areas declared as “**disturbed**” due to serious security threats. In September 2026, the Centre extended AFSPA for another six months in parts of **Manipur, Nagaland and Arunachal Pradesh**, reflecting the continuing tension between national security and civil liberties.

Need and Key Provisions of AFSPA

- **Counter-Insurgency Operations:** Provides operational flexibility to tackle insurgency and armed violence.
 - **Ex:** AFSPA was introduced in 1958 against the **Naga insurgency** in the then Assam region.
- **Declaration of Disturbed Areas:** Section 3 allows the Central or State authorities to declare an area “disturbed” when circumstances warrant deployment of armed forces.
 - **Ex:** Parts of **Manipur, Nagaland and Arunachal Pradesh** remain under AFSPA.
- **Power to Use Force:** Section 4 permits armed personnel to use force, including lethal force, under specified circumstances after due warning.
 - **Ex:** Action against persons violating prohibitory orders or carrying weapons.
- **Arrest and Search Powers:** Security personnel can **arrest without warrant and search premises without warrant** under specified conditions.
 - **Ex:** Search operations against suspected insurgents or recovery of arms and explosives.
- **Legal Protection:** Section 6 requires **prior Central Government sanction** for prosecution or legal proceedings against personnel for acts purportedly done under AFSPA.
 - **Ex:** Protection is intended to enable personnel to undertake counter-insurgency operations without fear of frivolous litigation.

Concerns and Challenges

- **Human Rights Concerns:** Extraordinary powers may create risks of excessive or disproportionate use of force.
 - **Ex:** Allegations of **extrajudicial killings and excessive force** in conflict-affected regions.
- **Accountability Deficit:** Prior sanction for prosecution can make legal accountability difficult.
 - **Ex:** Delays or denial of sanction can impede prosecution of alleged violations.
- **Impact on Fundamental Rights:** Broad operational powers can raise concerns regarding **Article 14, Article 19 and Article 21**.
 - **Ex:** Restrictions on movement and allegations of arbitrary detention.
- **Alienation of Local Communities:** Prolonged military presence can generate mistrust between citizens and security institutions.
 - **Ex:** Continued AFSPA in parts of the Northeast has remained a source of public opposition and political contestation.
- **Risk of Indefinite Application:** Periodic extensions can make an exceptional law appear permanent.
 - **Ex:** Manipur had witnessed progressive withdrawal before the **2023 ethnic conflict reversed the trend**.

Reforms and Way Forward

- **Evidence-Based Review:** Disturbed-area status should be based on objective security indicators and reviewed periodically.
 - **Ex:** The Supreme Court in **Naga People's Movement of Human Rights v. Union of India (1998)** required periodic review of disturbed-area declarations.
- **Strengthen Human Rights Oversight:** Independent mechanisms should investigate allegations of excesses.
 - **Ex:** Greater involvement of the **National Human Rights Commission (NHRC)** and independent review bodies.
- **Ensure Constitutional Safeguards:** Arrest and detention under AFSPA should comply with constitutional protections and due process.
 - **Ex:** Ensuring safeguards under **Article 22**, including production before a magistrate within 24 hours.
- **Promote Peace and Development:** Security measures should be complemented by dialogue, infrastructure and livelihood interventions.
 - **Ex:** **North East Special Infrastructure Development Scheme (NESIDS)** can complement security measures through infrastructure development.
- **Implement Institutional Reforms:** Combine security operations with political dialogue and cooperative federalism.
 - **Ex:** The **Justice Jeevan Reddy Committee** and **Second Administrative Reforms Commission (2nd ARC)** recommended substantial reform/reconsideration of AFSPA.

Conclusion

AFSPA provides security forces with necessary operational flexibility in areas facing serious insurgency and internal-security threats, but its extraordinary powers require **proportionality, accountability and periodic review**. A sustainable approach should combine **security, constitutional safeguards, development and political dialogue**, gradually enabling the transition from exceptional military powers to normal civilian administration.

KEY WORDS

- **Armed Forces (Special Powers) Act (AFSPA), 1958** - A law granting special powers to the armed forces in areas declared as "disturbed" to tackle serious security threats.
- **Disturbed Area** - An area notified under Section 3 of AFSPA where the use of armed forces is considered necessary to maintain public order.
- **Section 4 Powers** - Provides armed personnel specified powers, including use of force, arrest without warrant and search without warrant under prescribed conditions.
- **Section 6 Protection** - Requires prior sanction of the Central Government for prosecution of personnel for acts purportedly done under AFSPA.
- **Naga People's Movement of Human Rights Case (1998)** - Supreme Court judgment that upheld AFSPA while emphasising safeguards and periodic review of disturbed-area declarations.

UPSC PYQ 2015

Human rights activists constantly highlight the fact that the Armed forces (Special Powers) Act, 1958 (AFSPA) is a draconian act leading to cases of human rights abuses by security forces. What sections of AFSPA are opposed by the activists? Critically evaluate the requirement with reference to the view held by the Apex Court.

GEOTHERMAL ENERGY: INDIA'S UNTAPPED RENEWABLE POTENTIAL

GS-III: Infrastructure – Energy / Environment – Renewable Energy Transition / Science & Technology – Clean Energy

Geothermal energy harnesses heat from the Earth's interior for electricity generation and direct heating applications. Unlike solar and wind energy, it can provide **weather-independent, round-the-clock power**, complementing intermittent renewable sources. India's estimated theoretical geothermal potential is around **10,600 MW**, spread across several geothermal provinces. The **National Policy on Geothermal Energy, 2025**, introduced by the Ministry of New and Renewable Energy (MNRE), seeks to promote exploration, technological development and commercial utilisation of this largely untapped resource.

Significance

- **Ensures reliable renewable electricity:** Geothermal power can provide continuous electricity and reduce dependence on weather-sensitive generation.
 - **Ex:** The proposed **1 MW Puga geothermal project** targets electricity generation in Ladakh.
- **Strengthens energy security:** Indigenous geothermal resources can diversify India's energy mix and reduce dependence on imported fossil fuels.
 - **Ex:** Geothermal energy could diversify India's **50.22% non-fossil installed electricity capacity**.
- **Supports decarbonisation:** Geothermal electricity and heat can replace some fossil-fuel-based energy uses and reduce greenhouse gas emissions.
 - **Ex:** The **proposed 1 MW Puga geothermal project in Ladakh** aims to demonstrate low-carbon electricity generation in India.
- **Enables sustainable agricultural applications:** Geothermal heat can support temperature-controlled cultivation and aquaculture in suitable locations.
 - **Ex:** **Greenhouse heating in geothermal regions** can extend crop-growing seasons in colder climates.
- **Promotes scientific and technological development:** Geothermal exploration can strengthen domestic expertise in deep drilling, subsurface mapping and reservoir engineering.
 - **Ex:** **NGRI (National Geophysical Research Institute) and CSIR** conduct deep geophysical surveys to map subsurface heat flow across the **Son-Narmada-Tapti (SONATA) lineament**.

Challenges

- **High initial capital costs:** Deep drilling, exploration and reservoir testing require substantial investment before commercial returns become clear.
 - **Ex:** Exploration and well drilling account for **40%–60% of total project costs** in pilot sites like Puga Valley before any power is generated.
- **Geological uncertainty:** Hot springs do not necessarily indicate reservoirs with sufficient temperature, permeability and fluid flow for commercial power generation.
 - **Ex:** **GSI's geothermal surveys** identify surface manifestations, but subsurface reservoir quality must be confirmed through **exploratory drilling**.
- **Technological limitations:** Deep drilling, corrosion control and management of mineral-rich fluids require specialised engineering capabilities.

