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AN INSTITUTE FOR CIVIL SERVICES

CURRENT AFFAIRS

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Introduction

India's rapid digitalisation has transformed governance, markets, and citizen–state interactions. However, the exponential growth of personal data processing has simultaneously raised concerns regarding **privacy, surveillance, misuse, and cyber vulnerabilities**. In this context, the notification of the **Digital Personal Data Protection (DPDP) Rules, 2025**marks the **full operationalisation of the DPDP Act, 2023**, giving concrete shape to India's long-awaited data protection regime.

Why in News?

The **Government of India**, through the **Ministry of Electronics and Information Technology (MeitY)**, has notified the **DPDP Rules, 2025**, setting out procedural, institutional, and compliance frameworks for enforcing the **Digital Personal Data Protection Act, 2023**.

DPDP Rules, 2025: Salient Features

1. Operationalisation of the DPDP Act, 2023

- Rules provide **procedural clarity** for enforcement
- Introduce an **18-month phased compliance timeline** for organisations
- Aim to balance **individual privacy rights** with **lawful data processing**

Rights of Citizens (Data Principals)

The Rules concretise several rights, including:

- **Right to Give or Refuse Consent**
- **Right to Access Personal Data**
- **Right to Correction, Updating, and Erasure**
- **Right to Grievance Redressal**

These rights operationalise the constitutional vision of **informational self-determination**, as recognised by the Supreme Court of India.

Obligations of Data Fiduciaries

A. Consent Architecture

- **Standalone consent notices**:
  - Clear, simple, and unbundled
  - Purpose-specific and itemised
- **Withdrawal of consent** must be as easy as giving consent

B. Data Retention and Erasure

- Personal data to be erased once the **specified purpose is fulfilled**
- Mandatory retention of:
  - Personal data

  - Processing logs
- **Minimum retention period: 1 year**, unless law mandates otherwise

C. Breach Notification

- **Immediate intimation** to:
  - Affected individuals
  - Data Protection Board of India
- Disclosure must include:
  - Nature of breach
  - Possible consequences
  - Remedial steps taken

D. Accountability Mechanisms

- Publication of contact details of **Data Protection Officer (DPO)**
- Mandatory response to data principal requests within **90 days**

Special Safeguards for Children and Vulnerable Groups

- **Verifiable parental/guardian consent** mandatory for children's data
- **Consent exemption** permitted for:
  - Healthcare
  - Education
  - Child safety and protection
- Enhanced safeguards for **persons with disabilities** unable to make legal decisions

Institutional Framework

Data Protection Board of India (DPBI)

- Composed of **four members**
- Digital portal and mobile app for:
  - Filing complaints
  - Tracking case status
- Empowered to:
  - Monitor compliance
  - Impose financial penalties

Appellate Authority

- Appeals against DPBI decisions lie with the Telecom Disputes Settlement and Appellate Tribunal

Enhanced Obligations for Significant Data Fiduciaries (SDFs)

- Mandatory **Data Protection Impact Assessments (DPIA)**
- **Independent audits every 12 months**
- Stricter scrutiny for:
  - New technologies
  - Sensitive personal data
- **Consent Managers** must be India-based entities

DPDP Act, 2023: Core Framework

Objective: To regulate processing of digital personal data by balancing:

- **Individual privacy rights**
- **Legitimate state and commercial interests**

Seven Core Principles

1. Consent and Transparency
2. Purpose Limitation
3. Data Minimisation
4. Accuracy
5. Storage Limitation

6. Security Safeguards
7. Accountability

Key Definitions

- **Data Principal**: Individual to whom data relates
- **Data Fiduciary**: Entity determining purpose and means of processing
- **Consent Manager**: Registered intermediary enabling consent management

Applicability and Exemptions

Applicability

- Digital personal data processed in India
- Data processed outside India if goods/services are offered in India

Exemptions

- Personal or domestic use
- Publicly available data
- Certain **legitimate uses** (government benefits, medical emergencies)

Penalties for Non-Compliance

- **₹250 crore** – Failure to maintain security safeguards
- **₹200 crore** – Failure to report breaches or violations relating to children
- **₹50 crore** – Other violations

Interface with RTI Act

- Revises **Section 8(1)(j) of the RTI Act**
- Exempts disclosure of **personal information**, reinforcing privacy protection
- Raises debate on **transparency vs privacy**

Why Digital Data Protection Is Crucial

1. Protection of Individual Privacy

- Prevents mass surveillance and profiling by:
  - State agencies
  - Big Tech platforms

2. Preventing Data Misuse

- Risks include:
  - Identity theft
  - Financial fraud
  - Electoral manipulation
- **NCRB data**: 33,000 additional cybercrime cases in 2023 compared to 2021

3. Cyber and National Security

- Cyber incidents rose from **10.29 lakh (2022)** to **22.68 lakh (2024)**
- Large datasets are prime targets for:
  - Hackers
  - Hostile state actors

4. Trust in Digital Economy

- Digital economy contributed **11.74% of GDP (2022–23)**
- Data trust is essential for:
  - Innovation
  - Global competitiveness

5. Ethical Governance of Technology

- Protects vulnerable groups
- Ensures:
  - Algorithmic fairness
  - Human oversight
  - Non-discrimination

Criticisms and Concerns

Broad Government Exemptions

- Agencies may be exempted for:
  - Security
  - Sovereignty
  - Public order
- Lack of independent oversight raises accountability concerns

Missing Rights

- No explicit:
  - Right to data portability
  - Right to be forgotten

Ambiguities

- Unclear thresholds for **Significant Data Fiduciaries**

Impact on Innovation

- Compliance costs may burden:
  - Start-ups
  - Data-intensive businesses

Complementary Legal and Institutional Efforts

- **K.S. Puttaswamy Judgment (2017)** – Privacy as a Fundamental Right
- **Justice B.N. Srikrishna Committee** – Blueprint for data protection law
- **CERT-In Directions (2022)** – Mandatory breach reporting within 6 hours
- **DISHA** – Healthcare data protection framework

Conclusion

The **DPDP Act, 2023** and **DPDP Rules, 2025** collectively represent a **paradigm shift in India's digital governance architecture**. By institutionalising consent, accountability, and enforcement, they seek to foster a **trust-based digital ecosystem**. However, their long-term success will depend on **narrowing exemptions, strengthening oversight, and balancing innovation with privacy**, ensuring that India's digital growth remains both **secure and rights-respecting**.

Mains Practice Question

"The Digital Personal Data Protection Rules, 2025 mark a significant step in operationalising India's right to privacy in the digital age. Critically analyse their strengths and limitations in balancing individual rights, state interests, and innovation."

Tribunal Reforms and the Constitution

📌 Syllabus Mapping

- **GS Paper II** – Constitution, Polity, Governance
  - Separation of Powers
  - Judicial Independence
  - Tribunals and Quasi-Judicial Bodies
  - Parliament–Judiciary relations
- **GS Paper IV** – Ethics in Public Administration
  - Institutional integrity
  - Accountability and constitutional morality

Introduction

Tribunals play a critical role in India's justice delivery system by providing **specialised, speedy, and accessible adjudication**. However, their effectiveness depends fundamentally on **judicial independence, secure tenure, and transparent appointments**. The Supreme Court's decision striking down key provisions of the **Tribunal Reforms Act, 2021** has reignited the constitutional debate on **legislative override, separation of powers, and constitutional supremacy**.

Why in News?

Recently, the Supreme Court of India invalidated provisions of the **Tribunal Reforms Act, 2021** relating to **appointments, tenure, and service conditions of tribunal members**, holding them to be inconsistent with binding judicial precedents.

Key Highlights of the Supreme Court Judgment

1. Legislative Override of Judicial Pronouncements

- The Court observed that Parliament **re-enacted provisions previously struck down**, despite clear judicial directions.
- Earlier rulings:
  - **Madras Bar Association case (2020 – MBA IV)**: Tribunal Rules, 2020 struck down
  - **Madras Bar Association case (2021 – MBA V)**: Tribunal Reforms Ordinance, 2021 invalidated

The 2021 Act was held to **contradict settled law** on tribunal independence.

2. Violation of Constitutional Supremacy

- The Act failed to cure constitutional defects identified earlier
- Reintroducing invalid provisions under a new statute amounted to:
  - **Evasion of judicial review**
  - **Subversion of separation of powers**

The Court reaffirmed that **Parliamentary sovereignty is subordinate to constitutional supremacy**.

3. Interim Continuance of Judicial Directions

- Until Parliament enacts a **constitutionally compliant law**,
  → Directions issued in **MBA IV and MBA V** will continue to govern tribunal appointments and tenure.

4. Direction to Establish a National Tribunal Commission

- The Union Government was directed to constitute a **National Tribunal Commission (NTC)** within **four months**
- Purpose:
  - Safeguard independence
  - Ensure uniform administration
  - Build institutional capacity

Key Contentious Provisions: Act vs Supreme Court Rulings

1. Tenure and Age Criteria

- **Tribunal Reforms Act, 2021**
  - Fixed tenure: **4 years**
  - Minimum age: **50 years**
- **Supreme Court's Position**
  - Minimum tenure of **5 years** necessary for independence
  - Advocates with **at least 10 years of experience** must be eligible
  - Short tenure discourages institutional continuity and decisional autonomy

2. Search-cum-Selection Committee (SCSC)

- **Under the Act**
  - Dominance of executive nominees
  - Judicial presence diluted
- **Judicial View**
  - Absence of **judicial primacy** undermines tribunal independence
  - Echoed concerns raised in **MBA IV** judgment

3. National Tribunal Commission

- **Judicial Mandate**
  - Independent body to oversee:
    - Appointments
    - Service conditions
    - Infrastructure
    - Administration
- **Interim Measure**
  - Creation of a **dedicated wing in Ministry of Finance** until NTC is established

Tribunal System in India: An Overview

Nature and Purpose

- Tribunals are **judicial or quasi-judicial bodies** established by statute
- Aim:
  - Faster adjudication
  - Subject-matter expertise

Historical Evolution

- First tribunal: **Income Tax Appellate Tribunal (1941)**
- Major expansion after the **42nd Constitutional Amendment Act, 1976**

Constitutional Basis

- **Article 323A**: Administrative Tribunals for service matters
- **Article 323B**: Tribunals for specified subjects such as taxation, land reforms, etc.
- Supreme Court (2010): Article 323B subjects are **not exhaustive** and may extend to Seventh Schedule matters

Appeal Structure

- Some tribunals act as substitutes to High Courts → appeal lies directly to Supreme Court
- Others function under High Courts → appeal lies to respective High Court
- **Chandra Kumar case (1997)**:
  - Tribunal decisions subject to judicial review by **High Court Division Benches**

Significance of Tribunals

1. Specialisation: Domain-specific expertise improves quality of adjudication

2. Speedy Justice

- Critical in:
  - Service matters
  - Tax disputes
  - Environmental cases

3. Reducing Judicial Backlog: Diverts specialised litigation from constitutional courts

4. Accessibility: Multiple benches across the country enhance reach

5. Administrative Efficiency: CAT and similar bodies ensure quicker service-related dispute resolution

Constitutional Balance: Parliament and Judiciary

Checks and Balances

- Legislature: Policy-making and law-enactment
- Judiciary: Constitutional interpretation and legality review

Judicial Review

- **Article 13** prohibits laws violating Fundamental Rights
- Courts can strike down laws infringing:
  - Fundamental Rights
  - Basic Structure

Limits on Parliamentary Power

- Constitutional amendments require:
  - Special majority in Parliament
  - State ratification in federal matters
- **Basic Structure Doctrine** limits Parliament's amending power

Institutional Immunities

- Parliamentary speech and votes protected
- Judicial conduct immune from parliamentary discussion except during impeachment proceedings

Conclusion

The tribunal reform debate reflects a deeper constitutional tension between **efficiency-driven governance** and **judicial independence**. While Parliament possesses legislative competence, **constitutional supremacy mandates respect for binding judicial interpretation**. Sustainable tribunal reform requires **institutional autonomy, judicial primacy in appointments, and administrative insulation from executive control**. Only through mutual respect between institutions can India preserve the **rule of law and constitutional balance**.

Mains Practice Question

"Examine the Supreme Court's decision striking down provisions of the Tribunal Reforms Act, 2021 in the context of judicial independence and constitutional supremacy. Discuss the need for a National Tribunal Commission in India."

Legal Aid and Access to Justice

📌 Syllabus Mapping

- **GS Paper II** – Constitution, Polity, Governance
  - Directive Principles of State Policy
  - Access to justice
  - Judicial and quasi-judicial institutions
- **GS Paper IV** – Ethics
  - Justice, equity, inclusion
  - Ethical responsibility of the State towards the vulnerable

Introduction

Access to justice is a foundational requirement of a constitutional democracy. In a country marked by **socio-economic inequality and legal complexity**, the absence of affordable legal representation can render fundamental rights illusory. India's legal aid framework, anchored in **Article 39A of the Constitution** and institutionalised through the **Legal Services Authorities Act, 1987**, seeks to ensure that **justice is not denied by reason of economic or social disability**.

Why in News?

The **Legal Services Authorities Act, 1987**, which came into force on **9 November 1995**, has completed **30 years of implementation**, a milestone observed annually as **National Legal Services Day**. This occasion has renewed focus on the effectiveness, reach, and challenges of India's legal aid system.

Evolution of Legal Aid in India

Early Foundations

- **1949 – Bombay Government Committee**: Recognised the State's responsibility to provide **free legal aid**, including coverage of court fees and legal representation.
- **1958 – 14th Law Commission Report**: Categorically declared **free legal aid as a constitutional obligation**, not a matter of charity.

Move Towards Institutionalisation

- **1970 – National Conference on Legal Aid**
- **1973 – Expert Committee chaired by Justice V.R. Krishna Iyer**
  Advocated a **statutory framework** for legal aid, emphasising justice as a social good.
- **1976 – Constitutional Recognition**
  Insertion of **Article 39A** through the 42nd Constitutional Amendment, mandating the State to ensure **equal justice and free legal aid**.

Formal Legal Architecture

- **1980 – Committee under Justice P.N. Bhagwati** : Tasked with nationwide implementation of legal aid schemes.
- **1987 – Enactment of the Legal Services Authorities Act**: Provided statutory backing to legal aid institutions across India.

Legal Services Authorities Act, 1987: Institutional Framework

The Act establishes a **three-tier institutional structure**:

1. National Legal Services Authority (NALSA)

- Headed by the Chief Justice of India
- Apex body for policy formulation and coordination

2. State Legal Services Authorities (SLSAs)

- Headed by the Chief Justice of the High Court

3. District Legal Services Authorities (DLSAs)

- Headed by the District Judge
- Primary interface with beneficiaries

Eligibility for Free Legal Services

Legal aid is available to:

- **SC/ST communities**
- **Women and children**
- **Victims of trafficking, disasters, or sexual violence**
- **Persons with mental illness or disabilities**
- **Industrial workmen**
- **Persons in custody**
- **Economically weaker sections**
    - Income ceiling:
        - **₹5 lakh** for cases before the Supreme Court
        - States fix thresholds for other cases (₹1–3 lakh)

Role and Functions of NALSA

1. Policy and Scheme Formulation

- Frames national strategies for uniform implementation of legal aid.

2. Victim Compensation

- Schemes such as **Compensation for Women Victims/Survivors of Sexual Assault** provide financial and rehabilitative support.

3. Capacity Building

- Standardised selection of legal aid lawyers
- Training modules for:
    - Legal Services Lawyers
    - Para-Legal Volunteers (PLVs)

4. Prison Legal Aid

- Oversight of **Prison Legal Aid Clinics (PLACs)** in nearly all prisons.

5. Legal Representation and Assistance

Includes:

- Advocate services
- Payment of court and process fees
- Drafting, translation, and certified copies of documents

6. Social Justice Litigation

- Example: NALSA-initiated PIL leading to the **2014 Supreme Court judgment recognising transgender rights**, reinforcing substantive equality under Article 21.

Note: Legal aid also covers assistance in accessing **government welfare schemes**, reinforcing justice beyond courtrooms.

Lok Adalats: Alternative Dispute Resolution

Concept and Legal Status

- First organised in **Gujarat (1982)**
- Given statutory backing under the **Legal Services Authorities Act, 1987**
- **Permanent Lok Adalats** introduced via the **2002 amendment**

Types of Lok Adalats

1. **State Lok Adalats** – Based on regional needs
2. **National Lok Adalats** – Quarterly, one-day nationwide drives
3. **Permanent Lok Adalats** – Pre-litigation resolution for **Public Utility Services**

Key Features

- Handle civil, compoundable criminal, labour, and service disputes
- Awards are **final, binding, and non-appealable**
- No court fee
- Flexible procedures (CPC and Evidence Act not strictly applied)

Impact

- **44.22 lakh beneficiaries reached (2022–25)**
- **23.58 crore cases resolved** through Lok Adalats

Challenges Facing Legal Aid in India

1. Low Awareness

- Only **15% of rural population** aware of legal aid services
  (NALSA Report, 2022)

2. Quality of Representation

- Inadequate remuneration
- Heavy caseloads
- Risk of "poor legal aid for the poor"

3. Chronic Underfunding

- **₹0.75 per capita annual spending** on free legal aid
  (Parliamentary Committee Report, 2024)

4. Digital Divide

- Limited impact of initiatives like **Tele-Law** due to:
  - Low digital literacy
  - Weak rural infrastructure
- Internet access:
  - **33% rural** vs **67% urban**

5. Limited Physical Outreach

- Lawyer-population ratio:
  - **1:10,000 in rural areas**
  - **1:1,000 in urban areas**

Conclusion

Legal aid is not merely a welfare measure but a **constitutional imperative** central to the rule of law. While India has built an extensive institutional framework over three decades, **gaps in awareness, funding, quality, and outreach** continue to limit its transformative potential. Strengthening legal literacy, empowering para-legal volunteers, leveraging technology judiciously, and adopting a **needs-based approach for vulnerable groups** are essential to ensure that **justice becomes a lived reality rather than a constitutional promise**.

Mains Practice Question

"Access to justice is the cornerstone of a constitutional democracy." In this context, critically examine the evolution, achievements, and challenges of the legal aid system in India.

Assent to Bills: Constitutional Limits

📌 Syllabus Mapping

- **GS Paper II** – Constitution, Polity, Governance
  - Federalism
  - Separation of Powers
  - Role of Governor and President
  - Judicial Review and Advisory Jurisdiction

Introduction

The process of granting assent to legislation is a crucial link between the **legislature and the executive** in India's constitutional scheme. Recent judicial interventions on delays by Governors in assenting to Bills had raised significant questions regarding **judicial overreach, federal balance, and constitutional morality**. These concerns were addressed authoritatively by a **five-judge Constitution Bench of the Supreme Court of India** through the **16th Presidential Reference under Article 143**.

Why in News?

In its advisory opinion, the Supreme Court held that **courts cannot prescribe binding timelines** for the **President or Governors** to decide on Bills under **Articles 200 and 201** of the Constitution. This opinion revisited and partially corrected the Court's **April 2025 ruling**, where timelines had been judicially indicated for assent decisions.

Constitutional Background

Article 143 – Presidential Reference

- Empowers the President to seek the **opinion of the Supreme Court** on questions of:
  - Law
  - Fact
  - Public importance
- Such opinions are **advisory**, not binding, but carry high constitutional authority.

Articles 200 and 201 – Assent to Bills

- **Article 200**: Options available to a Governor regarding State Bills
- **Article 201**: Procedure when a Bill is reserved for the President's consideration

These provisions reflect a **deliberate constitutional silence on timelines**, granting discretion within constitutional limits.

Key Findings of the Supreme Court

1. Courts Cannot Impose Timelines for Assent

- The Constitution **does not prescribe any time-limit** for:
  - Governors under Article 200
  - President under Article 201
- Judicially fixing timelines would:
  - Rewrite the Constitution
  - Encroach upon executive discretion

The Court held that such directions would amount to **judicial legislation**, impermissible under the separation of powers.

2. "Deemed Assent" Has No Constitutional Basis

- The concept that a Bill is deemed approved after expiry of a judicially fixed timeline was rejected.
- The Court ruled that:
  - **Assent is a conscious constitutional act**
  - Silence or delay cannot be equated with approval

Introducing deemed assent would result in **judicial usurpation of executive authority**.

