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CURRENT AFFAIRS

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POLITY

Removal of the Lok Sabha Speaker: Constitutional Framework and Practice

📌 **Syllabus Mapping:**

- ✅ **GS Paper II – Polity (Parliament; Constitutional Offices; Parliamentary Procedures)**
- ✅ **GS Paper II – Governance (Accountability Mechanisms; Separation of Powers)**

Introduction

Recently, the Opposition moved a resolution seeking the removal of the **Lok Sabha Speaker**. The procedure for such removal is rooted in constitutional safeguards designed to balance **institutional neutrality** with **parliamentary accountability**.

The Speaker's office occupies a pivotal position in India's parliamentary democracy, often described as the guardian of the House's dignity and privileges.

Constitutional Basis
Article 94 of the Constitution

Article 94 provides for:

- Vacation of office,
- Resignation, and
- Removal of the Speaker and Deputy Speaker.

Article 94(c)

A Speaker or Deputy Speaker:

- May be removed by a resolution of the House of the People.
- The resolution must be passed by a **majority of all the then members of the House** (effective majority).

This ensures stability while allowing democratic accountability.

Procedure for Removal

1. Notice of Resolution

- A member intending to move the resolution must submit a **written notice** to the **Secretary-General of the Lok Sabha**.

2. Support Requirement

- The resolution must be supported by **at least 50 members** for it to be admitted.

This threshold prevents frivolous or politically motivated motions.

3. Notice Period

- A **minimum 14-day notice period** is mandatory before moving the resolution.

This cooling-off period ensures deliberation and procedural fairness.

4. Listing and Motion for Leave

- After notice, a motion seeking leave to move the resolution is included in the **List of Business** on a date fixed by the Speaker.

5. Speaker's Position During Discussion

- The Speaker **cannot preside** over the House during discussion of the resolution.
- However, the Speaker:
  - May speak in defence,
  - Participate in proceedings,
  - Vote in the first instance (as a member),
  - Cannot exercise a casting vote in case of a tie.

This ensures procedural fairness while safeguarding dignity of office.

Majority Requirement Explained

The required majority is: **Majority of all the then members of the House** (effective majority).

For example, if the effective strength of the House is 540, at least 271 members must vote in favour.

This is different from:

- Simple majority (present and voting),
- Special majority (two-thirds, etc.).

Historical Precedents

Resolutions for removal have been proposed against:

- **G.V. Mavalankar (1954)**
- **Sardar Hukam Singh (1966)**
- **Balram Jakhar (1987)**

In all cases, the motions did not result in removal.

Historically, the Speaker's office has retained stability despite political contestation.

Significance of the Speaker's Office

The Speaker:

- Presides over House proceedings.
- Decides on Money Bills (Article 110).
- Exercises powers under the Tenth Schedule (anti-defection law).
- Ensures orderly debate and parliamentary discipline.

Thus, removal motions often arise in politically charged contexts.

Constitutional Philosophy

The removal mechanism reflects:

- **Checks and balances within Parliament**.
- Accountability of constitutional offices.
- Protection of institutional integrity.

Dr. B.R. Ambedkar emphasized that constitutional morality requires offices to function beyond partisan considerations.

Issues and Debates

- Allegations of partisanship in certifying Money Bills.
- Controversies in anti-defection decisions.
- Debate over neutrality of the Speaker in a majority-dominated House.

Comparative Perspective:
In the UK, the Speaker resigns from party membership to ensure neutrality—an idea sometimes discussed in India.

Broader Democratic Implications

Aspect	Significance
Institutional Stability	Prevents arbitrary removal
Parliamentary Sovereignty	House retains power to remove
Political Accountability	Mechanism to address alleged bias
Procedural Safeguards	Notice period and support threshold

Conclusion

The removal of the Lok Sabha Speaker is governed by **Article 94(c)** and requires an **effective majority**, supported by procedural safeguards such as minimum notice and member backing. While the mechanism ensures accountability, its stringent requirements preserve institutional stability and prevent misuse.

The true strength of the office, however, lies in maintaining **impartiality, constitutional morality, and public trust**, which are foundational to parliamentary democracy.

Keywords: Article 94, Effective Majority, Parliamentary Accountability, Speaker's Neutrality, Constitutional Morality, Anti-Defection Powers.

Mains Practice Question

"The constitutional procedure for removal of the Lok Sabha Speaker balances accountability with institutional stability. Examine the safeguards and discuss the challenges associated with maintaining the Speaker's neutrality in a majoritarian parliamentary system."

GOVERNANCE

IT (Intermediary Guidelines and Digital Media Ethics Code) Amendment Rules, 2026: Regulating Synthetic and AI-Generated Content

📌 **Syllabus Mapping:**

- ✅ **GS Paper II – Governance (Regulation of Digital Media; Transparency & Accountability; Data Protection)**
- ✅ **GS Paper III – Science & Technology (Artificial Intelligence; Cybersecurity; Emerging Technologies)**
- ✅ **GS Paper III – Internal Security (Cybercrime; Online Radicalisation; Deepfakes)**

Introduction

The Government has notified the **Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Amendment Rules, 2026**, revising the 2021 framework to address risks emerging from **AI-generated and synthetically generated information (SGI)**.

The amendment reflects the growing challenge posed by **deepfakes, AI-driven impersonation, misinformation, and non-consensual synthetic media**, which threaten democratic discourse, cybersecurity, and individual rights.

Background

The original 2021 Rules operationalized due diligence requirements for intermediaries under the **Information Technology Act, 2000**. The 2026 amendment specifically strengthens oversight over **AI-generated content**, recognizing its transformative but potentially disruptive impact.

Key Provisions of the 2026 Amendment

1. Legal Recognition of Synthetic Content

- For the first time, the Rules formally define and regulate **Synthetically Generated Information (SGI)**.
- Targets:
  - Deepfakes
  - AI-based impersonation
- Excludes:
  - Routine editing
  - Academic and training materials

Significance: Provides legal clarity for enforcement agencies and courts.

2. Mandatory Labelling and Traceability

- All SGI must be:
  - Clearly marked as artificial.
  - Embedded with metadata or unique identifiers to trace origin.
- Platforms cannot allow removal or suppression of such labels.

This enhances transparency and accountability.

3. Obligations for Significant Social Media Intermediaries (SSMIs)

SSMIs must:

- Verify user declarations regarding synthetic content.
- Ensure clear disclosure before publication.

Failure to comply may result in loss of **Safe Harbour protection** under **Section 79 of the IT Act**, which otherwise shields intermediaries from liability for third-party content.

This increases compliance pressure on large platforms.

4. Prohibited Synthetic Content

Intermediaries must block AI-generated content involving:

- Child Sexual Abuse Material (CSAM)
- Non-consensual intimate imagery (NCII)
- False documents
- Deceptive impersonation

This strengthens victim protection and public safety.

5. Faster Compliance Timelines

- Content removal upon lawful order: **Within 3 hours** (earlier 36 hours).
- Grievance redressal timeline reduced from **15 days to 7 days**.

This reflects urgency in preventing viral harm.

Rationale: Why Regulation of AI-Generated Content is Necessary

1. Disinformation and Democratic Integrity

- Synthetic media blurs the line between authentic and fabricated content.
- Erodes trust in electoral processes and public discourse.

Deepfakes can distort political narratives and destabilize institutions.

2. Cybersecurity Concerns

- Increase in CSAM and NCII cases.
- Need for traceable metadata for law enforcement.

AI tools can automate and scale cyber exploitation.

3. Legal Enforcement

- Formal recognition of SGI enables:
  - Targeted regulation
  - Faster takedown
  - Accountability mechanisms

Clear definitions reduce ambiguity in judicial interpretation.

Complementary Legal and Institutional Measures

1. Digital Personal Data Protection (DPDP) Act, 2023

- Addresses misuse of personal data, especially in AI manipulation.

2. Bharatiya Nyaya Sanhita (BNS)

- Penalizes forgery, impersonation, and misinformation-related offences.

3. MeitY Advisories (2023–25)

- Reinforce platform due diligence obligations.

4. Indian Cyber Crime Coordination Centre (I4C)

- Monitors AI-enabled cyber threats.
- Coordinates enforcement responses.

Governance and Constitutional Dimensions

Principle	Relevance
Freedom of Speech (Article 19(1)(a))	Must be balanced with reasonable restrictions under Article 19(2)
Right to Privacy (Article 21)	Protection from AI-enabled misuse of personal data
Due Process	Ensuring fair compliance mechanisms
Platform Accountability	Reinforces responsible digital governance

The challenge lies in balancing **innovation and regulation**.

Concerns and Criticisms

- Risk of over-compliance leading to chilling effect on free speech.
- Increased compliance costs for smaller platforms.
- Implementation challenges in identifying AI-generated content accurately.
- Potential misuse of takedown powers.

Proportionality and judicial oversight are crucial safeguards.

Broader Strategic Implications

- Positions India as a proactive regulator of AI ecosystems.
- Aligns with global debates on AI governance (EU AI Act, US AI safety discussions).
- Strengthens digital sovereignty.

Conclusion

The 2026 Amendment to the IT Rules marks a significant shift in India's digital regulatory architecture by formally recognizing and regulating **synthetically generated and AI-based content**.

By mandating labelling, enhancing traceability, tightening platform obligations, and accelerating compliance timelines, the Rules aim to curb disinformation, cyber exploitation, and impersonation. However, the long-term success of this framework depends on ensuring **proportional enforcement, technological feasibility, and protection of constitutional freedoms**.

Keywords: Synthetic Content Regulation, Deepfakes, Safe Harbour, Section 79 IT Act, Digital Governance, Cybersecurity, AI Accountability.

Mains Practice Question

"The regulation of AI-generated synthetic content requires a delicate balance between safeguarding democratic integrity and protecting freedom of expression. Examine the significance and challenges of the IT (Intermediary Guidelines) Amendment Rules, 2026."

Rural Transformation through the 3Is: Institutions, Investment and Inclusion

📌 **Syllabus Mapping:**

- ✅ **GS Paper II – Governance (Panchayati Raj; Welfare Delivery; Decentralisation)**
- ✅ **GS Paper III – Indian Economy (Rural Infrastructure; Employment; Inclusive Growth)**
- ✅ **GS Paper I – Indian Society (Women Empowerment; Rural Development)**

Introduction

Over the past decade, Union Budget allocations for Rural Development have increased by over **211%**, signalling sustained fiscal commitment to strengthening rural institutions, infrastructure, and livelihoods.

The emerging **3Is Framework—Institutions, Investment and Inclusion**—captures the structural transformation underway in rural India. Rather than focusing solely on welfare transfers, the framework emphasizes **capacity-building, productive asset creation, and participatory governance**.

I. Institutions: Strengthening the Foundations of Rural Governance

1. From Welfare Delivery to Decentralised Partnerships

- Transition from a top-down government model to **community-led governance mechanisms**.
- Example: **Jal Jeevan Mission**, which leverages Panchayats and Self-Help Groups (SHGs) for participatory water governance.
    - Achieved near-universal rural tap water coverage (~99.6%).

This reflects subsidiarity and grassroots accountability.

2. Community-Led Institutions

- **Model Youth Gram Sabha** initiatives introduce students to grassroots governance.
- Women-led SHGs under **DAY–National Rural Livelihoods Mission (NRLM)** play a pivotal role in last-mile service delivery.

Such institutional deepening enhances democratic participation and social capital.

3. Fiscal Empowerment of Panchayats

- Direct fiscal transfers to Panchayats increased by ~85% under the **16th Finance Commission** framework.
- **Revamped Rashtriya Gram Swaraj Abhiyan** strengthens institutional capacity and e-governance.

Stronger fiscal decentralisation improves local planning and accountability.

II. Investment: Infrastructure-Led Rural Modernisation

1. Housing and Connectivity

- Enhanced allocations under:
    - **Pradhan Mantri Gram Sadak Yojana (PMGSY)**.
    - **Pradhan Mantri Awas Yojana – Gramin (PMAY-G)**.

These initiatives promote:

- All-weather road connectivity.
- Affordable rural housing.

Infrastructure investment catalyses productivity and market integration.

2. Asset Creation through Employment

- **Viksit Bharat Guarantee for Rozgar and Ajeevika Mission (Gramin) Act, 2025** guarantees 125 days of employment.
- Employment linked to productive asset creation.

This combines income support with long-term capital formation.

III. Inclusion: Expanding Economic and Social Participation

1. Economic Inclusion

- Women SHGs supported under the **Lakhpati Didi initiative**.
- Focus on income diversification and enterprise development.

2. Market Inclusion

- Proposal for **SHE-Marts**—community-owned retail outlets.
- Enables women entrepreneurs to transition from subsistence activities to sustainable enterprises.

This enhances rural market access and value addition.

3. Digital Rights and Property Ownership

- **SVAMITVA scheme** uses drone mapping to grant property cards to rural households.
- **Namo Drone Didi** promotes drone usage in agriculture.

These initiatives formalize property rights and integrate rural citizens into the digital economy.

Integrated Impact of the 3Is

Pillar	Structural Contribution
Institutions	Strengthens local governance and accountability
Investment	Enhances infrastructure and productivity
Inclusion	Expands economic, digital, and gender participation

The framework shifts rural policy from consumption-led welfare to **capacity-building and sustainable development**.

Broader Developmental Significance

- Aligns with constitutional mandate under Part IX (Panchayati Raj).
- Promotes gender equity and social empowerment.
- Strengthens rural contribution to Viksit Bharat goals.
- Supports balanced regional development.

Challenges

- Ensuring quality of asset creation.
- Preventing fiscal leakages at local levels.
- Sustaining women-led enterprises in competitive markets.
- Bridging inter-state disparities.

Institutional maturity and continuous monitoring are essential.

Conclusion

The 3Is framework—**Institutions, Investment, and Inclusion**—represents a holistic approach to rural transformation. By empowering local governance structures, investing in infrastructure and productive assets, and broadening economic participation, India is repositioning rural development as a driver of national growth rather than merely a welfare concern.

Sustained fiscal commitment, institutional strengthening, and inclusive participation will determine the long-term success of this transformation.

Keywords: Rural Transformation, Decentralisation, Fiscal Devolution, Women Empowerment, Infrastructure Investment, Digital Inclusion, 3Is Framework.

Mains Practice Question

"The 3Is framework of Institutions, Investment, and Inclusion marks a paradigm shift in India's rural development strategy. Critically examine its potential to achieve sustainable and inclusive rural transformation."

INTERNATIONAL RELATIONS

India–Malaysia Ties: Deepening the Comprehensive Strategic Partnership

📌 **Syllabus Mapping:**

- ✅ **GS Paper II – International Relations (India and ASEAN; Bilateral Relations; Global Governance)**
- ✅ **GS Paper III – Economic Development (Trade, Energy Security, Supply Chains, Semiconductor Ecosystem)**

Introduction

The Prime Minister's official visit to Malaysia in February 2026 represents a significant consolidation of the **Comprehensive Strategic Partnership (CSP)** established in August 2024. The joint statement reflects convergence on **regional stability, economic integration, technological collaboration, and multilateral reform**, particularly within the Indo-Pacific framework.

Background: Evolution of India–Malaysia Relations

- Diplomatic relations date back to 1957.
- Upgraded to **Comprehensive Strategic Partnership (CSP)** in August 2024.
- Malaysia is India's **3rd largest trading partner within ASEAN**.
- Strong diaspora presence:
  - ~2.75 million Persons of Indian Origin (second largest globally after the US)
  - ~2.9 million Indian diaspora (third largest globally)

This engagement aligns with India's **Act East Policy** and ASEAN's emphasis on **centrality in regional security architecture**.

Key Outcomes of the Joint Statement

1. Strategic & Defence Cooperation

Institutional Mechanisms

- Creation of a **Strategic Affairs Working Group (SAWG)** to deepen structured security dialogue.
- Establishment of a **Su-30 Forum** enabling cooperation between the two air forces in:
  - Maintenance
  - Technical support
  - Reduction of supply-chain vulnerabilities

Military Engagement

- Conduct of the **5th edition of Exercise Harimau Shakti**.
- Joint commitment to:
  - **Zero tolerance for terrorism**
  - Coordinated international counter-terrorism efforts

Strategic Significance:
This strengthens defence interoperability and reflects India's broader strategy of defence diplomacy in the Indo-Pacific.

2. Energy & Climate Cooperation

Renewable Energy

- Expansion of Malaysian investments in:
  - **Solar energy projects in India**
  - **Green hydrogen initiatives**
- Shared commitment toward **Net-Zero emission targets**.