- **Ex: Manikaran's 5 kW binary-cycle plant** illustrates the limited scale of India's demonstrated geothermal-generation technology.
- **Difficult terrain and connectivity:** Remote geothermal locations increase construction, transport and electricity-transmission costs.
 - **Ex: Puga Valley's altitude exceeds 14,000 feet**, complicating year-round field operations.
- **Environmental and operational risks:** Improper fluid extraction and reinjection may cause induced seismicity, groundwater contamination or reservoir depletion.
 - **Ex: Switzerland's Basel geothermal project (2006)** triggered a magnitude 3.4 earthquake during fluid injection.

Way Forward

- **Prioritise resource assessment:** Detailed geological and geophysical surveys should identify commercially viable sites before large-scale investment.
 - **Ex: GSI's Geothermal Atlas, 2022**, provides a baseline for prioritising Indian geothermal provinces.
- **Scale up pilot projects:** Demonstration plants should establish technical feasibility, operating costs and long-term reservoir performance.
 - **Ex: MNRE sanctioned five geothermal projects during July–August 2025** to assess techno-economic viability.
- **Promote international technology transfer:** Cooperation with experienced countries can accelerate technological learning and adaptation to Indian geological conditions.
 - **Ex: India's geothermal cooperation with Iceland** creates opportunities for specialised knowledge exchange.
- **Repurpose existing infrastructure:** Suitable abandoned oil and gas wells can potentially reduce new drilling requirements and development costs.
 - **Ex: IIT Madras received support for geothermal recovery research using abandoned oil wells.**
- **Expand direct-use applications:** Heating, cooling and other thermal applications can make geothermal resources useful even where electricity generation is uneconomical.
 - **Ex: India's geothermal-based Net Zero Energy Building at Jhansi** demonstrates building-level use of ground heat.

Geothermal energy can complement India's solar and wind capacity by providing **reliable, indigenous and low-carbon energy**. The National Policy on Geothermal Energy, 2025, offers an institutional foundation, but commercial expansion requires credible resource assessments, risk-sharing and technological innovation. Converting India's estimated **theoretical potential** into viable projects can strengthen energy security and support the **Net Zero 2070** commitment.

KEY WORDS

- **Geothermal Energy:** Energy derived from heat beneath the Earth's surface for electricity generation and direct heating.
- **Baseload Power:** Electricity supplied continuously to meet minimum demand; geothermal power can operate independently of sunlight and wind conditions.
- **Theoretical Geothermal Potential:** Estimated underground heat resources; the figure does not necessarily represent commercially recoverable electricity capacity.
- **Geothermal Reservoir:** An underground formation containing heat and, often, fluids that can be extracted through wells.
- **Binary-Cycle Power Plant:** A plant that transfers geothermal heat to a secondary fluid, which drives a turbine to generate electricity.
- **Ground Source Heat Pump (GSHP):** A system that transfers heat between buildings and the ground for space heating and cooling.
- **Direct-Use Applications:** Utilisation of geothermal heat without converting it into electricity, such as building heating and aquaculture.
- **Enhanced Geothermal Systems (EGS):** Technologies that improve fluid circulation through hot rocks to extract heat where natural permeability is insufficient.
- **Reservoir Sustainability:** Maintaining long-term geothermal output through appropriate fluid extraction, reinjection and heat management.

UPSC PYQ 2022

Do you think India will meet 50 percent of its energy needs from renewable energy by 2030? Justify your answer. How will the shift of subsidies from fossil fuels to renewables help achieve the above objective? Explain. (15 Marks, 250 Words)

INDIA'S 6G AMBITIONS AND DIGITAL SOVEREIGNTY

GS Paper III – Science and Technology / Indigenisation of Technology / Cybersecurity / Digital Infrastructure

Sixth-generation (6G) mobile technology is expected to enable ultra-high-speed connectivity, intelligent networks and advanced digital applications. India's **Bharat 6G Vision**, released in March 2023, aims to make India a global leader in 6G design, development and deployment by 2030. **Digital sovereignty** refers to India's ability to develop, govern and secure its critical digital infrastructure, data and technologies while reducing excessive external dependence.

Significance

- **Technological self-reliance:** Indigenous 6G capabilities can reduce dependence on foreign technologies and strengthen India's control over critical communication infrastructure.
 - **Ex:** India approved **104 6G research projects worth ₹271 crore by February 2026**, supporting domestic technology development.
- **Economic growth and innovation:** 6G can create opportunities in telecom equipment, semiconductor design, artificial intelligence and advanced manufacturing.
 - **Ex:** India's 6G terahertz testbed demonstrated high-data-rate communication at India Mobile Congress 2025.
- **Strategic autonomy and network security:** Domestic technological capabilities can strengthen control over critical networks and reduce strategic vulnerabilities arising from external dependence.
 - **Ex:** The **Bharat 6G Vision** identifies secure and intelligent connectivity as a core objective.
- **Global technological influence:** Developing patents and contributing to international standards can strengthen India's position in the global telecom ecosystem.
 - **Ex:** India aims to secure **10% of global 6G patents**.
- **Inclusive digital transformation:** Advanced connectivity can enable remote healthcare, precision agriculture, education and public services in underserved regions.
 - **Ex:** The **New Delhi Declaration on 6G** endorsed networks that are inclusive, affordable and accessible.

Challenges

- **Dependence on foreign technology:** Limited domestic capabilities in advanced semiconductors and specialised telecom components can constrain technological autonomy.
 - **Ex:** India meets approximately **90% of its semiconductor demand through imports**, highlighting dependence on foreign chip supplies.
- **High research and development costs:** Developing advanced antennas, terahertz communication and intelligent network architectures requires specialised expertise and substantial investment.
 - **Ex:** Allocating ₹271 crore across 104 projects may **fragment funding for capital-intensive 6G prototyping and indigenous chip design**.
- **Cybersecurity vulnerabilities:** Greater connectivity and AI-enabled networks may expand the attack surface for cybercrime, surveillance and disruption of critical services.
 - **Ex:** CERT-In recorded **29.44 lakh cybersecurity incidents in 2025**, illustrating India's wider cybersecurity burden.
- **High-frequency propagation limitations:** Terahertz signals face attenuation and obstruction, making reliable coverage difficult without suitable network design.
 - **Ex:** India's **270 GHz testbed demonstrated a line-of-sight link**, highlighting propagation challenges at very high frequencies.

- **Digital divide and affordability:** Expensive devices and infrastructure may restrict access to advanced connectivity in rural and low-income areas.
 - **Ex:** In December 2025, rural tele-density was **59.63%**, compared with **148.92% in urban India**.