3. Reinforcing Separation of Powers and Federalism

- Granting assent is a **constitutional function of the executive**
- Judicial enforcement of timelines would:
  - Disturb federal balance
  - Undermine the Governor's constitutional role
  - Dilute the President's discretionary domain

The Court emphasised that **federal governance requires mutual respect between institutions**, not coercive control.

4. Governors and President Cannot Sit on Bills Indefinitely

While rejecting enforceable timelines, the Court made it clear that:

- **Indefinite inaction is unconstitutional**
- Prolonged delay:
  - Defeats the will of the elected legislature
  - Violates constitutional morality
  - Weakens cooperative federalism

Thus, discretion is **not absolute**, but bounded by constitutional ethics.

5. Limited Scope of Judicial Review

The Court clarified the contours of judicial scrutiny:

- Courts may intervene only if:
  - There is **mala fide intent**
  - Power is exercised arbitrarily or for extraneous reasons
- Judicial review is:
  - **Procedural**, not substantive
  - Courts cannot examine the **merits of assent or withholding of assent**

6. President's Discretion on Reserved Bills

- When a Governor reserves a Bill under Article 200:
  - The President is **not constitutionally bound** to seek the Supreme Court's advice
  - The **subjective satisfaction of the President** is constitutionally sufficient

This preserves the **autonomy of the executive** at the Union level.

Constitutional Principles Reaffirmed

- **Constitutional Supremacy:** All organs—Legislature, Executive, Judiciary—are subordinate to the Constitution.
- **Separation of Powers:** Judiciary interprets law; it does not administer executive timelines.
- **Federalism:** States are not administrative extensions of the Union; Governors' roles must respect state legislative autonomy.
- **Constitutional Morality:** Discretion must be exercised in good faith, respecting democratic mandates.

Significance of the Judgment

- Clarifies constitutional ambiguity on assent procedures
- Prevents judicial overreach into executive functions
- Balances:
  - **Judicial restraint**
  - **Executive accountability**
  - **Legislative supremacy within constitutional limits**

The ruling restores **institutional equilibrium** while keeping the door open for **judicial correction of abuse**.

Conclusion

The Supreme Court's opinion on assent to Bills reflects a mature constitutional approach that **protects executive discretion without legitimising executive inertia**. By rejecting enforceable timelines and deemed assent while affirming limits grounded in constitutional morality, the Court has reinforced **federalism, separation of powers, and democratic accountability**. The judgment underscores that **constitutional governance thrives not on coercion, but on restraint, responsibility, and respect among institutions**.

Mains Practice Question

"Examine the Supreme Court's advisory opinion on assent to Bills under Articles 200 and 201. How does the judgment balance judicial restraint, executive discretion, and the principles of federalism and constitutional morality?"

AI and the Judiciary

📌 Syllabus Mapping

- **GS Paper II** – Constitution, Polity, Governance
  - Judiciary and judicial reforms
  - Transparency, accountability, and institutional integrity
- **GS Paper III** – Science & Technology
  - Artificial Intelligence and emerging technologies
  - Technology in governance
- **GS Paper IV** – Ethics
  - Ethical use of technology
  - Accountability, bias, and human values in decision-making

Introduction

The integration of **Artificial Intelligence (AI)** into judicial systems promises improved efficiency, research support, and case management. However, courts are also custodians of **constitutional rights, fairness, and due process**, making uncritical adoption of AI particularly risky. Recognising this delicate balance, the Supreme Court of India's **Centre for Research and Planning (CRP)** has released a **White Paper on Artificial Intelligence and the Judiciary**, outlining both the **potential benefits and ethical hazards** of AI use in judicial functions.

Why in News?

The White Paper released by the Supreme Court's Centre for Research and Planning examines:

- Safe and responsible use of AI in courts
- Ethical and constitutional challenges
- Global experiences and judicial precedents
- Policy recommendations for future adoption

It marks India's first **institutional judicial guidance** on AI governance.

Core Focus of the White Paper

The report does **not advocate replacement of judges**, but rather:

- Careful, limited, and assistive use of AI
- Preservation of **human judgment as central** to adjudication
- Protection of **judicial independence, transparency, and fairness**

Key Ethical and Legal Risks Identified

1. Overreliance and Erosion of Human Judgement

- Excessive dependence on AI tools may:
  - Dilute judicial discretion
  - Reduce independent reasoning
- The **opaque "black-box" nature** of AI models weakens:
  - Explainability
  - Accountability

This directly conflicts with the principle that **justice must not only be done but must be seen to be done**.

2. Hallucinations and Fabricated Content

- AI systems may generate:
  - Non-existent case laws
  - Incorrect legal citations
- **Illustrative US cases**:
  - *Roberto Mata v. Avianca*
  - *Coomer v. Lindell*

In both, courts encountered **fabricated legal authorities**, highlighting risks of unverified AI outputs in legal reasoning.

3. Algorithmic Bias

- AI trained on biased datasets can perpetuate:
  - Racial
  - Social
  - Economic discrimination

Example: The **COMPAS risk assessment tool** in the US, challenged in *State v. Loomis*, demonstrated potential racial bias in sentencing predictions.

In the Indian context, such bias would violate:

- **Article 14 (Equality before Law)**
- **Article 21 (Fair Procedure)**

4. Evidence Manipulation and Deepfakes

- AI-generated:
  - Deepfake videos
  - Synthetic audio
  - Altered digital evidence

These pose serious threats to:

- Evidentiary integrity
- Criminal justice processes
- Public confidence in courts

5. Privacy and Confidentiality Risks

- Judicial data includes:
  - Sensitive personal information
  - Confidential deliberations
- External AI platforms raise concerns of:
  - Data leakage
  - Unauthorized access
  - Cross-border data exposure

6. Intellectual Property Concerns

- AI tools trained on copyrighted judgments, pleadings, or legal texts raise unresolved questions on:
  - Ownership
  - Attribution
  - Commercial reuse

Key Recommendations of the White Paper

1. Establish AI Ethics Committees

- Courts should create **AI Ethics Committees** comprising:
  - Judges
  - Legal scholars
  - Technologists
- Functions:
  - Vet AI tools
  - Approve use-cases
  - Set ethical deployment standards

2. Prefer Secure In-House AI Systems

- Development of **court-controlled AI tools** is preferred over third-party platforms
- Benefits:
  - Better data security
  - Reduced confidentiality risks
  - Institutional control over training datasets

3. Adopt a Formal Ethical AI Policy

- Judiciary must adopt a **written ethical AI framework** clearly defining:
  - Permissible uses
  - Prohibited applications
  - Lines of responsibility and accountability

This aligns with the doctrine of **constitutional morality**.

4. Mandatory Disclosure and Audit Trails

- Any AI assistance in judicial work should be:
  - Disclosed transparently
  - Logged through audit trails

This ensures:

- Traceability
- Post-facto accountability
- Judicial review if required

5. Capacity Building and Training

- Judges, court staff, and registries must receive:
  - Technical literacy on AI
  - Training on ethical risks
  - Awareness of limitations of AI tools

AI and the Indian Judiciary: Existing Initiatives

- **E-Courts Mission Mode Project**
  - Digitisation of records
  - Case management systems
- **AI-based tools**:
  - Legal research assistance
  - Translation and transcription
  - Cause list and case flow management

These are **assistive**, not adjudicatory, in nature.

Constitutional and Ethical Perspective

- **Judicial decision-making is a sovereign constitutional function**
- AI may assist but **cannot replace**:
  - Human empathy
  - Contextual reasoning
  - Moral judgment

As legal philosopher **Ronald Dworkin** emphasised, law involves *interpretive judgment*, not mechanical application.

Conclusion

The Supreme Court's White Paper adopts a **cautious, principled, and constitutionally grounded approach** to Artificial Intelligence in the judiciary. While AI can enhance efficiency and access, its unchecked use risks undermining **fair trial rights, equality, transparency, and judicial independence**. A **human-in-command model**, guided by ethical frameworks, institutional safeguards, and continuous oversight, is essential to ensure that technology strengthens—rather than supplants—the foundations of justice.

Mains Practice Question

"Artificial Intelligence can assist but must not replace judicial decision-making." In the light of the Supreme Court's White Paper on AI and the Judiciary, critically examine the ethical and constitutional challenges posed by the use of AI in courts.

Prison Reforms in India

📌 Syllabus Mapping

- **GS Paper II** – Polity, Governance, Constitution
  - Criminal justice system
  - Rights of prisoners
  - Centre–State relations
- **GS Paper IV** – Ethics, Integrity and Aptitude
  - Human dignity
  - Social justice
  - Ethical governance of institutions

Introduction

Prisons represent the most coercive face of the State, yet constitutional democracy demands that even incarceration must operate within the boundaries of **human dignity, equality, and reformative justice**. The **Prisons in India 2025 Report**, published by the **Centre for Research and Planning (CRP)** of the Supreme Court of India, provides a comprehensive evaluation of prison governance, labour practices, mental health care, wages, and technological reforms, while advocating a **human-rights-based model of prison administration**.

Why in News?

The **Prisons in India 2025 Report** has drawn attention to persistent structural and ethical deficits in Indian prisons, particularly relating to **overcrowding, caste-based practices, gender inequality, wage disparities, and ineffective legal aid**, prompting renewed debate on prison reforms.

Governance Framework of Prisons in India

- **Constitutional Position**
  - **Prisons** fall under the **State List (List II, Schedule VII)**
  - Results in **diverse prison manuals, rules, and administrative practices** across States
- **International Normative Framework**
  - India follows the **United Nations Standard Minimum Rules for the Treatment of Prisoners (Nelson Mandela Rules)**
  - Emphasises:
    - Human dignity
    - Non-discrimination
    - Rehabilitation over retribution

Despite these commitments, ground-level practices remain inconsistent.

Key Issues Identified in Indian Prisons

1. Chronic Overcrowding

- **Occupancy Rate**: **131.4%**
- **Composition of Prison Population**:
  - **Nearly 75% are undertrials**, many incarcerated for prolonged periods without conviction
- **Open Prisons**:
  - Occupancy rate only **74%**
  - Underutilisation despite evidence that open prisons:
    - Reduce recidivism
    - Promote rehabilitation

➡️ **Implication**: Overcrowding undermines living conditions, healthcare delivery, and reformative objectives.

2. Stereotyping and Degrading Labour Practices

- Several prison manuals categorise:
  - Sanitation and conservancy work as **"menial" or "degrading"**
- Such language:
  - Reinforces **hierarchies of labour**
  - Violates the constitutional value of **dignity of labour**

This contradicts the reformative philosophy embedded in **Article 21**.

3. Persistence of Caste-Based Work Allocation

- Some prison manuals continue to:
  - Assign prison labour based on **caste identity**
- This practice has been held **unconstitutional** by the Supreme Court, as it violates:
  - **Article 14 (Equality before Law)**
  - **Article 15 (Non-discrimination)**

➡️ The report highlights the gap between **constitutional jurisprudence and administrative practice**.

4. Wage Disparities in Prison Labour

- **Extreme inter-State variation**:
  - **₹20 per day** in Mizoram
  - **₹524 per day** in Karnataka
- Issues:
  - Many wages fall **below the statutory minimum wage**
  - Undermines:
    - Prisoners' right to fair compensation
    - Rehabilitative potential of prison labour

5. Gender-Specific Concerns of Women Prisoners

- Prison manuals:
  - Do not explicitly recognise the **right to reproductive choice**
  - Assign women predominantly **domestic roles** (cooking, cleaning)
- Consequences:
  - Denial of **equal access to vocational training**
  - Reinforcement of **gender stereotypes**
  - Violation of **substantive equality**

6. Inadequate Legal Aid and Access to Justice

- Quality of legal aid for prisoners is constrained by:
  - Lack of **physical infrastructure**
  - Limited **digital connectivity**
  - Shortage of legal professionals inside prisons
- Result:
  - Delays in bail hearings
  - Prolonged undertrial detention

This weakens the constitutional guarantee of **fair trial and speedy justice**.

Ethical and Constitutional Dimensions

- **Article 21**: Prisoners retain the right to life with dignity
- **Reformative Theory of Punishment**: Prison is not meant to degrade but to **reform and reintegrate**
- **Justice V.R. Krishna Iyer's view**: *"The prisoner is not a non-person; incarceration does not eclipse humanity."*

The report reflects this ethical vision by advocating systemic correction rather than punitive expansion.

Way Forward Suggested by the Report

- **Uniform Human-Rights-Compliant Prison Manuals**
- **Expansion and Effective Use of Open Prisons**
- **Elimination of Caste-Based and Gender-Biased Work Allocation**
- **Rationalisation of Prison Wages** aligned with minimum wage principles
- **Strengthening Legal Aid Infrastructure** (physical + digital)
- **Mental Health and Psycho-Social Support** as core prison services
- **Technology-enabled prison administration** with safeguards for privacy and dignity

Conclusion

The **Prisons in India 2025 Report** underscores that prison reform is not merely an administrative task but a **constitutional and moral imperative**. Overcrowding, discrimination, wage injustice, and ineffective legal aid reveal a system still struggling to align with the ideals of **human dignity, equality, and reformative justice**. A shift towards a **rights-based, rehabilitative, and accountable prison administration** is essential to transform prisons from spaces of exclusion into institutions of correction and reintegration.

Mains Practice Question

"Indian prisons continue to reflect deep structural and ethical challenges despite constitutional and international human-rights commitments." In the light of the Prisons in India 2025 Report, critically examine the major issues in prison administration and suggest reforms.

Industrial Relations Code, 2020

📌 Syllabus Mapping

- **GS Paper II** – Polity & Governance
  - Labour legislation
  - Industrial relations
  - Centre–State relations
- **GS Paper III** – Indian Economy
  - Employment
  - Labour reforms
  - Ease of doing business

Introduction

The **Industrial Relations Code, 2020** represents a significant overhaul of India's industrial relations framework. By consolidating and modernising laws governing **trade unions, employment conditions, and industrial dispute resolution**, the Code seeks to promote **industrial harmony**, **ease of compliance**, and **flexibility in labour markets**, while retaining safeguards for workers.

Objective of the Code

- To **simplify and rationalise** laws relating to:
  - Trade unions
  - Conditions of employment in industrial establishments
  - Investigation and settlement of industrial disputes
- To balance:
  - **Workers' rights and collective bargaining**
  - **Employers' need for flexibility and predictability**

Laws Consolidated

The Code subsumes **three major labour laws**:

- Trade Unions Act, 1926
- Industrial Employment (Standing Orders) Act, 1946
- Industrial Disputes Act, 1947

Key Provisions of the Code

1. Trade Union Recognition

- A trade union must have **at least 51% membership** to be recognised as the **sole negotiating union**
- If no union attains 51% membership:
  - A **Negotiating Council** will be formed
  - Includes representatives from unions having **at least 20% membership**

➡️ Aims to streamline collective bargaining and avoid multiplicity of unions.

2. Fixed-Term Employment (FTE)

- Explicit statutory recognition of **Fixed-Term Employment**
- Workers employed for a fixed duration:
  - Receive **same wages and benefits** as permanent workers
  - Employment ends automatically on contract expiry

➡️ Intended to reduce informal contractualisation while offering flexibility to employers.

3. Expanded Definition of "Worker"

Coverage extended to include:

- Sales promotion employees
- Working journalists
- Supervisory staff earning up to **₹18,000 per month**

➡️ Brings more categories under labour law protection.

4. Higher Threshold for Lay-off, Retrenchment and Closure

- Prior government approval required only for establishments with:
  - **300 or more workers** (earlier 100)
- States empowered to further raise this threshold

➡️ Seeks to encourage industrial expansion and job creation.

5. Broader Definition of Industry

- Covers **all systematic employer–employee activities**
- Applies regardless of:
  - Profit motive
  - Capital investment

➡️ Expands applicability and reduces interpretational disputes.

Merits of the Industrial Relations Code

1. Skill Protection through Re-skilling Fund

- Employers must contribute **15 days' wages per retrenched worker**
- Fund to be used for:
  - Re-skilling
  - Re-employment support

➡️ Introduces a transition safety net for displaced workers.

2. Simplified Dispute Resolution

- Mandatory **Internal Grievance Redressal Committees (IGRCs)**
- Applicable to establishments with **20 or more workers**

➡️ Enables faster, workplace-level resolution of disputes.

3. Industrial Flexibility

- Higher approval thresholds reduce regulatory friction
- Encourages firms to scale operations without fear of rigid exit barriers.

Concerns and Criticisms

1. Risk of "Hire and Fire"

- Higher thresholds may:
  - Dilute job security
  - Increase arbitrary retrenchment in medium-sized firms

2. Permanent Temporariness

- Excessive reliance on **Fixed-Term Employment** may:
  - Replace permanent jobs with rolling short-term contracts
  - Reduce long-term employment stability

3. Weakening of Collective Bargaining

- **51% recognition threshold** may:
  - Marginalise smaller unions
  - Centralise bargaining power
  - Reduce pluralism in labour representation

Conclusion

The **Industrial Relations Code, 2020** marks a decisive shift towards a **simplified, flexible, and investment-friendly industrial relations regime**. While it promises faster dispute resolution, clearer trade union structures, and improved ease of doing business, concerns remain regarding **job security, union pluralism, and long-term labour stability**. Its success will depend on **balanced implementation**, strong grievance redress mechanisms, and continuous social dialogue to ensure that labour flexibility does not come at the cost of **workers' dignity and rights**.

Mains Practice Question

"The Industrial Relations Code, 2020 seeks to balance industrial flexibility with workers' rights." Critically examine its key provisions and discuss the concerns associated with its implementation.

Ex-Post Facto Environmental Clearances

📌 Syllabus Mapping

- **GS Paper II** – *Judiciary, Constitutionalism, Environmental Governance*
- **GS Paper III** – *Environment, Environmental Impact Assessment, Sustainable Development*
- **GS Paper IV** – *Ethics in Public Administration (Precautionary Principle vs Developmental Ethics)*

Introduction

In a significant development in India's environmental jurisprudence, the **Supreme Court of India** recalled its earlier **Vanashakti judgment**, which had categorically struck down the grant of **ex-post facto environmental clearances (ECs)**. The recall reflects a judicial attempt to reconcile **environmental safeguards with legal consistency and economic pragmatism**, while revisiting the rigidity earlier imposed on the Environmental Impact Assessment (EIA) regime.

Why in News?

- The Supreme Court recalled the **Vanashakti judgment**, which had invalidated:
  - A **2017 Notification**
  - A **2021 Office Memorandum (OM)** of the Union Government
- These instruments had recognised and provided a framework for **granting ex-post facto environmental clearances** in certain situations.

Background: The Vanashakti Judgment

- The Vanashakti ruling had held that:
  - Granting **ex-post facto ECs** violates the principle of **prior environmental clearance**.
  - Such clearances are **inconsistent with environmental rule of law**.
- Consequently, the Court struck down executive measures that legitimised post-facto approvals.

Reasons for Recalling the Vanashakti Judgment

1. Judgment Rendered *Per Incuriam*

- The Chief Justice of India observed that Vanashakti was delivered **without considering binding precedents of coordinate benches**.
- Hence, it suffered from the doctrine of *per incuriam* (decided in ignorance of law).

2. Ignored Judicial Precedents

- **D. Swamy v. Karnataka State Pollution Control Board**
  - Held that **post-facto ECs may be granted in exceptional circumstances**.
- **Alembic Pharmaceuticals Ltd v. Rohit Prajapati**
  - While discouraging ex-post facto ECs, the Court:
    - **Regularised existing post-facto clearances**
    - Imposed **monetary penalties and remediation obligations**.

The Vanashakti judgment failed to harmonise with these rulings.

3. Economic and Developmental Considerations

- Strict enforcement of Vanashakti would have required:
  - **Demolition of completed public infrastructure projects**.
- The Court noted that:

    - Demolition itself can lead to **greater environmental harm**:
        - Debris pollution
        - Reconstruction-related emissions
- Hence, an absolutist approach may paradoxically **undermine environmental objectives**.

Understanding Ex-Post Facto Environmental Clearance

What is Ex-Post Facto EC?

- It permits a project to **continue or be regularised even if environmental clearance was not obtained before commencement**.

Legal Position under EIA Framework

- **EIA Notification, 2006** mandates: **Prior environmental clearance** before any project activity begins.

Judicial Evolution on Ex-Post Facto ECs

Earlier Strict Approach

- **Common Cause v. Union of India**
    - Held that ex-post facto ECs are **alien to environmental jurisprudence**.
    - Emphasised the **precautionary principle** and **preventive environmental governance**.