Semiconductor Collaboration

Cooperation in:

- Workforce development
- Institutional partnerships
- Supply chain resilience

Analytical Perspective: Semiconductors are critical to economic security. This partnership complements India's domestic semiconductor initiatives and global supply-chain diversification efforts.

3. Trade, Investment & Financial Cooperation

Trade Focus

- Emphasis on **balanced and diversified trade relations**.
- Priority sectors:
  - Semiconductors
  - Digital economy
  - Advanced manufacturing

Local Currency Settlement

- Promotion of **INR–MYR settlement mechanism**.
- Institutional cooperation between RBI and Bank Negara Malaysia.

Importance:

- Reduces reliance on the US dollar

- Mitigates exchange rate volatility
- Strengthens financial sovereignty

4. Food Security & Agriculture

- Malaysia reaffirmed its position as a **reliable supplier of palm oil**.
- Cooperation across:
  - Oil palm value chain
  - Downstream industries
  - Value-added products

Contemporary Dimension:
While palm oil supports India's edible oil security, sustainability and deforestation concerns remain important policy considerations.

5. Regional & Multilateral Cooperation

Global Governance Reform

- Support for **UN reforms**.
- Backing India's bid for permanent membership in a reformed **UN Security Council**.

Indo-Pacific Convergence

Commitment to:

- **ASEAN Centrality**
- Implementation of:
  - ASEAN Outlook on the Indo-Pacific (AOIP)
  - India's Indo-Pacific Oceans Initiative (IPOI)

Maritime Principles

- Reaffirmation of **UNCLOS 1982**.
- Emphasis on **Freedom of Navigation**.

Geopolitical Context: This reflects alignment in maintaining a **rules-based maritime order** amid growing strategic competition in the Indo-Pacific.

People-to-People & Cultural Diplomacy

- Malaysia hosts nearly **20,000 Hindu temples and Gurudwaras**.
- Strong presence of Indian languages and cultural institutions.
- Highest participation in **Pravasi Bharatiya Divas** from Malaysia.

This strengthens India's **soft power diplomacy** and civilizational linkages.

Broader Strategic Implications

Dimension	Significance
Geopolitical	Strengthens India's Indo-Pacific engagement
Economic	Diversifies supply chains; promotes semiconductor ecosystem
Energy Security	Enhances renewable energy and palm oil cooperation
Security	Boosts defence cooperation and counter-terrorism
Multilateralism	Reinforces commitment to UN reform and ASEAN centrality

Challenges

- Trade imbalances
- Environmental concerns regarding palm oil
- Managing ASEAN unity amid US–China rivalry
- Ensuring continuity in institutional mechanisms

Conclusion

The 2026 visit operationalizes the **Comprehensive Strategic Partnership** into a multidimensional framework covering **defence cooperation, semiconductor resilience, renewable energy transition, food security, and Indo-Pacific maritime governance**.

It reflects India's broader objective of strengthening ASEAN partnerships to advance **strategic autonomy, economic resilience, and a rules-based regional order**.

Keywords: Comprehensive Strategic Partnership, Indo-Pacific, ASEAN Centrality, Semiconductor Cooperation, Energy Transition, Strategic Autonomy.

Mains Practice Question

"India–Malaysia Comprehensive Strategic Partnership marks a shift from traditional bilateral engagement to a multidimensional Indo-Pacific strategic alignment." Discuss.

India–Seychelles Relations at 50: Consolidating the Indian Ocean Partnership

📌 **Syllabus Mapping:**

- ✅ **GS Paper II – International Relations (India and Indian Ocean Region; Maritime Security; Global Groupings)**
- ✅ **GS Paper III – Security (Maritime Security; Coastal Surveillance; Regional Stability)**
- ✅ **GS Paper II – Governance (Development Cooperation; Digital Public Infrastructure; Health Diplomacy)**

Introduction

The visit of the President of Seychelles to India in 2026 marks **50 years of diplomatic relations** between the two nations. The engagement culminated in a **joint vision focused on sustainability, economic growth, and maritime security**, reflecting the evolving depth of India–Seychelles cooperation within the broader Indian Ocean framework.

This milestone visit reinforces India's expanding role as a **net security provider and development partner** in the region.

Key Outcomes of the Visit

1. Special Economic Package

- India announced a **USD 175 million assistance package**.
- Focus areas:
  - Development projects
  - Capacity building
  - Maritime security

This strengthens India's development diplomacy and enhances Seychelles' economic resilience.

2. Regional Security Architecture

Membership in the Colombo Security Conclave (CSC)

Seychelles will become a **full member** of the Colombo Security Conclave, a regional grouping comprising:

- India
- Sri Lanka
- Mauritius
- Maldives
- Bangladesh

Objectives of CSC

- Address transnational threats
- Combat maritime crime
- Strengthen cybersecurity cooperation
- Enhance counter-terrorism coordination

Seychelles' inclusion expands the security net across the western Indian Ocean.

3. Disaster Resilience Cooperation

- Seychelles agreed to join the **Coalition for Disaster Resilient Infrastructure (CDRI)**.

Given its vulnerability to climate change and extreme weather events, this cooperation enhances climate adaptation capacity.

4. Health Diplomacy

- Seychelles to recognize the **Indian Pharmacopoeia**, enabling procurement of affordable and quality medicines from India.

This strengthens India's role as a **pharmacy of the Global South** and ensures affordable healthcare access for Seychelles.

5. Digital Transformation

- India will assist in building **Digital Public Infrastructure (DPI)** in Seychelles.

DPI components may include:

- Digital identity systems
- Digital payments platforms
- E-governance frameworks

This reflects India's growing digital diplomacy footprint, similar to collaborations with other Global South nations.

6. Maritime Cooperation

- Seychelles will establish a **Hydrographic Unit** with Indian assistance.

Hydrographic mapping improves:

- Maritime navigation safety
- Resource exploration
- Maritime domain awareness

Strategic Significance of Seychelles for India

1. SAGAR and Vision MAHASAGAR

Seychelles is central to India's maritime doctrine:

- **SAGAR (Security and Growth for All in the Region)**
- **Vision MAHASAGAR (Mutual and Holistic Advancement for Security and Growth Across Regions)**

These frameworks emphasize inclusive maritime cooperation and regional stability.

2. Geostrategic Location

Seychelles lies near critical **Sea Lines of Communication (SLOCs)** in the western Indian Ocean, particularly close to the **Mozambique Channel**, a vital energy transit route.

Strategic initiatives include: India's effort to develop **Assumption Island** for surveillance capabilities.

Control and monitoring of this region enhance India's maritime security posture.

3. Countering Expanding Chinese Influence

China's growing footprint in the Indian Ocean through:

- **String of Pearls strategy**
- **Two Ocean Strategy**
- **Belt and Road Initiative (BRI)**

India has strengthened maritime domain awareness in Seychelles through:

- Deployment of **Coastal Surveillance Radar Systems**.

This contributes to balancing external influence while maintaining strategic autonomy.

4. Defence Cooperation

- Joint maritime exercise **LAMITYE** enhances interoperability.
- Training and capacity-building support deepen defence ties.

Such cooperation strengthens India's position as a **reliable security partner**.

5. Multilateral Support

Seychelles supports India's bid for **permanent membership in a reformed UN Security Council**, reinforcing diplomatic convergence.

Broader Geopolitical Context

Dimension	Relevance
Maritime Security	Safeguarding trade routes and countering piracy
Climate Diplomacy	Small Island Developing States (SIDS) cooperation
Development Partnership	Infrastructure and capacity building
Strategic Competition	Managing India–China rivalry in the Indian Ocean
Digital Diplomacy	Expansion of India's DPI model globally

Challenges

- Balancing strategic cooperation without triggering geopolitical polarization.
- Financial sustainability of development projects.
- Climate vulnerability of island states.
- Domestic political sensitivities in Seychelles regarding external military presence.

Conclusion

The 50th anniversary visit underscores the transformation of India–Seychelles ties from traditional diplomatic engagement to a **comprehensive strategic maritime partnership**. Through economic assistance, security cooperation, digital infrastructure support, and climate resilience initiatives, India strengthens its role as a **responsible stakeholder in the Indian Ocean Region**.

The partnership advances the objectives of **SAGAR, Vision MAHASAGAR, maritime domain awareness, and sustainable development**, reinforcing India's strategic depth in the western Indian Ocean.

Keywords: SAGAR, Vision MAHASAGAR, Colombo Security Conclave, Maritime Domain Awareness, Indian Ocean Region, Strategic Autonomy, Development Diplomacy.

Mains Practice Question

"India's engagement with Seychelles reflects its broader Indian Ocean strategy under SAGAR and Vision MAHASAGAR. Examine the strategic and developmental dimensions of this partnership."

INTERNAL SECURITY & DEFENCE

Draft Defence Acquisition Procedure (DAP) 2026: Reforming India's Defence Procurement Architecture

📌 **Syllabus Mapping:**

- ✅ **GS Paper III – Security (Defence Modernisation; Indigenous Defence Production; Strategic Preparedness)**
- ✅ **GS Paper III – Economy (Manufacturing; MSMEs; Atmanirbhar Bharat; Industrial Policy)**
- ✅ **GS Paper II – Governance (Institutional Reforms; Transparency; Public Procurement Systems)**

Introduction

The Department of Defence has released the **Draft Defence Acquisition Procedure (DAP) 2026**, aimed at accelerating **jointness, force modernisation, indigenisation (Atmanirbharta), and scaling up of India's defence production ecosystem**.

Once approved, it will replace the **DAP 2020**, marking a significant shift in procurement philosophy to align with the **rapidly evolving geo-strategic environment, emerging technologies, and private sector participation**.

Rationale for DAP 2026

India faces a complex security environment marked by:

- Two-front security challenges.
- Rapid technological advancements in AI, drones, cyber warfare, and space capabilities.
- Shortened technological life cycles.

Thus, defence procurement must transition from **slow, import-heavy processes to agile, technology-driven, and indigenous systems**.

Key Provisions of Draft DAP 2026

1. Strategic Objective

The draft seeks to align defence acquisitions with:

- Changing geo-strategic realities.
- Growth of India's economy.
- Expansion of private defence industry.
- Technological imperatives of modern warfare.

It integrates procurement with national industrial capacity building.

2. Easing Financial and Experience Criteria

- Relaxation of eligibility norms to encourage wider industry participation.
- Greater delegation of decision-making authority for faster acquisitions.
- Reform of trials and quality assurance mechanisms.

This reduces entry barriers for emerging players and improves procurement speed.

3. Digitisation and Automation

- Increased use of digital platforms in acquisition processes.
- Automation to enhance transparency and reduce delays.

This reflects governance reforms towards **process efficiency and accountability**.

4. Strengthening Atmanirbharta

Institutional Preference for "Buy Indian-IDDM"

- "Indian – Indigenously Designed, Developed and Manufactured" category to receive priority in procurement decisions.

This aims to deepen domestic value addition and technological self-reliance.

5. Categorisation of Acquisition Projects

Projects will be classified based on:

- Technological availability.
- Manufacturing readiness.
- Innovation potential.

This structured categorisation supports strategic planning and capability mapping.

6. Support for Start-ups and MSMEs

- Provision for advance payments against intellectual property rights or bank guarantees.

This reduces financial constraints for smaller innovators and boosts defence startups under initiatives like **iDEX (Innovations for Defence Excellence)**.

7. Revamping Trials and Quality Assurance

- Streamlined trials and QA processes.
- Alignment with rapid technological cycles.

This addresses a long-standing bottleneck where prolonged trials delayed induction.

Key Features of Defence Acquisition Procedure (DAP) 2020

Understanding DAP 2026 requires contextualising its predecessor.

1. Import Embargo

- Ministry of Defence notified a list of **101 weapons/platforms banned for import**.

This was a major step toward indigenisation.

2. Buy (Global – Manufacture in India) Category

- Replaced the earlier "Buy and Make" category.
- Encouraged global vendors to manufacture in India.

3. Definition of Indian Vendor

- A company qualifies as "Indian Owned" if **more than 50% capital is beneficially owned by resident Indian citizens**.

This tightened eligibility norms to prevent indirect foreign control.

Strategic Implications of DAP 2026

Dimension	Impact
Military Preparedness	Faster procurement cycles
Industrial Policy	Boost to domestic defence manufacturing
Innovation Ecosystem	Encourages start-ups and MSMEs
Strategic Autonomy	Reduces import dependence
Employment	Expansion of high-skilled manufacturing jobs

Challenges

- Ensuring transparency in delegated procurement decisions.
- Balancing speed with quality assurance.
- Preventing monopolisation within domestic industry.
- Bridging technological gaps in high-end platforms (engines, advanced electronics).

Broader Strategic Context

India is among the world's largest defence importers. Strengthening indigenous procurement aligns with:

- **Atmanirbhar Bharat**
- Defence export ambitions
- Strategic autonomy in a multipolar world

Modern warfare increasingly depends on **AI-enabled systems, cyber capabilities, unmanned platforms, and space technologies**, requiring dynamic procurement reforms.

Conclusion

The Draft DAP 2026 signals a shift toward a **technology-driven, industry-integrated, and self-reliant defence acquisition ecosystem**. By easing participation norms, prioritising indigenous design, supporting MSMEs, and streamlining trials, it seeks to address systemic inefficiencies while enhancing strategic autonomy.

However, the effectiveness of DAP 2026 will depend on maintaining **transparency, technological competitiveness, and institutional capacity** to execute reforms efficiently.

Keywords: Defence Modernisation, Atmanirbharta, Buy Indian-IDDM, MSMEs, Digitisation in Procurement, Strategic Autonomy, Jointness.

Mains Practice Question

"The Draft Defence Acquisition Procedure (DAP) 2026 seeks to reconcile rapid force modernisation with self-reliance in defence production. Critically analyse its potential benefits and implementation challenges."

Defence Acquisition Council Approvals: Strengthening India's Combat Readiness

📌 **Syllabus Mapping:**

- ✅ **GS Paper III – Security (Defence Modernisation; National Security; Maritime Security)**
- ✅ **GS Paper III – Science & Technology (Defence Technology; Aerospace Systems)**
- ✅ **GS Paper II – Governance (Defence Procurement; Institutional Mechanisms)**

Introduction

The **Defence Acquisition Council (DAC)**, chaired by the Defence Minister, has accorded **Acceptance of Necessity (AoN)** to multiple capital acquisition proposals worth approximately **₹3.60 lakh crore**.

AoN marks the formal clearance for procurement under India's defence acquisition framework, signalling a major step toward enhancing **operational preparedness, technological capability, and deterrence strength**.

Institutional Context

The DAC functions as the apex decision-making body for defence procurement under the Ministry of Defence. It evaluates and approves capital acquisition proposals in line with the **Defence Acquisition Procedure (DAP)** framework.

The recent approvals reflect India's focus on **air superiority, surveillance enhancement, maritime security, and force modernisation**.

Key Platforms Approved

1. Multi Role Fighter Aircraft (MRFA) – Rafale

Overview

- Twin-jet, **4.5-generation fighter aircraft**.
- Developed by **Dassault Aviation (France)**.

Operational Capability

- Can operate from:
  - Aircraft carriers.
  - Shore-based airfields.
- Omnirole capabilities:
  - Air defence missions.
  - Deep strike operations.
  - Reconnaissance.
  - Nuclear deterrence roles.

Technological Features

- Low radar observability.
- Advanced avionics and weapon systems.
- High manoeuvrability and multi-mission adaptability.

Strategic Significance

- Enhances air dominance and precision strike capability.
- Strengthens deterrence posture in a two-front security environment.

2. Air-Ship Based High Altitude Pseudo Satellite (AS-HAPS)

Concept

- Operates at extreme altitudes for extended durations.
- Functions as a persistent surveillance and communication platform.

Station-Keeping Capability

- Can remain positioned over a designated area for **weeks or months**.
- Provides uninterrupted coverage unlike conventional aircraft or drones.

Design Advantages

- Enhanced endurance and higher payload capacity.
- Integration of multiple sensors for:
  - Intelligence gathering.
  - Border monitoring.
  - Communication relay.

Strategic Importance

- Improves real-time situational awareness.

- Strengthens surveillance along borders and maritime zones.

Other Key Proposals

Indian Army

- **Anti-Tank Mines (Vibhav)**.
- Upgradation and support systems for **T-72 tanks**.

Enhances ground combat readiness and armour strength.

Indian Navy

- **P-8I Long Range Maritime Reconnaissance Aircraft**.

These aircraft provide:

- Anti-submarine warfare capability.
- Maritime surveillance.
- Long-range reconnaissance in the Indian Ocean Region.