Way Forward

- **Strengthen indigenous research:** Expand support for domestic researchers, startups and manufacturers to develop core 6G technologies and reduce external dependence.
 - **Ex:** The **Telecom Technology Development Fund (TTDF)** supports indigenous telecom research and development.
- **Build testing and prototyping capacity:** Expand facilities to validate network components, interoperability, performance and security before commercial deployment.
 - **Ex:** A government-approved **6G terahertz testbed at SAMEER, Kolkata**, involves IIT Madras, IIT Guwahati and IIT Patna.
- **Promote industry-academia collaboration:** Connect universities, startups, telecom operators and manufacturers to accelerate commercialisation and patent generation.
 - **Ex:** The **Bharat 6G Alliance** brings together industry, academia and research institutions to advance India's 6G ecosystem.
- **Shape global standards and spectrum policy:** Participate in international standard-setting to protect India's interests and support interoperable 6G networks.
 - **Ex:** The Department of Telecommunications released a **Spectrum Roadmap for 6G**, outlining short-, medium- and long-term spectrum planning.
- **Ensure secure and inclusive deployment:** Integrate cybersecurity and privacy safeguards while prioritising affordable connectivity for underserved communities.
 - **Ex:** The **New Delhi Declaration on 6G** endorsed networks that are secure, resilient, interoperable, inclusive and affordable.

India's 6G ambition is not merely about faster internet; it is about **moving from technology consumption to technology creation**. Indigenous research, secure digital infrastructure, domestic innovation and global standard-setting can strengthen digital sovereignty while ensuring that next-generation connectivity remains inclusive and affordable.

KEY WORDS

- **Bharat 6G Vision:** India's roadmap, released in 2023, to develop and deploy 6G technologies and position India as a global leader by 2030.
- **Indigenisation of technology:** Developing and manufacturing technologies domestically to reduce dependence on foreign suppliers.
- **Terahertz communication:** Communication using very high-frequency electromagnetic waves that can support high data rates but face propagation challenges.
- **Spectrum management:** Planning and allocating radio frequencies to enable efficient, interference-free wireless communication.
- **Security-by-design:** Integrating cybersecurity and privacy safeguards into a system from the beginning of its development.
- **Digital divide:** The gap between people or regions with access to affordable, reliable digital services and those without such access.

UPSC PYQ

Data security has assumed significant importance in the digitized world due to rising cyber-crimes. The Justice B. N. Srikrishna Committee Report addresses issues related to data security. What, in your view, are the strengths and weaknesses of the Report relating to protection of personal data in cyber space? **(15marks, 250 words)**

FOREIGN PORTFOLIO INVESTMENT (FPI) OUTFLOWS

(GS paper III : Indian Economy and Development)

Foreign Portfolio Investment (FPI) outflows refer to the **withdrawal of foreign investors'** money from a country's financial markets by selling financial assets such as shares, bonds and government securities.

- **FPI inflows:** Foreign investors purchase Indian financial assets.
- **FPI outflows:** Foreign investors sell Indian financial assets and repatriate the proceeds abroad.

FPI is generally considered **hot money** because it can move across countries relatively quickly in response to changing economic conditions.

FPI is regulated in India by SEBI under the applicable regulatory framework, while foreign investment policy also involves the Government of India and other relevant authorities.

Why are foreign investors withdrawing?

- **Higher US interest rates and bond yields:** US assets become more attractive relative to emerging-market investments.
- **Strong US dollar:** Investors may prefer dollar-denominated assets, while a weaker rupee reduces dollar returns from Indian investments.
- **High crude oil prices:** India's dependence on imported crude increases import costs, inflationary pressures and the current account deficit risk.
- **Geopolitical uncertainty:** Conflicts and global economic uncertainty encourage investors to shift towards perceived safe-haven assets.
- **Valuation concerns:** Foreign investors may sell Indian shares if valuations appear expensive relative to expected corporate earnings or competing markets.
- **Weak relative market performance:** Investors may shift funds to markets or sectors offering better expected returns.

Recent reports have highlighted the combination of elevated oil prices, rising global yields, rupee weakness and global uncertainty as important factors behind India's current selling pressure.

Impact of FPI outflows on the Indian economy

- **Stock market volatility** - Large-scale selling puts downward pressure on share prices, reduces investor wealth and can weaken market confidence.
- **Depreciation of the rupee** - Repatriation of funds can raise demand for foreign currency, particularly dollars, and put pressure on the rupee.
- **Higher cost of capital** - Falling share prices and uncertain market conditions may make it harder for firms to raise equity capital at attractive valuations.
- **Imported inflation** - If the rupee depreciates, imported crude oil, electronics, machinery and other goods may become more expensive.
- **Monetary policy dilemma** - The RBI may face pressure to manage exchange-rate volatility and inflation without excessively tightening monetary conditions and hurting growth.

Is an FPI outflow always bad?

- FPI outflows are **not necessarily** evidence of a weak domestic economy. They can reflect global portfolio reallocation, profit-booking or changes in risk appetite.
- Their impact **depends on the scale, duration and wider economic context**.

- For instance, strong **domestic institutional investor (DII)** participation can partly offset foreign selling, while robust domestic savings and corporate earnings can support long-term market resilience.

Measures to manage FPI outflows

- **Maintain macroeconomic stability:** Control inflation, fiscal deficits and external imbalances.
- **Strengthen foreign exchange reserves:** Maintain adequate reserves to manage excessive exchange-rate volatility and external shocks.
- **Attract stable capital:** Encourage long-term FDI in manufacturing, infrastructure, renewable energy and other productive sectors.
- **Improve ease of doing business:** Ensure policy predictability, transparent taxation and stable regulation.
- **Deepen domestic capital markets:** Encourage household financial savings, mutual funds and domestic institutional participation.
- **Improve corporate fundamentals:** Promote productivity, earnings growth, innovation and better corporate governance.
- **Maintain exchange-rate flexibility:** Allow the rupee to respond to market forces while the RBI addresses disorderly market movements.

The solution to volatile FPI outflows is not restricting foreign capital indiscriminately, but building strong domestic financial institutions, credible macroeconomic policies and a resilient, investment-friendly economy.

KEY WORDS

- **Hot Money:** Funds that move quickly between countries to earn short-term profits from changes in interest rates or exchange rates.
- **Macroeconomic Stability:** A condition in which an economy has stable prices, steady economic growth, and low unemployment.
- **Capital Flight:** The rapid movement of money out of a country due to economic or political uncertainty.
- **Domestic Institutional Investors (DIIs):** Indian financial institutions, such as mutual funds, insurance companies, and banks, that invest in domestic financial markets.
- **Exchange Rate Flexibility:** A system in which a currency's value is mainly determined by market demand and supply.

ANNUAL SURVEY OF INDUSTRIES 2024-2025

GS-III: Indian Economy – Industrial Growth, Manufacturing, Employment, Investment, Infrastructure & Inclusive Growth

Introduction

The **Annual Survey of Industries (ASI)** is India's principal source of statistics on the **organised/registered manufacturing sector**, providing data on output, GVA, employment, wages, capital formation and industrial structure. The **2024–25 ASI**, released by MoSPI for April 2024–March 2025, indicates broad-based industrial expansion, with **GVA rising 9.59% and employment crossing 2 crore**.