Gradual Shift Towards Pragmatism

- Subsequent rulings acknowledged:
    - Reality of administrative lapses
    - Economic costs of undoing completed projects
- Led to a **conditional tolerance**, not endorsement, of post-facto ECs.

Analytical Assessment

Environmental Rule of Law

- Prior EC remains the **norm and legal mandate**.
- Ex-post facto ECs must remain **exceptions**, not a parallel system.

Judicial Balance

- Reflects tension between:
    - **Precautionary principle**
    - **Principle of proportionality**
- Court seeks to avoid:
    - Environmental dilution
    - Developmental paralysis

Governance Concerns

- Risk of moral hazard:
    - Project proponents may deliberately bypass EC processes.
- Highlights need for:
    - Stronger enforcement
    - Deterrent penalties
    - Time-bound approvals

Way Forward

- **Codified Framework**: Clear statutory conditions defining when (and when not) ex-post facto ECs may be considered.
- **Deterrence Mechanism**: Higher penalties, remediation costs, and criminal liability for wilful violations.
- **Institutional Accountability**: Fix responsibility of regulatory authorities for approval delays.
- **Strengthen EIA Process**: Faster, transparent, and technology-enabled clearance systems.
- **Judicial Consistency**: Harmonisation of environmental rulings to avoid regulatory uncertainty.

Conclusion

The recall of the Vanashakti judgment marks a **course correction rather than a retreat** from environmental protection. While reaffirming that **prior environmental clearance is the cornerstone of environmental governance**, the Supreme Court has acknowledged **legal precedents, economic realities, and proportionality**. The challenge ahead lies in ensuring that **ex-post facto clearances remain rare, penalised, and tightly regulated**, safeguarding both **environmental integrity and developmental justice**.

Keywords: *Ex-post facto EC, Environmental rule of law, Per incuriam, Precautionary principle, Sustainable development*

Mains Practice Question

"The recall of the Vanashakti judgment reflects the Supreme Court's attempt to balance environmental jurisprudence with economic pragmatism. Critically examine the evolving judicial approach towards ex-post facto environmental clearances in India."

GOVERNANCE

Land Registration Reforms

Syllabus Mapping

- **GS Paper II** – Governance, Constitution, Polity
  - Land as a State subject
  - Role of Judiciary in governance reforms
  - Centre–State coordination
- **GS Paper III** – Economy & Technology
  - Land as an economic asset
  - Digital governance
  - Use of emerging technologies (Blockchain)

Introduction

Land administration forms the backbone of **property rights, economic development, urban planning, and social justice**. In India, however, land ownership disputes continue to clog courts and undermine ease of doing business. Recognising this structural deficiency, the **Supreme Court of India (2025)** has strongly advocated a **fundamental overhaul of the land registration and titling system**, emphasising the shift from a **presumptive** to a **conclusive title regime**.

Why in News?

In **Samiullah v. State of Bihar (2025)**, the Supreme Court underscored the urgent need to modernise India's land registration framework, observing that outdated records and procedural fragmentation have created a **"bureaucratic loop"** perpetuating disputes and uncertainty in land ownership.

Judicial Observations: Clarifying Registration vs Ownership

K. Gopi v. Sub-Registrar Case (2025)

The Supreme Court made several critical clarifications:

- **Limited Role of Sub-Registrars**
  Under the **Registration Act, 1908**, sub-registrars perform a **purely ministerial function**, limited to:
  - Verifying documentation
  - Ensuring voluntary execution
  - Recording transactions
- **No Verification of Title**
  Registration **does not confirm ownership**; it merely records a transaction.
- **Mutation is Not Title**
  - Mutation updates revenue records for fiscal purposes
  - It **does not confer ownership rights**
- **Striking Down Bihar Rule**
  The Court invalidated Bihar's requirement of mutation proof for registration, reaffirming that **registration ≠ ownership**.

These rulings collectively highlight the **systemic confusion between transaction records and title certainty** in India.

Constitutional and Legal Context

- **Land** → *State Subject* (List II)
- **Registration of deeds** → *Concurrent List* (List III) under **Schedule VII**

This division results in **procedural diversity across States**, often at the cost of legal certainty and uniformity.

Structural Issues in India's Land Registration System

1. Colonial-Era Legal Framework

India continues to rely on laws enacted in the 19th century:

- **Transfer of Property Act, 1882**
- **Indian Stamp Act, 1899**
- **Registration Act, 1908**

These statutes were designed for a **paper-based, low-volume economy**, not for today's complex real-estate ecosystem.

2. Absence of Conclusive Titles

- Registration only provides **presumptive evidentiary value**
- Ownership must still be proven through **historical chains of documents**
- This uncertainty weakens property rights and investment confidence

3. High Litigation Burden

- **Around 66% of civil litigation in India relates to land disputes**
- Causes include:
  - Fake or forged documents
  - Encroachments
  - Delayed mutation
  - Fragmented state procedures

4. Administrative Inefficiencies

- Mandatory physical presence of:
  - Buyer
  - Seller
  - Two witnesses
- Manual verification at sub-registrar offices makes the process:
  - Time-consuming
  - Corruption-prone
  - Citizen-unfriendly

5. Incomplete Digitisation

- Initiatives like **DILRMP** and **NGDRS** focus on digitisation
- However, **digitising flawed records does not correct defective titles**

As economist **Hernando de Soto** argues, *assets without clear titles remain "dead capital"*.

Government Initiatives to Modernise Land Records

Digital India Land Records Modernization Programme (DILRMP)

Objective: Transition from **presumptive titles** to **clear, computerised land records**

Key Components

- **ULPIN (Bhu-Aadhaar)**
  - 14-digit alphanumeric ID
  - Based on geo-coordinates
  - Enables parcel-level identification
- **National Generic Document Registration System (NGDRS)**
  - Online deed entry
  - Online payment & appointment
  - Document search and certified copies
- **Integration with e-Courts**

  - Direct access to land data for courts
  - Faster adjudication of disputes
- **Transliteration of Records**
  - Conversion of land records into all **22 Schedule VIII languages**
  - Enhances accessibility and transparency

State-Level Digital Platforms

- **Telangana – Dharani / Bhu Bharati Portal**
- **Karnataka – Kaveri Portal**
- **West Bengal – Banglarbhumi Platform**

These initiatives demonstrate **best practices**, but remain **unevenly implemented across India**.

Supreme Court's Vision: Systemic Transformation

1. Conclusive Titling Regime

- Law Commission of India to form a **committee with State participation**
- Objective:
  - Integrate registration with **guaranteed ownership titles**
  - Reduce post-registration litigation

2. Legal Restructuring

- Comprehensive review of:
  - Transfer of Property Act, 1882
  - Registration Act, 1908
  - Stamp Act, 1899
- Align laws with **digital governance and technological realities**

3. Synchronisation of Records

- Real-time alignment between:
  - Registration data
  - Mutation records
  - Survey and settlement operations
- Ensures registration reflects **actual landholding**

4. Dedicated Regulatory Authority

- Permanent regulatory body for:
  - Registration offices
  - Capacity building
  - Institutional memory
  - Continuous upgradation

Blockchain-Based Land Titling: A Future Pathway

Why Blockchain?

- **Decentralised**
- **Immutable**
- **Tamper-proof**
- **Transparent**

Potential Benefits

- Cryptographically linked land records
- Integration of:
  - Cadastral maps
  - Survey data
  - Revenue records
- Reduces fraud
- Enhances traceability
- Builds **public trust in ownership records**

Countries like **Sweden and Georgia** have already piloted blockchain-based land registries, offering lessons for India.

Conclusion

India's land governance crisis is **not merely administrative but structural**. A **future-ready land administration framework** built on **conclusive titling, harmonised laws, accurate records, and advanced technologies like blockchain** can:

- Drastically reduce litigation
- Improve ease of property transactions
- Strengthen federal governance
- Unlock land's potential for **economic growth, urban planning, and social equity**

Such reforms are indispensable for transforming land from a **source of conflict** into an **engine of development**.

Mains Practice Question

"Critically examine the limitations of India's presumptive land registration system and evaluate the role of judicial interventions and technology in transitioning towards a conclusive land titling regime."

AI Governance in India

📌 Syllabus Mapping

- **GS Paper II** – Governance, Constitution, Polity
  - Role of State in technology governance
  - Regulatory institutions and public policy
  - Rights, accountability, and transparency
- **GS Paper III** – Economy, Science & Technology, Internal Security
  - Artificial Intelligence and emerging technologies
  - Cybersecurity and digital infrastructure
  - Innovation ecosystem
- **GS Paper IV** – Ethics
  - Ethical use of technology
  - Algorithmic bias, accountability, and public trust

Introduction

Artificial Intelligence (AI) is rapidly reshaping governance, markets, and society. While it offers transformative potential for productivity, public service delivery, and economic growth, it also raises concerns relating to **bias, opacity, cyber threats, misuse, and regulatory gaps**. Against this backdrop, the Government of India has unveiled the **India AI Governance Guidelines** under the **IndiaAI Mission**, signalling a move towards **responsible, inclusive, and risk-aware AI governance**.

Why in News?

The **Union Ministry of Electronics and Information Technology (MeitY)** has released **India AI Governance Guidelines**, outlining an institutional and regulatory framework to guide the **safe development, deployment, and use of AI systems** across sectors.

India AI Governance Guidelines: Core Vision

The guidelines seek to:

- Promote **innovation-friendly AI development**
- Ensure **safety, accountability, and trust**
- Mitigate risks to:
  - Individuals
  - Society
  - Democratic institutions

The approach reflects a **balanced governance model**, avoiding over-regulation while preventing misuse.

Institutional Framework for AI Governance

1. Central Coordination Mechanism

AI Governance Group (High-Level Body)

- Responsible for:

  - National AI policy formulation
  - Inter-ministerial coordination
  - Strategic oversight of AI governance

2. Role of Government Ministries and Regulators

- Key Ministries:
  - Ministry of Electronics and Information Technology
  - Ministry of Home Affairs (MHA)
- Sectoral Regulators:
  - RBI (Finance)
  - SEBI (Capital markets)
  - TRAI (Telecom)
  - CCI (Competition)

Function:

- Issue **sector-specific AI norms**
- Handle grievances and enforcement within their domains

3. Advisory Bodies

- NITI Aayog
- Office of the Principal Scientific Adviser

Role:

- Provide strategic inputs
- Offer periodic briefings on emerging AI risks and opportunities

4. Standards-Setting Bodies

- Bureau of Indian Standards (BIS)
- Telecommunication Engineering Centre

Mandate:

- Develop:
  - AI risk taxonomies
  - Certification frameworks
  - Technical and ethical standards

Key Challenges in AI Governance

1. Digital Divide

- Uneven access to:
  - Digital Public Infrastructure
  - Computing power
  - High-quality data
- **Internet in India Report (2024)**:
  - **51% of rural population lacks internet access**

This restricts AI adoption in:

- Agriculture
- Healthcare
- Public services

2. Algorithmic Discrimination

- AI systems trained on biased datasets may:
  - Reinforce social inequalities
  - Produce discriminatory outcomes in:
    - Welfare delivery
    - Policing
    - Credit allocation

Marginalised communities face **disproportionate harm** without safeguards.

3. Transparency and Accountability Deficit

- AI often functions as a **"black box"**
- Opaque decision-making undermines:
  - Explainability
  - Institutional accountability

This is particularly problematic in:

- Welfare schemes
- Law enforcement
- Automated governance tools

4. Cybersecurity Risks

- AI systems vulnerable to:
  - Data manipulation
  - Model hijacking
  - Adversarial attacks

These threats can:

- Disrupt public service delivery
- Leak sensitive personal and strategic data

5. Regulatory and Legal Gaps

- Existing laws not designed for AI-driven decision-making
- Need for sector-specific updates

Example: PCPNDT Act must address misuse of **AI-based radiology tools** that could facilitate illegal sex determination.

6. Intellectual Property Rights (IPR) Issues

- AI models trained on copyrighted content raise questions on:
  - Ownership
  - Attribution
  - Compensation

Contemporary example: Lawsuits against Google over **"AI Overviews"**, alleging diversion of traffic and revenue from original content creators.

7. Malicious Use of AI

- Deepfakes
- Disinformation campaigns
- Data poisoning
- AI-enabled cyber warfare

Such misuse can threaten:

- Public order
- Electoral integrity
- National security

Existing Initiatives Supporting AI Governance

Domestic Initiatives

- **National Strategy for AI (AI for All)** – NITI Aayog
  - Focus sectors: healthcare, agriculture, education
- **Digital Personal Data Protection Act, 2023**
  - Addresses privacy risks in AI-based data processing
- **India's Membership in Global Partnership on AI**
  - Promotes responsible AI aligned with:
    - Human rights
    - Inclusion
    - Democratic values

Global Best Practices

- **EU AI Act, 2024**
  - Risk-based classification:
    - Unacceptable
    - High
    - Limited
    - Minimal risk
- **Bletchley Declaration, 2023**
  - Shared understanding of frontier AI risks
- **G7 AI Pact, 2023**
  - Voluntary global framework for responsible AI
- **OECD AI Principles (2019)**
  - First intergovernmental standard on trustworthy AI

IndiaAI Mission: Enabling Infrastructure for Governance

Overview: Launched in **2024**, the IndiaAI Mission aims to create a **comprehensive AI ecosystem** by:

- Democratizing access to computing
- Improving data quality
- Supporting indigenous AI innovation

Key Features

- Deployment of **10,000+ GPUs** for AI computing
- Implemented by **IndiaAI**, an independent business division under Digital India Corporation
- Positions AI as a **public good**, not an elite technology

Conclusion

India's AI Governance Guidelines represent a **pragmatic and forward-looking approach** to regulating one of the most disruptive technologies of the 21st century. By combining **risk-based regulation, innovation-friendly standards, inclusive digital infrastructure, and strong institutions**, India can harness AI as a **development multiplier rather than a source of exclusion or harm**. Sustained global cooperation, ethical grounding, and constitutional alignment will be essential to position India as a **credible and responsible leader in the global AI ecosystem**.

Mains Practice Question

"Discuss the key challenges in governing Artificial Intelligence in India. Evaluate how the India AI Governance Guidelines seek to balance innovation, ethical safeguards, and constitutional values."

Model Youth Gram Sabha

📌 Syllabus Mapping

- **GS Paper II** – Governance, Constitution, Polity
  - Panchayati Raj Institutions
  - Participatory democracy and decentralisation
  - Citizen engagement in governance
- **GS Paper I** – Society / Social Empowerment
  - Role of youth in democracy
  - Education and social transformation

Introduction

Deepening democracy requires more than periodic elections; it demands **active citizen participation at the grassroots**. Recognising this, the Government of India has launched the **Model Youth Gram Sabha (MYGS)** initiative to familiarise young citizens with **local self-governance, deliberation, and collective decision-making**. By integrating democratic practices within the education system, MYGS seeks to institutionalise **Janbhagidari (people's participation)** from an early age.

Why in News?

The **Model Youth Gram Sabha (MYGS)** initiative has been launched by the **Ministry of Panchayati Raj**, in collaboration with the **Ministry of Education** and the **Ministry of Tribal Affairs**, to promote participatory local governance through **simulated Gram Sabha sessions** in schools.

About the Model Youth Gram Sabha (MYGS)

- **Nature of Initiative**
  MYGS is a **pioneering civic education programme** that engages students in **mock Gram Sabha proceedings**, enabling them to understand:
  - Roles of Gram Sabha and Panchayats
  - Local planning and budgeting
  - Consensus-building and democratic deliberation
- **Core Objective**
  To strengthen **Janbhagidari** and inculcate democratic values by exposing students to the **functioning of grassroots institutions**.

Institutional and Policy Alignment

1. Alignment with National Education Policy (NEP) 2020

- MYGS reflects NEP 2020's emphasis on:
  - **Experiential learning**
  - **Civic responsibility**
  - **Holistic development beyond rote learning**
- It integrates **constitutional values** and **democratic ethics** into school education.

2. Institutions Covered under MYGS

Jawahar Navodaya Vidyalayas (JNVs)

- Residential schools established under **NEP 1986**
- Aim to provide **quality education to rural children**, irrespective of socio-economic background
- MYGS complements JNVs' mandate by linking education with **civic awareness**

Eklavya Model Residential Schools (EMRSs)

- Designed to provide quality education to **Scheduled Tribe (ST) students**
- Located in areas with:
  - More than **50% ST population**
  - At least **20,000 tribal persons**
- MYGS empowers tribal youth by:
  - Familiarising them with **constitutional local governance structures**
  - Encouraging leadership and participation in community affairs

State Government Schools

- Ensures **scalable and inclusive implementation**
- Bridges the gap between:
  - Classroom learning
  - Real-world democratic practices

Significance of MYGS

1. Strengthening Grassroots Democracy

- Familiarises youth with:
  - Functions of Gram Sabha
  - Decentralised planning under the Panchayati Raj system

2. Youth Empowerment

- Transforms students from **passive learners to active citizens**
- Encourages leadership, articulation, and collective problem-solving

3. Social Inclusion

- Special focus on:
  - Rural students
  - Tribal communities
- Promotes **substantive equality** by ensuring marginalised voices understand governance mechanisms

4. Long-Term Governance Impact

- Creates a pipeline of **informed, participatory citizens**
- Strengthens democratic culture at the village level in the long run

Broader Governance Perspective

- The initiative aligns with:
  - **73rd Constitutional Amendment** (empowering Gram Sabha)
  - Gandhian vision of **Gram Swaraj**
- Political thinkers like **Alexis de Tocqueville** highlighted that democracy thrives when citizens participate in **local institutions**, a principle MYGS operationalises in the Indian context.

Conclusion

The **Model Youth Gram Sabha (MYGS)** represents an innovative convergence of **education and governance**, aimed at nurturing democratic consciousness among India's youth. By institutionalising participatory learning aligned with **NEP 2020**, and by targeting rural and tribal students through JNVs and EMRSs, MYGS strengthens the foundations of **grassroots democracy**. In the long run, such initiatives are crucial for building a **responsive, inclusive, and participatory governance ecosystem** in India.

Mains Practice Question

"The Model Youth Gram Sabha (MYGS) initiative reflects a shift towards participatory civic education in India." Examine its significance in strengthening grassroots democracy and youth engagement in local governance.

Labour Codes Implementation

📌 Syllabus Mapping

- **GS Paper II** – Polity & Governance
  - Constitutional provisions related to labour
  - Role of ministries and institutions
- **GS Paper III** – Indian Economy
  - Labour reforms
  - Employment, social security, and ease of doing business
- **GS Paper I** – Society
  - Workers' rights and social justice

Introduction

Labour reforms constitute a critical pillar of India's economic and social transformation. After nearly five years of legislative passage, the **implementation of the four Labour Codes** marks a decisive shift from a fragmented, compliance-heavy framework to a **simplified, contemporary, and inclusive labour governance system**. The move aims to balance **workers' welfare, industrial harmony, and economic competitiveness** in a rapidly changing labour market.

Why in News?

The **Ministry of Labour and Employment** recently brought into force the **four Labour Codes**, which were earlier approved by Parliament, consolidating **29 central labour laws** into a unified legal framework.

The Four Labour Codes

1. **Code on Wages**
2. **Industrial Relations Code**
3. **Code on Social Security**
4. **Occupational Safety, Health and Working Conditions Code (OSHWC)**

Together, these codes aim to rationalise regulation, extend social security, and modernise industrial relations.

India's Labour Law Framework: Constitutional Foundations

1. Constitutional Jurisdiction

- **Labour in the Concurrent List (Seventh Schedule)** → Both Union and States can legislate, requiring cooperative federalism in implementation.

2. Preamble: Emphasises **social justice, dignity of labour, and equality**, forming the normative basis of labour welfare legislation.

3. Directive Principles of State Policy

- **Article 39** – Equal pay for equal work
- **Article 41** – Right to work, education, and public assistance
- **Article 42** – Humane working conditions and maternity relief
- **Article 43** – Living wage and decent standard of life
- **Article 43A** – Workers' participation in management

4. Fundamental Rights

- **Article 16** – Equality of opportunity in public employment
- **Article 19(1)(c)** – Right to form associations and trade unions
- **Article 23** – Prohibition of forced labour
- **Article 24** – Prohibition of child labour in hazardous industries

Labour Market Context in India

- **Labour Force Participation Rate (2024)**: **59.6%**
- **Female LFPR (2023–24)**: **41.7%**
- **Total employment**: **64.33 crore persons**
- **Unorganised sector share**: **~90% of workforce**

➡️ Highlights the urgency of **universal social security and regulatory simplification**.