Indian Coast Guard (ICG)

- Integration of **Electro-Optical/Infra-Red (EO/IR) systems** in **Dornier DO-228 aircraft**.

The DO-228 is a versatile multi-purpose light transport aircraft.
EO/IR systems enhance maritime surveillance, search-and-rescue, and coastal security.

Strategic Implications

Dimension	Impact
Air Power Enhancement	MRFA improves multi-role combat readiness
Surveillance Capability	AS-HAPS ensures persistent monitoring
Maritime Security	P-8I and EO/IR strengthen Indian Ocean vigilance
Ground Combat Readiness	Upgraded tanks and anti-tank systems
Deterrence Posture	Reinforces multi-domain defence preparedness

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Alignment with Broader Defence Strategy

The approvals reflect:

- Emphasis on **multi-domain warfare readiness** (air, land, sea, cyber).
- Focus on rapid force modernisation.
- Integration of advanced aerospace and surveillance technologies.

In a dynamic geopolitical environment, technological superiority becomes central to deterrence.

Challenges

- High capital expenditure and fiscal pressures.
- Timely delivery and technology transfer.
- Balancing imports with indigenous defence manufacturing.
- Lifecycle maintenance costs.

Conclusion

The DAC's approval of capital acquisitions worth ₹3.60 lakh crore marks a decisive step toward enhancing India's **combat capability, surveillance reach, and maritime dominance**. The induction of platforms like MRFA and AS-HAPS signals a shift toward **technology-intensive, multi-domain defence preparedness**.

Sustained emphasis on indigenous manufacturing, cost efficiency, and strategic autonomy will be crucial for long-term defence resilience.

Keywords: Defence Modernisation, Acceptance of Necessity, MRFA, Rafale, AS-HAPS, Maritime Surveillance, Multi-Domain Warfare.

Mains Practice Question

"Defence modernisation today requires integration of advanced aerospace platforms and persistent surveillance systems. Analyse the strategic significance of recent DAC approvals in strengthening India's combat readiness."

ECONOMY

Viksit Bharat 2047 and Net Zero 2070: Macroeconomic Pathways and Policy Imperatives

📌 **Syllabus Mapping:**

- ✅ **GS Paper III – Indian Economy (Growth, Investment Models, Infrastructure, Energy Security)**
- ✅ **GS Paper III – Environment (Climate Change, Net Zero Commitments, Sustainable Development)**
- ✅ **GS Paper II – Governance (NITI Aayog; Policy Formulation; Institutional Reforms)**

Introduction

NITI Aayog has released three analytical reports outlining **scenarios towards Viksit Bharat 2047 and Net Zero 2070**, focusing on:

1. A comprehensive transition roadmap,
2. Macroeconomic implications, and
3. Financing requirements.

The vision of **Viksit Bharat 2047** aspires to transform India into a **USD 30 trillion developed economy** by its centenary of independence, while honoring the climate commitment of achieving **Net Zero greenhouse gas emissions by 2070**.

The central policy question is whether rapid economic growth and deep decarbonisation can proceed simultaneously.

Conceptual Framework

Viksit Bharat 2047

- Target: Developed nation status by 2047.
- Projected GDP size: ~USD 30 trillion.
- Emphasis on high productivity, innovation-led growth, and inclusive development.

Net Zero 2070

- Commitment announced at COP26.
- Balancing emissions with carbon removal mechanisms by 2070.
- Requires structural transformation in energy, industry, transport, and urban systems.

Key Macroeconomic Implications

1. GDP Resilience with High Investment Requirements

- Long-term GDP impact of Net Zero pathways is projected to be **limited**.
- However, the transition requires **substantial upfront capital investment** in infrastructure and clean technologies.

This reflects the idea of "creative destruction" (Joseph Schumpeter), where old industries contract while new sectors expand.

2. Shift from Consumption-Led to Investment-Led Growth

- Structural rebalancing toward **capital-intensive growth**.
- Higher public and private investment in:
  - Renewable energy
  - Transmission grids
  - Electric mobility
  - Green hydrogen

This aligns with the **Harrod-Domar growth model**, emphasizing investment as a driver of sustained growth.

3. Industrial Transformation

- Industry's share in Gross Value Added (GVA) projected to rise to **~33% by 2050**.
- Clean energy manufacturing and green industrial ecosystems expand.

- Fossil fuel-based industries are expected to contract gradually.

This transition enhances India's competitiveness in global clean-tech supply chains.

4. Employment Reallocation

- Jobs shift from:
  - Coal and fossil-based sectors
  - Traditional thermal power

To:

- Renewable energy
- Construction
- Clean manufacturing
- Sustainable transport

Overall net employment effect projected to be **modest but positive**, provided reskilling mechanisms are robust.

5. Reduced Import Dependence

- Fuel import bill projected to decline from **~4% of GDP today to ~0.2% by 2070**.

This strengthens:

- Energy security
- Current account stability
- Macroeconomic resilience

Reduced fossil fuel dependence also insulates India from geopolitical supply shocks.

Financing the Transition

Achieving Net Zero alongside high growth requires massive capital mobilization.

Investment Priorities

- Renewable energy expansion
- Grid modernization
- EV infrastructure
- Green hydrogen ecosystem
- Urban sustainable infrastructure

The reports highlight the need for:

- Blended finance
- Bankable project pipelines
- International climate finance

Policy Recommendations

1. Civilisational Sustainability

- Promote traditional low-carbon lifestyles via **Mission LiFE (Lifestyle for Environment)**.
- Scale circular economy practices.
- Redefine development metrics toward **well-being and resilience**, beyond GDP alone.

This resonates with Amartya Sen's **Capability Approach**, focusing on quality of life.

2. Net Zero Infrastructure Push

- Front-load public investment in:
  - Power grids
  - Urban transport
  - Electric mobility
  - Logistics corridors
- Use blended finance models to crowd in private capital.

3. Green Jobs Mission

- Promote labour-intensive green sectors.
- Establish a **Green-Digital Skills Stack** for future workforce readiness.
- Expand targeted reskilling for fossil-fuel dependent regions.

4. Boost Green R&D

- Increase public-private R&D spending to global benchmarks.
- Accelerate innovation in:
  - Battery storage
  - Carbon capture
  - Hydrogen technologies

Technological leadership reduces transition costs over time.

5. Institutional Strengthening

- Reform DISCOMs to improve financial viability.
- Simplify regulatory processes.
- Introduce single-window clearance mechanisms for clean energy projects.

Institutional capacity is critical for policy execution.

Broader Strategic Implications

Dimension	Impact
Economic Growth	Sustains high GDP growth trajectory
Energy Security	Reduces import dependence
Climate Leadership	Enhances global credibility
Industrial Policy	Positions India in green manufacturing value chains
Social Equity	Requires just transition for affected workers

Challenges

- Large financing gap.
- Technological dependency risks.
- Social resistance in coal-dependent regions.
- Global trade barriers (e.g., carbon border adjustments).

A **just transition framework** is essential to prevent socio-economic disruptions.

Conclusion

The NITI Aayog study demonstrates that **Viksit Bharat 2047 and Net Zero 2070 are not mutually exclusive goals**, but require a strategic shift toward **investment-led growth, industrial transformation, green innovation, and institutional reform**.

If implemented effectively, the transition could enhance **energy security, macroeconomic stability, global competitiveness, and sustainable prosperity**. However, success depends on mobilizing finance, strengthening institutions, and ensuring a socially just transition.

Keywords: Viksit Bharat 2047, Net Zero 2070, Investment-Led Growth, Green Industrialization, Energy Security, Just Transition, Climate Finance.

Mains Practice Question

“Achieving Net Zero emissions by 2070 while aspiring to become a USD 30 trillion economy by 2047 requires structural transformation of India’s economy. Examine the macroeconomic implications and policy priorities for this transition.”

Financing Viksit Bharat and Net Zero: Bridging India’s Climate Investment Gap

📌 **Syllabus Mapping:**

- ✅ **GS Paper III – Indian Economy (Infrastructure Financing; Investment Models; Energy Transition)**
- ✅ **GS Paper III – Environment (Climate Change; Mitigation and Adaptation; Carbon Markets)**
- ✅ **GS Paper II – Governance (NITI Aayog; Regulatory Frameworks; Financial Sector Reforms)**

Introduction

NITI Aayog's report on **Financing Needs towards Viksit Bharat and Net Zero** highlights the magnitude of financial mobilization required to align India's developmental ambitions with its climate commitments.

While India aspires to become a **USD 30 trillion economy by 2047**, it has also pledged to achieve **Net Zero emissions by 2070**. The report underlines that achieving both goals simultaneously will require unprecedented capital flows, institutional innovation, and financial sector reforms.

Current Climate Financing Landscape

1. Global Scenario

- Climate finance flows reached approximately **USD 1.9 trillion annually in 2023**.
- However, achieving the **1.5°C temperature goal** requires **USD 6–9 trillion annually**.
- Financing is predominantly **debt-driven**, raising concerns of debt sustainability, especially in developing economies.
- **Adaptation projects** and early-stage clean technologies remain significantly underfunded.

This reflects a structural imbalance in global climate finance architecture.

2. India's Financing Requirement

- India's cumulative investment requirement for Net Zero transition: **USD 22.7 trillion by 2070**.
- Estimated cumulative financing gap: **USD 6.5 trillion by 2070**.
- The **power sector alone constitutes 82% of the financing gap**, reflecting the centrality of energy transition.

This underscores that decarbonizing electricity generation is foundational to broader sectoral decarbonization (transport, industry, buildings).

Sectoral Implications

1. Power Sector

- Expansion of renewable energy capacity.
- Grid modernization and storage solutions.
- Phasing down coal-based power plants.

High upfront capital intensity makes financing critical.

2. Hard-to-Abate Sectors

- Steel, cement, petrochemicals.
- Require green hydrogen, carbon capture, and energy efficiency upgrades.

These sectors demand long-term patient capital and technology support.

Strengthening India's Climate Finance Architecture

India has initiated several reforms to build a credible climate finance ecosystem.

1. Draft National Climate Finance Taxonomy

- Prepared by the Ministry of Finance.
- Categorizes economic activities into:
  - Climate-supportive
  - Adaptation-focused
  - Transition-aligned sectors

Purpose:

- Prevent greenwashing.
- Provide clarity to investors.
- Channel capital efficiently toward sustainable activities.

2. Carbon Credit Trading Scheme (CCTS)

- Introduces **GHG Emission Intensity (GEI)** targets.
- Initial sectors:
  - Aluminium

  - Cement
  - Chlor Alkali
  - Pulp & Paper
- Recently expanded to include:
  - Petroleum refineries
  - Petrochemicals
  - Textiles
  - Secondary aluminium

CCTS operationalizes a domestic carbon market, creating economic incentives for emission reduction.

3. Sustainability Disclosures

SEBI's Business Responsibility and Sustainability Reporting (BRSR)

- Mandates ESG disclosures by listed companies.
- Enhances transparency and accountability.

RBI's Draft Framework on Climate-Related Financial Risks

- Integrates climate risk into banking supervision.
- Encourages stress testing and risk disclosure.

These reforms align India's financial sector with global ESG norms.

Macroeconomic and Strategic Implications

Dimension	Implication
Energy Security	Reduced fossil fuel import dependency
Fiscal Policy	Higher public investment requirements
Financial Stability	Need for climate risk integration
Industrial Policy	Boost to green manufacturing
Global Positioning	Strengthens credibility in climate negotiations

Key Challenges

- Mobilizing long-term low-cost capital.
- Avoiding excessive debt burden.
- Limited access to international climate finance.
- Ensuring equitable transition for coal-dependent regions.

A **Just Transition Framework** is necessary to protect vulnerable workers and communities.

Way Forward

1. Expand blended finance mechanisms combining public and private capital.
2. Strengthen green bond markets and sovereign green bond issuances.
3. Improve viability of DISCOMs to attract private investment in renewables.
4. Leverage multilateral development banks for concessional finance.
5. Develop robust carbon pricing mechanisms for market efficiency.

Conclusion

The NITI Aayog report makes clear that achieving **Viksit Bharat 2047 and Net Zero 2070** requires mobilizing trillions in investment while closing a significant financing gap. The dominance of the power sector in the funding requirement highlights the centrality of energy transition.

India has begun strengthening its climate finance ecosystem through **taxonomy reforms, carbon markets, ESG disclosures, and regulatory oversight**. However, bridging the financing gap demands innovative financial instruments, institutional reforms, and global cooperation.

Keywords: Climate Finance Gap, Net Zero 2070, Viksit Bharat 2047, Carbon Credit Trading Scheme, Climate Taxonomy, Green Bonds, Just Transition.

Mains Practice Question

"Bridging the climate finance gap is central to India's ambition of achieving Viksit Bharat 2047 alongside Net Zero 2070. Examine the scale of financing needs and evaluate the effectiveness of recent institutional reforms."

Critical Minerals and India's Net Zero Pathway: Strategic Imperatives for Viksit Bharat

📌 **Syllabus Mapping:**

- ✅ **GS Paper III – Indian Economy (Energy Security; Industrial Policy; Infrastructure; Mining Sector)**
- ✅ **GS Paper III – Environment (Climate Change; Net Zero Transition; Resource Sustainability)**
- ✅ **GS Paper II – International Relations (Strategic Partnerships; Supply Chain Diplomacy)**

Introduction

NITI Aayog's report on **Scenarios Towards Viksit Bharat and Net Zero – Critical Mineral Assessment** underscores that India's transition to **Net Zero emissions by 2070** will be significantly influenced by secure and affordable access to **Critical Energy Transition Minerals (CETMs)**.

Critical minerals are those indispensable for **economic development and national security**, particularly in sectors such as renewable energy, electric mobility, advanced electronics, and defence technologies.

India's aspiration to become a **USD 30 trillion economy by 2047** is thus deeply intertwined with mineral security.

Why Critical Minerals Matter

The clean energy transition depends heavily on minerals such as:

- Lithium
- Cobalt
- Nickel
- Rare earth elements

These are essential for:

- Batteries (EVs, storage systems)
- Solar panels
- Wind turbines
- Hydrogen electrolyzers
- Defence electronics

The International Energy Agency (IEA) has noted that clean energy technologies are significantly more mineral-intensive than fossil fuel systems.

Key Challenges Identified

1. Demand Surge

- Under the Net Zero scenario, demand for CETMs is projected to be **51% higher** than the current policy scenario.
- Battery-linked minerals are the primary drivers of this surge.

This reflects rapid electrification of transport and grid-scale storage expansion.

2. High Import Dependence

India is:

- **100% import-dependent** for minerals like lithium, cobalt, and nickel.

Such dependence creates vulnerability to global supply disruptions and price volatility.

3. Concentration Risk

- Supply chains are geographically concentrated.
- Heavy dependence on **China** for processing and refining exposes India to strategic risks.

This mirrors concerns seen in semiconductor supply chains.

4. Domestic Bottlenecks

- Underutilised domestic exploration and mining capacity.

- Limited private sector participation.
- Weak refining and processing infrastructure.
- Limited R&D in advanced material sciences.

Thus, India's challenge is not merely geological scarcity but institutional and technological gaps.

Policy Recommendations

1. Strengthen Domestic Exploration and Mining

- Introduce a conditional **"First Come, First Served" (FCFS)** model for early-stage exploration.
- Encourage risk-sharing mechanisms to attract private investment.

This improves speed and investor confidence.

2. Mission-Oriented R&D

- Launch dedicated R&D programs for:
  - Mineral processing
  - Refining technologies
  - Substitution materials

Technological self-reliance reduces external vulnerability.

3. Diversify International Supply

- Participate in value-chain partnerships such as the **Mineral Security Partnership (MSP)**.
- Strengthen **Khanij Bidesh India Limited (KABIL)** for overseas asset acquisition.

Strategic mineral diplomacy becomes central to foreign policy.

4. Scale Circularity and Refining

- Provide capital support and output-linked incentives.
- Promote recycling of batteries and electronic waste.

Circular economy reduces import intensity and environmental footprint.

5. Institutional Architecture

- Establish a **National Critical Raw Material (CRM) Analytical Unit**.
- Conduct continuous risk assessments and scenario modelling.

Institutional foresight is critical in volatile commodity markets.

Existing Initiatives Supporting Mineral Security

1. National Critical Mineral Mission (NCMM)

- Framework to promote self-reliance in critical minerals.
- Focus on exploration, processing, and strategic reserves.

2. Incentive Scheme for Critical Mineral Recycling

- Encourages domestic recycling capacity development.

3. Khanij Bidesh India Limited (KABIL)

- A Ministry of Mines joint venture.
- Mandate: Acquire and develop mineral assets abroad.