Key Findings of ASI 2024–25

- **Expansion of the industrial base:** The number of registered manufacturing establishments increased, indicating continued formalisation and expansion of industrial activity.
 - **Ex:** Establishments rose from **2.60 lakh in 2023–24 to 2.67 lakh in 2024–25**, a growth of **2.64%**.
- **Higher value addition:** Manufacturing generated greater economic value, reflecting expansion in industrial production and value creation.
 - **Ex:** Manufacturing **GVA increased from ₹24.58 lakh crore to ₹26.94 lakh crore**, registering **9.59% growth**.
- **Employment crossed the 2-crore mark:** Industrial expansion translated into significant employment generation.
 - **Ex:** Persons engaged increased from **1.96 crore to 2.10 crore**, recording **7.19% growth** and adding more than **14 lakh persons**.
- **Capital formation strengthened:** Rising fixed and invested capital indicates increasing productive capacity in manufacturing.
 - **Ex:** **Fixed capital grew by 10.54%**, while invested capital increased by **11.10%** during 2024–25.

Manufacturing as an Engine of Growth and Competitiveness

- **Drives value addition and economic growth:** Manufacturing converts raw materials into higher-value goods, raising productivity and strengthening industrial output.
 - **Ex:** Manufacturing **GVA increased by 9.59%** in 2024–25, reaching **₹26.94 lakh crore**.
- **Generates employment and supports structural transformation:** Expansion of manufacturing creates non-farm jobs and facilitates the movement of labour towards higher-productivity activities.
 - **Ex:** Manufacturing employment crossed **2 crore**, with **more than 14 lakh persons** added in 2024–25.
- **Strengthens high-value and diversified industries:** Automobile, chemical, pharmaceutical, metal and food-processing sectors enhance industrial diversification, domestic value addition and export potential.
 - **Ex:** **Basic metals, motor vehicles, chemicals, pharmaceuticals and food products** together contributed **more than 45% of manufacturing GVA**.
- **Promotes regional industrial development:** Manufacturing clusters create local ecosystems of suppliers, workers and services, while diversification across states can reduce regional concentration.

- **Ex: Maharashtra, Gujarat, Tamil Nadu, Karnataka and Uttar Pradesh** together accounted for **more than 54% of manufacturing GVA**.
- **Enhances global manufacturing competitiveness:** India must move beyond production scale towards technology-intensive, globally integrated and higher-value manufacturing.
 - **Ex: Industry 4.0, AI, robotics, PLI, PM Gati Shakti and the National Logistics Policy** can improve productivity, value chains and global competitiveness.

Challenges Revealed by the Industrial Structure

- **Regional concentration:** A few states continue to account for a disproportionate share of manufacturing activity, creating uneven industrial development.
- **MSME competitiveness:** Smaller firms face constraints related to credit, technology, productivity, infrastructure and market access.
- **Low technological intensity:** Limited R&D, design capabilities and uneven Industry 4.0 adoption can restrict movement towards high-value manufacturing.
- **Global competitiveness pressures:** Indian manufacturers face competition from low-cost producers and increasing international trade and environmental standards.
- **Infrastructure and logistics constraints:** Gaps in transport, power, warehousing and industrial infrastructure can raise production and logistics costs.

Way Forward

- **Use ASI data for targeted industrial policy:** Frame sector-specific policies based on industry-level data to address productivity, investment and employment gaps.
 - **Ex:** Support high-potential sectors such as **electronics, pharmaceuticals and advanced manufacturing**.
- **Promote balanced regional industrialisation:** Use State-level ASI data to identify industrially lagging regions and direct infrastructure and investment towards them.
 - **Ex:** Develop **industrial corridors and manufacturing clusters** in less-industrialised regions.
- **Strengthen MSMEs and technological capabilities:** Improve access to credit, modern technology, skilled labour and global value chains to raise manufacturing productivity.
 - **Ex:** Expand **MSME technology upgradation and Industry 4.0 adoption**.
- **Improve ASI data quality and policy implementation:** Strengthen digital data collection, timeliness and integration with other economic datasets for evidence-based decision-making.
 - **Ex:** Enhance the **ASI web portal** to support reliable, timely and disaggregated industrial statistics.

The **ASI 2024–25** reflects a manufacturing sector expanding in establishments, capital, value addition and employment, providing an important foundation for India's ambition of becoming a global manufacturing hub. The next stage must convert this quantitative expansion into **higher productivity, deeper domestic value addition, wider regional participation and globally competitive manufacturing**, making industry a stronger engine of **Viksit Bharat 2047**.

KEY WORDS

- **Annual Survey of Industries (ASI):** Principal source of statistics on India's registered manufacturing sector, conducted by the **National Statistical Office (NSO), MoSPI**.
- **GVA:** Value added by producers during production; broadly calculated as **output minus intermediate inputs**.
- **Industry 4.0:** Integration of **AI, IoT, robotics, automation, cloud computing and data analytics** into manufacturing to improve productivity, efficiency and competitiveness.
- **Production Linked Incentive (PLI) Scheme:** Provides **financial incentives linked to incremental production and sales** to boost domestic manufacturing, investment and exports in identified sectors.
- **PM Gati Shakti:** A **National Master Plan for multimodal connectivity** that integrates infrastructure planning across ministries to improve logistics efficiency and reduce project delays.
- **National Logistics Policy (NLP):** Aims to create a **technology-enabled, integrated and cost-efficient logistics ecosystem** to reduce logistics costs and improve India's global competitiveness.
- **Registered manufacturing sector:** Manufacturing establishments falling within the coverage of ASI, including factories, specified electricity undertakings, bidi/cigar units and certain large establishments.

UPSC PYQ

Faster economic growth requires increased share of the manufacturing sector in GDP, particularly of MSMEs. Comment on the present policies of the Government in this regard.”(2023)

GREEN ENERGY CORRIDOR

GS-III: Infrastructure – Energy / Environment – Renewable Energy Transition / Economy – Energy Security

Introduction

India's renewable-energy transition increasingly requires not only higher generation capacity but also **adequate transmission and storage infrastructure** to evacuate and balance intermittent renewable power. The **Green Energy Corridor (GEC)** is designed to strengthen transmission networks in renewable-rich regions. With India having around **263 GW of renewable energy capacity**, GEC Phase III aims to facilitate evacuation of **135 GW of renewable energy** along with **50 GWh of Battery Energy Storage Systems (BESS)**.

Key features of GEC

GEC Phase I

- **Initial transmission expansion:** Focused on strengthening **intra-state transmission infrastructure** in renewable-rich States to evacuate renewable power.
 - **Ex:** GEC-I was approved in **2015** with Central Financial Assistance for transmission infrastructure.
- **Focused on renewable-rich States:** Targeted States with significant solar and wind potential to integrate renewable generation into the grid.
 - **Ex:** States such as **Tamil Nadu, Rajasthan, Gujarat, Andhra Pradesh, Karnataka and Madhya Pradesh** were covered.
- **Foundation for large-scale renewable integration:** Created the initial transmission backbone required for India's growing renewable-energy capacity.
 - **Ex:** GEC-I was designed to facilitate evacuation of around **24 GW of renewable energy**.

GEC Phase II

- **Expanded renewable evacuation capacity:** Built upon Phase I to accommodate the rapid increase in India's solar and wind capacity.
 - **Ex:** GEC-II was designed to facilitate evacuation of around **20 GW of renewable energy**.
- **Prepared the grid for higher renewable penetration:** Enhanced transmission capacity ahead of India's ambitious renewable-energy targets.