Institutional Mechanisms

- **Ministry of Labour and Employment**: Policy formulation and worker protection
- **Labour Bureau**: Data on wages, disputes, closures, and working conditions
- **Chief Labour Commissioner**: Dispute resolution and law enforcement

Social Security Institutions

- **Employees' State Insurance (ESI)**
  - Coverage up to ₹21,000/month
  - Sickness, maternity, disablement benefits
- **Employees' Provident Fund Organisation (EPFO)**
  - Retirement savings under EPF Act, 1952

Why Labour Reforms Were Necessary

1. Simplifying Compliance

- Multiple laws created:
  - Overlapping definitions
  - Inspector raj
  - High compliance costs
- **2nd National Commission on Labour** recommended consolidation into **4–5 labour codes**.

2. Modernising Archaic Laws

- Several laws dated back to:
  - Colonial period
  - Early post-independence era

Example: Payment of Wages Act, 1936 applied only to workers earning up to ₹24,000/month.

3. Addressing Universal Coverage Gaps

- Informal workers lacked:
  - Social security
  - Legal protection

➡️ Codes expand coverage to **gig, platform, and migrant workers**.

4. Promoting Economic Objectives

- Simplified compliance improves:
  - Ease of Doing Business
  - Investment climate
  - Job creation

5. Responding to New Forms of Work

- Gig and platform economy expansion
- As per **NITI Aayog**, **7.7 million gig workers (2020–21)**, ~1.5% of workforce.

Key Concepts under the Labour Codes

Gig, Platform Workers & Aggregators

- **Gig worker**: Works outside traditional employer–employee relationship
- **Platform worker**: Work mediated via digital platforms (e.g., ride-hailing, food delivery)
- **Aggregator**: Digital intermediary connecting buyers and service providers

Fixed-Term Employment (FTE)

- Employment for a **defined contractual period**
- Same benefits as permanent workers
- No retrenchment notice on contract expiry

Lay-off, Retrenchment, and Closure

- **Lay-off**: Temporary inability to provide work
- **Retrenchment**: Termination not related to disciplinary action
- **Closure**: Permanent shutdown of establishment

Contract Labour

- Workers hired through contractors rather than directly by principal employer.

Floor Wage

- Central benchmark minimum wage
- State minimum wages **cannot fall below** this level

Concerns and Implementation Challenges

- **State readiness and rule-making delays**
- **Trade union concerns** over job security and collective bargaining
- **Capacity constraints** in enforcement machinery
- **Awareness gaps** among informal workers

Conclusion

The implementation of the **four Labour Codes** marks a **structural reform in India's labour governance**, seeking to harmonise **workers' rights with economic efficiency**. While the codes promise simplified compliance, broader social security, and adaptability to new employment forms, their success will depend on **cooperative federalism, robust enforcement, and social dialogue**. If implemented effectively, these reforms can support **inclusive growth, employment generation, and industrial harmony** in a rapidly evolving economy.

Mains Practice Question

"The implementation of the four Labour Codes represents a paradigm shift in India's labour governance." Examine their constitutional basis, objectives, and challenges in achieving inclusive and sustainable labour market reforms.

Code on Wages, 2019

📌 Syllabus Mapping

- **GS Paper II** – Polity & Governance
  - Social justice
  - Centre–State relations
  - Labour welfare legislation
- **GS Paper III** – Indian Economy
  - Employment and wages
  - Labour reforms
  - Informal sector

Introduction

The **Code on Wages, 2019** represents a foundational reform in India's labour law architecture. By consolidating multiple wage-related legislations into a single code, it seeks to ensure **universal wage protection**, **gender equality**, and **regulatory clarity**, while simplifying compliance for employers. The Code reflects a shift from fragmented wage governance to a **rights-based, nationally harmonised framework**.

Background and Objective

- The Code consolidates **four existing wage laws**:
  - Minimum Wages Act, 1948
  - Payment of Wages Act, 1936
  - Payment of Bonus Act, 1965
  - Equal Remuneration Act, 1976

Core Aim

- To **strengthen workers' wage rights**
- To promote **simplicity, uniformity, and transparency** in wage-related compliance

Key Provisions of the Code

1. Universal Coverage of Minimum Wages

- Establishes a **statutory right to minimum wages** for **all employees**
- Applies to both:
  - **Organised sector**
  - **Unorganised sector**

➡️ Ends sector-based exclusions that existed under earlier laws.

2. Criteria for Fixation of Minimum Wages

Minimum wages may vary based on:

- **Skill levels**
- **Geographical regions**
- **Nature of work and working conditions**, including:
  - Hazardous environments
  - Extreme temperature or humidity

➡️ Allows contextual flexibility while retaining national safeguards.

3. Introduction of Statutory Floor Wage

- The **Central Government** will notify a **Floor Wage** based on: Minimum living standards
- **States cannot fix minimum wages below this floor**

➡️ Ensures **national adequacy and uniformity**, while allowing regional variation above the floor.

4. Timely Payment and Overtime Compensation

- Mandates **timely payment of wages**
- Overtime to be paid at **not less than twice** the normal wage rate

➡️ Strengthens enforcement against wage delays and exploitation.

5. Standardisation and Simplification

- Uniform definitions of key terms such as:
  - **"Wages"**
  - **"Employee"**
  - **"Employer"**

➡️ Reduces ambiguity and compliance confusion across labour laws.

Merits and Significance

1. Reduction of Regional Wage Disparities

- National floor wage ensures a **minimum subsistence level across India**
- Prevents a "race to the bottom" among States.

2. Gender Equality in Wages

- Mandates **equal wages and working conditions** irrespective of:
  - Gender
  - Includes **transgender persons**

➡️ Advances constitutional principles of **equality and dignity**.

3. Trust-Based Regulatory Ecosystem

- **Decriminalisation of offences**: Certain first-time violations attract **monetary penalties instead of imprisonment**

➡️ Encourages voluntary compliance and reduces inspector raj.

4. Inclusion of Informal Workers

- For the first time, wage protection extends comprehensively to:
  - Informal
  - Casual
  - Contract workers

Concerns and Challenges

1. Implementation Deficit

- Effective enforcement remains challenging in:
  - Rural areas
  - Informal sector
- Limited inspection capacity and awareness gaps may dilute outcomes.

2. Federalism Concerns

- States' autonomy in wage fixation may be **constrained** by: Centralised determination of floor wage

➡️ Raises concerns over **Centre–State balance** under the Concurrent List.

3. Compliance Burden for MSMEs

- Small enterprises may face:
  - Higher wage costs
  - Administrative adjustments

Conclusion

The **Code on Wages, 2019** lays the cornerstone for a **fair, transparent, and inclusive wage regime** in India. By ensuring universal minimum wages, enforcing gender equality, and simplifying compliance, it strengthens labour rights while supporting economic formalisation. However, its success will depend on **robust implementation, cooperative federalism, and effective outreach** to informal workers. If executed well, the Code can significantly advance **social justice and inclusive growth**.

Mains Practice Question

"The Code on Wages, 2019 seeks to balance uniform wage protection with federal flexibility." Critically examine its key provisions, significance, and implementation challenges.

Occupational Safety Code, 2020

📌 Syllabus Mapping

- **GS Paper II** – Polity & Governance
  - Labour welfare legislation
  - Institutional mechanisms
  - Gender equality at workplace
- **GS Paper III** – Indian Economy
  - Labour reforms
  - Working conditions and productivity

Introduction

Safe, humane, and dignified working conditions are integral to both **constitutional morality** and **economic productivity**. The **Occupational Safety, Health and Working Conditions Code, 2020 (OSHWC)** represents a comprehensive attempt to modernise India's fragmented safety and welfare framework by consolidating multiple laws into a **single, uniform, and technology-enabled regime**. The Code seeks to balance **worker protection** with **ease of compliance for enterprises**, especially in a rapidly formalising economy.

Objective of the Code

- To ensure **safe, healthy, and humane working conditions** for all workers
- To simplify and rationalise compliance by consolidating multiple legislations
- To promote **gender inclusion**, **labour mobility**, and **industrial efficiency**

Laws Consolidated

The OSHWC Code subsumes **13 central labour laws**, including:

- Factories Act, 1948
- Mines Act, 1952
- Contract Labour (Regulation and Abolition) Act, 1970
- Inter-State Migrant Workmen Act, 1979
  (among others)

Key Provisions of the Code

1. Unified Registration and Coverage Threshold

- A **uniform threshold of 10 employees** for electronic registration of establishments
- Aims to replace multiple, sector-specific registration systems

➡️ Enhances regulatory clarity and reduces compliance burden.

2. Extension to Hazardous Occupations

- Government empowered to extend OSHWC provisions to:
  - **Any establishment**, even with **one employee**
  - If engaged in **hazardous or life-threatening activities**

➡️ Reflects a **risk-based approach** to workplace safety.

3. Expanded Definition of Inter-State Migrant Workers (ISMW)

- Covers workers who:
  - Are employed directly or through contractors
  - Migrate independently for employment

➡️ Recognises the realities of circular and informal migration.

4. Women's Employment and Gender Inclusion

- Women permitted to work:
  - In **all types of establishments**
  - During **night hours** (before 6 a.m. and after 7 p.m.)
- Subject to:
  - Worker consent
  - Employer-provided safety and welfare measures

➡️ Aligns labour law with **constitutional equality (Article 14)** and **Article 42**.

5. National Occupational Safety and Health Advisory Board

- Establishes a **single tripartite advisory body**
- Replaces **six earlier sector-specific boards**
- Mandated to:
  - Frame national OSH standards
  - Ensure uniformity across sectors

Institutional Oversight Mechanisms

- **Safety Committees** mandatory for:
  - Factories with **500+ workers**
  - Construction units with **250+ workers**
  - Mines with **100+ workers**
- **Welfare Officers** compulsory in establishments with:
  - **250 or more workers**

➡️ Ensures participatory and institutional monitoring.

Contract Labour Provisions

- OSHWC applies to contractors employing **50 or more workers** (earlier 20)
- Employers allowed to engage contract labour even in **core activities** such as sanitation, subject to safeguards

➡️ Seeks flexibility while retaining accountability.

Merits of the OSHWC Code

1. Strengthened Workers' Rights

- Statutory cap on:
  - **Working hours: 8 hours/day**
  - **48 hours/week**

➡️ Reinforces humane working standards.

2. Transparency and Accountability

- Mandatory:
  - **Appointment letters**
  - **Digital compliance mechanisms**

➡️ Reduces informality and arbitrary employment practices.

3. Boost to Female Labour Force Participation

- Enables women's participation across sectors and shifts
- Complements broader goals of **gender-inclusive growth**

Concerns and Limitations

1. Narrowed Coverage Due to Higher Thresholds

- Factory licensing threshold raised:
  - From 10 to **20 workers** (with power)
  - To **40 workers** (without power)

➡️ May exclude small units from safety compliance.

2. Oversight and Enforcement Gaps

- Increased reliance on:
  - **Self-certification**
  - Reduced physical inspections

➡️ Risks under-reporting of safety violations, especially in informal sectors.

Conclusion

The **Occupational Safety, Health and Working Conditions Code, 2020** represents a major step toward **modernising India's workplace governance** by integrating safety, dignity, gender inclusion, and regulatory efficiency. While the Code simplifies compliance and expands rights—particularly for women and migrant workers—its effectiveness will depend on **robust enforcement, capacity building of inspectors, and continuous social dialogue**. If implemented sincerely, the OSHWC Code can significantly enhance **worker welfare, productivity, and trust** in India's labour ecosystem.

Mains Practice Question

"The Occupational Safety, Health and Working Conditions Code, 2020 seeks to balance worker welfare with business efficiency." Examine its key provisions, merits, and challenges in ensuring safe and humane workplaces in India.

INTERNATIONAL RELATIONS

Global Nuclear Risk

📌 Syllabus Mapping

- **GS Paper II** – International Relations
  - Global security architecture
  - Arms control and disarmament
  - India's foreign policy principles
- **GS Paper III** – Security
  - Nuclear security
  - Emerging technologies and strategic stability
- **GS Paper IV** – Ethics
  - Global responsibility
  - Ethics of deterrence and mass destruction

Introduction

Nuclear weapons continue to pose the gravest existential threat to humanity. Recent developments in global security—marked by renewed nuclear testing rhetoric, breakdown of arms control regimes, and rapid technological change—have intensified concerns about **strategic instability and accidental escalation**. Against this backdrop, India's long-standing advocacy for **universal, non-discriminatory, and verifiable nuclear disarmament** acquires renewed relevance.

Why in News?

Recently, the **United States President announced the resumption of nuclear weapons testing**, a move that risks weakening decades-old non-proliferation and disarmament norms. This has reignited global debate on **nuclear restraint, treaty erosion, and strategic risk reduction**.

Factors Driving the Rise in Global Nuclear Risk

1. Intensifying Geopolitical Tensions

- Heightened rivalries encourage **nuclear securitisation and readiness**
- According to the **Stockholm International Peace Research Institute (SIPRI) Yearbook 2024**, the number of **operational nuclear warheads has increased consistently**

➡️ **Impact:** Greater likelihood of crisis escalation under stressed geopolitical conditions.

2. Doctrinal Ambiguity and Escalation Risks

- Lack of clarity on **nuclear response thresholds**
- Uncertainty over retaliation to:
  - Cyber-attacks on nuclear command and control systems

➡️ **Result:** Increased scope for **miscalculation and unintended escalation**

3. Breakdown of Arms Control Treaties

- Collapse of major agreements weakens:
  - Transparency
  - Communication
  - Arms limitation

Examples:

- Collapse of the **INF Treaty (US–Russia)**
- U.S. withdrawal from the **Iran Nuclear Deal (JCPOA)**

➡️ **Consequence:** Strategic unpredictability and arms racing.

4. Faster and Advanced Delivery Systems

- Emergence of:
  - Hypersonic missiles
  - Dual-use delivery platforms

➡️ These **compress decision-making time**, increasing the danger of **misidentification and rapid escalation**.

5. False Alarm and Accidental Risks

- Dependence on early-warning systems remains vulnerable

Illustrative Case:

- **1983 Soviet false-alarm incident**, where human intervention prevented nuclear catastrophe

➡️ **Lesson:** Automation without human oversight is inherently dangerous.

6. Militarisation of Outer Space

- Expansion of strategic competition into space
- Example: Expansion of the **U.S. Space Force**

➡️ **Effect:** New domains of conflict destabilise existing deterrence frameworks.

7. Weaponisation of Artificial Intelligence

- AI integration into military systems:
  - Speeds up decision-making
  - Reduces human deliberation

➡️ Even outside nuclear platforms, AI-enabled systems can **trigger cascading escalation risks**.

Nuclear Disarmament: Concept and Challenges

What is Nuclear Disarmament?

- The reduction or elimination of nuclear weapons through:
  - International agreements
  - Unilateral commitments

Ultimate Goal: A **nuclear-weapon-free world**

Key Challenges to Global Disarmament

1. Ineffective Multilateral Platforms

- Bodies such as the **Conference on Disarmament** have remained stalled for decades

➡️ Undermines confidence in collective diplomacy.

2. Treaty Design Limitations

- Ambiguities allow delay or evasion
- Example: **Treaty on the Non-Proliferation of Nuclear Weapons (NPT)** lacks enforceable timelines for arsenal reduction

3. Withdrawal and Non-Compliance

- Treaty exits weaken norms

Example: North Korea's withdrawal from the NPT

4. States Outside the Framework

- De-facto nuclear powers outside NPT obligations:
  - India
  - Israel
  - Pakistan

➡️ Challenges universality and legitimacy of the regime.

5. Commitment–Implementation Gap

- States support disarmament rhetorically while Modernising arsenals

Example: Russia supports NPT objectives but upgrades delivery systems.

6. Reliance on Nuclear Deterrence

- Conventional military asymmetries push states to rely on nuclear weapons for strategic balance

Example: Russia's dependence on nuclear deterrence vis-à-vis NATO.

7. Lack of Regulation on Delivery Systems

- Absence of binding legal controls on:
  - Missiles
  - Hypersonic weapons

➡️ Enables unchecked competition.

India's Approach to Nuclear Disarmament

1. Core Principle

India advocates **global, universal, non-discriminatory, and verifiable nuclear disarmament**, applicable equally to all states.

2. Early Leadership in Disarmament Advocacy

- **1954**: First country to call for a **global ban on nuclear testing**
- **1978**: Proposed a **Nuclear Weapons Convention** prohibiting use or threat of nuclear weapons
- **1988**: Presented a **UN General Assembly Action Plan** for phased elimination of nuclear weapons

3. India's Position on Major Treaties

- **NPT**: Opposed as it institutionalises **nuclear apartheid** by recognising only five nuclear-weapon states
- **CTBT**:
  - Not signed due to:
    - Absence of time-bound disarmament
    - India's security concerns
- **TPNW**: Not supported as it does not introduce **new verification or enforcement mechanisms**

4. Multilateralism and Institutional Faith

- India supports:

- Negotiated universal agreements
- A **Nuclear Weapons Convention** through the Conference on Disarmament, which it considers the most appropriate forum

Ethical and Strategic Perspective

- Nuclear weapons violate principles of:
  - **Just war**
  - **Proportionality**
  - **Humanitarian ethics**

As Mahatma Gandhi argued, *means determine ends*—weapons of mass destruction undermine the moral foundations of global peace.

Conclusion

The rising global nuclear risk reflects a convergence of **geopolitical rivalry, treaty erosion, and technological acceleration**. Addressing these dangers requires **renewed arms control, doctrinal transparency, and inclusive multilateralism** that keeps pace with emerging technologies. India's consistent emphasis on **universal, non-discriminatory, and verifiable disarmament**, combined with restraint, civilian oversight, and confidence-building measures, offers a **pragmatic and principled pathway**. Sustained dialogue, institutional reform, and incremental trust-building remain essential to bridge the gap between deterrence realities and the shared aspiration of a **nuclear-weapon-free world**.

Mains Practice Question

"Rising geopolitical tensions, technological advancements, and treaty breakdowns have increased global nuclear risks." In this context, examine the challenges to nuclear disarmament and critically evaluate India's approach towards achieving a nuclear-weapon-free world.

The G2 Power Debate

📌 Syllabus Mapping

- **GS Paper II** – International Relations
  - Major power relations
  - India–US–China dynamics
  - Multilateralism and global order
- **GS Paper III** – Security
  - Strategic stability
  - Economic and technological leverage in geopolitics

Introduction

The evolving balance of global power has revived debates on whether international politics is moving towards **multipolarity or a new bipolarity**. The recent reference to a **"G2"** by the United States President—suggesting a US–China duopoly—has renewed concerns about the marginalisation of other major powers and the future of a rules-based multilateral order. This development carries significant implications for India's strategic environment.

Why in News?

At the recent **Asia-Pacific Economic Cooperation (APEC) Summit** in Busan, South Korea, the US President described his engagement with the Chinese President as a **"G2" meeting**, implicitly portraying the United States and China as joint managers of global affairs.

Background of the US–China Engagement

- The meeting occurred amid an **intensifying trade war** between the two countries.
- Outcomes included a **temporary trade truce**, featuring:
  - Reduction of US tariffs on Chinese goods
  - Relaxation of Chinese restrictions on **rare-earth exports** to the US

These steps underscored the **mutual economic leverage** shaping US–China relations.

Understanding the G2 (Group of Two) Concept

- The G2 idea was first articulated in **2005 by economist C. Fred Bergsten**.
- It envisages:
  - Formal recognition of China as a **great power**
  - Shared responsibility between the US and China for managing:
    - Global macroeconomic stability

- Climate change
- Financial crises

In essence, it implies a **division of global influence into two major spheres**, centred on Washington and Beijing.

Implications of a G2-Style Duopoly

1. Global Duopoly and Strategic Realignment

- Signals a shift from **multipolar aspirations** to a **near-bipolar order**
- Risks sidelining other major actors such as:
  - India
  - European Union
  - Russia
  - Japan

This could weaken inclusive global governance.

2. Enhanced Economic Leverage for China

- China's use of **rare-earth export controls** demonstrates:
  - Strategic confidence
  - Ability to shape negotiations through supply-chain dominance

This may embolden Beijing in future economic or strategic bargaining.