4. Rare Earth Corridors

- Being developed across:
  - Odisha
  - Kerala
  - Andhra Pradesh

- Tamil Nadu

These aim to boost domestic rare earth processing capacity.

Strategic Implications

Dimension	Implication
Energy Security	Enables renewable and EV expansion
Industrial Competitiveness	Supports battery and clean-tech manufacturing
Geopolitics	Reduces vulnerability to external supply shocks
Economic Growth	Facilitates Net Zero-compatible industrialisation
Environmental Sustainability	Encourages recycling and circular economy

Broader Context

Critical mineral strategy is increasingly linked to:

- Trade policy
- Defence manufacturing
- Climate diplomacy
- Global supply chain restructuring

The transition from fossil fuel dependency to mineral dependency requires careful governance to avoid replacing one vulnerability with another.

Challenges Ahead

- Environmental concerns in mining expansion.
- Land acquisition and community resistance.
- Balancing ecological sustainability with extraction.
- International competition for overseas mineral assets.

A sustainable mining framework aligned with ESG norms is essential.

Conclusion

India's pathway to **Viksit Bharat 2047 and Net Zero 2070** will be decisively influenced by its ability to secure **Critical Energy Transition Minerals**. Rising demand, import dependence, and supply concentration risks necessitate a comprehensive strategy combining **domestic exploration, global partnerships, R&D innovation, circular economy expansion, and institutional strengthening**.

Mineral security is no longer a sectoral issue—it is central to **energy transition, economic sovereignty, and national security**.

Keywords: Critical Minerals, Net Zero 2070, Energy Transition, Mineral Security, KABIL, Circular Economy, Strategic Autonomy.

Mains Practice Question

"Critical mineral security is emerging as the new frontier of energy security in the era of clean energy transition. Examine the challenges and policy responses required for India's Net Zero pathway."

PLFS (Oct–Dec 2025): Trends in Participation, Employment and Unemployment

📌 **Syllabus Mapping:**

- ✅ **GS Paper III – Indian Economy (Employment; Labour Markets; Inclusive Growth)**
- ✅ **GS Paper II – Governance (Data Systems; Evidence-Based Policymaking)**

Introduction

The **Periodic Labour Force Survey (PLFS)** for the October–December 2025 quarter, released by the National Statistical Office (NSO) under the Ministry of Statistics & Programme Implementation, provides the latest assessment of India's employment landscape.

PLFS is the primary official dataset for analysing **labour force participation, employment trends, and unemployment dynamics**, serving as a key input for macroeconomic policy.

Key Findings (October–December 2025)

1. Labour Force Participation Rate (LFPR)

- Overall LFPR (15 years and above): **55.8%**.
- Female LFPR (15 years and above): **34.9%**, showing a rising trend.

Significance

- Increasing female participation indicates gradual improvement in women's economic engagement.
- Higher LFPR suggests expanding labour supply.

2. Worker Population Ratio (WPR)

- Overall WPR (15+): **53.1%**.
- Rural WPR continued steady upward movement for both genders.

This indicates that a larger share of the working-age population is employed.

3. Unemployment Rate (UR)

- Rural UR: **4%**.
- Urban UR: **6.7%**.

Decline in unemployment signals improved absorption of labour into economic activities.

4. Rise in Self-Employment

- Rural self-employment: **63.2%**.
- Urban self-employment: **39.7%**.

This trend may reflect entrepreneurial activity, gig work expansion, or disguised employment patterns.

5. Sectoral Distribution of Workforce

Rural Areas: Agriculture employs **58.5%** of workers.

Urban Areas: Tertiary (services) sector employs **61.9%** of workers.

The data highlights persistent structural differences between rural and urban labour markets.

Important Definitions

Labour Force Participation Rate (LFPR)

Number of persons (or person-days) in the labour force per 1000 persons (or person-days).

Labour force includes:

- Employed persons.
- Unemployed persons seeking/available for work.

Worker Population Ratio (WPR)

Number of employed persons per 1000 persons in the population.

Unemployment Rate (UR)

Number of unemployed persons per 1000 persons in the labour force.

Analytical Interpretation

1. Positive Signals

- Rising LFPR and WPR indicate labour market expansion.
- Declining UR suggests better employment absorption.
- Increased female LFPR reflects gradual socio-economic change.

2. Structural Concerns

High Rural Agricultural Dependence

- 58.5% workforce in agriculture despite agriculture contributing ~14% to GVA.
- Indicates disguised unemployment and low productivity.

Rising Self-Employment

- Could signal entrepreneurial dynamism.
- Alternatively, may reflect informalisation and underemployment.

Urban Unemployment Higher than Rural

- Urban job market remains competitive and skill-sensitive.

Broader Economic Context

Indicator	Implication
Rising LFPR	Improved labour supply
Higher Female Participation	Boost to demographic dividend
Sectoral Concentration	Need for structural transformation
Self-Employment Growth	Mixed signal – opportunity vs informality

Arthur Lewis' dual-sector model suggests labour must gradually move from low-productivity agriculture to higher-productivity industry and services.

Policy Implications

- Promote labour-intensive manufacturing under Make in India.
- Strengthen skilling and digital literacy initiatives.
- Support women's workforce participation through childcare and safety measures.
- Formalize gig and self-employed workers via social security expansion.

Conclusion

The PLFS October–December 2025 data presents encouraging trends in rising participation, increasing female engagement, and declining unemployment. However, the persistence of high agricultural employment and growth in self-employment underscore the need for deeper structural transformation toward high-productivity sectors.

Sustaining inclusive growth requires translating labour participation gains into **quality, formal, and productivity-enhancing employment opportunities**.

Keywords: Labour Force Participation Rate, Worker Population Ratio, Unemployment Rate, Female LFPR, Self-Employment, Structural Transformation.

Mains Practice Question

"Rising labour force participation and declining unemployment rates do not necessarily imply quality employment generation. Examine the recent PLFS findings in the context of India's structural transformation challenges."

Consumer Price Index (Base Year 2024): Reflecting Changing Consumption Patterns

📌 **Syllabus Mapping:**

- ✅ **GS Paper III – Indian Economy (Inflation; Monetary Policy; Macroeconomic Indicators)**
- ✅ **GS Paper II – Governance (Statistical Systems; Evidence-Based Policymaking)**

Introduction

The Ministry of Statistics & Programme Implementation (MoSPI) has released the revised **Consumer Price Index (CPI)**with **base year 2024**. The revision aligns the inflation measurement framework with evolving **household consumption patterns, price structures, and structural transformation of the Indian economy**.

The update is based on the **Household Consumption Expenditure Survey (HCES) 2023–24**, which provides updated expenditure weights for rural and urban households.

Key Highlights of the Revised CPI

1. Inflation Trends

- Year-on-Year inflation (January 2026 over January 2025): **2.75% (Provisional)**.
- Rural inflation: **2.73%**.
- Urban inflation: **2.77%**.

This indicates relatively moderate price pressures during the reference period.

2. Updated Consumption Basket

Newly Added Items

Reflecting digitalisation and lifestyle changes:

- OTT subscriptions
- Rural house rent
- Value-added dairy products
- Pen drives
- Babysitting services
- Fitness equipment

Removed Obsolete Items

- VCR/DVD players
- Tape recorders

The revision ensures representativeness of contemporary consumption.

Why Base Year Revision is Important

1. **Captures Structural Changes** – Growth of services and digital economy.
2. **Improves Accuracy of Inflation Measurement** – Adjusts outdated weights.
3. **Enhances Policy Relevance** – Provides reliable inputs for monetary policy.

As consumption patterns evolve, failure to update the base year can distort inflation estimates.

About Consumer Price Index (CPI)

Definition

CPI measures changes over time in the **retail prices of a fixed basket of goods and services** consumed by households.

Compilation

- Compiled monthly by **MoSPI**.
- Published for:
  - Rural sector
  - Urban sector
  - Combined (All India)

Formula Used

CPI is calculated using the **Laspeyres Index Formula**, which relies on:

- Base year prices
- Base year expenditure weights
- Current period prices

The formula measures price changes while keeping consumption weights constant at base year levels.

Economic Significance of CPI

1. Monetary Policy Anchor

- CPI inflation is the key indicator used by the **Monetary Policy Committee (MPC)** under the RBI's inflation targeting framework (4% ± 2% band).

2. Real Income Assessment

- Determines real wage growth.
- Influences Dearness Allowance (DA) revisions for government employees.

3. Fiscal and Welfare Planning

- Used for indexation of social security schemes and poverty estimation.

Rural–Urban Dimensions

The close convergence between rural (2.73%) and urban (2.77%) inflation suggests relatively balanced price pressures across geographies. However:

- Rural CPI is more sensitive to food prices.
- Urban CPI reflects services and housing inflation.

Broader Structural Insights

Aspect	Implication
Inclusion of OTT & Digital Services	Rise of digital consumption
Rural House Rent Inclusion	Recognition of changing rural housing markets
Removal of Obsolete Goods	Technological obsolescence in consumption basket
Low Inflation (2.75%)	Macro-economic stability

Challenges

- Fixed basket limitations under Laspeyres formula may not capture substitution effects.
- Rapid technological changes may require more frequent updates.
- Regional heterogeneity in consumption patterns.

Conclusion

The revision of CPI with base year 2024 enhances the reliability and relevance of inflation measurement by reflecting contemporary consumption patterns. With January 2026 inflation at **2.75%**, price stability appears relatively anchored.

Accurate CPI measurement is central to **monetary policy, welfare indexation, and macroeconomic stability**, making periodic base revision essential in a dynamic economy.

Keywords: Consumer Price Index, Base Year Revision, Inflation Targeting, Laspeyres Index, Household Consumption Expenditure Survey, Monetary Policy.

Mains Practice Question

“Periodic revision of the Consumer Price Index base year is essential for accurate inflation measurement. Examine its significance in the context of India’s evolving consumption patterns and monetary policy framework.”

AGRICULTURE

Integrated Farming Systems: A Pathway to Resilient Smallholder Agriculture

📌 **Syllabus Mapping:**

- ✅ **GS Paper III – Agriculture (Cropping Patterns; Farm Income; Sustainable Agriculture; Allied Activities)**
- ✅ **GS Paper III – Environment (Biodiversity; Sustainable Resource Use)**
- ✅ **GS Paper II – Governance (Government Policies and Interventions in Agriculture)**

Introduction

The Union Agriculture Minister’s call for the scientific development of **Integrated Farming Systems (IFS)** underscores the urgency of redesigning India’s smallholder agriculture. With nearly **89.4% of Indian farmers cultivating less than 2 hectares**, fragmented landholdings demand a **diversified, resource-efficient, and risk-resilient farming model**.

Integrated Farming Systems offer a holistic alternative to monocropping by combining **crops, livestock, fisheries, poultry, horticulture, and apiary** within a single farm unit to maximize productivity and sustainability.

Understanding Integrated Farming Systems (IFS)

IFS is a **synergistic production model** where outputs of one component serve as inputs for another.

Core Components

- **Crop cultivation** (food grains, pulses, vegetables)
- **Livestock** (dairy, goats)
- **Fishery**
- **Poultry and backyard farming**
- **Horticulture and agroforestry**
- **Beekeeping (apiary)**

For example:

- Crop residues → animal feed
- Animal manure → organic fertilizer
- Pond water → irrigation

Thus, IFS promotes **circular nutrient flows** and reduces dependence on external inputs.

Significance of IFS for Small Farmers

1. Income Security

- Diversified income streams reduce vulnerability to:
  - Crop failure
  - Price volatility
  - Climate shocks
- Potential for **higher net farm income** compared to monoculture systems.

This aligns with the goal of **doubling farmers' income** through diversification.

2. Resource Efficiency

- Recycling of farm waste lowers:
  - Fertilizer costs
  - Feed expenses
  - Chemical input dependency

This supports **sustainable intensification** without ecological degradation.

3. Nutritional Security

IFS enhances household-level food security by ensuring availability of:

- Milk
- Eggs
- Vegetables
- Fruits

It addresses **rural malnutrition**, especially protein and micronutrient deficiencies.

4. Ecological Sustainability

- Encourages:
  - Intercropping
  - Mixed cropping
  - Crop rotation
- Reduces pest incidence and soil degradation.
- Enhances **agrobiodiversity**.

In the context of climate change, IFS strengthens **climate resilience**.

Structural Importance in Indian Context

Factor	Relevance
Small Landholdings (89.4%)	Necessitates intensive, multi-output systems
Climate Variability	Diversification reduces risk
Rural Distress	Provides year-round employment
Soil Health Decline	Promotes organic recycling

Challenges in Scaling IFS

1. High Initial Capital

- Infrastructure for:
  - Cattle sheds
  - Fish ponds
  - Poultry units
    Requires upfront investment beyond the capacity of marginal farmers.

2. Knowledge and Skill Gap

- IFS requires technical know-how in:
  - Animal husbandry
  - Aquaculture
  - Integrated nutrient management

Traditional farmers may lack training.

3. Labour Intensive Nature

- Multi-component systems demand higher labour input.
- Migration of rural youth aggravates labour constraints.

4. Market Linkages

- Diversified production requires reliable markets for milk, fish, poultry, and vegetables.
- Absence of aggregation and cold storage limits profitability.

Government Initiatives Supporting IFS

1. National Mission for Sustainable Agriculture (NMSA) – Rainfed Area Development (RAD)

- Promotes location-specific IFS clusters.
- Focus on sustainability in rainfed regions.

2. Rashtriya Krishi Vikas Yojana (RKVY)

- Provides states flexibility to design and fund customized IFS models.

3. Paramparagat Krishi Vikas Yojana (PKVY)

- Encourages organic farming and nutrient recycling between crop and livestock components.

4. Viksit Krishi Sankalp Abhiyan

- Bridges the **lab-to-land gap** by deploying scientists to promote region-specific IFS practices.

5. ICAR – All India Coordinated Research Project (AICRP) on IFS

- Developing agro-climatic zone–specific models across 25 states.
- Aims to optimize productivity and sustainability under varying ecological conditions.

Contemporary Relevance

- Supports **Atmanirbhar Bharat in agriculture**.
- Aligns with **SDG 2 (Zero Hunger)** and **SDG 12 (Responsible Consumption and Production)**.
- Contributes to **natural farming and low-carbon agriculture transition**.

Economist M.S. Swaminathan emphasized the need for “evergreen revolution” — productivity enhancement without ecological harm — which IFS embodies.

Way Forward

- Subsidized credit for IFS infrastructure.
- Farmer Producer Organizations (FPOs) for aggregation and marketing.
- Digital advisory platforms for technical guidance.

- Skill training through Krishi Vigyan Kendras (KVKs).
- Integration with climate-resilient agriculture policies.

Conclusion

Integrated Farming Systems represent a **scientifically grounded, economically viable, and ecologically sustainable**model tailored for India's smallholders. By promoting **income diversification, nutrient recycling, biodiversity enhancement, and climate resilience**, IFS can transform subsistence agriculture into a **sustainable livelihood system**.

However, scaling requires **institutional support, capital access, technical training, and robust market linkages** to ensure long-term viability.

Keywords: Integrated Farming System, Small Farmers, Diversification, Sustainable Agriculture, Nutritional Security, Resource Recycling, Climate Resilience.

Mains Practice Question

"Integrated Farming Systems can address the twin challenges of farm income instability and ecological degradation in India. Critically examine their potential and limitations."

Agriculture in the Net Zero Pathway: Strategic Sequencing for Viksit Bharat

📌 **Syllabus Mapping:**

- ✅ **GS Paper III – Agriculture (Cropping Patterns; Irrigation; Farm Subsidies; Food Security)**
- ✅ **GS Paper III – Environment (Climate Change; GHG Emissions; Sustainable Development)**
- ✅ **GS Paper III – Indian Economy (Resource Efficiency; Energy Use in Agriculture)**

Introduction

NITI Aayog's study on *Scenarios Towards Viksit Bharat and Net Zero* highlights the centrality of agriculture in India's growth and climate strategy. The report stresses **"strategic sequencing"**—a calibrated transition pathway that enhances productivity while reducing environmental stress through resource-efficient technologies and crop realignment.

As India moves toward becoming a **developed economy by 2047** and achieving **Net Zero emissions by 2070**, agriculture emerges as both a developmental pillar and a mitigation frontier.

Structural Importance of Agriculture

Contribution to Economy

- Employs approximately **46% of India's workforce**.
- Contributes around **14% to Gross Value Added (GVA)**.

This reflects a classic structural transformation challenge: high employment dependence with relatively lower output contribution.

Food Security Achievements

- Foodgrain production increased from ~**285 million tonnes (2011–19 period)**
- Reached ~**332 million tonnes in 2023–24**.