GEC Phase III

- **Large-scale renewable evacuation:** The phase substantially expands India's capacity to transmit renewable electricity.
 - **Ex:** It will facilitate evacuation of **135 GW of renewable energy**.
- **Large-scale battery storage:** Storage infrastructure is incorporated to address intermittency and improve grid reliability.
 - **Ex:** **50 GWh of BESS** will be established under the programme.
- **Significant financial investment:** Large public investment reflects the importance of transmission infrastructure for India's energy transition.
 - **Ex:** GEC-III has a total outlay of around **₹1.86 lakh crore**, including approximately **₹1.36 lakh crore for intra-state transmission systems**.
- **Central financial support:** Government support helps reduce the financial burden of transmission development and contain electricity costs.

- **Ex:** The Centre will provide around **₹54,082 crore as Central Financial Support**.
- **Long-term implementation:** The programme is designed to support India's renewable expansion over the coming decade.
 - **Ex:** GEC-III is targeted for completion by **FY 2032–33**.

Economic, Environmental and Developmental Significance

- **Promotes green infrastructure-led growth:** Expansion of transmission and storage infrastructure creates demand for engineering, construction, manufacturing and clean-energy services.
 - **Ex:** GEC-III can generate employment across **power, manufacturing, construction and energy-storage sectors**.
- **Strengthens domestic clean-energy ecosystem:** Large-scale deployment of transmission equipment and BESS can stimulate domestic manufacturing and technological capabilities.
 - **Ex:** Expansion of **50 GWh BESS** can support India's emerging battery and energy-storage industry.
- **Enables green industrialisation:** Reliable access to renewable electricity can support low-carbon industrial sectors and improve India's competitiveness.
 - **Ex:** Greater renewable integration can support **green hydrogen, green steel and renewable-powered manufacturing**.
- **Enables sustainable economic growth:** Transmission infrastructure allows growing electricity demand from industry, transport and urbanisation to be increasingly met through renewable sources.
 - **Ex:** Renewable power can increasingly support **electrification of transport and industrial processes** without proportionate growth in fossil-fuel consumption.

Challenges

- **High capital requirement:** Transmission corridors and large-scale storage require substantial upfront investment.
 - **Ex:** The **₹1.86 lakh crore** GEC-III outlay illustrates the significant financial requirement of renewable-grid expansion.
- **Land and right-of-way constraints:** Transmission projects can face delays due to land acquisition, forest clearances and local opposition.
 - **Ex:** High-voltage transmission lines may require large **rights-of-way across multiple districts and States**.
- **Renewable intermittency:** Transmission expansion alone cannot completely address fluctuations in solar and wind generation.
 - **Ex:** Solar power generation falls sharply after sunset, creating a need for **BESS, pumped storage and other flexible resources**.

Way Forward

- **Integrate generation, transmission and storage planning:** Renewable capacity should be planned alongside evacuation and balancing infrastructure.
 - **Ex:** Future renewable projects can be synchronised with **transmission corridors and BESS capacity** from the planning stage itself.
- **Diversify energy-storage technologies:** India should combine batteries with long-duration storage technologies to manage different grid requirements.

- **Ex:** Greater deployment of **Pumped Storage Projects (PSPs) alongside BESS** can provide both short- and long-duration flexibility.
- **Strengthen domestic manufacturing:** Building domestic capabilities in batteries, transformers, power electronics and transmission equipment can reduce external dependence.
 - **Ex:** Linking storage expansion with **domestic battery manufacturing** can strengthen India's clean-energy supply chain.
- **Streamline project clearances:** Faster land, forest and environmental clearances can reduce delays and cost overruns.
 - **Ex:** Improved **single-window and coordinated clearance mechanisms** can accelerate transmission-line construction.
- **Promote smart-grid technologies:** Digital monitoring, forecasting and automated grid management can improve the integration of variable renewable energy.
 - **Ex:** **AI-based renewable forecasting and smart-grid systems** can improve real-time balancing of solar and wind power.

The **Green Energy Corridor is the transmission backbone of India's renewable-energy transition**. GEC Phase I, II and III marks a shift from merely expanding renewable generation towards an integrated ecosystem of **generation, transmission and storage**. By enabling up to **135 GW of renewable-energy evacuation and 50 GWh of storage**, by phase III it can strengthen energy security, reduce emissions and support India's journey towards a **reliable, flexible and sustainable energy system**.

KEY WORDS

- **Green Energy Corridor (GEC):** Transmission infrastructure programme designed to facilitate the **integration and evacuation of renewable energy** into the electricity grid.
- **BESS: Battery Energy Storage System** that stores electricity and supplies it when required, helping manage renewable intermittency.
- **Intra-State Transmission System:** Transmission network carrying electricity **within a State**, connecting generation centres with load centres.
- **AI-based renewable forecasting:** Uses **AI/ML to predict solar and wind power generation** based on weather and historical data, helping grid operators balance supply and demand.
- **Smart-grid systems:** Digitally enabled electricity networks that use **sensors, automation and real-time data** to monitor and efficiently manage power generation, transmission and distribution.
- **Right-of-way (RoW):** The **legal permission to use a specific stretch of land** for infrastructure such as transmission lines, roads or pipelines, without necessarily owning the land.
- **Pumped Storage Projects (PSPs):** Hydropower systems that store electricity by pumping water to an upper reservoir during surplus power and generating electricity by releasing it through turbines when demand is high.

UPSC PYQ

“India has immense potential for solar energy though there are regional variations in its developments. Elaborate.”(2020)

DISTRICTS AS EXPORT HUBS: DECENTRALISING INDIA'S EXPORT STRATEGY

GS Paper III – Indian Economy, Infrastructure, Industrial Policy, MSMEs and Inclusive Growth

Background

India's export performance is closely linked to its manufacturing capacity, logistics infrastructure, trade policies and integration with global value chains. However, export activity remains concentrated in certain industrial clusters and states, while many districts with agricultural, manufacturing and traditional-product potential remain underutilised.

Decentralising India's export strategy involves enabling districts to participate directly in international trade by strengthening local production, improving connectivity, facilitating access to global markets and supporting small businesses. This approach can transform local economic strengths into export opportunities while promoting balanced regional development. The objective is not merely to increase export volumes but also to broaden the geographical base of exports, generate employment and improve the competitiveness of local enterprises.

Why Is Decentralising India's Export Strategy Important?

- **Regional imbalance:** Export opportunities are concentrated in established industrial and commercial centres, limiting the participation of less-developed regions.
- **Untapped local potential:** Districts possess diverse agricultural products, handicrafts, textiles, minerals and manufacturing capabilities that can serve international markets.
- **MSME participation:** Smaller enterprises often face difficulties in accessing overseas buyers, export finance, certification and logistics.
- **Employment generation:** Export-oriented production can create jobs in manufacturing, food processing, packaging, transport and warehousing.
- **Economic resilience:** Expanding exports across districts and sectors can reduce excessive dependence on a limited number of industrial clusters.
- **Global value-chain integration:** Stronger district-level production networks can help Indian enterprises become suppliers to international manufacturing and distribution networks.

Key Dimensions of a Decentralised Export Strategy

1. Strengthening District-Level Production

- Identify products and services with genuine competitive advantages in each district.
- Develop specialised production clusters and improve links between farmers, manufacturers, processors and exporters.
- Encourage value addition instead of relying primarily on the export of raw materials.

2. Improving Trade and Logistics Infrastructure

- Strengthen road, rail and port connectivity to reduce transportation costs.
- Develop warehouses, cold-chain facilities, testing laboratories and common processing centres.
- Improve access to inland container depots, logistics parks and export-related services where commercially viable.