3. Anxiety Among US Allies

- A perceived G2 arrangement raises concerns that:
  - US security commitments in East Asia may dilute
  - Regional deterrence could weaken

Example: Heightened apprehensions regarding **Taiwan's security**

4. Implications for India–US Relations

- The G2 narrative coincides with:
  - Trade frictions between India and the US
  - Increased tariffs on Indian exports
- It also generates uncertainty over:
  - The future role of India in the **Indo-Pacific strategy**
  - The momentum of groupings such as the **Quadrilateral Security Dialogue (Quad)**, illustrated by summit postponements.

Why a G2 Duopoly Is Structurally Limited

1. Political and Ideological Differences

- **United States**:
  - Liberal democratic order
  - Rules-based international system
- **China**:
  - State-centric governance
  - Emphasis on sovereignty and non-interference

These divergent worldviews constrain sustained partnership.

2. Deep Mutual Distrust and Strategic Rivalry

- Persistent fault lines include:
  - Taiwan
  - South China Sea disputes
  - Trade and technology wars

The relationship is better described as **competitive coexistence** rather than cooperation.

3. China's Reluctance to Embrace G2

- China has historically avoided formal G2 framing to:

- Prevent being perceived as a **junior partner**
- Preserve flexibility through multilateral platforms such as:
  - United Nations
  - BRICS

Way Forward for India

1. Preserving Strategic Autonomy

- Continue engagement across multiple platforms:
  - BRICS
  - Quad
  - G20

This avoids dependence on any single power bloc.

2. Diversifying Economic and Security Partnerships

- Reduce vulnerability by:
  - Expanding trade partnerships
  - Finalising FTAs, particularly with the **European Union**

3. Deepening Regional and Global Collaboration

- Strengthen ties with:
  - **ASEAN**
  - Like-minded middle powers

This supports India's vision of a **multipolar Indo-Pacific**.

Conclusion

While the renewed talk of a **G2** highlights the enduring weight of US–China relations, **deep ideological differences, strategic rivalry, and mutual mistrust** make a durable duopoly unlikely. For India, the imperative lies in **upholding strategic autonomy, expanding diversified partnerships, and strengthening multilateralism**. By working with like-minded nations, India can contribute to a **balanced multipolar global order**, preventing the concentration of power in the hands of two dominant states.

Mains Practice Question

"The renewed discourse on a G2 (US–China) duopoly reflects shifting global power dynamics." Critically examine its implications for the international order and evaluate India's strategic options in such a scenario.

G20 Johannesburg Summit 2025

📌 Syllabus Mapping

- **GS Paper II** – International Relations
  - Multilateral institutions
  - Global governance reforms
  - India and the Global South
- **GS Paper III** – Economy, Environment & Development
  - Debt sustainability
  - Climate and energy transition
  - Digital and AI-led development

Introduction

The **G20** has emerged as the premier forum for global economic coordination in a rapidly fragmenting world order. The **20th G20 Summit**, held in **Johannesburg, South Africa**, marked a historic milestone as the **first G20 summit on African soil**, signalling a deeper shift towards **inclusive multilateralism** and **Global South leadership**. Guided by the African philosophy of **Ubuntu – "I am because we are"**, the summit sought to balance growth, equity, and sustainability.

Why in News?

The **20th G20 Summit (2025)** concluded in Johannesburg with the adoption of the **Johannesburg Declaration**, focusing on **debt relief, climate transition, AI-led development, youth and gender inclusion**, and institutional reforms, while reaffirming the G20's relevance amid geopolitical fragmentation.

Key Outcomes of the Johannesburg Declaration

1. Debt Sustainability and Development Finance

- Proposal to establish a **Cost of Capital Commission**
- Objective:
  - Examine **structural drivers of high borrowing costs** for developing economies
  - Address asymmetries in global financial architecture

➡️ Reflects Global South demand for **fairer access to development finance**.

2. Global Resilience and Disaster Risk Reduction

- Commitment to **universal coverage of Early Warning Systems by 2027**
- Implementation through the **UN Early Warnings for All Initiative**

➡️ Strengthens climate adaptation capacity for disaster-prone developing countries.

3. AI and Digital Transformation

- Launch of **AI for Africa Initiative**
- Focus:
  - Expanding computing infrastructure
  - Developing local AI talent ecosystems

➡️ Positions AI as a **development enabler**, not merely a strategic technology.

4. Energy and Climate Transition

- **Mission 300**:
  - Joint initiative of the **World Bank Group** and **African Development Bank**
  - Target: **Electricity access for 300 million Africans by 2030**
- Reaffirmation of commitments to:
  - **Triple global renewable energy capacity**
  - **Double annual energy efficiency improvements by 2030**

➡️ Aligns climate action with development imperatives.

5. G20 Critical Minerals Framework

- A **voluntary, non-binding framework** to:
  - Secure sustainable critical mineral value chains
  - Promote responsible mining practices
  - Encourage investment and governance reforms
- Explicitly **preserves sovereign rights** of mineral-rich countries

➡️ Important for Africa, Latin America, and India amid global energy transition.

6. Youth and Gender Inclusion Targets

- **Nelson Mandela Bay Target**: Reduce **Youth Not in Employment, Education, or Training (NEET)** by **5% by 2030**
- **Revised Brisbane–eThekwini Goal**: Reduce **gender gap in labour force participation by 25% by 2030** (from 2012 levels)

➡️ Emphasises **inclusive growth and demographic dividends**.

Why G20 Matters: Structural Significance

1. Legitimacy and Inclusivity

- Brings together:
  - Advanced economies (G7)

    - Emerging economies (BRICS)
- Inclusion of the **African Union** enhances representativeness

➡️ Greater legitimacy than smaller elite groupings.

2. Global Economic Crisis Management

- Demonstrated effectiveness during the **2008 Global Financial Crisis**
- Prevented escalation into a global depression through coordinated stimulus

3. Driver of Multilateral Institutional Reform

- Collective push for reforms in:
    - **International Monetary Fund**
    - **World Trade Organization**

➡️ Reflects evolving **multipolar global reality**.

4. Global Agenda Setting Role

- Norm-setting on:
    - International taxation (BEPS, Global Minimum Tax)
    - Digital Public Infrastructure (DPI)
    - Climate finance and development models

G20 and the Global South: Johannesburg Effect

Shifting Power Dynamics

- Four-year Global South presidency continuum:
    - Indonesia → India → Brazil → South Africa
- Successfully mainstreamed:
    - Debt relief
    - Development finance reform
    - Climate justice

Africa at the Centre

- Consensus declaration despite geopolitical tensions
- Demonstrates:
    - Institutional resilience
    - Growing agenda-setting capacity of developing countries

Challenges Facing the G20

1. Consensus Fatigue

- Strategic rivalries:
    - US–China
    - Russia–West
- Result: Diluted language on sensitive geopolitical issues

2. Undermined Political Legitimacy

- Absence of key leaders (e.g., US President) due to political disagreements
- Weakens perception of G20 as the **global steering committee**

3. Non-Binding Commitments

- G20 decisions lack enforcement mechanisms
- Chronic delays in:
    - Climate finance
    - Debt restructuring

4. Ineffective Debt Frameworks

- **G20 Common Framework for Debt Treatment**: Criticised for being slow and procedurally complex

5. Protectionism and Geo-economics

- Resurgence of:
  - Industrial subsidies
  - Trade nationalism

Example: "MAGA"-driven protectionism in the US

6. Agenda Overload

- Expansion into multiple domains:
  - AI governance
  - Health security
  - Gender equality

➡️ Risks dilution of focus and implementation capacity.

India's Strategic Stakes

- India's leadership on:
  - **Debt relief**
  - **Critical minerals**
  - **Digital Public Infrastructure**

will determine its ability to:

- Translate agenda-setting into **long-term global leadership**
- Shape a **multipolar, development-centric world order**

Conclusion

The **Johannesburg G20 Summit** marks a decisive moment in the evolution of global governance, highlighting the **rising influence of the Global South** and Africa's centrality in shaping future priorities. While structural challenges—consensus fatigue, non-binding commitments, and geopolitical rivalry—persist, the summit reaffirmed the G20's role as the most **representative platform for global economic coordination**. For India, the task ahead lies in sustaining momentum, deepening reforms, and converting collective declarations into **durable global outcomes**.

Mains Practice Question

"The G20 Johannesburg Summit reflects the growing influence of the Global South in global governance." Discuss its key outcomes and critically examine the challenges facing the G20 in a fragmented world order.

India–US Defence Partnership

📌 Syllabus Mapping

- **GS Paper II** – International Relations
  - India–US relations
  - Defence diplomacy and strategic partnerships
  - Indo-Pacific security architecture
- **GS Paper III** – Security & Economy
  - Defence preparedness
  - Defence manufacturing and technology transfer

Introduction

India–US defence relations have evolved from episodic cooperation to a **comprehensive strategic partnership** shaped by converging interests in the **Indo-Pacific**, technological collaboration, and shared concerns over regional stability. The signing of a **new 10-year Framework for Defence Partnership** marks a decisive step toward institutionalising long-term cooperation, moving beyond a buyer–seller relationship to **co-development, interoperability, and industrial integration**.

Why in News?

India and the United States have signed a **fresh 10-year defence framework agreement**, renewing and expanding earlier frameworks concluded in **2005** and **2015**. In parallel, the US approved the sale of advanced systems such as **Javelin anti-tank missiles** and **Excalibur guided artillery munitions**, underscoring deepening defence trust.

Evolution of India–US Defence Cooperation

- **Origins (1962)**: Cooperation began during the Sino-Indian War, when the US provided airlift support, equipment, and training.
- **Post-2000s**: Defence ties accelerated with strategic convergence after the Cold War, culminating in structured frameworks and foundational agreements.

Institutional Dialogue Architecture

Apex-Level Engagement

- **2+2 Ministerial Dialogue**: Co-chaired by India's Ministers of External Affairs and Defence and the US Secretaries of State and Defence—the principal platform for strategic alignment.

Supporting Mechanisms

- Defence Policy Group (DPG)
- Military Cooperation Group (MCG)
- Defence Joint Working Groups (DJWGs)

These ensure continuity across **policy, operations, and industry**.

Foundational Defence Agreements

- **GSOMIA (2002)**: Enables sharing of classified military information between governments and authorised entities.
- **LEMOA (2016)**: Provides reciprocal access to military facilities for refuelling and replenishment, enhancing operational reach.
- **COMCASA (2018)**: Facilitates secure, encrypted communications and interoperable systems.
- **BECA (2020)**: Allows sharing of high-end geospatial and satellite data for navigation and precision targeting.

Collectively, these agreements underpin **interoperability and trust**.

Defence Trade and Industrial Cooperation

- **Major Defence Partner Status (2016)**: Recognised India's unique position outside formal alliances.
- **STA-1 Status (2018)**: Eases export controls, enabling faster access to dual-use and defence technologies.
- **Key Platforms in Indian Service**:
  - P-8I maritime patrol aircraft
  - C-17 and C-130J transport aircraft
  - Apache and MH-60R helicopters
  - M777 ultra-light howitzers

Defence trade has crossed **USD 20 billion**, reflecting scale and depth.

Joint Exercises and Interoperability

Bilateral

- **Yudh Abhyas** (Army)
- **Vajra Prahar** (Special Forces)
- **Cope India** (Air Force)
- **Tiger Triumph** (Tri-Service)

Multilateral

- **Malabar** (with Japan and Australia)
- **RIMPAC**, **Red Flag**

These exercises enhance **jointness, domain awareness, and crisis-response readiness**.

Strategic Significance

1. Indo-Pacific Balancing

- Strengthens India's maritime posture and situational awareness amid China's assertiveness.
- Reinforces rules-based order through partnerships like the Quad.

2. **Technology and Industrial Upgradation:** Facilitates access to advanced systems and **co-production**, including jet-engine manufacturing (GE F-414).
3. **Boost to Make-in-India and Exports:** The US has emerged among India's **top defence export destinations**, supporting indigenous manufacturing.
4. **Logistics and Global Reach:** LEMOA expands India's operational footprint and humanitarian assistance capabilities.
5. **Strategic Diversification:**Reduces over-dependence on legacy suppliers by broadening India's technology base.

Key Irritants and Constraints

1. **Strategic Autonomy Pressures:** US expectations on Russia-related sanctions and defence purchases create friction.
    - *Example*: CAATSA concerns during the S-400 acquisition.
2. **Technology Transfer Limits:** Despite STA-1, sensitive technologies (e.g., jet-engine components) remain tightly controlled.
3. **Divergent Regional Priorities:** Continued US security engagement with Pakistan causes strategic discomfort for India.
4. **Interoperability Challenges:** Mixed inventories (Russian and US platforms) complicate integration and logistics.
5. **US Domestic Politics:** Congressional oversight can delay or stall deals (e.g., MQ-9B drones).
6. **Shifting Great-Power Dynamics:** Changes in US–Russia or Russia–China equations can indirectly affect India's defence calculus.

Conclusion

The renewed **10-year India–US Defence Framework** offers a window to transform cooperation from **transactional procurement** to **strategic co-creation**. By expanding co-development, easing technology barriers, and respecting India's **strategic autonomy**, the partnership can reinforce stability in the Indo-Pacific while advancing India's goals of **defence self-reliance, industrial capability, and global security contribution**.

Mains Practice Question

"India–US defence ties have evolved from limited cooperation to a comprehensive strategic partnership." Examine the drivers, achievements, and constraints of this relationship in the context of India's strategic autonomy and Indo-Pacific security.

India–Bhutan Relations

📌 Syllabus Mapping

- **GS Paper II** – International Relations
    - India and its Neighbourhood
    - Bilateral treaties and agreements
    - Security, connectivity, and development diplomacy
- **GS Paper III** – Economy & Security
    - Energy cooperation
    - Strategic infrastructure
    - Border management

Introduction

India–Bhutan relations represent one of India's most **stable, trust-based, and mutually respectful neighbourhood partnerships**. Rooted in shared civilisational links, spiritual heritage, and strategic convergence, the relationship has steadily evolved from a **protectorate-style arrangement** to a **sovereign, equal partnership**. The recent high-level visit of the Indian Prime Minister to Bhutan reaffirms the centrality of Bhutan in India's **Neighbourhood First** and **Act East**policies.

Why in News?

The Prime Minister of India paid a **two-day State Visit to Bhutan**, at the invitation of **His Majesty the King of Bhutan**, coinciding with the **Global Peace Prayer Festival in Thimphu**, during which the **Piprahwa Relics of Lord Buddha**from India were ceremonially displayed.

Key Outcomes of the State Visit

- **Inauguration of Punatsangchhu-II Hydroelectric Project**, strengthening bilateral energy cooperation
- **Support to Gyalsung National Service Programme**:
    - ₹200 crore grant
    - ₹1500 crore concessional loan
- **MoU on Railway Connectivity**:
    - Kokrajhar–Gelephu
    - Banarhat–Samtse

- **Cultural Diplomacy**:
  - India to allot land in **Varanasi** for construction of a **Bhutanese monastery/temple**

These initiatives collectively span **energy, youth development, connectivity, and civilisational ties**.

Historical Evolution of India–Bhutan Relations

1949 Treaty of Friendship and Cooperation

- Established formal diplomatic relations
- **Article 2**:
  - Bhutan guided by India in external affairs
  - India provided military training, arms, and support

This reflected the **post-colonial security realities** of the region.

2007 Revised Treaty

- Removed the clause requiring Bhutan to seek India's guidance in foreign policy
- Introduced **sovereign equality**
- Revised Article 2:
  - Mutual cooperation
  - Commitment to prevent use of territory for activities harmful to each other's security

➡️ Marked Bhutan's transition from dependence to **strategic partnership**.

Strategic Significance of India–Bhutan Relations

For India

1. Strategic Buffer and National Security

- Bhutan's geography acts as a **buffer between India and China**
- **Doklam Plateau**:
  - Crucial for the security of India's **Siliguri Corridor (Chicken's Neck)**
- Bhutan's security choices directly affect India's eastern defence posture

2. Energy Security

- Bhutan is India's **most reliable hydropower partner**
- Five major hydropower projects:
  - Chukha
  - Kurichhu
  - Tala
  - Mangdechhu
  - Punatsangchhu-II
- **Total capacity: ~2986 MW**

3. Economic and Digital Integration

- Bhutan is India's:
  - Top trading partner
  - Major investment destination
- **Digital Connectivity**:
  - Bhutan is the **first country** to adopt **BHIM-UPI QR standards**
  - **RuPay cards fully interoperable**

For Bhutan

1. Development Partnership

- India is Bhutan's **principal development partner** since **1961 (First Five-Year Plan)**
- In Bhutan's **12th Five-Year Plan**:
  - India contributed **73% of total external grants**

2. Revenue and Fiscal Stability

- Electricity exports to India:

- ~40% of government revenue
- ~25% of GDP

Hydropower remains Bhutan's **economic backbone**.

3. Overcoming Landlocked Constraints

- **2016 Trade, Commerce and Transit Agreement**:
  - Duty-free access
  - Transit to third countries via India

4. Financial and Monetary Support

- India provides:
  - ₹1500 crore **Currency Swap Facility**
  - Multiple **Standby Credit Facilities**

Ensures Bhutan's **macro-economic stability**.

5. Education, Capacity & Technology

- Over **1500 scholarships** (Ambassador's, Nehru-Wangchuck, etc.)
- ~325 **ITEC slots annually**
- **India–Bhutan SAT (2022)**: joint satellite project

6. Defence Cooperation

- **Indian Military Training Team (IMTRAT)**:
  - Trains Bhutanese armed forces
  - Strengthens indigenous security capacity

Key Challenges in India–Bhutan Relations

1. Rising Chinese Influence

- China pushing for:
  - Diplomatic relations
  - Border settlement
- Infrastructure expansion in Tibet:
  - Lhasa–Shigatse railway extension towards **Yatung**

➡️ Gradually erodes India's geographic advantage.

2. Doklam Dilemma

- China's proposed **"package deal"**:
  - Swap Doklam plateau for other disputed areas

➡️ Strategically unacceptable for India due to Siliguri Corridor vulnerability.

3. Economic Perception Issues

- Sections in Bhutan perceive:
  - Indian dominance
  - "Jobless growth"
  - Recycling of aid back to Indian firms

Requires **greater local participation and transparency**.

4. Hydropower Financing Concerns

- Shift from earlier **60:40 grant–loan model**
- Now **60–70% loans**, sometimes at higher interest rates

➡️ Fuels domestic debate in Bhutan on debt sustainability.

Broader Strategic Context

- India–Bhutan relations exemplify:

  - **Asymmetric but benevolent partnership**
  - Respect for sovereignty
  - Non-interference
- Strategically vital in the context of:
  - China's Himalayan strategy
  - South Asian stability
  - India's eastern frontier security

Conclusion

India–Bhutan relations remain a **model neighbourhood partnership**, grounded in **shared spiritual heritage, strategic trust, and developmental cooperation**. While new challenges—particularly from China's growing footprint and hydropower financing concerns—require sensitive handling, recent high-level engagements reaffirm India's commitment to being a **reliable, respectful, and long-term partner**. Sustaining this relationship will depend on **equitable economic cooperation, people-centric development, and continuous strategic dialogue**, ensuring stability in the eastern Himalayas and beyond.

Mains Practice Question

"India–Bhutan relations are often described as a unique partnership in India's neighbourhood diplomacy." Examine the strategic, economic, and geopolitical dimensions of this relationship in the context of emerging regional challenges.

UN80 Reform Initiative

📌 Syllabus Mapping

- **GS Paper II** – International Relations
  - United Nations and its reforms
  - Global governance institutions
  - India and multilateral diplomacy
- **GS Paper III** – Global Challenges
  - International institutions and resource constraints
  - Emerging global governance issues

Introduction

As the world confronts overlapping crises—geopolitical conflicts, humanitarian emergencies, climate change, and disruptive technologies—the **United Nations (UN)** faces mounting questions about its relevance, efficiency, and legitimacy. On the occasion of its **80th anniversary**, the UN has unveiled the **UN80 Initiative Action Plan**, a comprehensive, system-wide reform roadmap aimed at making the organisation **more agile, coherent, and impactful** in an era of shrinking resources and expanding mandates.

Why in News?

The **United Nations** recently presented the **UN80 Initiative Action Plan**, outlining time-bound reforms to rationalise mandates, improve operational efficiency, and restructure parts of the UN system between **November 2025 and December 2026**.