India has moved from food scarcity to food sufficiency, strengthening national food security.

Key Structural Challenges

1. Small and Marginal Holdings

- Dominance of small and marginal farmers limits economies of scale.
- Constrains mechanisation and adoption of advanced technologies.

2. Dual Challenge: Food Demand vs Environmental Footprint

Agriculture must:

- Sustain food production for a growing population.
- Reduce environmental degradation and emissions.

3. Emissions Profile

- Agriculture accounts for ~**14% of India's total GHG emissions**.
- Major sources:
  - Methane from enteric fermentation (livestock).
  - Methane from rice cultivation.
  - Nitrous oxide from fertiliser use and soils.

4. Energy Consumption

- Agriculture consumes ~**18% of national electricity**, largely for groundwater irrigation and mechanisation.

This creates both fiscal and environmental stress.

Emission Scenarios

Current Policy Scenario (CPS)

- Non-energy agricultural emissions projected to rise from:
  - **~506 $MtCO_2e$ in 2019**
  - To **~531 $MtCO_2e$ by 2070**

This indicates limited mitigation under existing practices.

Net Zero Scenario

- Emissions projected to decline to **~399 $MtCO_2e$ by 2070**.
- Offers nearly **25% mitigation co-benefits** compared to CPS.

This demonstrates that climate-aligned agricultural reforms can generate measurable emission reductions.

Strategic Sequencing: Core Elements

1. Resource Efficiency

- Expansion of **micro-irrigation systems** (drip and sprinkler).
- Fertilizer optimization using precision agriculture tools.

This reduces water use and nitrous oxide emissions.

2. Crop Diversification

- Gradual shift away from water-intensive crops such as:
  - Rice
  - Sugarcane

Encouragement of:

- Millets
- Pulses
- Oilseeds

Diversification improves nutritional security and reduces methane emissions.

3. Solarisation and Electrification

- Increase share of **solar pumps** and efficient electric pumps.

This lowers diesel dependence and improves energy efficiency.

Policy Recommendations

1. Integrated Agri-Food Systems Approach

- Institutionalise a holistic framework linking:
  - Production
  - Processing
  - Distribution

- Consumption

This recognizes agriculture as part of a broader value chain.

2. Demand-Side and Supply-Side Levers

Supply-Side

- Precision farming
- Improved seed varieties
- Livestock productivity enhancement

Demand-Side

- Dietary diversification
- Reduction of food wastage

3. Institutional Reforms

- Strengthen extension services.
- Promote Farmer Producer Organisations (FPOs).
- Rationalize subsidies towards sustainable practices.

Broader Implications

Dimension	Impact
Climate Mitigation	25% emission reduction potential
Water Security	Reduced groundwater depletion
Energy Savings	Lower electricity demand
Nutritional Security	Diversified food basket
Rural Income	Higher-value crop systems

Challenges

- Political economy of MSP and procurement systems.
- Farmer resistance to crop shifts.
- Regional disparities in irrigation and infrastructure.
- Balancing short-term income concerns with long-term sustainability.

Conclusion

The NITI Aayog study makes it clear that agriculture is central to achieving both **Viksit Bharat 2047 and Net Zero 2070**. Through strategic sequencing—resource efficiency, crop diversification, renewable energy adoption, and integrated agri-food systems—India can reconcile food security with climate sustainability.

However, success depends on aligning **incentive structures, institutional reforms, and farmer participation** to ensure a just and economically viable transition.

Keywords: Strategic Sequencing, Crop Diversification, Micro-Irrigation, Agricultural Emissions, Net Zero Pathway, Agri-Food Systems, Resource Efficiency.

Mains Practice Question

“Agriculture is both a contributor to and a potential solution for India’s climate challenge. Examine the role of strategic sequencing in aligning agricultural transformation with the Net Zero pathway.”

Doubling of Agriculture Infrastructure Fund (AIF): Strengthening the Farm Value Chain

📌 **Syllabus Mapping:**

- ✅ **GS Paper III – Agriculture (Post-Harvest Management; Agricultural Marketing; Farm Income)**
- ✅ **GS Paper III – Infrastructure (Rural Infrastructure; Credit and Financial Inclusion)**
- ✅ **GS Paper II – Governance (Central Sector Schemes; Institutional Support for Farmers)**

Introduction

The Prime Minister has announced the doubling of the **Agriculture Infrastructure Fund (AIF)** loan target from **₹1 lakh crore to ₹2 lakh crore**. The move aims to strengthen India's **agriculture value chain**, particularly in post-harvest management and community farming infrastructure.

The decision reflects a policy shift from production-centric support toward **infrastructure-led agricultural transformation**.

About the Agriculture Infrastructure Fund (AIF)

Objective

The AIF is a **medium- to long-term debt financing facility** designed to promote investment in:

- Post-harvest management infrastructure.
- Community farming assets.

It provides financial support through:

- Interest subvention.
- Credit guarantee coverage.

Key Features

- **Central Sector Scheme**.
- Implementation period: **2020–21 to 2029–30**.
- Interest subvention: **3% per annum**.
- Credit guarantee under **Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE)** for loans up to ₹2 crore.

This reduces borrowing costs and risk exposure.

Eligible Beneficiaries

Primary Beneficiaries

- Individual farmers.
- Primary Agricultural Credit Societies (PACS).
- Farmer Producer Organizations (FPOs).
- Self-Help Groups (SHGs).

Institutional Beneficiaries

- Agricultural Produce Market Committees (APMCs).
- State agencies and cooperatives.

This ensures broad-based participation across stakeholders.

Eligible Projects

1. Post-Harvest Management Infrastructure

- Warehouses.
- Cold storage facilities.
- Cold chains.
- Ripening chambers.

Reducing post-harvest losses enhances farmer income and food security.

2. Community Farming Assets

- Infrastructure for smart and precision agriculture.
- Drones for crop monitoring.
- Sensors and AI-based farm tools.

Encourages technology adoption in agriculture.

Rationale for Doubling the Loan Target

1. Addressing Post-Harvest Losses

India faces significant losses in fruits, vegetables, and perishables due to inadequate storage and logistics.

2. Enhancing Value Addition

Improved infrastructure allows:

- Agro-processing.
- Grading and packaging.
- Export competitiveness.

3. Income Diversification

Infrastructure enables farmers to shift from subsistence farming to value chain participation.

4. Climate Resilience

Cold chains and storage reduce wastage linked to climate variability.

Linkages with Other Agricultural Infrastructure Initiatives

Initiative	Focus Area
Agricultural Marketing Infrastructure (AMI)	Rural godowns subsidy
Mission Organic Value Chain Development (MOVCDNER)	Organic clusters in Northeast
Pradhan Mantri Matsya Sampada Yojana (PMMSY)	Fisheries infrastructure & exports
Micro Irrigation Fund (MIF)	Water-use efficiency

Together, these initiatives create a holistic rural infrastructure ecosystem.

Broader Economic and Developmental Significance

Dimension	Impact
Farm Income	Reduces distress sale
Food Security	Minimizes wastage
Employment	Boosts agro-processing sector
Export Competitiveness	Improves quality and shelf life
Financial Inclusion	Expands institutional credit access

The initiative aligns with the objective of doubling farmers' income through structural reform rather than mere subsidy support.

Challenges

- Ensuring equitable access to small and marginal farmers.
- Avoiding regional disparities in infrastructure development.
- Monitoring effective utilization of loans.
- Addressing coordination issues between banks and beneficiaries.

Conclusion

The doubling of the Agriculture Infrastructure Fund loan target to ₹2 lakh crore signals a strong policy push toward **value-chain development, post-harvest efficiency, and technology integration in agriculture**. By combining credit support, risk mitigation, and infrastructure creation, AIF aims to transform agriculture from a production-driven sector into a **market-linked and technology-enabled ecosystem**, essential for achieving sustainable rural prosperity.

Keywords: Agriculture Infrastructure Fund, Post-Harvest Management, Value Chain Development, Interest Subvention, Credit Guarantee, Rural Infrastructure, Farm Income Enhancement.

Mains Practice Question

"Infrastructure development is crucial for enhancing agricultural productivity and farmer incomes. Examine the role of the Agriculture Infrastructure Fund in transforming India's agricultural value chain."

INDIAN SOCITY & SOCIAL JUSTICE

50 Years of the Bonded Labour System (Abolition) Act, 1976: Progress and Persistent Gaps

📌 **Syllabus Mapping:**

- ✅ **GS Paper II – Governance, Constitution, Social Justice (Vulnerable Sections; Welfare Schemes; Fundamental Rights)**
- ✅ **GS Paper I – Indian Society (Poverty, Caste, Social Inequality)**
- ✅ **GS Paper IV – Ethics (Human Dignity, Justice, Constitutional Morality)**

Introduction

Enacted in February 1976, the **Bonded Labour System (Abolition) Act, 1976 (BLSA)** was a transformative step toward dismantling exploitative labour structures rooted in poverty, caste hierarchy, and feudal relations. As the law completes 50 years, it offers an opportunity to assess its **constitutional foundations, implementation record, and continuing challenges**.

Bonded labour represents not merely an economic exploitation but a denial of **human dignity and freedom**, striking at the core of India's constitutional morality.

Constitutional and Legal Framework

1. Constitutional Safeguards

The prohibition of bonded labour derives strength from fundamental rights:

- **Article 21** – Protection of life and personal liberty, interpreted by the Supreme Court to include the right to live with dignity.
- **Article 23** – Explicit prohibition of trafficking, begar, and forced labour.
- **Article 24** – Prohibits child labour in hazardous occupations.

In **People's Union for Democratic Rights v. Union of India (1982)**, the Supreme Court held that non-payment of minimum wages amounts to forced labour under Article 23.

2. Statutory Provisions

Bonded Labour System (Abolition) Act, 1976

The Act:

- Abolished the bonded labour system in all forms.
- Declared bonded labour agreements void.
- Cancelled all outstanding bonded debts.
- Mandated immediate release of bonded labourers.
- Provided protection from eviction from land occupied by freed labourers.
- Assigned **District Magistrates** and **Vigilance Committees** responsibility for identification, release, and rehabilitation.

Contemporary Legal Reinforcement

- **Section 143 of the Bharatiya Nyaya Sanhita, 2023** penalizes trafficking and forced labour, strengthening criminal liability.

Implementation Architecture

1. Identification and Rescue

- Periodic surveys and rescue operations conducted at district level.
- Lakhs of bonded labourers identified and released since 1976.
- Approximately **3 lakh persons freed/rehabilitated since 1978**, indicating both progress and enforcement limitations.

2. Rehabilitation Measures

Through Central and State schemes:

- Financial assistance packages

- Land allocation
- Housing support
- Livelihood and skill training

Rehabilitation is critical because mere release without economic alternatives often results in re-bondage.

Why Does Bonded Labour Persist?

Despite five decades of legal prohibition, bonded labour continues in sectors such as agriculture, brick kilns, mining, carpet weaving, and domestic work.

1. Structural Poverty

- Chronic indebtedness due to lack of formal credit access.
- Informal labour markets lacking written contracts and regulatory oversight.

Amartya Sen's **Capability Approach** suggests that deprivation of capabilities traps individuals in exploitative economic arrangements.

2. Caste and Social Hierarchies

- SC/ST communities are disproportionately affected.
- Social discrimination reinforces economic vulnerability.

Bonded labour thus reflects the intersection of **caste oppression and economic marginalization**.

3. Weak Enforcement

- Low conviction rates reduce deterrence.
- Limited victim-centric approach in criminal justice processes.
- Underreporting due to fear, illiteracy, and social pressure.

The implementation gap reflects broader governance challenges in the informal sector.

4. Migration and Informalisation

- Inter-state migrant workers often fall prey to debt-based coercion.
- Supply chain opacity in informal industries hides exploitative practices.

The COVID-19 migrant crisis exposed the fragility of informal labour protections.

Ethical and Governance Dimensions

Bonded labour is not only a legal violation but an ethical issue concerning:

- **Human dignity (Article 21)**
- **Substantive equality (Article 14)**
- **Social justice as envisioned in the Preamble**

Dr. B.R. Ambedkar emphasized that political democracy must be accompanied by **social and economic democracy** — bonded labour represents a failure to achieve this balance.

Contemporary Relevance

Dimension	Significance
Human Rights	Protection against forced labour aligns with ILO conventions
Sustainable Development Goals (SDG 8.7)	Calls for eradication of forced labour and modern slavery
Economic Justice	Ensures fair wages and decent work
Governance Reform	Need for data transparency and better conviction rates

Way Forward

A durable solution requires:

- Strengthening **legal enforcement and prosecution mechanisms**
- Real-time labour market monitoring using digital platforms
- Expanding access to formal credit to prevent debt bondage
- Social awareness campaigns in vulnerable districts
- Convergence between labour, rural development, and social justice departments

Most importantly, sustained **political commitment and community participation** are indispensable.

Conclusion

Fifty years after the enactment of the Bonded Labour System (Abolition) Act, India has achieved notable progress in dismantling overt forms of bonded labour. However, **structural poverty, caste-based vulnerability, informal sector exploitation, and weak enforcement mechanisms** continue to impede total eradication.

A comprehensive strategy combining **legal vigilance, socio-economic rehabilitation, and institutional accountability** is essential to realize the constitutional promise of **freedom, equality, and dignity**.

Keywords: Bonded Labour, Article 23, Human Dignity, Informal Sector Exploitation, Rehabilitation, Social Justice, Governance Gap.

Mains Practice Question

"Despite five decades of the Bonded Labour System (Abolition) Act, 1976, bonded labour continues in new forms. Examine the structural causes and suggest comprehensive measures for its eradication."

India's Emerging Mental Health Crisis: Policy Signals from the Economic Survey and Union Budget

📌 **Syllabus Mapping:**

- ✅ **GS Paper II – Social Justice (Health; Vulnerable Sections; Welfare Schemes)**
- ✅ **GS Paper III – Indian Economy (Human Capital; Productivity Loss; Social Sector Expenditure)**
- ✅ **GS Paper IV – Ethics (Human Dignity; Empathy; Public Policy and Well-being)**

Introduction

The **Economic Survey 2025–26** and the **Union Budget 2026–27** have highlighted mental health as a growing public health and economic concern. According to the **World Health Organization (WHO)**, mental health is a state of well-being enabling individuals to cope with life stresses, realize their potential, and contribute productively to society.

India's demographic dividend and economic aspirations are at risk if the silent mental health burden remains inadequately addressed.

Mental Health Scenario in India

1. Prevalence of Mental Disorders

- **10.6% of Indian adults** suffer from mental disorders.
  - Source: National Mental Health Survey (2015–16) conducted by NIMHANS.

This translates into millions of affected individuals across age groups.

2. Treatment Gap

- **70% to 92%** of individuals do not receive adequate treatment.

Reasons:

- Social stigma
- Limited awareness
- Shortage of trained psychiatrists and psychologists
- Rural-urban disparities

India's mental health workforce density remains significantly below global standards.

3. Economic Impact

- Estimated economic loss: **USD 1.03 trillion (2012–2030)**.

Untreated mental illness reduces labour productivity, increases absenteeism, and raises healthcare costs, affecting overall GDP growth.

4. Rising Suicide Rates

- **171,418 suicides reported in 2023** (NCRB data).

Suicide reflects acute psychological distress and systemic gaps in early intervention.

5. Digital Addiction and Behavioural Disorders

The Economic Survey notes increasing addictive behaviour linked to:

- Smartphones
- Online gaming
- Social media platforms

Near-universal internet penetration has amplified concerns regarding **screen dependency, cyberbullying, and social isolation**, especially among youth.

Structural Causes

Dimension	Explanation
Socio-economic Stress	Unemployment, academic pressure, migration
Urbanisation	Social fragmentation and loneliness
Digital Overexposure	Reduced physical interaction, dopamine-driven dependency
Gender & Vulnerability	Higher stress among women and marginalized groups

Amartya Sen's human development framework emphasizes that health — including mental health — is central to expanding human capabilities.

Key Government Initiatives

1. NIMHANS Act, 2012

- Declared the National Institute of Mental Health and Neurosciences (Bengaluru) as an **Institute of National Importance**.

Budget 2026–27 Provisions

- Establishment of **NIMHANS-2**.
- Upgradation of national mental health institutes in **Ranchi and Tezpur**.

This strengthens tertiary mental healthcare infrastructure.

2. National Suicide Prevention Strategy (NSPS), 2022

- Target: Reduce suicide mortality by **10% by 2030**.
- Focus areas:
  - Early identification
  - Crisis helplines
  - Restricting access to means

3. Financial Protection

- Under **Ayushman Bharat PM-JAY**, mental illnesses are covered up to **₹5 lakh per family annually**.