3. Integrating MSMEs into Global Markets

- Simplify export documentation and improve access to export credit and insurance.

- Provide assistance with international quality standards, certification, packaging and product design.
- Encourage digital platforms and e-commerce channels to connect smaller producers with overseas buyers.

4. Promoting Cooperative Centre–State–District Governance

- Improve coordination between Central ministries, state governments, district administrations and industry bodies.
- Align industrial policy, skill development, infrastructure investment and export promotion.
- Establish measurable district-level export targets based on local economic conditions.

5. Diversifying Products and Export Markets

- Promote processed agricultural products, engineering goods, textiles, handicrafts and emerging manufacturing sectors.
- Encourage exporters to explore new geographical markets.
- Help businesses adapt to changing international standards and sustainability requirements.

Government Initiatives Supporting Decentralised Exports

- **Districts as Export Hubs (DEH):** Seeks to identify district-level export potential and address local barriers through district-specific planning.
- **One District One Product (ODOP):** Promotes distinctive products associated with districts and supports their visibility and market access.
- **Export Promotion Mission:** Aims to strengthen export competitiveness, particularly by addressing the needs of MSMEs and other exporters.
- **PM Gati Shakti National Master Plan:** Supports integrated infrastructure planning and improved multimodal connectivity.
- **Foreign Trade Policy 2023:** Provides the broader policy framework for facilitating trade and promoting India's export competitiveness.

Key Challenges

- **Infrastructure disparities:** Many districts lack efficient logistics networks, testing facilities and reliable industrial infrastructure.
- **High export costs:** Freight, certification, compliance and financing costs can reduce the competitiveness of small producers.
- **Limited institutional capacity:** Some districts lack specialised personnel and reliable data for identifying and developing export opportunities.
- **Quality constraints:** Local producers may struggle to meet international standards, consistency requirements and sustainability norms.
- **Market access barriers:** Smaller firms often lack international networks, market intelligence and bargaining power.
- **Uneven regional capabilities:** Differences in skills, industrial development and access to finance can widen the gap between districts.

Way Forward

- **Adopt a district-specific approach:** Design export strategies according to local resources, production capabilities and international demand rather than applying a uniform model.
- **Prioritise value addition:** Develop processing and manufacturing capabilities to increase domestic value creation.
- **Improve logistics efficiency:** Address last-mile connectivity and provide shared infrastructure for smaller exporters.
- **Strengthen export institutions:** Build the capacity of district administrations and establish coordination mechanisms among government agencies.
- **Support MSMEs:** Expand access to finance, technology, market intelligence and export-related training.
- **Promote sustainable production:** Encourage resource-efficient manufacturing and compliance with international environmental and labour standards.

Conclusion

Decentralising India's export strategy can make international trade a broader driver of economic development rather than an activity concentrated in a few established centres. By combining local production strengths with infrastructure, finance, technology and global market access, India can expand its export base and create employment across regions. The success of this approach will depend on translating district-level potential into competitive, sustainable and market-oriented production.

KEYWORDS

1. **Export diversification:** Expansion of exports across products, sectors and geographical markets.
2. **Regional economic disparity:** Unequal distribution of economic activity and opportunities across regions.
3. **Global value chains:** International production networks in which different stages of production occur across countries.
4. **Value addition:** Increasing a product's economic worth through processing, manufacturing or improved design.
5. **Export competitiveness:** The ability of domestic producers to compete effectively in international markets.
6. **Trade facilitation:** Measures that simplify trade procedures and reduce the time and cost of cross-border transactions.

INDIA'S NEW GDP SERIES: METHODOLOGY AND MEASUREMENT CHALLENGES

GS Paper III – Indian Economy

Indian economy and issues relating to planning, mobilisation of resources, growth, development and employment; Government Budgeting and major economic indicators

Introduction:

India's GDP series provides the statistical framework for measuring the size and growth of the Indian economy. Periodic revisions in the base year, data sources, methodology and estimation techniques are necessary to capture structural changes in the economy. However, changes in methodology can also create challenges relating to comparability, data quality, informal-sector measurement and credibility of official estimates.

What is the New GDP Series ?:

- **Revision of Base Year:** The new GDP series seeks to update the base year to better reflect the current structure of the Indian economy.
 - **Ex:** A more recent base year can give greater weight to emerging sectors such as digital services, e-commerce and modern manufacturing.
- **Updated Data Sources:** The revised series incorporates newer administrative and survey-based datasets to improve the coverage of economic activity.
 - **Ex:** GST data, MCA corporate filings and other administrative databases can provide more comprehensive information on registered businesses.
- **Improved Estimation Methodology:** The methodology is updated to capture changes in production, consumption, investment and value addition more accurately.
 - **Ex:** Greater use of enterprise-level and administrative data can improve estimates of the organised corporate sector.
- **Better Sectoral Coverage:** The new series attempts to capture the changing composition of India's economy, including services, manufacturing and emerging economic activities.
 - **Ex:** The growing importance of IT, digital services and financial services requires better measurement than older statistical frameworks.

Significance:

- **Reflects Structural Changes:** A new GDP series helps ensure that national income statistics reflect the contemporary structure of the Indian economy.
 - **Ex:** The increasing contribution of services and technology-based businesses can be better incorporated.
- **Improves Accuracy:** Updated databases and estimation techniques can reduce gaps in economic measurement.
 - **Ex:** GST and MCA databases can supplement traditional surveys and improve estimates of formal-sector activity.
- **Better Policy Formulation:** Reliable GDP estimates are essential for designing fiscal, monetary and development policies.
 - **Ex:** GDP growth estimates influence decisions of the RBI on monetary policy and government decisions on public expenditure.
- **International Comparability:** A modern statistical framework helps India maintain internationally accepted standards for national accounts.

- **Ex:** National accounts methodology is periodically aligned with evolving UN System of National Accounts (SNA) standards.
- **Improves Sectoral Policy:** More accurate sector-wise data enables targeted interventions.
 - **Ex:** Better measurement of manufacturing value addition can help assess the impact of Make in India and PLI schemes.

Methodological Changes:

- **Updated Base Year:** The base year is revised periodically so that the prices and production structure used for comparison remain relevant.
 - **Ex:** An outdated base year may give excessive weight to sectors that were more important in the past.
- **Greater Use of Administrative Data:** Government databases are increasingly used alongside traditional surveys.
 - **Ex:** GST returns and MCA corporate filings can provide high-frequency information on registered enterprises.
- **Improved Coverage of Informal Sector:** The methodology seeks to better estimate activities outside the formal corporate economy.
 - **Ex:** Information from unincorporated enterprises and labour surveys can help capture informal employment and production.
- **Supply-Use Framework:** A supply-use approach can help reconcile production and expenditure-side estimates.
 - **Ex:** Output reported by producers can be cross-checked against the consumption and investment expenditure recorded elsewhere in the economy.
- **Greater Use of Deflators:** Real GDP requires adjustment for price changes to distinguish genuine growth from inflation.
 - **Ex:** Appropriate sector-specific price indices provide a better estimate of real value added.