About the UN80 Initiative

- **Launch**: March 2025
- **Occasion**: 80th anniversary of the UN
- **Nature**: Ambitious, system-wide reform programme
- **Core Objective**:
  - Make the UN **efficient, integrated, cost-effective, and results-oriented**, especially amid declining financial resources

Three Core Work Streams of UN80

1. Operational Efficiency

- Identifying redundancies and improving internal processes
- Streamlining administrative and delivery mechanisms

2. Mandate Review

- Reviewing the implementation of mandates given by Member States
- Prioritising mandates based on relevance, impact, and feasibility

3. Structural and Programmatic Realignment

- Examining structural reforms and possible mergers
- Aligning programmes with contemporary global priorities

Key Reform Areas (Work Packages)

1. Peace and Security Architecture

- Developing **new models of peace operations**
- Delegating tasks more efficiently across UN entities
- Reducing duplication in field missions

➡️ Aimed at improving responsiveness amid complex conflicts.

2. Humanitarian Response System

- Proposal for a **New Humanitarian Compact**
- Focus on:
  - Simplified emergency response plans
  - Integrated and shared supply chains

➡️ Addresses delays and inefficiencies in crisis response.

3. UN Development System Reforms

- Reconfiguration of:
  - UN Country Teams
  - Regional coordination structures
- Goal:
  - Greater cost-effectiveness
  - Improved SDG delivery

4. Institutional Mergers

- Assessing consolidation of entities with overlapping mandates
- Example: Possible rationalisation between **United Nations Development Programme** and **United Nations Office for Project Services**

➡️ Intended to improve coherence and reduce administrative overheads.

5. Operational Enablers

- Common data standards
- Shared digital platforms
- Unified supply chains
- Simplified training and human-resource systems

➡️ Tackles inefficiencies caused by fragmented back-office systems.

Why UN Reforms Are Imperative

1. Structural Challenges

Outdated Power Structures

- The **United Nations Security Council** reflects **post-World War II geopolitics**
- Absence of permanent representation for:
  - India
  - Africa
  - Latin America

➡️ Undermines legitimacy in a multipolar world.

Erosion of Global Trust

- Repeated deadlocks due to veto power:
  - Russia–Ukraine conflict
  - Israel–Palestine crisis

- Selective enforcement of international norms

➡️ Weakens moral authority of the UN.

2. Governance Challenges

- Emergence of **new global threats**:
  - Cyber security
  - Artificial Intelligence ethics
  - Digital governance
- Absence of:
  - Adequately resourced specialised bodies
  - Clear governance frameworks
- **Mandate overload**:
  - Over **40,000 mandates** causing duplication and inefficiency

3. Institutional and Financial Challenges

Severe Resource Constraints

- UN system resources projected to decline: From **$66 billion (2024)** to **$50 billion (2026)**
- Around **80% of funding is voluntary**, creating unpredictability

Institutional Fragmentation

- Multiple agencies working in similar domains increase transaction costs

Example: Overlapping roles of **UN-Women** and **UNFPA**

Outdated Administrative Systems

- Manual processes and weak digital tracking slow implementation and accountability

Ambition–Capacity Mismatch

- Member States continue to expand UN responsibilities without proportional funding or capacity enhancement

Relevance for India and the Global South

- UN80 reforms align with India's long-standing demand for:
  - **Efficient multilateralism**
  - **Equitable representation**
  - **Development-centric global governance**
- Strengthening the UN Development System supports:
  - SDG delivery
  - South-South cooperation
  - Needs of developing countries

Conclusion

The **UN80 Initiative Action Plan** represents one of the most comprehensive attempts to revitalise the United Nations since the post-Cold War reforms. By focusing on **efficiency, mandate rationalisation, structural coherence, and cost-effectiveness**, UN80 seeks to restore the UN's capacity to respond to **21st-century global challenges**. While deeper political reforms—especially of the Security Council—remain unresolved, UN80 can significantly enhance **operational credibility and development effectiveness**, ensuring that multilateralism remains relevant in a rapidly transforming world.

Mains Practice Question

"The UN80 Initiative reflects the growing recognition that institutional reform is essential for effective multilateralism." Examine the rationale, key reform areas, and potential significance of the UN80 Initiative Action Plan in strengthening the United Nations.

East Asia Summit

📌 Syllabus Mapping

- **GS Paper II** – International Relations
  - Regional groupings and multilateral forums
  - ASEAN centrality and Indo-Pacific
  - India's Act East Policy
- **GS Paper III** – Security
  - Regional peace and stability
  - Maritime security and cooperation

Introduction

The **East Asia Summit (EAS)** has emerged as a key leaders-level platform for shaping the **strategic architecture of the Indo-Pacific**. By bringing together major regional and extra-regional powers, the EAS facilitates dialogue on **peace, stability, economic cooperation, and emerging security challenges**. The adoption of the **Kuala Lumpur Declaration on Peace and Stability** at the **20th EAS** underscores renewed commitment to cooperative security and ASEAN-centric regionalism.

Why in News?

The **20th East Asia Summit** adopted the **Kuala Lumpur Declaration on Peace and Stability**, committing members to implement **joint projects and activities under the EAS Plan of Action (2024–2028)**, aligned with **ASEAN 2045: Our Shared Future**.

About the East Asia Summit (EAS)

Overview

- A **leaders-led forum** for dialogue and cooperation on:
  - Strategic
  - Political
  - Economic issues
- Objective: Promote **peace, stability, and prosperity** in East Asia and the wider Indo-Pacific.

Genesis and Evolution

- **Established**: 2005
- **First Summit**: Kuala Lumpur, Malaysia
- Conceived to complement ASEAN-led regional architecture by engaging major powers in **confidence-building and norm-setting**.

Nature of the Forum

- **Annual meeting** of Heads of State or Government
- Operates on principles of:
  - **Consensus**
  - **ASEAN centrality**
  - **Non-confrontational dialogue**

Membership

- **ASEAN Member States**
- Plus:
  - Australia
  - China
  - India
  - Japan
  - New Zealand
  - Republic of Korea
  - United States
  - Russia

This diverse membership gives the EAS **strategic depth and global relevance**.

Kuala Lumpur Declaration on Peace and Stability

Core Objectives

- Implement **collaborative projects** under the **EAS Plan of Action (2024–2028)**
- Reinforce commitment to:
  - Peaceful resolution of disputes
  - Respect for international law
  - Inclusive and rules-based regional order

Alignment with ASEAN Vision 2045

- Anchored in **ASEAN 2045: Our Shared Future**, which envisages:
  - A resilient
  - Innovative
  - People-centred ASEAN

The declaration strengthens ASEAN's role as the **driving force of regional multilateralism**.

Strategic Significance of the EAS

1. Platform for Major Power Dialogue

- Brings together competing powers in a **non-alliance setting**
- Helps manage strategic rivalries through dialogue rather than confrontation

2. Reinforcing ASEAN Centrality

- Ensures that regional security architecture is:
  - Inclusive
  - ASEAN-led
- Prevents dominance of any single power bloc

3. Addressing Emerging Challenges

- The EAS provides space to discuss:
  - Maritime security
  - Terrorism
  - Cyber security
  - Climate change
  - Supply-chain resilience

Relevance for India

- Supports India's **Act East Policy** and **Indo-Pacific vision**
- Enables India to:
  - Engage East and Southeast Asia at the highest political level
  - Advocate for a **free, open, and inclusive Indo-Pacific**
  - Balance strategic competition through multilateral engagement

India views the EAS as a crucial forum for **strategic autonomy without alliance entanglement**.

Challenges Facing the EAS

- **Geopolitical rivalries** can limit consensus
- **Non-binding nature** of declarations affects implementation
- Overlap with other regional forums may dilute focus

Yet, its **leaders-level character and ASEAN anchoring** sustain its relevance.

Conclusion

The **East Asia Summit** remains a cornerstone of the Indo-Pacific's **inclusive security architecture**. The **Kuala Lumpur Declaration on Peace and Stability** reaffirms collective commitment to dialogue, cooperation, and ASEAN centrality amid rising regional tensions. For India, the EAS offers a vital platform to advance strategic interests, strengthen partnerships, and contribute to a **stable, multipolar regional order**.

Mains Practice Question

"The East Asia Summit plays a crucial role in shaping the security and strategic architecture of the Indo-Pacific." Discuss in the light of the Kuala Lumpur Declaration on Peace and Stability.

ACITI Tech Partnership

📌 Syllabus Mapping

- **GS Paper II** – International Relations
  - Minilateral and plurilateral groupings
  - India's technology diplomacy
  - Strategic partnerships
- **GS Paper III** – Science & Technology, Economy
  - Emerging and critical technologies
  - Supply-chain resilience
  - Clean energy and innovation ecosystems

Introduction

In an era marked by technological disruption, supply-chain vulnerabilities, and strategic competition, countries are increasingly turning to **minilateral technology partnerships** to safeguard innovation, resilience, and economic security. Against this backdrop, **India, Australia, and Canada** have launched the **Australia–Canada–India Technology and Innovation (ACITI) Partnership**, signalling a shared commitment to **collaborative innovation in critical and emerging technologies**.

Why in News?

On the sidelines of the **G20 Summit in Johannesburg**, **India**, **Australia**, and **Canada** announced the **ACITI trilateral framework**, aimed at strengthening cooperation in technology, innovation, and resilient supply chains.

About the ACITI Partnership

Nature of the Framework

- A **trilateral technology and innovation partnership**
- Focused on **practical cooperation**, not alliance politics
- Complements existing bilateral and multilateral engagements

Core Purpose

- Enhance collaboration in **critical and emerging technologies**
- Promote **innovation-led growth**
- Reduce strategic and economic vulnerabilities through diversification

Key Focus Areas of ACITI

1. Clean Energy and Climate Technologies

- Joint cooperation in:
  - Renewable energy technologies
  - Energy storage
  - Decarbonisation solutions
- Leverages:
  - India's scale and deployment capacity
  - Australia's mineral resources
  - Canada's clean-tech expertise

➡️ Supports **global climate commitments** alongside economic growth.

2. Critical Minerals and Supply-Chain Resilience

- Emphasis on **diversified, transparent, and resilient supply chains**
- Focus on minerals essential for:
  - Electric vehicles
  - Renewable energy
  - Advanced electronics

➡️ Reduces over-dependence on **single-country supply chains**, particularly relevant in the context of geopolitical disruptions.

3. Artificial Intelligence (AI) and Digital Innovation

- Exploring cooperation to:
  - Accelerate **AI development**
  - Enable **mass adoption of AI solutions**
- Objective:
  - Improve governance
  - Enhance service delivery
  - Boost productivity and inclusion

➡️ Reflects a **human-centric approach** to AI deployment.

Strategic Significance of ACITI

1. Rise of Minilateralism

- ACITI exemplifies **flexible, issue-based cooperation**
- Avoids rigidity of formal alliances while delivering tangible outcomes

2. Technology as Strategic Currency

- Recognises technology and innovation as:
  - Pillars of national power
  - Drivers of economic resilience
- Positions India as a **technology co-creator**, not merely a consumer

3. Complementing Indo-Pacific and Global Engagements

- Reinforces India's partnerships with:
  - Like-minded democracies
  - Resource-rich and innovation-driven economies

4. Development-Oriented Innovation

- Focus on **citizen-centric applications** of technology
- Aligns with India's vision of **inclusive digital transformation**

Relevance for India

- Strengthens India's:
  - **Technology diplomacy**
  - **Critical minerals security**
  - **Clean energy transition**
- Supports initiatives such as:
  - Make in India
  - Digital India
  - Atmanirbhar Bharat
- Enhances India's role as a **bridge between advanced economies and the Global South** in emerging technology governance.

Challenges and Way Forward

- Translating intent into:
  - Funded projects
  - Research collaboration
  - Industry-academia partnerships
- Ensuring:
  - Intellectual property protection
  - Equitable technology access
  - Policy coordination across regulatory systems

Sustained political commitment and private-sector participation will be critical.

Conclusion

The **ACITI Partnership** reflects a strategic convergence among India, Australia, and Canada to harness **technology, innovation, and clean energy** as engines of resilience and inclusive growth. By focusing on **critical minerals, AI, and sustainable technologies**, ACITI strengthens supply-chain security while promoting human-centric innovation. For India, the initiative reinforces its emergence as a **key technology partner in a multipolar world**, capable of shaping future-ready global cooperation beyond traditional geopolitical blocs.

Mains Practice Question

"Minilateral technology partnerships are emerging as important instruments of strategic and economic resilience." In this context, examine the significance of the Australia–Canada–India Technology and Innovation (ACITI) Partnership for India's technology diplomacy.

WAICO and Global AI Governance

📌 Syllabus Mapping

- **GS Paper II** – International Relations
  - Global governance institutions
  - Technology diplomacy and soft power
  - Multilateralism vs bloc-based governance
- **GS Paper III** – Science & Technology
  - Artificial Intelligence governance
  - Emerging technologies and regulation
- **GS Paper IV** – Ethics
  - Human-centric technology
  - Transparency, accountability, and data sovereignty

Introduction

Artificial Intelligence (AI) has emerged as a defining force in global power politics, economic competitiveness, and governance norms. As nations race to harness AI's transformative potential, the absence of a universally accepted governance framework has intensified debates over **standards, ethics, data control, and strategic dominance**. Against this backdrop, China's proposal for a **World Artificial Intelligence Cooperation Organization (WAICO)** marks a significant attempt to **reshape the international architecture of AI governance**.

Why in News?

At the recent **Asia-Pacific Economic Cooperation (APEC)** meeting held in South Korea, **China** advocated the creation of a new global body—**WAICO**—to set norms and coordinate international cooperation on Artificial Intelligence.

About the World Artificial Intelligence Cooperation Organization (WAICO)

Genesis

- Announced during the **2025 World Artificial Intelligence Conference** in Shanghai
- Builds upon China's **Global AI Governance Initiative (2023)**

Stated Aim

- To **shape global standards** and promote international cooperation in AI development and deployment

Core Principles Embedded in WAICO

Derived largely from China's AI governance framework, WAICO emphasises:

- **Human-centric AI design** – AI systems should serve human welfare and social stability
- **Data sovereignty** – States retain control over data generated within their borders
- **Algorithmic transparency** – Greater visibility into AI decision-making processes

These principles contrast sharply with the **market-driven and innovation-first approaches** favoured by Western economies.

Key Strategic Purposes Behind WAICO

1. Reimagining Global AI Governance Architecture

- Seeks to create an **alternative institutional pathway** outside existing Western-led or OECD-centric frameworks
- Challenges the dominance of:
  - US-driven technology norms
  - Private-sector-led standard setting

2. Positioning China as a Norm-Setter

- Moves China from being a **rule-taker to a rule-maker** in emerging technologies

- Attempts to internationalise Chinese regulatory preferences on:
  - Data localisation
  - State oversight of algorithms

3. Soft Power Projection

- WAICO acts as an instrument of **technology-based soft power**, particularly aimed at:
  - Developing countries
  - Global South economies seeking AI access without stringent Western compliance regimes

4. Strategic Competition with the United States

- Presents China as a **credible alternative** to US-led AI governance models
- Part of a broader techno-geopolitical contest spanning:
  - Semiconductors
  - Digital infrastructure
  - Cyber governance

Broader Geopolitical and Governance Implications

Fragmentation of AI Governance

- WAICO could contribute to:
  - **Parallel AI governance regimes**
  - Competing standards across geopolitical blocs

This risks a **"splinternet of AI norms"**, complicating interoperability and global cooperation.

Data Sovereignty vs Open Data Flows

- China's emphasis on data sovereignty may:
  - Appeal to states concerned about digital colonialism
  - Conflict with open, cross-border data flow models favoured by advanced economies

Ethical Tensions

- While "human-centric AI" is highlighted, critics argue:
  - Excessive state control may dilute individual privacy
  - Transparency standards may not extend to government use of AI

Implications for India

- India faces a strategic choice between:
  - Western liberal AI governance models
  - China-centric sovereignty-driven frameworks
- India's stated preference aligns with:
  - **Open, inclusive, and democratic AI governance**
  - Multilateral platforms rather than bloc-centric institutions
- WAICO reinforces the need for India to:
  - Actively shape global AI norms
  - Champion **human rights, innovation, and strategic autonomy** simultaneously

Way Forward for Global AI Governance

- Avoid rigid bloc-based institutions
- Promote:
  - **Interoperable standards**
  - Transparent, accountable, and inclusive multilateral frameworks
- Strengthen platforms such as:
  - UN-based AI discussions
  - G20 and GPAI-style cooperative mechanisms

Conclusion

The proposal for a **World Artificial Intelligence Cooperation Organization (WAICO)** reflects China's growing ambition to **influence global technology governance** and project soft power through AI norms. While it highlights legitimate concerns such as data sovereignty and transparency, WAICO also risks **fragmenting global AI governance** along geopolitical lines. For the international community—and particularly for India—the

challenge lies in ensuring that AI governance remains **inclusive, rights-respecting, and innovation-friendly**, rather than becoming another arena of strategic rivalry.

Mains Practice Question

"The proposal for a World Artificial Intelligence Cooperation Organization (WAICO) reflects the growing geopolitics of technology." Critically examine its objectives and implications for global AI governance, with special reference to India.

Abraham Accords

📌 Syllabus Mapping

- **GS Paper II** – International Relations
  - West Asia and Middle East geopolitics
  - Normalisation agreements and peace processes
  - India's strategic interests in West Asia

Introduction

The **Abraham Accords** represent a significant departure from the traditional fault lines of West Asian politics, where Arab–Israeli relations were long conditioned on the resolution of the Palestinian question. By prioritising **pragmatic diplomacy, economic cooperation, and shared security interests**, the Accords have reshaped regional alignments and introduced a new template for engagement between Israel and the Arab world.

Why in News?

Recently, the **United States President** confirmed that **Kazakhstan** would join the **Abraham Accords**, signalling a potential **geographical and conceptual expansion** of the framework beyond the Arab world and the Middle East.

About the Abraham Accords

Purpose

- To **defuse long-standing tensions in West Asia** by normalising relations between **Israel** and select states
- To establish **formal diplomatic, trade, technological, and security ties** with Israel
- To promote **regional stability through cooperation rather than confrontation**

Symbolism of the Name

- Named after **Abraham**, revered by **Jews and Arabs** as a common ancestor
- Symbolises:
  - Shared heritage
  - Brotherhood
  - Inter-civilisational reconciliation

Genesis

- **Signed in 2020**, under US mediation
- Initial signatories:
  - Israel
  - United Arab Emirates
  - Bahrain
  - Morocco

These agreements marked the **first major normalisation wave** since the Egypt–Israel and Jordan–Israel peace treaties.

Strategic Rationale Behind the Accords

1. Shift from Ideological to Interest-Based Diplomacy

- Arab states prioritised:
  - Economic diversification
  - Technological access
  - Security cooperation

over ideological opposition to Israel.

2. Shared Security Concerns

- Convergence of interests against:
  - Regional instability
  - Extremism
  - Iran's growing influence

3. Economic and Technological Incentives

- Cooperation in:
  - Trade and investment
  - Innovation and start-ups
  - Energy and water technologies
  - Tourism and aviation

Israel's technological strengths complemented Gulf states' capital and market access.

Implications of the Abraham Accords

1. Redefinition of West Asian Power Dynamics

- Weakens the traditional **Arab consensus** linking Israel's recognition to Palestinian statehood
- Encourages **issue-based coalitions** rather than bloc politics

2. Marginalisation of the Palestinian Issue

- Palestinians perceive the Accords as a **dilution of Arab solidarity**
- Raises concerns about:
  - Reduced diplomatic leverage
  - Loss of collective bargaining power

3. Expanding Geographical Scope

- Kazakhstan's inclusion indicates:
  - A shift from **Arab–Israeli normalisation** to a **broader diplomatic platform**
  - Growing acceptance of Israel beyond the immediate Middle Eastern neighbourhood

4. Role of the United States

- Reinforces the US as:
  - A key diplomatic broker
  - A stabilising actor in West Asia

while countering rival influences in the region.

Relevance for India

- India maintains strong ties with:
  - Israel
  - Gulf Cooperation Council (GCC) states
- The Accords:
  - Complement India's **West Asia policy**
  - Enable **trilateral and minilateral cooperation** (India–Israel–UAE, I2U2, etc.)
  - Enhance stability in a region critical for:
    - Energy security
    - Trade
    - Indian diaspora welfare

India has cautiously welcomed the Accords while continuing to support a **two-state solution** for Palestine.