This addresses affordability barriers.

4. Rights-Based Framework

Rights of Persons with Disabilities (RPwD) Act

- Recognizes mental illness under disability category.
- Ensures access to reservation, welfare, and legal protection.

5. National Tele Mental Health Programme (Tele MANAS)

- Free 24×7 national toll-free helpline.
- Expands outreach, especially in underserved districts.

Digital platforms improve accessibility but require strong referral systems.

Gaps and Concerns

- Inadequate integration of mental health into primary healthcare.
- Insufficient counsellors in schools and workplaces.

- Persistent stigma despite awareness campaigns.
- Data gaps and underreporting of cases.

The WHO recommends integrating mental health into universal health coverage frameworks.

Need for a Whole-of-Community Approach

1. School-Level Interventions

- Incorporate emotional intelligence and stress management into curricula.
- Establish school counsellor networks.

2. Workplace Mental Health Policies

- Stress audits and burnout management.
- Flexible working arrangements.

3. Community and Digital Literacy

- Awareness campaigns to combat stigma.
- Regulation of addictive digital platforms.

Broader Policy Implications

Dimension	Relevance
Human Capital	Mental well-being enhances productivity
Demographic Dividend	Youth mental health critical for economic growth
Public Health	Early intervention reduces long-term costs
Ethical Governance	Promotes dignity and inclusion

Conclusion

The Economic Survey and Union Budget have rightly flagged mental health as a pressing socio-economic challenge. With significant **treatment gaps, rising suicides, digital addiction, and economic losses**, mental health demands policy priority equivalent to physical health.

Strengthening institutional infrastructure, expanding insurance coverage, digital outreach through Tele MANAS, and promoting a **whole-of-community approach** are essential. Ultimately, safeguarding mental health is central to building a **productive, resilient, and inclusive Viksit Bharat**.

Keywords: Mental Health Crisis, Treatment Gap, Suicide Prevention, Digital Addiction, Human Capital, Tele MANAS, Social Justice.

Mains Practice Question

“Mental health is not merely a health sector issue but a socio-economic and governance challenge. Examine the scale of India’s mental health crisis and evaluate the adequacy of recent policy responses.”

Major Social and Economic Initiatives: Strengthening Women, Youth and Vulnerable Citizens

📌 **Syllabus Mapping:**

- ✅ **GS Paper II – Social Justice (Welfare Schemes; Vulnerable Sections; Women Empowerment)**
- ✅ **GS Paper III – Indian Economy (Entrepreneurship; Startup Ecosystem; Inclusive Growth)**
- ✅ **GS Paper II – Governance (Policy Implementation; Social Protection Mechanisms)**

Introduction

The Prime Minister has approved a set of major initiatives aimed at strengthening **social protection, women’s economic empowerment, and youth entrepreneurship**. The key measures include:

- Launch of **PM RAHAT (Road Accident Holistic Action for Treatment)** scheme.
- Expansion of the **Lakhpati Didi Initiative**.
- Approval of **Startup India Fund of Funds 2.0 (FFS 2.0)** with a corpus of ₹10,000 crore.

Together, these initiatives reflect a multidimensional approach to inclusive growth under the vision of **Viksit Bharat**.

1. PM RAHAT Scheme

Objective

To prevent fatalities arising from delays in emergency medical treatment following road accidents.

Key Features

- Provides **cashless treatment up to ₹1.5 lakh** for accident victims.
- Ensures immediate access to trauma care without financial barriers.

Significance

- India records one of the highest numbers of road accident fatalities globally.
- Financial constraints often delay treatment, worsening outcomes.

The scheme strengthens the **right to life under Article 21**, reinforcing state responsibility toward emergency healthcare.

2. Lakhpati Didi Initiative: Expansion of Target

Target Revision

- New target: **6 crore Lakhpati Didis by March 2029**.
- Earlier goal of 3 crore achieved ahead of March 2027 timeline.

This acceleration reflects strong implementation momentum.

About the Initiative

Launched in 2023 under:

- **Deendayal Antyodaya Yojana – National Rural Livelihoods Mission (DAY-NRLM)**
- Implemented by the Ministry of Rural Development.

Definition: A **Lakhpati Didi** is a member of a Self-Help Group (SHG) with a sustainable annual household income of ₹1 lakh or more.

Core Strategy

- Livelihood diversification.
- Skill development.
- Financial inclusion.
- Market access support.

Activities include small enterprises, food processing, handicrafts, livestock management, and agri-based ventures.

Significance

Dimension	Impact
Women Empowerment	Enhances economic agency
Poverty Reduction	Sustainable income generation
Rural Development	Strengthens SHG ecosystem
Gender Equity	Improves financial independence

The initiative aligns with the broader goal of increasing **Female Labour Force Participation Rate (FLFPR)**.

3. Startup India Fund of Funds 2.0 (FFS 2.0)

Overview

- Approved corpus: **₹10,000 crore**.
- Announced in Union Budget 2025–26.
- Focus on manufacturing and high-technology sectors requiring long-term capital.

About Fund of Funds for Startups (FFS)

- Flagship initiative under **Startup India Action Plan**.
- Administered by the **Department for Promotion of Industry and Internal Trade (DPIIT)**.
- Managed by **SIDBI (Small Industries Development Bank of India)**.

Operational Model

- Funds are invested in SEBI-registered **Alternative Investment Funds (AIFs)**.
- AIFs then invest in startups.

This indirect structure expands domestic risk capital availability.

Strategic Importance

- Supports deep-tech, AI, semiconductor, and manufacturing startups.
- Reduces reliance on foreign venture capital.
- Strengthens domestic innovation ecosystem.

Integrated Development Perspective

Initiative	Target Group	Policy Objective
PM RAHAT	Accident victims	Social protection & emergency healthcare
Lakhpati Didi	Rural women SHGs	Poverty alleviation & women empowerment
FFS 2.0	Startups & youth entrepreneurs	Innovation-driven growth

The schemes collectively address both **welfare and wealth creation** dimensions.

Broader Policy Significance

- Strengthens social safety nets.
- Promotes entrepreneurship-led job creation.
- Enhances women's economic participation.
- Supports structural transformation toward high-value sectors.

These initiatives align with inclusive growth and demographic dividend harnessing.

Challenges

- Ensuring efficient hospital network coverage under PM RAHAT.
- Maintaining income sustainability for Lakhpati Didis.
- Monitoring fund deployment efficiency in FFS 2.0.
- Avoiding regional and gender disparities in implementation.

Conclusion

The approval of PM RAHAT, expansion of the Lakhpati Didi Initiative, and launch of Startup India Fund of Funds 2.0 represent a comprehensive policy push combining **social protection, women-led rural transformation, and innovation-driven economic growth**.

By integrating welfare with entrepreneurship and financial inclusion, these initiatives advance the objectives of **inclusive development, gender equity, and sustainable economic expansion under Viksit Bharat**.

Keywords: PM RAHAT, Lakhpati Didi, SHG Empowerment, Fund of Funds, Startup Ecosystem, Women-Led Development, Inclusive Growth.

Mains Practice Question

"Inclusive development requires simultaneous strengthening of social protection, women's empowerment, and entrepreneurship ecosystems. Analyse the significance of recent government initiatives in this context."

ENVIRONMENT & ECOLOGY

Waste Sector and India's Net Zero Pathway: Infrastructure, Behaviour and Institutional Reforms

📌 **Syllabus Mapping:**

- ✅ **GS Paper III – Environment (Waste Management; Climate Change; Urban Environmental Issues)**
- ✅ **GS Paper III – Infrastructure (Urban Infrastructure; Sewerage and Sanitation Systems)**
- ✅ **GS Paper II – Governance (Urban Local Bodies; Public Policy; Behavioural Change Initiatives)**

Introduction

NITI Aayog's report titled **"Scenarios Towards Viksit Bharat and Net Zero: Waste"** examines how India's waste sector must transform to align with the national commitment of achieving **Net Zero emissions by 2070**.

Though contributing a relatively smaller share to national emissions, the waste sector presents significant **mitigation opportunities** through improved infrastructure, technological innovation, and behavioural transformation.

Current Status and Challenges

1. Emission Contribution

- Waste sector accounted for **2.56% of India's total greenhouse gas emissions (2020)**.

Major emissions arise from methane generated by landfills and untreated wastewater.

2. Infrastructure Gaps

- Only **39% of India is covered by sewer networks**.
- Only **44.9% of sewage is collected and treated**.

This results in methane emissions and water contamination.

3. Urban Pressure and Waste Volume

- Urban population projected to reach **53% by 2050**.
- Municipal Solid Waste (2020): **100.9 million tonnes annually**.
- Domestic wastewater generation: **221,173 million litres per day (MLD)**.

Rapid urbanisation intensifies waste management challenges.

4. Low Scientific Processing

- Only **39% of waste is scientifically processed**.

Remaining waste often ends up in open dumpsites, contributing to methane release and public health risks.

5. Structural and Social Issues

- Limited source segregation.
- Plastic waste mismanagement.
- Social stigma attached to waste handling occupations.
- Fragmented and unreliable data systems.

Waste governance thus involves both technical and socio-cultural barriers.

Emission Reduction Potential

Improved waste management offers dual benefits:

- Methane mitigation.
- Resource recovery (energy and compost).

Methane has a global warming potential many times higher than CO_2 over short time horizons, making landfill reform critical.

Key Transformation Levers

I. Solid Waste Management

1. Bio-Methanation

- Transition from basic composting to **anaerobic digestion systems**.
- Converts organic waste into **biogas (methane)**.
- Produces renewable energy and reduces landfill emissions.

2. Source Segregation

- Target: **100% door-to-door segregation**, aligned with Swachh Bharat Mission 2.0.
- Enables efficient recycling and scientific processing.

3. Bio-Remediation of Legacy Waste

- Treatment of old dumpsites using microorganisms in open environments.
- Reduces hazardous leachate and methane emissions.

This is crucial for cities with large legacy landfill burdens.

II. Wastewater Management

1. Domestic Wastewater

- Expand sewer network coverage to **85% by 2070**.
- Ensure **100% faecal sludge treatment** through:
  - Faecal Sludge Treatment Plants (FSTPs).
  - Co-treatment mechanisms.

Improved sewage treatment reduces methane and nitrous oxide emissions.

2. Industrial Wastewater

- Upgrade aerobic treatment systems.
- Achieve near-zero **Methane Correction Factor (MCF)** by 2035.
- Focus sectors:
  - Fertilizers
  - Petroleum refining
  - Fish processing

Industrial reform is essential for emission intensity reduction.

Behavioural and Institutional Shifts

1. Mission LiFE (Lifestyle for Environment)

- Promote sustainable consumption habits.
- Reduce waste generation at source.

Behavioural change complements technological interventions.

2. Informal Sector Integration

- Formalise waste pickers into the value chain.
- Provide social protection and skill upgradation.

India's recycling economy heavily depends on informal workers.

3. Green Financing

- Use **Public-Private Partnerships (PPP)** for infrastructure expansion.
- Mobilise funds via:
  - Carbon credits
  - Green bonds

Financing is critical given capital-intensive infrastructure needs.

Broader Implications

Dimension	Impact
Climate Mitigation	Methane reduction from landfills
Urban Governance	Improved sanitation and public health
Circular Economy	Resource recovery from waste streams
Employment	Formalisation of waste workforce
Energy Security	Biogas as renewable energy source

Key Challenges

- Capacity constraints in Urban Local Bodies (ULBs).
- High capital costs for treatment plants.

- Resistance to behavioural change.
- Data reliability and monitoring gaps.

Strong institutional coordination is required.

Conclusion

The NITI Aayog Waste Report highlights that the waste sector, though contributing only **2.56% of national emissions**, holds substantial potential for cost-effective mitigation. Bridging infrastructure gaps, scaling bio-methanation, expanding sewer networks, integrating informal workers, and promoting sustainable lifestyles are central to aligning the sector with **Net Zero 2070**.

Waste transformation is not merely an environmental imperative—it is a governance, behavioural, and economic reform agenda critical to building a **clean, resilient, and climate-aligned Viksit Bharat**.

Keywords: Waste Sector Emissions, Bio-Methanation, Source Segregation, Sewer Coverage, Methane Mitigation, Circular Economy, Mission LiFE.

Mains Practice Question

"India's waste sector presents both environmental challenges and climate mitigation opportunities. Examine the structural gaps and policy pathways required to align the waste sector with the Net Zero 2070 goal."

Power Sector Transition for Viksit Bharat and Net Zero 2070

📌 **Syllabus Mapping:**

- ✅ **GS Paper III – Indian Economy (Energy Infrastructure; Investment Models; Industrial Growth)**
- ✅ **GS Paper III – Environment (Climate Change; Mitigation; Renewable Energy Transition)**
- ✅ **GS Paper II – Governance (Regulatory Reforms; Public Sector Enterprises; Electricity Reforms)**

Introduction

NITI Aayog's report titled **"Scenarios Towards Viksit Bharat and Net Zero: Power"** analyses India's electricity transition under two pathways:

- **Current Policy Scenario (CPS)**
- **Net Zero Scenario (NZS)** aligned with India's 2070 climate commitment.

The power sector is pivotal, accounting for **39.4% of India's total greenhouse gas emissions in 2020** (MoEFCC, 2024). Decarbonising electricity is therefore central to achieving Net Zero while sustaining economic growth.

Structural Context

Electricity demand is expected to rise significantly due to:

- Industrialisation.
- Electrification of transport and cooking.
- Urbanisation.
- Digital economy expansion.

Thus, India must simultaneously ensure **energy security, affordability, and sustainability**.

Key Projections

1. Electrification-Led Demand Growth

- Electricity share in final energy demand rises to:
  - **40% under CPS**
  - **60% under NZS by 2070**

Electricity becomes the dominant energy carrier, replacing fossil fuels in transport and industry.

2. Renewable Capacity Expansion

- Installed power capacity projected to expand **9–14 times by 2070**.
- Renewables expected to supply **90–93% of total capacity**, primarily:
  - Solar PV
  - Wind energy
  - Distributed generation systems

This marks a structural shift from coal-dominated generation.

3. Storage and Grid Flexibility

A renewable-heavy grid demands large-scale storage to manage intermittency.

- Up to **3,000 GW of battery storage**.
- Around **160 GW of pumped hydro storage**.

Grid stability becomes a technological and financial challenge.

4. Nuclear as Firm Power

- Nuclear capacity projected to expand from **8.8 GW to over 300 GW by 2070**.
- Small Modular Reactors (SMRs) to enhance flexibility and scalability.

Nuclear provides reliable baseload power, complementing intermittent renewables.

Key Recommendations

I. Generation Sector

- Scale **solar–wind–storage hybrid systems**.
- Expand nuclear power, including SMRs.
- Enable flexible operation of coal plants.
- Repurpose ageing thermal plants.
- Provide incentives for energy storage technologies.

II. Transmission & Distribution

- Expand **Green Energy Corridors** for renewable integration.
- Digitise power grids using smart technologies.
- Reform financially stressed DISCOMs.
- Promote peer-to-peer electricity trading.

Distribution reforms are essential for financial sustainability.

III. Policy and Regulatory Reforms

- Deepen competitive power markets.
- Implement **cost-reflective tariffs**.
- Strengthen renewable purchase obligations (RPOs).
- Institutionalise resource adequacy planning.

Regulatory certainty is crucial to attract private investment.

IV. Sustainability and Innovation

- Strengthen domestic manufacturing via **Production Linked Incentive (PLI)** schemes.
- Develop recycling frameworks for batteries and solar panels.
- Integrate cybersecurity safeguards.
- Deploy AI/ML for demand forecasting and grid optimisation.

V. Financing Mechanisms

- Mobilise climate finance and green bonds.
- Adopt blended finance and PPP models.
- Improve risk-sharing frameworks to crowd in private capital.

The transition requires trillions of dollars in long-term investment.

Comparative Outlook: CPS vs NZS

Indicator	CPS	NZS
Electricity Share in Energy Mix	40%	60%
Renewable Capacity Share	High	Dominant (90%+)
Nuclear Expansion	Moderate	Significant (300+ GW)
Storage Requirement	High	Very High

NZS demands deeper structural transformation.

Strategic Implications

Dimension	Impact
Climate Mitigation	Major emission reduction in largest emitting sector
Energy Security	Reduced fossil fuel imports
Industrial Policy	Boost to domestic clean-tech manufacturing
Employment	Growth in renewable and storage sectors
Grid Modernisation	Digital and smart infrastructure development

Key Challenges

- Financing the massive infrastructure build-out.
- Managing coal-dependent regions in a just transition.
- Ensuring DISCOM financial viability.
- Maintaining grid stability with high renewable penetration.