Major Measurement Challenges:

- **Informal Sector Measurement:** A large part of India's economic activity occurs through informal and unincorporated enterprises, which are difficult to measure regularly.
 - **Ex:** Small retailers, household enterprises and informal workers may not have detailed administrative records.
- **Data Gaps and Time Lag:** Surveys may be conducted periodically, while economic conditions can change rapidly.
 - **Ex:** A sudden shock such as the COVID-19 pandemic can make older survey benchmarks less representative of current economic activity.
- **Corporate Sector Bias:** Greater dependence on MCA and GST data may improve formal-sector measurement but may not fully capture informal businesses.
 - **Ex:** A rise in formalisation may appear as stronger measured activity even when part of the change reflects a shift in reporting rather than equivalent growth in underlying production.
- **Difficulty in Measuring Digital Economy:** Digital platforms and new business models often generate economic value that is difficult to capture through traditional statistical methods.
 - **Ex:** Free digital services, platform-based work and data-driven businesses pose challenges for conventional GDP measurement.

- **State-Level Measurement:** Differences in statistical capacity across States can affect the quality and consistency of State Domestic Product estimates.
 - **Ex:** States with weaker statistical systems may face greater difficulties in collecting reliable enterprise and sectoral data.

Way Forward:

- **Strengthen Statistical Capacity:** Invest in modern statistical infrastructure, skilled manpower and digital data systems.
 - **Ex:** Strengthening the Ministry of Statistics and Programme Implementation (MoSPI) and State statistical agencies can improve data quality.
- **Improve Informal-Sector Surveys:** Conduct more frequent and comprehensive surveys of unincorporated enterprises and informal employment.
 - **Ex:** Regular enterprise surveys can provide updated benchmarks between major national sample surveys.
- **Integrate Multiple Data Sources:** Combine surveys, administrative databases and big-data sources while maintaining statistical safeguards.
 - **Ex:** GST, MCA, EPFO and labour-market datasets can complement traditional surveys.
- **Improve Digital Economy Measurement:** Develop specialised methodologies for platform businesses, digital services, gig work and data-driven economic activity.
 - **Ex:** Satellite accounts for the digital economy can supplement conventional national accounts.
- **Strengthen Independent Statistical Credibility:** Maintain professional autonomy, methodological consistency and peer review in the statistical system.
 - **Ex:** Greater involvement of economists, statisticians and independent experts can improve confidence in revised estimates.

Conclusion

A revised GDP series is essential to ensure that India's economic statistics keep pace with its structural transformation, formalisation and digitalisation. However, credible measurement requires not merely a new methodology but also high-quality data, better informal-sector coverage, transparent revisions and strong statistical institutions. A robust national accounting system will enable India to measure growth more accurately and design evidence-based policies for inclusive and sustainable development.

KEY WORDS

- **GDP:** Market value of final goods and services produced within an economy during a given period.
- **Base Year:** Reference year against which prices and economic structure are compared for calculating real GDP.
- **Nominal GDP:** GDP measured at current prices.
- **Real GDP:** GDP adjusted for price changes.
- **GDP Deflator:** Broad measure of price changes in domestically produced goods and services.
- **GVA:** Value of output minus intermediate consumption; measures value added by different sectors.
- **National Accounts:** Systematic framework for measuring production, income and expenditure in an economy.

CARBON MARKETS AND INDIA'S CARBON CREDIT TRADING SCHEME (CCTS)

GS Paper III – Environment & Economy

Environmental pollution and degradation; Conservation and environmental impact; Carbon markets and climate-change mitigation.

Introduction:

A carbon market is a market-based mechanism that puts a price on greenhouse-gas emissions by allowing the trading of carbon credits or emission allowances. India is developing its own Carbon Credit Trading Scheme (CCTS) to create economic incentives for reducing emissions, promote low-carbon technologies and support its transition towards a low-carbon economy while pursuing its climate commitments.

What are Carbon Markets?

- Carbon markets allow entities to buy and sell instruments representing greenhouse-gas emission reductions or permitted emissions.
 - **Ex:** A company that reduces emissions beyond its requirement can generate credits and sell them to another entity.
- One carbon credit generally represents one tonne of CO₂-equivalent (tCO₂e) reduced, avoided or removed, subject to the applicable methodology.
 - **Ex:** A verified renewable-energy or energy-efficiency project may generate tradable carbon credits.

Types of Carbon Markets:

- **Compliance Carbon Market:** Entities are legally required to meet prescribed emission limits or surrender allowances/credits.
 - **Ex:** India's CCTS is developing a compliance mechanism for obligated entities.
- **Voluntary Carbon Market:** Companies voluntarily purchase credits to support emission-reduction projects or meet self-imposed climate commitments.
 - **Ex:** A company may purchase credits from a verified afforestation project to compensate for part of its emissions

India's Carbon Credit Trading Scheme (CCTS):

The Carbon Credit Trading Scheme (CCTS) was notified by the Government of India in June 2023 under the Energy Conservation Act, 2001, creating the institutional framework for a domestic carbon market.

Objectives:

- **Reduce GHG Emissions:** Create financial incentives for industries to reduce their emissions.
 - **Ex:** Energy-intensive industries can adopt energy-efficient technologies to reduce their emission intensity.
- **Promote Low-Carbon Technologies:** Carbon pricing can make cleaner technologies more economically attractive.
 - **Ex:** Industries may shift towards renewable electricity, green hydrogen or energy-efficient production processes.
- **Mobilise Private Investment:** Tradable carbon credits can generate an additional revenue stream for emission-reduction projects.
 - **Ex:** Investments in renewable-energy and carbon-removal projects can become more financially viable.

- **Support India's Climate Goals:** The scheme complements India's broader objective of achieving net-zero emissions by 2070.
 - **Ex:** Carbon pricing can encourage gradual decarbonisation of hard-to-abate sectors.

Key Features of CCTS:

- **Two Mechanisms:** The CCTS provides for a compliance mechanism as well as an offset mechanism.
 - **Ex:** Obligated entities can meet their targets through compliance credits, while eligible non-obligated projects can potentially generate offset credits.
- **Emission-Intensity Targets:** Under the compliance mechanism, designated consumers are assigned targets relating to the greenhouse-gas emission intensity of their products.
 - **Ex:** An industrial unit reducing its emission intensity beyond the prescribed level may earn carbon credits.
- **Carbon Credit:** One Carbon Credit Certificate (CCC) represents one tonne of CO₂-equivalent of emissions reduced, avoided or removed.
 - **Ex:** A verified emission-reduction project generating 10,000 tCO₂e of reductions could potentially receive 10,000 CCCs, subject to the scheme's rules.
- **Bureau of Energy Efficiency (BEE):** Acts as the administrator of the Indian carbon market.
 - **Ex:** BEE is responsible for developing the institutional framework and procedures for the scheme.
- **Grid Controller of India Limited (Grid-India):** Acts as the registry for the Indian Carbon Market.
 - **Ex:** The registry maintains records relating to carbon credit certificates.

Significance for India:

- **Cost-Effective Decarbonisation:** Carbon markets allow emission reductions to occur where they are relatively cheaper.
 - **Ex:** An industry with lower-cost abatement opportunities can reduce emissions and generate credits.
- **Industrial Competitiveness:** Carbon pricing can encourage Indian industries to improve energy efficiency and prepare for increasingly stringent global climate regulations.
 - **Ex:** Indian exporters can benefit from lower carbon intensity as global markets introduce carbon-related trade measures.
- **Green Investment:** Creates a potential financial incentive for renewable energy, energy efficiency and carbon-removal projects.
 - **Ex:** Carbon-credit revenues can supplement returns from clean-energy projects.
- **Technology Innovation:** Encourages industries to adopt cleaner technologies.
 - **Ex:** Green hydrogen, electrification and energy-efficient industrial processes can become more attractive.
- **International Climate Finance:** A credible domestic carbon market can help channel private capital towards India's climate-transition needs.
 - **Ex:** Domestic and international investors may participate in verified emission-reduction projects.