Limitations and Criticisms

- **Lack of Inclusivity**: Excludes key regional actors and the Palestinian leadership
- **Fragility of Peace**: Normalisation remains vulnerable to regional conflicts
- **Transactional Nature**: Critics argue the Accords prioritise short-term interests over comprehensive peace

Conclusion

The **Abraham Accords** signify a pragmatic recalibration of West Asian diplomacy, driven by **shared interests rather than historic antagonisms**. Kazakhstan's inclusion underscores the Accords' evolving nature as a **broader diplomatic framework** rather than a purely Middle Eastern arrangement. While the Accords have improved regional cooperation and stability, their long-term legitimacy will depend on whether they can coexist with — and eventually contribute to — a **just and durable resolution of the Palestinian question**.

Mains Practice Question

"The Abraham Accords mark a shift from ideology-driven to interest-based diplomacy in West Asia." Examine their objectives and implications for regional stability and India's strategic interests.

UN Water Convention

📌 Syllabus Mapping

- **GS Paper II** – International Relations
  - International conventions and treaties
  - India and neighbourhood relations
  - Global governance institutions
- **GS Paper III** – Environment & Resource Management
  - Water resources
  - Sustainable development
  - Climate change and shared natural resources

Introduction

Transboundary water resources are increasingly becoming sites of **cooperation as well as conflict**, particularly under conditions of climate stress, population growth, and competing developmental demands. In this context, international legal frameworks that promote **equitable, sustainable, and cooperative water management** assume critical importance. Bangladesh's decision to accede to the **UN Water Convention** marks a significant development in South Asia's engagement with global water governance norms.

Why in News?

Bangladesh has become the **first country in South Asia** to join the **Convention on the Protection and Use of Transboundary Watercourses and International Lakes**, commonly known as the **UN Water Convention**.

About the UN Water Convention

Genesis and Legal Status

- **Adopted**: 1992, Helsinki
- **Entered into force**: 1996
- Initially a **UNECE (European) convention**, later opened globally in 2016

Nature of the Convention

- A **legally binding international agreement**
- Aims at the **sustainable and cooperative management of transboundary watercourses and international lakes**

Core Principles and Obligations

1. Prevention of Transboundary Harm

- Parties must **prevent, control, and reduce** activities that cause significant adverse impacts across borders
- Includes pollution control, ecosystem protection, and disaster risk reduction

2. Equitable and Reasonable Utilisation

- Shared waters must be used in a manner that is:
  - **Equitable**
  - **Reasonable**
  - **Sustainable**

This aligns with customary principles of **international water law**.

3. Mandatory Cooperation

- Riparian states are required to:
  - Enter into **bilateral or multilateral agreements**
  - Establish **joint bodies or commissions** for water management

4. Integrated and Ecosystem-Based Approach

- Encourages basin-level planning
- Links water management with:
  - Environmental protection
  - Climate adaptation
  - Sustainable development

Significance of Bangladesh's Accession

Regional Implications

- South Asia hosts several **highly interdependent river systems** (Ganga–Brahmaputra–Meghna basin)
- Bangladesh's move:
  - Signals commitment to **rules-based water cooperation**
  - Sets a **precedent for other South Asian countries**

Climate and Development Context

- Bangladesh is among the most **climate-vulnerable countries**
- Cooperative water governance is essential for:
  - Flood management
  - Sediment control
  - Water security

Normative Impact

- Strengthens the role of **international law** in addressing water disputes
- Encourages **preventive diplomacy** rather than reactive conflict resolution

Relevance for India

- India shares multiple transboundary rivers with neighbours
- While India is **not a party** to the Convention, its principles resonate with:
  - Bilateral river treaties
  - Basin-level cooperation mechanisms

Bangladesh's accession may renew discussions on **multilateral approaches to water governance** in South Asia, complementing existing bilateral arrangements.

Challenges and Limitations

- Convention relies on **political will** for effective implementation
- Does not override existing bilateral treaties
- Power asymmetries among riparian states can still affect outcomes

Conclusion

The **UN Water Convention** represents a mature, law-based approach to managing shared water resources in an era of rising scarcity and climate uncertainty. Bangladesh's accession as the **first South Asian member** underscores growing recognition of **cooperative, equitable, and sustainable water governance** as a necessity rather than a choice. For regions like South Asia, where rivers bind nations together, such frameworks offer a pathway from **water conflict to water cooperation**.

Mains Practice Question

"Discuss the significance of the UN Water Convention in promoting transboundary water cooperation. In this context, examine the implications of Bangladesh becoming the first South Asian country to join the Convention."

INTERNAL SECURITY & DEFENCE

India's Maritime Strategy

📌 Syllabus Mapping

- **GS Paper III** – Indian Economy
  - Infrastructure: Ports, shipping, inland waterways
  - Logistics, trade facilitation, blue economy
  - Environmental sustainability
- **GS Paper II** – Governance & International Relations
  - Maritime security
  - International conventions and cooperation

Introduction

India's maritime sector forms the backbone of its external trade, energy security, and coastal economy. With **India Maritime Week 2025**, the government has signalled a decisive shift—treating maritime infrastructure not merely as a support service, but as a **strategic driver of economic growth, sustainability, and geopolitical influence**. Recent initiatives reflect India's ambition to emerge as a **globally competitive, green, and self-reliant maritime power**.

Why in the News?

During **India Maritime Week 2025**, the Prime Minister unveiled **major maritime initiatives** aimed at boosting **investment, digitalisation, and sustainability** across ports, shipping, and allied sectors.

Major Initiatives Announced

1. Maritime Investment Roadmap

- A **₹1 lakh crore investment roadmap** covering:
  - Shipbuilding
  - Port modernisation
  - Green fuel collaboration
- India invited **Singapore** to participate, signalling deeper global maritime partnerships.

2. Digi Bandar Initiative

- A **national digital framework** to make all ports:
  - Data-driven
  - AI-enabled
  - Interconnected

Objective: Improve **efficiency, safety, transparency**, and real-time decision-making across ports.

3. Green Tug Programme

- Deployment of **100 eco-friendly harbour tugs by 2040**
- Investment: **~₹12,000 crore**
- Supports India's transition to **low-emission maritime logistics**

India's Maritime Sector: Current Status

1. Trade and Economic Significance

- **~95% of India's trade by volume** and **~70% by value** moves through sea routes
- Maritime transport is the **lifeline of India's commerce**

2. Port Infrastructure

- **Major ports cargo handling (FY 2024–25)**: **~855 million tonnes**
- Total port capacity expanded from:
  - **1,400 MMTPA → 2,762 MMTPA**

- **Average vessel turnaround time** reduced from **93 hours to 48 hours**, improving global competitiveness

3. Shipping Sector

- Indian-flagged vessels increased from **1,205 → 1,549**
- Gross Tonnage expanded from **10 MGT → 13.52 MGT**

4. Inland Waterways

- Operational National Waterways increased from **3 to 29**
- Cargo movement surged by **~710% since 2014**

5. Maritime Workforce

- Seafarers increased from **1.25 lakh → over 3 lakh**
- India now supplies **~12% of the global seafaring workforce**
- Among the **top three seafarer-supplying nations globally**

Key Challenges Facing India's Maritime Sector

1. Connectivity Bottlenecks

- Inadequate **last-mile road and rail connectivity** to ports
- Raises logistics costs and reduces trade efficiency

2. Weak Trans-shipment Competitiveness

- Limited domestic trans-shipment capacity
- Heavy dependence on foreign hubs like **Colombo**, leading to revenue leakage

3. Low Indian-Flagged Tonnage

- High taxation and regulatory costs discourage Indian flag registration
- India accounts for only **~0.8% of the global shipping fleet**

4. Shipbuilding and Manufacturing Gaps

- India's global shipbuilding share: **~1%**
- **>95% of marine engines** are imported
- Weak domestic maritime manufacturing ecosystem

5. Maritime Security Threats

- **Non-state threats**: piracy, terrorism, drug and arms trafficking
- **Economic threats**: IUU fishing, marine pollution, emissions
- **State-led threats**: Strategic competition from **China and Pakistan**

Major Programmes for Atmanirbhar Maritime Growth

1. Maritime India Vision (MIV) 2030

- Launched in 2021
- Identifies **10 priority themes**, including:
  - Port efficiency
  - Shipbuilding
  - Maritime skill development
  - Sustainability

2. Maritime Amrit Kaal Vision 2047

- Long-term blueprint for maritime resurgence
- Investment target: **~₹80 lakh crore**
- Covers:
  - Ports
  - Coastal shipping
  - Inland waterways
  - Shipbuilding
  - Green shipping

3. Sagarmala Programme

- Focus on:
  - Reducing logistics costs
  - Improving port-led development
  - Employment generation

4. Port and Legal Reforms

- **Vizhinjam Port** operationalised as India's first deep-water international trans-shipment hub
- **One Nation One Port Process** for uniform documentation
- Enactment of **five key maritime laws**, including:
  - Indian Ports Act, 2025
  - Merchant Shipping Act, 2025
  - Coastal Shipping Act, 2025

5. Investment and IWT Promotion

- **100% FDI** permitted in port development
- **Jalvahak Cargo Promotion Scheme**:
  - 35% reimbursement on operational costs
  - Encourages scheduled cargo movement on National Waterways

Greening India's Maritime Sector

Why Green Transition is Necessary

- Maritime transport contributes **~3% of global GHG emissions**
- Ports are major sources of:
  - Air pollution
  - Water contamination
- Stress on coastal ecosystems:
  - Mangroves
  - Coral reefs
  - Lagoons and beaches
- Heavy reliance on imported **heavy fuel oil (HFO)** impacts energy security
- **IMO target**: 40% CO_2 reduction from shipping by 2030

Key Green Measures

1. Indian Ports Act, 2025

- Mandates compliance with:
  - Global green norms
  - Pollution control standards
- Aligns with:
  - **MARPOL Convention**
  - **Ballast Water Management Convention**

2. Maritime India Vision 2030

- Focus on:
  - Renewable energy adoption
  - Emission reduction
  - Water optimisation
  - Solid waste management

3. Harit Sagar – Green Port Guidelines

- Framework for:
  - Safe
  - Efficient
  - Sustainable port operations

4. Green Tug Transition Programme

- Replaces conventional fuel-based harbour tugs with green alternatives

5. Harit Nauka Initiative

- Promotes green technologies in **inland waterway vessels**

Conclusion

India's maritime sector is undergoing a **structural transformation**—from a trade-support function to a **strategic pillar of economic growth, sustainability, and global influence**. Enhanced port efficiency, expanding inland waterways, a globally competitive seafaring workforce, and a strong decarbonisation push collectively position India for maritime leadership. Aligning maritime expansion with **Atmanirbhar Bharat** and **climate responsibility** will be crucial for securing India's long-term economic and strategic interests in the Indo-Pacific and beyond.

Mains Practice Question

"India's maritime sector is evolving from a logistics enabler to a strategic engine of economic growth and sustainability." Discuss the recent initiatives, challenges, and the role of green transition in shaping India's maritime future.

Military Exercises and Diplomacy

📌 Syllabus Mapping

- **GS Paper III** – Internal Security
  - Defence preparedness
  - Border and coastal security
- **GS Paper II** – International Relations
  - Defence diplomacy
  - Strategic partnerships

Introduction

Military exercises are a critical instrument of **national security, deterrence, interoperability, and defence diplomacy**. India conducts a wide spectrum of **tri-service, bilateral, and multilateral exercises** to enhance operational readiness, secure its land and maritime frontiers, and strengthen strategic partnerships. Recent exercises underscore India's focus on **border security, coastal defence, and Indo-Pacific stability**.

Exercises in News

Exercise	Type & Participants	Key Purpose / Strategic Significance
Trishul 2025	Tri-Service (Army, Navy, Air Force) – India	Large-scale drill along the **western border with Pakistan** across **Gujarat and Rajasthan**; tests **jointness, rapid mobilisation, and integrated firepower**.
Sagar Kavach	National (Indian Coast Guard with Navy & coastal agencies)	**Biannual coastal security exercise** to assess preparedness against **maritime terrorism, infiltration, and smuggling** along India's coastline.
Mitra Shakti	Bilateral – Indian Army & Sri Lankan Army	Annual exercise (alternately hosted) to enhance **counter-insurgency, joint planning, and interoperability** in South Asia.
VINBAX	Bilateral – Indian Army & Vietnam People's Army	Strengthens **Act East Policy**, focuses on **joint training, tactics, and defence cooperation** in the Indo-Pacific context.
Malabar	Multilateral – India, USA, Japan, Australia	Flagship naval exercise to bolster **maritime security, interoperability, and rules-based order** in the **Indo-Pacific**.
GARUDA	Bilateral – Indian Air Force & French Air and Space Force	Enhances **air combat readiness, force integration, and strategic air cooperation**.
Ajeya Warrior	Bilateral – India & United Kingdom (Army)	**Biennial** exercise focusing on **combined arms operations, counter-terrorism, and interoperability**.

Strategic Significance

1. **Operational Readiness & Jointness:** Tri-service drills like **Trishul 2025** test **integrated theatre-level responses**, aligning with India's push for **joint commands**.
2. **Coastal & Maritime Security: Sagar Kavach** strengthens **layered coastal defence**, vital after lessons from **26/11** and increasing **non-state maritime threats**.
3. **Defence Diplomacy:** Bilateral exercises (**Mitra Shakti, VINBAX, GARUDA, Ajeya Warrior**) deepen **trust, interoperability, and strategic convergence** with key partners.
4. **Indo-Pacific Stability: Malabar** reinforces **Quad cohesion**, freedom of navigation, and a **rules-based maritime order** amid regional power competition.

Conclusion

Recent military exercises highlight India's multi-dimensional defence approach—**credible deterrence at borders, secure coastlines, and robust partnerships abroad**. For UPSC, such exercises are important not only as **factual Prelims items**but also as **analytical anchors** for answers on **internal security, defence reforms, and India's strategic posture in the Indo-Pacific**.

Mains Practice Question

"Military exercises serve as tools of both defence preparedness and diplomacy." Discuss with reference to recent bilateral, multilateral, and tri-service exercises involving India.

Ricin and Ammonium Nitrate Threats

📌 Syllabus Mapping

- **GS Paper III** – *Internal Security, Terrorism, Emerging Security Threats*
- **GS Paper III** – *Science & Technology – Chemical Hazards*
- **GS Paper II** – *Governance, Security Challenges*

Introduction

Recent intelligence-led operations have averted **terror-related incidents involving Ricin poison and Ammonium Nitrate**, highlighting the growing risk of **chemical and material misuse by non-state actors**. These substances, though very different in nature, pose **serious internal security and public safety threats** due to their **high lethality, ease of concealment, and dual-use character**.

Why in News?

- Security agencies recently **foiled terror plots** involving:
  - **Ricin**, a highly lethal biological toxin.
  - **Ammonium Nitrate**, a commonly used industrial chemical with explosive potential.
- The incidents underscore concerns regarding **chemical terrorism** and **improvised explosive devices (IEDs)**.

Ricin: A Lethal Biological Toxin

What is Ricin?

- Ricin is a **highly toxic protein** naturally present in **castor beans** (*Ricinus communis*).
- It can be extracted from the **waste residue** left after castor oil production.

Toxicity and Lethality

- **Extremely lethal:**
  - As little as **1 milligram**, if ingested, can kill an adult.
- **No antidote or specific treatment** currently exists.
- Considered a **potential bioterrorism agent** due to:
  - Ease of extraction
  - High lethality
  - Difficulty in detection

Mechanism of Action

- Ricin enters human cells and **inhibits protein synthesis**.
- By blocking ribosomal function, it causes:
  - Cell death
  - Multi-organ failure
- Death can occur within **36–72 hours**, depending on exposure route (ingestion, inhalation, injection).

Security Implications

- Classified globally as a **chemical/biological weapon risk**.
- Small quantities can cause **mass casualties** if dispersed covertly.
- Difficult to detect in food or water without specialised equipment.

Ammonium Nitrate: Dual-Use Chemical

What is Ammonium Nitrate?

- Chemical formula: **NH_4NO_3**
- Physical properties:
  - White, crystalline, water-soluble solid
  - Melting point: **~170°C**

Legitimate Uses

- Widely used as:
  - **Fertiliser** in agriculture
  - **Industrial oxidiser**
  - Component in mining and construction blasting agents

Explosive Potential

- **Not explosive by itself** under normal conditions.
- Becomes dangerous when:
  - Mixed with fuel (e.g., ANFO – Ammonium Nitrate Fuel Oil)
  - Subjected to intense heat or shock
- Frequently used in **IEDs and terror attacks** due to:
  - Easy availability
  - High explosive yield when improperly handled

Security Concerns

- Has been used in several major terror incidents globally.
- Misuse often linked to:
  - Poor regulation
  - Illegal diversion from legitimate supply chains

Comparative Assessment

Aspect	Ricin	Ammonium Nitrate
Nature	Biological toxin	Industrial chemical
Lethality	Extremely high (mg-level)	High when weaponised
Antidote	None	Not applicable
Legitimate Use	None (outside labs)	Fertiliser, mining
Terror Use	Poisoning, assassination	Explosives, IEDs

Internal Security Dimensions

- **Chemical Terrorism:** Use of toxic substances to cause panic, mass casualties, or targeted killings.
- **Dual-Use Challenge:** Difficulty in regulating substances with legitimate civilian applications.
- **Detection & Response Gaps:** Limited field-level capacity to quickly detect biological toxins like ricin.

Way Forward

1. Strengthen Regulation

- Tighten licensing, storage, and transport norms for **ammonium nitrate**.
- Continuous monitoring of **castor bean by-products** and chemical precursors.

2. Intelligence & Surveillance

- Enhance intelligence-sharing across agencies.
- Monitor online radicalisation and procurement networks.

3. Capacity Building

- Train police and first responders in:
  - Chemical hazard identification
  - Bio-toxin exposure response
- Strengthen forensic and laboratory capabilities.

4. Public Awareness

- Educate farmers, traders, and industries about:
  - Safe handling
  - Mandatory reporting of suspicious activities

5. Legal Framework

- Effective enforcement of:
  - Explosives Act
  - Unlawful Activities (Prevention) Act (UAPA)

- Disaster Management protocols for chemical incidents

Conclusion

The recent incidents involving **Ricin and Ammonium Nitrate** underline the evolving nature of **internal security threats**, where **low-cost, high-impact materials** can be weaponised by terror groups. Addressing this challenge requires a **multi-layered strategy** combining **regulatory vigilance, intelligence coordination, scientific capacity, and public awareness** to prevent chemical and biological threats from undermining national security.

Keywords: *Chemical terrorism, Dual-use substances, Ricin toxin, Ammonium nitrate, Internal security*

Mains Practice Question

"The misuse of toxic substances and industrial chemicals poses serious internal security challenges. Examine the security implications of substances like Ricin and Ammonium Nitrate and suggest measures to prevent their use in terror-related activities."

ECONOMY

Export Promotion Mission

Syllabus Mapping

- **GS Paper III** – Economy
  - External sector and trade promotion
  - MSMEs and export competitiveness
  - Logistics, infrastructure, and supply chains
- **GS Paper II** – Governance
  - Government policies and implementation mechanisms

Introduction

In an increasingly protectionist and volatile global trade environment, India's export strategy requires **scale, diversification, resilience, and institutional coherence**. Recognising this, the Government of India has approved the **Export Promotion Mission (EPM)**—a mission-mode, digitally enabled framework aimed at consolidating export support, reducing transaction costs, and enhancing competitiveness across sectors. Announced in the **Union Budget 2025–26**, EPM seeks to move India from fragmented incentives to a **holistic export ecosystem**.

Why in News?

The **Union Cabinet** approved the **Export Promotion Mission (EPM)** along with the **Credit Guarantee Scheme for Exporters (CGSE)** to improve access to finance, address logistics and market-access bottlenecks, and counter adverse impacts of global tariff escalations.