A phased and socially sensitive transition is essential.

Conclusion

The NITI Aayog Power report makes it clear that decarbonising the electricity sector is foundational to achieving **Viksit Bharat 2047 and Net Zero 2070**. Massive renewable expansion, storage deployment, nuclear scaling, regulatory reform, and climate finance mobilisation form the backbone of this transition.

Success will depend on aligning **energy security, economic growth, and environmental sustainability**, while ensuring affordability and equity in the transformation process.

Keywords: Electricity Transition, Net Zero 2070, Renewable Energy, Energy Storage, Nuclear Expansion, DISCOM Reforms, Climate Finance.

Mains Practice Question

"Decarbonising the power sector is central to India's Net Zero 2070 commitment. Analyse the projected transformation pathways and evaluate the policy and financing challenges involved."

BIOTECHNOLOGY & HEALTH

Davos Compact on Antimicrobial Resistance (2025): Financing the Fight Against a Silent Pandemic

📌 **Syllabus Mapping:**

- ✅ **GS Paper II – Health (Public Health Challenges; Global Health Governance)**
- ✅ **GS Paper III – Science & Technology (Biotechnology; Drug Resistance; Innovation in Pharmaceuticals)**
- ✅ **GS Paper II – International Relations (Global Institutions; Multilateral Health Cooperation)**

Introduction

The **World Economic Forum (WEF)** has launched the **Davos Compact on Antimicrobial Resistance (AMR) 2025**, supported by the Unified Coalition for AMR Response. The initiative seeks to mobilise sustainable public and private financing to curb global AMR-related mortality, with an ambitious target of **saving over 100 million lives by 2050**.

AMR is increasingly described as a "silent pandemic" that threatens modern medicine, economic stability, and global health security.

Understanding Antimicrobial Resistance (AMR)

Definition

AMR occurs when **bacteria, viruses, fungi, and parasites** evolve and no longer respond to antimicrobial medicines such as:

- Antibiotics
- Antivirals
- Antifungals

This renders standard treatments ineffective, increasing morbidity and mortality.

Nature of AMR

- AMR is a **natural evolutionary process** driven by genetic mutations.
- However, its spread is accelerated by:
  - Misuse and overuse of antibiotics.
  - Self-medication and over-the-counter sales.
  - Overuse in livestock and agriculture.
  - Poor infection prevention practices.

Global and Indian Scenario

Global Threat

Without intervention, AMR could become a leading cause of death globally, undermining decades of medical progress.

Status in India

- Approximately **6 lakh deaths annually** are linked to resistant infections.

India faces heightened risk due to:

- High population density.
- Antibiotic over-prescription.
- Inadequate sanitation and infection control in some settings.

Significance of the Davos Compact 2025

1. Sustainable Financing Mechanism

- Seeks to unlock funding from:
  - Governments
  - Private sector
  - Philanthropic institutions

Financing is critical as antibiotic R&D faces low commercial returns compared to chronic disease drugs.

2. Public-Private Collaboration

- Encourages pharmaceutical innovation.
- Supports equitable access to new antimicrobials.

This addresses the “market failure” in antibiotic development.

3. Global Mortality Reduction Target

- Aim to reduce AMR deaths substantially, potentially saving **100 million lives by 2050**.

This complements existing UN and WHO commitments.

Key Initiatives to Address AMR

1. National Action Plan on AMR 2.0 (2025–2029)

- Adopts a **One Health approach**, integrating:
  - Human health
  - Animal health
  - Agriculture
  - Environmental sectors

This recognizes interlinked transmission pathways.

2. Indigenous Innovation

- Launch of **Nafithromycin (2024)** – India’s first indigenous antibiotic targeting drug-resistant pathogens.

This strengthens pharmaceutical self-reliance and innovation capacity.

3. Surveillance Networks

- National AMR surveillance generates annual reports.
- Data submitted to WHO's **Global AMR Surveillance System (GLASS)**.

Robust surveillance is foundational to policy planning.

Global Efforts

1. WHO Global Action Plan (2015)

- Adopted at the World Health Assembly.
- Focus on awareness, surveillance, infection prevention, and research.

2. UN General Assembly High-Level Meeting on AMR (2024)

- Target: Reduce global bacterial AMR deaths by **10% by 2030** (against 2019 baseline).

This reflects high-level political recognition of the crisis.

Broader Implications

Dimension	Significance
Public Health	Threatens routine surgeries, cancer therapy, organ transplants
Economic Impact	Increased healthcare costs and productivity loss
Global Security	Risk of transnational spread
Pharmaceutical Policy	Need for new incentive models

Key Challenges

- Over-the-counter antibiotic sales.
- Inadequate infection prevention in healthcare settings.
- Antibiotic use in livestock.
- Limited pipeline of new antibiotics.

Behavioural change and regulatory enforcement remain central.

Way Forward

- Strengthen antimicrobial stewardship programs.
- Promote rational prescription practices.
- Enhance sanitation and infection control.
- Incentivize R&D through public funding and global partnerships.
- Improve awareness campaigns among citizens.

Conclusion

The Davos Compact on AMR 2025 represents a crucial step in mobilizing sustainable financing and global cooperation to combat antimicrobial resistance. For India, where resistant infections claim **around 6 lakh lives annually**, strengthening surveillance, promoting indigenous innovation, and implementing the One Health approach are essential.

Unchecked AMR could reverse decades of medical progress, making it imperative to act through **coordinated policy, innovation, financing, and behavioural reform**.

Keywords: Antimicrobial Resistance, One Health, Antibiotic Stewardship, Global Health Governance, Nafithromycin, AMR Surveillance, Sustainable Financing.

Mains Practice Question

"Antimicrobial Resistance represents a looming public health and economic crisis. Discuss the drivers of AMR and evaluate national and global responses to address it."

Transforming Healthcare Delivery through Artificial Intelligence

📌 **Syllabus Mapping:**

- ✅ **GS Paper II – Health (Public Health Systems; Digital Health; Governance in Healthcare)**

- ✅ **GS Paper III – Science & Technology (Artificial Intelligence; Emerging Technologies)**
- ✅ **GS Paper III – Indian Economy (Human Capital; Innovation Ecosystem)**

Introduction

Artificial Intelligence (AI) is reshaping healthcare delivery by improving diagnostics, expanding access to care, strengthening public health surveillance, and enhancing administrative efficiency.

In a country like India—marked by **specialist shortages, rural–urban disparities, and high disease burden**—AI offers a scalable solution to bridge systemic gaps.

Role of AI in Healthcare

1. Disease Management and Diagnostics

AI-powered tools assist in early detection and screening.

- **MadhuNetrAI**: Used for diabetic retinopathy screening through AI-driven retinal image analysis.

Significance

- Addresses shortage of ophthalmologists.
- Enables large-scale preventive screening.
- Reduces risk of preventable blindness.

AI algorithms can detect patterns in imaging data faster than traditional manual review.

2. Telemedicine and Remote Monitoring

AI enhances virtual consultation platforms.

- **eSanjeevani Clinical Decision Support System (CDSS)**:
  Provides AI-based differential diagnosis recommendations.

Impact

- Extends medical advice to remote and underserved regions.
- Reduces burden on tertiary hospitals.
- Improves triaging and treatment prioritization.

This strengthens universal health coverage goals.

3. Public Health Surveillance and Nutrition

AI enables early warning systems for disease outbreaks.

- **Media Disease Surveillance (MDS)**:
  Uses AI to scan digital news sources for symptom clusters and emerging health trends.

Significance

- Enhances epidemic preparedness.
- Supports real-time public health interventions.

AI also aids in tracking nutrition patterns and environmental health risks.

4. Administrative Efficiency and Fraud Detection

AI tools streamline government health schemes and insurance systems.

- Detect anomalies and fraudulent claims.
- Optimize hospital resource allocation.

This ensures better utilisation of public funds.

5. Record Management and Documentation

- **Eka Doc** and **Sunoh.Ai** use Natural Language Processing (NLP) to summarize patient records.

Benefits

- Reduces documentation burden on doctors.
- Improves continuity of care.
- Enhances clinical decision-making.

Broader Impact on Healthcare Outcomes

Domain	Contribution of AI
Accessibility	Expands reach to rural areas
Affordability	Reduces diagnostic costs
Accuracy	Enhances early detection
Efficiency	Streamlines administration
Preparedness	Strengthens surveillance systems

AI aligns with the objectives of **Ayushman Bharat and Digital Health Mission**.

Key Challenges

1. Algorithmic Bias

- AI systems may underperform for underrepresented populations.
- Risk of reinforcing health inequities.

2. Digital Divide

- Unequal access to internet and digital literacy.
- Rural areas may lag in AI adoption.

3. Data Privacy and Security

- Health data is sensitive personal information.
- Requires strong compliance with data protection norms.

4. Accuracy and Reliability

- AI diagnostics must meet clinical validation standards.
- Risk of over-reliance without human oversight.

Policy Considerations

- Strengthen ethical AI frameworks in healthcare.
- Promote inclusive datasets to reduce bias.
- Enhance cybersecurity measures.
- Build AI literacy among healthcare professionals.
- Encourage public-private collaboration for innovation.

Conclusion

Artificial Intelligence is emerging as a transformative force in India's healthcare system, addressing challenges of access, affordability, and efficiency. Tools such as MadhuNetrAI, eSanjeevani CDSS, and AI-based surveillance platforms demonstrate the potential for scalable public health solutions.

However, ensuring **ethical deployment, equitable access, data security, and human oversight** is critical to harness AI responsibly for sustainable healthcare transformation.

Keywords: AI in Healthcare, Digital Health, Telemedicine, Public Health Surveillance, Algorithmic Bias, Health Data Security, Clinical Decision Support.

Mains Practice Question

"Artificial Intelligence has the potential to revolutionize healthcare delivery in India. Examine its applications and critically analyse the ethical and governance challenges associated with its deployment."

BIRAC–RDI Fund: Catalysing India's Biotech Innovation Ecosystem

📌 **Syllabus Mapping:**

- ✅ **GS Paper III – Science & Technology (Biotechnology; Research & Innovation Ecosystem)**
- ✅ **GS Paper III – Indian Economy (Industrial Policy; Startup Ecosystem; Innovation Financing)**
- ✅ **GS Paper II – Governance (Institutional Frameworks; Public Funding for R&D)**

Introduction

The Government has announced the **first National Call under the ₹2,000 crore BIRAC–RDI Fund**, part of the broader **₹1 lakh crore Research, Development and Innovation (RDI) Initiative**.

The move aims to accelerate India's biotechnology ecosystem by bridging the persistent gap between **laboratory research and industrial-scale manufacturing**, thereby strengthening the country's bioeconomy ambitions.

About the BIRAC–RDI Fund

Institutional Framework

- Launched in **November 2025**.
- Operates under the **Anusandhan National Research Foundation (ANRF)**.
- Anchored by the **Department of Science & Technology (DST)**.
- Fund Manager: **Biotechnology Industry Research Assistance Council (BIRAC)**.

Core Objective

To facilitate the **"Lab-to-Industry" transition** by supporting technologies at **Technology Readiness Level (TRL) 4 and above**—that is, innovations beyond the proof-of-concept stage.

Financial Instruments

The fund deploys a mix of:

- Equity support.
- Convertible instruments.
- Long-term debt financing.

This diversified structure reduces early-stage commercialization risk.

Focus Sectors

The Fund complements the **BioE3 Policy** and targets high-potential segments such as:

- Biopharmaceuticals.
- Bio-industrial manufacturing.
- Bioenergy.
- Advanced bioproducts.

These sectors are critical for sustainable growth and economic security.

About the RDI (Research, Development and Innovation) Initiative

Institutional Oversight

- Implemented under the aegis of **DST** and **ANRF**.

Financial Outlay

- ₹1 lakh crore over six years.
- ₹20,000 crore allocated for FY 2025–26.

Objectives

1. Encourage private sector participation in frontier research.
2. Promote strategic technologies such as deep tech, biotechnology, and AI.
3. Enhance technological self-reliance and economic security.

The initiative seeks to correct India's historically low R&D expenditure relative to GDP.

India's Bioeconomy: Growth Trajectory

- Expanded from **$10 billion in 2014** to **$165.7 billion in 2024**.
- Target: **$300 billion by 2030**.

Biotechnology now plays a key role in pharmaceuticals, agriculture, renewable energy, and industrial processes.

Complementary Policy Initiatives

1. BioE3 Policy

Biotechnology for Economy, Environment, and Employment aims to promote:

- High-performance biomanufacturing.
- Sustainable bio-based industrial solutions.

2. National Biopharma Mission (NBM)

- Strengthens capabilities in vaccines, biosimilars, diagnostics, and medical devices.
- Encourages academia-industry collaboration.

3. Biotech-KISAN

- Scientist–farmer partnership programme.
- Supports agricultural biotechnology innovations.

Strategic Significance

Dimension	Impact
Innovation Ecosystem	Strengthens commercialization pipeline
Economic Growth	Boosts high-value biotech sectors
Self-Reliance	Reduces dependence on imports
Employment Generation	Expands skilled biotech workforce
Sustainability	Promotes green bio-industrial solutions

The initiative aligns with India's ambition to become a **global biotech hub**.

Key Challenges

- High capital intensity of biotech R&D.
- Long gestation periods for commercialization.
- Regulatory complexities in biopharma approvals.
- Need for stronger industry-academia linkages.

Addressing these constraints is essential for effective fund deployment.

Conclusion

The BIRAC–RDI Fund represents a strategic effort to institutionalize innovation financing and bridge the commercialization gap in biotechnology. By supporting mid-to-advanced stage technologies through blended financing, the initiative strengthens India's research ecosystem while advancing economic self-reliance.

If effectively implemented, it can propel India toward achieving its **$300 billion bioeconomy target by 2030**, contributing to technological leadership and sustainable growth.

Keywords: BIRAC–RDI Fund, ANRF, Lab-to-Industry Transition, Bioeconomy, Technology Readiness Level, Innovation Financing, BioE3 Policy.

Mains Practice Question

"Bridging the gap between laboratory research and industrial commercialization is critical for technological self-reliance. Examine the role of the BIRAC–RDI Fund in strengthening India's biotechnology ecosystem."

SCIENCE & TECHNOLOGY

Amaravati Quantum Valley: India's Quantum Leap

📌 **Syllabus Mapping:**

- ✅ **GS Paper III – Science & Technology (Emerging Technologies; Indigenization of Technology; R&D)**
- ✅ **GS Paper III – Economic Development (Innovation, Startups, High-Technology Manufacturing)**
- ✅ **GS Paper II – Governance (Government Policies & Interventions in S&T)**

Introduction

The foundation ceremony of the **Amaravati Quantum Valley** marks a major step in operationalising India's **National Quantum Mission (NQM)**. Envisioned as a leading hub for quantum research, innovation, and industrial collaboration, Amaravati is being positioned at the forefront of India's strategy to emerge as a global player in **Quantum Technologies (QT)**.

National Quantum Mission (NQM): An Overview

The **National Quantum Mission (2023–24 to 2030–31)** is India's flagship programme to build indigenous capabilities in quantum science and applications.

Aim: To **seed, nurture, and scale up scientific and industrial R&D** in Quantum Technology and create a vibrant ecosystem integrating academia, industry, and startups.

Budget

- Approximate outlay: **₹6,000 crore**
- Implementation period: **2023–24 to 2030–31**

Understanding Quantum Technology

Unlike classical computers that use **binary bits (0 or 1)**, quantum systems use **qubits**, which can exist in superposition (0 and 1 simultaneously) and exhibit entanglement.

Implication: Quantum systems can solve certain complex problems exponentially faster than classical systems — especially in cryptography, optimization, and molecular simulations.

Core Objectives of the National Quantum Mission

1. Quantum Computing

- Develop **intermediate-scale quantum computers**:
  - 20–50 physical qubits within 3 years
  - Scale up to **1,000 qubits within 8 years**

Importance: Such systems can revolutionize cryptography, logistics, financial modelling, and climate simulations.

2. Quantum Communication

- **Satellite-based secure quantum communication** over 2,000 km
- Inter-city **Quantum Key Distribution (QKD)** networks

Strategic Relevance: Quantum encryption enables virtually unhackable communication systems, crucial for defence, banking, and governance.

3. Advanced Quantum Sensing & Metrology

- Development of:
  - High-sensitivity magnetometers
  - Atomic clocks

Applications:

- Precision navigation
- Submarine detection

- Space research
- Seismic activity monitoring

4. Next-Generation Materials

- Synthesis of:
  - Superconductors
  - Topological materials

These materials are essential for stable qubit fabrication and scalable quantum hardware.