Challenges:

- **Measurement, Reporting and Verification (MRV):** Accurate measurement of emission reductions is essential for the credibility of carbon credits.

- **Ex:** Weak verification could result in credits being issued for emission reductions that are overstated or did not actually occur.
- **Additionality Problem:** It can be difficult to establish whether a project reduced emissions because of carbon-market incentives or would have done so anyway.
 - **Ex:** A renewable-energy project that was already commercially viable may not represent genuinely additional emission reductions.
- **Greenwashing:** Poor-quality credits can allow companies to claim climate action without achieving meaningful emission reductions.
 - **Ex:** Questionable offset projects may create a perception of decarbonisation without equivalent real-world benefits.
- **Carbon Leakage:** Production may shift from regulated regions or industries to less-regulated jurisdictions rather than genuinely reducing global emissions.
 - **Ex:** Carbon-intensive manufacturing could relocate to countries with weaker climate regulations.

Way Forward:

- **Strengthen MRV:** Develop robust, transparent and independently verifiable systems for measuring emission reductions.
 - **Ex:** Use digital monitoring, standardised methodologies and third-party verification.
- **Ensure High-Integrity Credits:** Establish stringent additionality, permanence and leakage criteria.
 - **Ex:** Credits should represent real, measurable and additional emission reductions.
- **Gradual Expansion of Coverage:** Expand the compliance mechanism carefully to more sectors as institutional capacity improves.
 - **Ex:** Gradually incorporate other energy-intensive and hard-to-abate industries.
- **Provide Predictable Carbon Pricing:** Develop a market framework that gives industries sufficient certainty for long-term investments.
 - **Ex:** Clear rules on credit issuance, trading and compliance can improve investor confidence.

Conclusion:

India's Carbon Credit Trading Scheme represents a shift from a predominantly regulatory approach to a market-based approach to climate mitigation. If supported by credible MRV, high-quality credits, transparent institutions and predictable carbon pricing, CCTS can convert emission reduction from a regulatory obligation into an economic opportunity, helping India reconcile climate action, industrial competitiveness and sustainable economic growth.

KEY WORDS:

- **Carbon Credit:** Tradable unit representing one tonne of CO₂-equivalent emission reduction, avoidance or removal.
- **Carbon Pricing:** Assigning an economic cost to greenhouse-gas emissions.
- **MRV:** Measurement, Reporting and Verification of emissions and emission reductions.
- **Additionality:** Requirement that an emission reduction would not have occurred without the carbon-market intervention.
- **Carbon Leakage:** Shift of emissions or carbon-intensive production to jurisdictions with weaker climate regulations.
- **Carbon Offset:** Reduction or removal of emissions in one place used to compensate for emissions elsewhere.

MODEL QUESTIONS

1. "Universal Health Coverage is essential for achieving social equity and sustainable human development in India. Discuss the major challenges in achieving UHC and suggest measures to ensure accessible and affordable healthcare for all."
2. "Census is not merely a population-counting exercise but an essential instrument for evidence-based governance and inclusive development. Discuss the significance and challenges of conducting Census 2027 in India."
3. India-Russia relations have evolved from a defence-centric partnership into a broader strategic partnership. Discuss the significance of India-Russia relations for India's strategic autonomy, defence and energy security, and Eurasian connectivity. Also examine the major challenges confronting the relationship. (15 marks, 250 words)
4. "The Legal Metrology (Indian Standard Time) Rules, 2026 are an important step towards technological sovereignty and critical infrastructure security." Discuss. (10 marks, 150 words)
5. "One Nation, One Time is not merely an administrative reform but a strategic technology initiative." Analyse with reference to NavIC and indigenous timing infrastructure. (15 marks, 250 words)
6. "Foreign funding regulation requires a balance between national security, financial accountability and the autonomy of civil society organisations." Examine the key provisions of the Foreign Contribution (Regulation) Amendment Bill, 2026 and discuss the challenges associated with its implementation. (15 Marks, 250 Words)
7. "BRICS has evolved from an economic grouping into an important platform for advancing the interests of the Global South. However, its growing membership and internal geopolitical divergences also pose challenges to its effectiveness." Discuss the significance of BRICS for India and examine the challenges faced by the grouping.
8. "The Shanghai Cooperation Organisation (SCO) has emerged as an important platform for addressing security, connectivity and developmental challenges in Eurasia. However, internal geopolitical divergences limit its effectiveness." Discuss the significance of the SCO for India and examine the key challenges confronting the organisation. Suggest measures to strengthen its role.
9. India's rapid expansion of data centres is creating new environmental challenges. Discuss the impact of data centres on energy and water resources and suggest measures for sustainable growth. (10 marks, 150 words).
10. "The increasing integration of Artificial Intelligence into warfare is transforming the nature of modern conflicts, while Lethal Autonomous Weapons Systems raise serious ethical, legal and strategic concerns." Discuss the role of AI in modern warfare, examine the concerns associated with Lethal Autonomous Weapons Systems (LAWS), and suggest measures to ensure meaningful human control over autonomous weapons. (15 Marks, 250 Words)
11. "AFSPA represents a difficult balance between the imperatives of national security and the protection of civil liberties." Discuss the need for AFSPA, examine the concerns associated with its implementation, and suggest measures to ensure greater accountability while maintaining internal security. (15 Marks, 250 Words)
12. Geothermal energy remains an underutilised renewable resource in India. Discuss its potential, challenges and measures to promote its development. (15 Marks, 250 Words)

13. India's 6G ambitions are not merely a technological pursuit but also a strategic imperative for achieving digital sovereignty." Discuss the opportunities and challenges involved in realising this objective (15marks, 250 words)
14. What are Foreign Portfolio Investment (FPI) outflows? Examine the major factors responsible for FPI outflows from India. 150 words
15. "FPI outflows are not necessarily a reflection of weakness in the Indian economy." Discuss in the context of India's macroeconomic fundamentals and domestic investment ecosystem. 250 words
16. "India's manufacturing expansion cannot be sustained without strengthening the productivity and competitiveness of MSMEs. Discuss in the context of the findings of the Annual Survey of Industries 2024-25." (150 words)
17. "The Green Energy Corridor is critical for integrating India's rapidly expanding renewable-energy capacity into the national grid." Discuss the significance of Green Energy Corridor Phase III in ensuring energy security and accelerating India's clean-energy transition. (15 marks, 250 words)
18. "Decentralising India's export strategy can promote regional economic development and strengthen the global competitiveness of Indian enterprises." Examine the opportunities and challenges associated with this approach.
19. "India's periodic revision of the GDP series is necessary to capture the changing structure of the economy, but it also raises concerns regarding data quality, comparability and measurement of informal and emerging sectors." Examine the methodological and measurement challenges associated with India's new GDP series and suggest measures to strengthen the national statistical system.
20. Explain the concept of carbon markets. Examine how India's Carbon Credit Trading Scheme can contribute to achieving its climate commitments while balancing economic growth and industrial competitiveness.