Significance of Amaravati Quantum Valley

1. Strategic & Security Imperative

- Enables development of **unbreakable quantum encryption**.
- Protects:
  - Defence communications
  - Financial systems
  - Critical digital infrastructure

In the context of rising cyber threats and AI-enabled cyber warfare, quantum communication strengthens **national security architecture**.

2. Global Technological Standing

Only a handful of countries (US, China, EU members) have structured quantum missions.

By institutionalizing NQM and establishing hubs like Amaravati Quantum Valley, India joins the league of **quantum-aspirant powers**, enhancing its technological sovereignty.

3. Economic & Sectoral Transformation

Healthcare

- Faster drug discovery via molecular simulation
- Precision radiation therapies
- Personalized medicine

Economy & Startups

- Stimulates high-tech startups
- Generates skilled employment
- Enhances semiconductor and space ecosystems

Space Economy

Quantum navigation and atomic clocks can improve:

- Satellite accuracy
- Deep-space communication
- ISRO missions

Governance & Ecosystem Perspective

The NQM promotes:

- Academia–industry collaboration
- Startup incubation
- Talent development in frontier technologies

This aligns with broader initiatives like:

- Atmanirbhar Bharat
- Digital India
- National Deep Tech Strategy

Challenges & Concerns

- High capital intensity and long gestation period
- Shortage of quantum-skilled workforce
- Need for international collaboration amid technology export controls
- Ethical and cybersecurity implications

Broader Strategic Context

Dimension	Relevance
National Security	Quantum encryption and secure communication
Economic Growth	High-tech manufacturing & startup ecosystem
Global Diplomacy	Technological credibility in multilateral forums
Scientific Advancement	Cutting-edge research leadership

Conclusion

The Amaravati Quantum Valley operationalizes the vision of the **National Quantum Mission**, positioning India at the frontier of **quantum computing, communication, sensing, and advanced materials research**.

By integrating **strategic security, economic growth, and technological sovereignty**, this initiative marks a decisive step toward building a **future-ready knowledge economy**.

Keywords: National Quantum Mission, Quantum Computing, Qubits, Quantum Key Distribution, Technological Sovereignty, Deep Tech Ecosystem, Strategic Security.

Mains Practice Question

"The National Quantum Mission represents not merely a technological initiative but a strategic necessity for India's economic security and global positioning." Critically examine.

Democratizing Artificial Intelligence in India: Building an Inclusive AI Ecosystem

📌 **Syllabus Mapping:**

- ✅ **GS Paper III – Science & Technology (Artificial Intelligence; Digital Infrastructure; Emerging Technologies)**
- ✅ **GS Paper II – Governance (Digital Public Infrastructure; Data Protection; E-Governance)**
- ✅ **GS Paper III – Economy (Innovation Ecosystem; Skilling; Digital Economy)**

Introduction

India's comprehensive strategy to **democratize Artificial Intelligence (AI)** reflects a shift from elite, centralized AI development to an inclusive and accessible ecosystem.

AI democratization implies making AI **accessible, affordable, and usable across diverse stakeholders**—governments, startups, MSMEs, farmers, students, and citizens. Importantly, it extends beyond user-facing applications to include access to **core AI building blocks such as computing power, datasets, models, and infrastructure**.

This approach aligns with India's broader goal of building a **Digital Public Infrastructure (DPI)-based development model**.

Understanding AI Democratization

AI democratization involves:

- Reducing entry barriers for developers and innovators.
- Ensuring equitable access to AI tools and infrastructure.
- Enabling localized and context-specific AI solutions.

It transforms AI from a corporate-dominated resource into a **public digital utility**.

Key Pillars of India's AI Democratization Strategy

1. Democratizing AI Applications for Public Impact

India is deploying AI to address developmental challenges.

Examples:

- **Bhashini** – Promotes language inclusivity by enabling AI-driven translation and voice technologies.
- **Kisan e-Mitra** – AI assistance for farmers in crop advisory and decision-making.
- **MausamGPT** – AI-enabled disaster forecasting and climate advisory.

These initiatives demonstrate AI as a tool for **public service delivery and social inclusion**.

2. Accessible Data and Models

- **AIKosh**: A national AI platform hosting:
  - Over **7,500 datasets**
  - **273 reusable AI models**

It provides shared digital assets for developers, fostering innovation while reducing duplication of effort.

Data availability is foundational for AI development.

3. Affordable Computing Power

- Under the **IndiaAI Mission**, over **38,000 high-end GPUs** have been onboarded.
- Subsidized access at **₹65 per hour**, significantly lower than global averages.

Affordable compute bridges the gap between large corporations and startups or academic institutions.

4. Robust Infrastructure and Connectivity

- 5G services cover **99.9% of districts**.

High-speed connectivity enables:

- Real-time AI applications
- Edge computing
- Digital inclusion in rural areas

Infrastructure readiness is a prerequisite for AI scaling.

5. Sustainable Energy Integration

AI systems are energy-intensive. India has aligned AI infrastructure with green energy objectives:

- **50% of installed electricity capacity from non-fossil fuel sources (June 2025)**.

This ensures AI growth does not undermine climate commitments.

Supporting Ecosystem Measures

1. Regulatory and Policy Framework

- **GI Cloud (MeghRaj)** under Digital India enhances cloud-based e-governance services.
- **Digital Personal Data Protection Act, 2023** ensures safeguards for personal data in AI systems.

A balanced regulatory framework builds public trust.

2. Education and Skilling

Initiatives:

- 5 National Centres of Excellence for Skilling.
- Skilling for AI Readiness Programme.
- **YUVAi Initiative** for youth exposure to AI.
- AI Competency Framework.

Human capital development ensures broad participation in AI economy.

Strategic Significance

Dimension	Impact
Economic Growth	Boosts AI startups and digital economy
Governance	Enhances service delivery efficiency

Inclusion	Local language AI bridges digital divide
Innovation	Lowers barriers to entry
Climate Responsibility	Green energy integration reduces carbon footprint

Challenges

- Data privacy concerns.
- Algorithmic bias and ethical risks.
- Digital divide in skill access.
- Dependence on imported semiconductor hardware.
- Need for robust AI safety frameworks.

Balancing innovation with ethical governance remains critical.

Broader Global Context

Globally, AI ecosystems are concentrated in a few countries. India's DPI-led model offers an alternative approach focused on **open access, affordability, and public good orientation**.
This enhances India's soft power and digital leadership in the Global South.

Conclusion

India's strategy to democratize AI represents a systemic effort to convert AI from an elite technological resource into a **public digital infrastructure**. By ensuring access to datasets, models, computing power, connectivity, green energy, and skilling, India aims to create an **inclusive AI ecosystem aligned with development goals**.

However, sustaining this momentum requires strengthening data governance, AI ethics frameworks, semiconductor capabilities, and research excellence to ensure long-term technological sovereignty.

Keywords: AI Democratization, Digital Public Infrastructure, AIKosh, IndiaAI Mission, Affordable Compute, Data Protection, Inclusive Innovation.

Mains Practice Question

"Democratization of Artificial Intelligence requires more than access to applications—it demands inclusive access to data, computing power, and infrastructure. Examine India's strategy in this regard and assess its challenges."

Space-Based Systems as Catalysts for National Development

📌 **Syllabus Mapping:**

- ✅ **GS Paper III – Science & Technology (Space Technology; Applications in Governance and Development)**
- ✅ **GS Paper III – Disaster Management; Agriculture; Environment and Climate Change**
- ✅ **GS Paper II – Governance (Use of Technology in Public Service Delivery)**

Introduction

India's space programme has evolved from a purely scientific enterprise to a **development-oriented strategic asset**. The Indian Space Research Organisation (ISRO) has deployed space-based systems to support agriculture, disaster management, climate monitoring, fisheries, housing, and defence.

This reflects the founding philosophy articulated by Dr. Vikram Sarabhai—that space technology must be harnessed for **national development and societal transformation**.

Key Development Goals Supported by Space-Based Systems

1. Agricultural Development

Space applications strengthen farm productivity and risk management.

Major Interventions

- **CROP (Comprehensive Remote Sensing Observation on Crop Progress)**:
  Provides satellite-based crop monitoring and yield estimation.
- Support to **Pradhan Mantri Fasal Bima Yojana (PMFBY)**:
  Satellite imagery improves crop loss assessment and claim verification.
- Soil moisture and drought assessment tools.

Impact

- Enhances precision agriculture.
- Reduces disputes in insurance claims.
- Supports evidence-based agricultural policy.

2. Disaster Management

Space-based early warning systems improve preparedness and response.

Applications

- Monitoring of glacial lakes (GLOF risk).
- Mapping flood-affected areas.
- Lightning nowcasting systems.
- Satellite Integrated Landslide Assessment and Alert System.

Fisheries Safety

- **Vessel Communication and Support System (VCSS)** under Pradhan Mantri Matsya Sampada Yojana (PMMSY): Provides real-time weather alerts and safety information to fishermen.

Impact

- Reduces loss of life and property.
- Strengthens climate resilience.

3. Climate and Environmental Monitoring

- Development of **GeoAI framework** for air quality monitoring.
- Quantification of Greenhouse Gas emissions linked to Land Use and Land Use Change (LULUCF).

Significance

- Supports India's **Net Zero 2070 commitment**.
- Enhances environmental governance through real-time data.

4. Societal Welfare and Infrastructure Monitoring

Watershed and Irrigation: Monitoring under **Watershed Development Component – Pradhan Mantri Krishi Sinchayee Yojana (WDC-PMKSY)**.

Housing: Monitoring projects under **Pradhan Mantri Awas Yojana (Urban)** using satellite imagery.

Digital Access: **Bhuvan Geoportal** provides open access to remote sensing datasets for planners and citizens.

Impact

- Enhances transparency and accountability in welfare schemes.
- Improves implementation efficiency.

5. Defence and Strategic Applications

- **MOSDAC-IN (Meteorological and Oceanographic Satellite Data Archival Centre – Indian Navy)** provides customized satellite-derived weather and oceanographic products.

Significance

- Supports maritime operations.
- Enhances situational awareness in the Indian Ocean Region.

Space assets increasingly contribute to national security architecture.

India's Space Profile

Institutional Framework

- **Indian Space Research Organisation (ISRO)**
  - Established: 1969

- Headquarters: Bengaluru
- Operates under the Department of Space (DoS).

Mandate: Harness space technology for national development and peaceful purposes.

Major Launch Vehicles

- Polar Satellite Launch Vehicle (PSLV)
- Geosynchronous Satellite Launch Vehicle (GSLV)
- Launch Vehicle Mark-3 (LVM3)

Key Space Missions

- **NISAR** (NASA-ISRO Synthetic Aperture Radar mission).
- **Aditya-L1** (Solar mission).
- **Chandrayaan-3** (Lunar exploration).

These missions enhance scientific capabilities alongside developmental applications.

Broader Strategic Significance

Dimension	Contribution
Agricultural Productivity	Precision farming and crop insurance
Disaster Resilience	Early warning and damage assessment
Climate Governance	GHG monitoring and air quality mapping
Social Welfare Monitoring	Transparency in public schemes
National Security	Maritime and meteorological intelligence

Challenges

- Increasing space debris and orbital congestion.
- Need for stronger private sector participation.
- Cybersecurity risks to satellite systems.
- Ensuring data privacy and ethical use.

Conclusion

Space-based systems have become integral to India's pursuit of inclusive growth, climate resilience, disaster preparedness, and strategic autonomy. ISRO's development-centric approach demonstrates how advanced science can directly support **national welfare and governance efficiency**.

As India advances toward **Viksit Bharat 2047**, space technology will remain a critical enabler of sustainable development and national security.

Keywords: Space Applications, Remote Sensing, Disaster Management, GeoAI, ISRO, National Development, Strategic Autonomy.

Mains Practice Question

"Space-based systems have emerged as critical instruments for achieving national development goals in India. Examine their role across sectors and assess the challenges in scaling their impact."

India's Tech Services Industry: Ten-Year Roadmap for Global Leadership

📌 **Syllabus Mapping:**

- ✅ **GS Paper III – Indian Economy (Services Sector; Innovation; Digital Economy; Growth Strategy)**
- ✅ **GS Paper III – Science & Technology (AI; Digital Infrastructure; Emerging Technologies)**
- ✅ **GS Paper II – Governance (Policy Think Tanks; Long-Term Economic Planning)**

Introduction

NITI Aayog's Frontier Tech Hub has unveiled a ten-year roadmap titled **"India's Technology Services – Reimagination Ahead"**, outlining strategies to reposition India's technology services industry for sustained global competitiveness.

The report envisions transforming India from a cost-arbitrage IT services provider to a **high-value innovation and AI-driven technology powerhouse**, aligned with the broader goal of **Viksit Bharat@2047**.

India's Tech Services Industry: Current Profile

Sector Overview

India's tech services ecosystem includes firms engaged in:

- IT services
- Software development
- Digital transformation
- Technology consulting
- Managed operations and platform support

Economic Contribution

- Contributes nearly **7% to GDP**.
- Generates approximately **$265 billion in annual revenue**.
- Accounts for around **20% of global market share** in technology services exports.

The sector has been a cornerstone of India's services-led growth model since the 1990s.

Growth Aspirations and Targets

To remain aligned with Viksit Bharat ambitions:

- Target revenue: **$750–850 billion annually by 2035**.
- Maintain 7–8% share of GDP.
- Expand global market share from 20% to **over 25%**.

Failure to accelerate growth could lead to a projected **$250–300 billion shortfall** under current trajectories.

Emerging Challenges

1. Post-Pandemic Slowdown

- Growth moderated to **4–5% annually**.

2. AI-Led Automation

- Generative AI and automation threaten traditional outsourcing models.

3. Intensifying Global Competition

- Rise of new tech hubs in Eastern Europe, Southeast Asia, and Latin America.

The industry must transition from volume-driven services to innovation-led models.

Five Priority Growth Levers Identified

1. Agentic AI

- Develop hybrid **"human + AI agent" service models**.
- Move beyond back-office functions toward intelligent automation and decision support.

This ensures productivity enhancement rather than workforce displacement.

2. Software & Product Leadership

- Strengthen India's position as a global **SaaS (Software-as-a-Service) capital**.
- Encourage product-based startups and IP creation.

This shifts value capture from services to proprietary platforms.

3. Digital Infrastructure Hub

- Position India as a global center for:
  - Data services
  - AI infrastructure

- Cloud computing ecosystems

Leveraging India's expanding digital public infrastructure and 5G penetration.

4. Innovation-Led Engineering

- Establish India-based innovation centers and Centres of Excellence (CoEs).
- Increase R&D expenditure and frontier technology partnerships.

This aligns with the goal of raising India's R&D spending toward global benchmarks.

5. India-for-India Solutions

- Develop localized AI solutions for domestic markets.
- Build multilingual platforms to cater to India's linguistic diversity.

India's vast domestic digital demand becomes a testing ground for scalable innovation.

Strategic Significance

Dimension	Impact
Economic Growth	Higher value addition and export earnings
Employment	Creation of high-skill, AI-driven jobs
Innovation Ecosystem	Shift from services to IP-based models
Global Competitiveness	Strengthened technological leadership
Digital Sovereignty	Reduced dependence on foreign platforms

Policy Implications

- Enhance AI and semiconductor ecosystem development.
- Expand skilling initiatives in AI, cloud, cybersecurity.
- Promote startup financing and venture capital access.
- Strengthen data protection and regulatory frameworks.

Public–private collaboration will be crucial.

Broader Context

India's services-led development model must now evolve toward **knowledge-intensive and innovation-driven growth**. The roadmap reflects an attempt to avoid the "middle-income trap" by climbing the global value chain.

Conclusion

The ten-year roadmap envisions transforming India's tech services sector into a **$750–850 billion high-value innovation ecosystem by 2035**, driven by Agentic AI, SaaS leadership, digital infrastructure, R&D expansion, and domestic innovation scaling.

Achieving this vision requires structural shifts from cost arbitrage to intellectual property creation, from services execution to AI-enabled value generation, and from global outsourcing to global innovation leadership.

Keywords: Tech Services Industry, Agentic AI, SaaS Leadership, Digital Infrastructure, Innovation Ecosystem, Viksit Bharat, AI-Driven Growth.

Mains Practice Question

"India's technology services industry must transition from a cost-arbitrage model to an innovation-driven ecosystem to achieve Viksit Bharat goals. Examine the challenges and strategic levers required for this transformation."