About the Export Promotion Mission (EPM)

Vision

- Create a **comprehensive, flexible, and digitally driven export-promotion framework**
- Enable exporters—especially MSMEs—to **diversify markets, upgrade quality, and compete globally**

Financial Outlay

- **₹25,060 crore**

Timeline

- **Six years**: FY **2025–26 to 2030–31**

Targeted Sectors

- Priority support to sectors affected by global tariff shocks:
  - **Textiles**
  - **Leather**
  - **Gems & Jewellery**

  - **Engineering goods**
  - **Marine products**

Implementing Agency

- **Directorate General of Foreign Trade (DGFT)**

Mission Architecture: Two Integrated Sub-Schemes

1. Niryat Protsahan (Financial Support)

Objective:

- Improve access to **affordable trade finance** and enable **market diversification**

Key Features

- Credit facilitation for new markets
- Support to mitigate working-capital constraints
- Alignment with interest equalisation and export-credit needs

➡️ Particularly beneficial for **MSMEs** facing credit constraints.

2. Niryat Disha (Non-Financial Support)

Objective:

- Enhance **market readiness, quality compliance, and global branding**

Key Interventions

- Export quality and standards compliance
- International branding and buyer discovery
- Export warehousing and logistics support
- Capacity-building for documentation and regulations

➡️ Addresses **soft barriers** that often restrict export scale-up.

Why India Needs the Export Promotion Mission

1. Consolidation of Fragmented Schemes

- Integrates and modernises existing initiatives such as:
  - Interest Equalisation Scheme
  - Market Access Initiative

➡️ Reduces overlap and improves policy coherence.

2. Logistics and Supply-Chain Constraints

- High logistics costs and transit delays
- Freight shocks and disruptions (e.g., **Red Sea route disturbances**)

➡️ Undermines export reliability and price competitiveness.

3. Market Access and Visibility Gaps

- Limited buyer discovery
- Difficulty entering new and niche markets
- Weak export branding for Indian MSMEs

4. Regulatory and Compliance Burden

- Multiple documents (certificates of origin, inspections, packing lists)
- Complex procedures increase **time and cost of trade**

5. Adverse Global Environment

- Rising competition from low-cost producers (e.g., China)
- Escalating trade barriers and tariffs
    - Example: **50% tariff imposed by the US on select Indian goods**, impacting exports to India's largest market

Complementary Government Initiatives

Foreign Trade and Export Promotion

- **Foreign Trade Policy (FTP) 2023**: incentives, ease of doing business, e-commerce exports
- **RoSCTL Scheme**: tax and duty reimbursements for key sectors

Ease of Doing Business and Digitalisation

- Decriminalisation of over **3,800 provisions** and reduction of **42,000 compliances**
- **National Single Window System (NSWS)** and **Trade Connect e-Platform**

Infrastructure and Logistics

- **National Logistics Policy (NLP)**
- **PM GatiShakti**

Digital and E-Commerce Exports

- **E-Commerce Export Hubs (ECEH)**
- **ICEGATE** for paperless customs and real-time tracking

Agriculture and Organic Exports

- **National Programme for Organic Production (NPOP)**

What More Can Be Done? (Way Forward)

- **Fast-track Free Trade Agreements (FTAs)** with Europe and Central Asia
- **Leverage high-value services exports** (R&D, MRO, supply-chain services)
- **Strengthen MSME export capacity** through training, trade fairs, and standards support
- **Boost innovation and value addition** (e.g., **APEDA's BHARATI** initiative)
- **Unlock e-commerce exports** with dedicated customs codes
- **Create a National Trade Network (NTN)**:
    - Unified digital platform integrating customs, DGFT, banks, and ports
    - Reduce transaction costs and information asymmetry

Credit Guarantee Scheme for Exporters (CGSE)

Objective

- Enhance liquidity, boost market diversification, support employment, and improve competitiveness

Key Features

- **Up to ₹20,000 crore** additional collateral-free credit
- **100% guarantee coverage** by **National Credit Guarantee Trustee Company Limited (NCGTC)**
- Covers **MSME and non-MSME exporters**

Implementation and Oversight

- Implemented by **Department of Financial Services (DFS)** through NCGTC
- Oversight by a Management Committee chaired by **Secretary, DFS**

Conclusion

The **Export Promotion Mission (EPM)** marks a decisive shift from **scheme-based incentives to a mission-mode export strategy**. By integrating finance, logistics, compliance, and market access within a digital framework—and reinforced by the **CGSE**—EPM addresses structural constraints that have long limited India's export potential. If implemented effectively, it can drive **diversified, resilient, and value-added export growth**, positioning India as a competitive player in a turbulent global trade environment.

Mains Practice Question

"The Export Promotion Mission (EPM) represents a paradigm shift in India's trade policy from fragmented incentives to a mission-mode export ecosystem." Examine its objectives, key features, and potential impact on India's export competitiveness.

Technology-Led Manufacturing

📌 Syllabus Mapping

- **GS Paper III** – Indian Economy
  - Industrial growth and manufacturing
  - Technology and innovation
  - Employment generation and productivity
- **GS Paper II** – Governance
  - Role of NITI Aayog
  - Public–private collaboration

Introduction

Manufacturing has long been recognised as the backbone of **structural economic transformation**, enabling large-scale employment, productivity gains, and strategic self-reliance. In this context, the **10-year roadmap titled *"Reimagining Manufacturing: India's Roadmap to Global Leadership in Advanced Manufacturing"***, unveiled by **NITI Aayog's Frontier Technology Hub** in collaboration with **CII and Deloitte**, provides a forward-looking blueprint to reposition India in global manufacturing value chains through **frontier technologies**.

Why in News?

NITI Aayog, along with industry and consulting partners, released a **decade-long roadmap** outlining how **Artificial Intelligence, Digital Twins, Robotics, and Advanced Materials** can transform Indian manufacturing and prevent long-term erosion of India's global manufacturing share.

Key Highlights of the Manufacturing Roadmap

1. Core Frontier Technology Enablers

The roadmap identifies four foundational technologies:

- **Artificial Intelligence & Machine Learning (AI/ML)**
- **Advanced Materials**
- **Digital Twins** (virtual, real-time replicas of physical manufacturing systems)
- **Robotics and Automation**

These technologies are envisaged as **horizontal enablers** cutting across sectors.

2. Sector-Focused Strategy

- Identifies **13 priority manufacturing sectors**, including:
  - Electronics and semiconductors
  - Pharmaceuticals and medical devices
  - Green energy and advanced batteries
  - Automotive and aerospace

➡️ This targeted approach maximises **technology impact and resource efficiency**.

3. Frontier Technology Integration

- **AI & ML**:
  - Predictive maintenance
  - Quality assurance
  - Process optimisation
- **Digital Twins**:
  - Real-time factory simulation
  - Reduced downtime and wastage
- **Advanced Materials**:
  - Improved durability
  - Sustainability and lightweighting
- **Robotics & Automation**:
  - Enhanced precision
  - Worker safety
  - Productivity scaling

Why Manufacturing Matters for India

1. Structural Transformation of the Economy

- Manufacturing enables:
  - Movement of labour from **low-productivity agriculture** to **higher-productivity industry**
- India's services-led growth has not absorbed labour at the required scale.

2. Employment Generation

- Manufacturing has **strong backward and forward linkages**
- Each direct manufacturing job creates multiple **indirect jobs** across logistics, services, and suppliers.

3. Strategic Autonomy

- A robust manufacturing base strengthens:
  - Defence production
  - Semiconductor security
  - Pharmaceutical independence
  - Energy equipment resilience

COVID-19 exposed India's dependence on imports for APIs, medical equipment, and chips.

4. Innovation Spillovers

- Manufacturing drives:
  - R&D spillovers
  - Skill formation
  - Supplier ecosystem development

This creates **economy-wide productivity gains**.

5. Balanced Regional Development

- Manufacturing supports decentralised growth in:
  - Tier-2 and Tier-3 cities
  - Rural and aspirational districts

Example: *Micro & Small Enterprises Cluster Development Programme* promoting rural industrialisation.

Key Challenges Facing Manufacturing in India

1. Funding Gaps for Frontier Technologies

- Insufficient public and private investment in:
  - Pilot-to-scale transitions
- **NITI Aayog warning**:
  - India's global manufacturing share could fall to **2.5% by 2035** if adoption remains weak.

2. Low R&D Intensity

- India's R&D expenditure (2023): **0.64% of GDP**
- China: **~2.5% of GDP**

➡️ Limits innovation-driven competitiveness.

3. Disincentives to Scale

- Regulatory thresholds encourage firms to:
  - Remain small
  - Avoid formalisation
- **MSMEs contribute ~35.5%** of manufacturing output but struggle to scale.

4. Manufacturing–Services Imbalance

- Services account for **~55% of GDP**
- High-productivity services (IT, finance) are **low-employment sectors**

➡️ Results in **jobless growth**.

5. Low Labour Productivity

- As per **ILO**, India's GDP per working hour: **$8**
- Global rank: **133rd**

6. Regional Concentration

- **Top 5 states contribute ~54%** of manufacturing GVA
- Reflects uneven industrial development.

Government Initiatives to Boost Manufacturing

1. Make in India (2014)

- Target:
  - Manufacturing share of GDP at **25%**
  - **100 million jobs**
  - Industrial growth of **12–14% annually**

2. Production Linked Incentive (PLI) Scheme (2020)

- Covers **14 strategic sectors**
- Incentives linked to **incremental sales**

3. National Logistics Policy (2022)

- Target logistics cost: **8% of GDP**
- India recently achieved **7.97%**

4. Semiconductor & Display Ecosystem Programme

- **50% capital subsidy**
- Strengthens electronics and chip manufacturing.

5. PM GatiShakti

- Multimodal infrastructure
- Supports **Aatmanirbhar Bharat** and $5-trillion-economy ambition.

6. National Industrial Corridor Programme

- **32 projects** across major corridors
- Focus on greenfield industrial clusters.

Way Forward

- **Regulatory rationalisation** to enable firm-level scaling
- **Higher public and private R&D investment**
- **Skill development aligned with Industry 4.0**
- **Technology diffusion to MSMEs**
- **Balanced regional industrialisation** through cluster-based planning

As **Dani Rodrik** notes, *manufacturing remains the most reliable escalator for inclusive growth* in developing economies.

Conclusion

India's manufacturing future lies at the intersection of **frontier technologies, policy coherence, and skill transformation**. The NITI Aayog roadmap provides a timely strategic vision to arrest premature de-industrialisation and elevate India into **global advanced manufacturing leadership**. However, success will depend on **execution capacity**, **investment in innovation**, and **institutional reforms** that allow firms to scale, compete, and integrate into global value chains.

Mains Practice Question

"Manufacturing remains central to India's aspirations of inclusive growth and strategic autonomy." In the light of NITI Aayog's roadmap on advanced manufacturing, discuss the opportunities and challenges before India's manufacturing sector.

World Inequality Report 2026

📌 Syllabus Mapping

- **GS Paper III** – Economy
  - Inclusive growth
  - Poverty and inequality
  - Human development
- **GS Paper I** – Society
  - Social stratification
  - Intergenerational mobility
- **GS Paper II** – Governance & Global Institutions
  - Global economic governance
  - Climate justice

Introduction

Inequality has emerged as one of the defining challenges of the 21st century, influencing **economic growth, social cohesion, climate action, and democratic stability**. The **World Inequality Report 2026**, released by the **World Inequality Lab**, provides a comprehensive assessment of income, wealth, and climate-related inequalities across countries, highlighting deep structural imbalances at both global and national levels.

Why in News?

The **World Inequality Report 2026** was recently released, offering updated evidence on **wealth concentration, income disparity, climate inequality, and systemic financial asymmetries**, with specific insights on India's inequality profile.

Key Global Findings

1. Extreme Concentration of Global Wealth

- **Top 10%** of the global population owns **~75% of total global wealth**
- **Bottom 50%** holds only **~2% of global wealth**

➡️ Indicates unprecedented concentration of assets and capital.

2. Sharp Income Divide

- **Top 10% income earners** receive **more income than the remaining 90% combined**
- **Bottom half of the world's population** earns **less than 10% of global income**

➡️ Growth benefits remain heavily skewed towards the affluent.

Climate Inequality: The Carbon Divide

Disproportionate Responsibility

- **Poorest 50%** of the global population accounts for only **~3%** of private capital-related carbon emissions
- **Richest 10%** are responsible for **~77%** of such emissions

Unequal Exposure

- Those contributing least to climate change—primarily in **low-income countries**—are the **most vulnerable** to:
  - Heat stress
  - Floods
  - Extreme weather events

➡️ Highlights the moral and economic basis for **climate justice**.

Systemic Global Financial Inequality

The "Exorbitant Privilege"

- Wealthy economies:
  - Borrow at **lower interest rates**
  - Earn **higher returns** on overseas investments

Net Resource Transfer

- Results in an annual transfer of **~1% of global GDP** from poorer to richer countries
- This is **nearly three times global development aid**

➡️ Reveals how the global financial architecture structurally favours advanced economies.

India-Specific Findings

1. Income Inequality

- **Top 10%** capture **~58% of national income**
- **Bottom 50%** receive only **~15%**

2. Wealth Inequality

- **Top 10%** hold **~65% of total national wealth**
- **Top 1% alone** controls **~40% of total wealth**

➡️ Indicates **extreme asset concentration**, with implications for opportunity and mobility.

Measuring Inequality: Key Indicators

1. Gini Index

- Measures deviation from perfect equality (0 = perfect equality, 100 = perfect inequality)
- Based on the **Lorenz Curve**

2. Kuznets Ratio

- Compares income share of top groups to bottom groups
- Higher ratio = higher inequality

Example: Palma Ratio

- Income share of **top 10% ÷ bottom 40%**
- Focuses on extremes rather than the middle.

Consequences of High Inequality

1. Economic Inefficiency and Growth Loss

- Inequality constrains:
  - Education
  - Nutrition
  - Healthcare access

Example: High anaemia prevalence affecting workforce productivity (as highlighted in **NFHS-5**)

2. Intergenerational Poverty Traps

- Parental income and education strongly shape children's life outcomes
- Limits **social mobility** and perpetuates disadvantage.

3. Undermined Climate Action

- High consumption by the wealthy drives emissions
- Poor countries with **low per-capita emissions** face disproportionate damage.

4. Increased Vulnerability and Household Debt

- Informal and low-income households face:
  - Income shocks
  - High indebtedness

Example: COVID-19 lockdown impacts on migrant workers and street vendors.

5. Democratic and Institutional Erosion

- Economic inequality often translates into:
  - Political inequality
  - Policy capture by elites

Example: Concentration of oil wealth among elites in Nigeria undermining democratic accountability.

India: Progress and Paradox

- According to the **World Bank**, India ranks **4th globally in income equality** with a **Gini Index of 25.5**
- **Extreme poverty declined to 2.3% in 2022–23**
- Around **171 million people exited extreme poverty (2011–23)**

Key Enablers

- **PM Jan Dhan Yojana**
- **Direct Benefit Transfer (DBT)**
- **Ayushman Bharat**
- **PMGKAY**

➡️ Reflects progress in **poverty reduction**, though **wealth and opportunity inequality** remain high.

Way Forward

- **Employment-intensive growth**, especially in manufacturing
- **Quality education and skilling** to break intergenerational inequality
- **Progressive taxation and wealth transparency**
- **Universal social protection**
- **Climate policies grounded in equity and responsibility**

As **Amartya Sen** argues, development must expand **real freedoms**, not merely incomes.

Conclusion

The **World Inequality Report 2026** underscores that inequality today is **not accidental but structural**, embedded in economic systems, climate responsibility, and global finance. While India has achieved commendable success in reducing extreme poverty, **income and wealth concentration** pose long-term risks to inclusive growth, social mobility, and democratic health. Sustained equity will require a **balanced strategy**—combining growth, redistribution, human capital investment, and climate justice—to ensure that prosperity is both **broad-based and durable**.

Mains Practice Question

"The World Inequality Report 2026 highlights inequality as a multidimensional challenge encompassing income, wealth, and climate responsibility." Discuss the key findings of the report and examine their implications for India's inclusive growth strategy.

FSAP and India's Financial Stability

📌 Syllabus Mapping

- **GS Paper III** – Indian Economy
  - Banking, capital markets, and financial reforms
  - Infrastructure financing and risk management
- **GS Paper II** – Governance
  - Role of regulators (RBI, SEBI)
  - Institutional capacity and oversight

Introduction

A resilient and efficient financial system is indispensable for sustaining high growth and mobilising long-term capital. The latest **Financial Sector Assessment Program (FSAP)** review underscores that while India's financial system has become **larger, more diversified, and digitally advanced**, targeted reforms are essential to support the country's aspiration of becoming a **USD 30-trillion economy by 2047**.

Why in News?

The **FSAP report**, prepared under the joint framework of the **World Bank** and the **International Monetary Fund**, has urged India to **accelerate financial sector reforms**—particularly in **market deepening, non-bank oversight, and risk management**—to sustain long-term growth.

About the FSAP

- **Genesis**: Launched in **1999** as a joint World Bank–IMF initiative
- **Coverage**:
  - Advanced economies: led by the IMF
  - Developing & emerging markets: conducted jointly by the IMF and World Bank
- **India's previous FSAP**: **2017**

Purpose: Evaluate financial stability, resilience, and development gaps; recommend reforms to strengthen systems and institutions.

Key Findings of the FSAP on India

1. Systemic Resilience and Scale

- Financial system assets have expanded to **~175% of GDP**, up from **144% in 2017**
- The system is **stronger and more diversified**, though the **state remains a dominant player**

Implication: Stability has improved, but **crowding-in of private capital** remains critical.

2. Digital Public Infrastructure (DPI) as a Strength

- India's DPI has:
  - Expanded access
  - Reduced transaction costs
  - Improved inclusion and efficiency

Implication: Digital rails can be leveraged to **scale credit delivery**, improve supervision, and enhance consumer protection.

3. Regulatory and Supervisory Progress

- **RBI and SEBI** reforms have strengthened:
  - Prudential norms
  - Market supervision
- **Positive assessment** of:
  - Expanded regulatory authority over **cooperative banks**
  - Tighter prudential standards

Remaining gaps:

- **NBFC oversight**
- **Group-level risk management**
- **Data integration for supervision**

4. Market Development Constraints

- **Corporate bond market** and **infrastructure financing** remain shallow
- Investor preference skews toward **government securities**

Implication: Long-term financing for infrastructure and industry is constrained.

5. Tax and Incentive Distortions

- **Uneven tax treatment** between debt and equity:
  - Discourages bond market participation
  - Limits institutional investor appetite

Implication: Tax rationalisation is key to **deepening capital markets**.

Reform Priorities Highlighted by FSAP

1. Deepen Capital Markets

- Develop:
  - Corporate bond markets
  - Credit enhancement mechanisms
  - Market-making and liquidity facilities
- Encourage participation by:
  - Pension funds
  - Insurance companies
  - Foreign portfolio investors

2. Strengthen NBFC Oversight

- Improve:
  - Consolidated supervision
  - Stress testing
  - Resolution frameworks
- Reduce regulatory arbitrage between banks and NBFCs

3. Align Tax Policy with Market Development

- Rationalise debt–equity taxation
- Incentivise long-term savings and bond investments

4. Leverage DPI for Supervision and Inclusion

- Use digital trails for:
  - Real-time risk monitoring
  - Consumer protection
  - Targeted credit delivery to MSMEs

5. Reduce State Dominance Gradually

- Enhance governance of public financial institutions
- Crowd-in private capital while preserving stability

Broader Economic Significance

- A robust financial system is essential to:
  - Mobilise **long-term infrastructure finance**
  - Support **manufacturing and MSME growth**
  - Manage risks from **climate transition and global volatility**

As **Hyman Minsky** cautioned, *financial stability must be actively managed to prevent fragility*—a lesson relevant as India's system scales rapidly.

Conclusion

The FSAP assessment recognises India's **substantial progress** in resilience, regulation, and digitalisation, while clearly flagging **unfinished reforms** in market deepening, NBFC supervision, and tax alignment. Achieving the **USD 30-trillion economy vision by 2047** will require converting financial stability into **financial depth**—by mobilising long-term capital, diversifying markets, and strengthening institutional capacity. Timely implementation of FSAP recommendations can ensure that India's financial system becomes not only **safe**, but also **transformative**.

Mains Practice Question

"The Financial Sector Assessment Program (FSAP) report highlights both resilience and structural gaps in India's financial system." Examine its key findings and discuss the reforms required to support India's aspiration of becoming a USD 30-trillion economy by 2047.

Digitising Warehousing and PDS

📌 Syllabus Mapping

- **GS Paper II** – Governance
  - Public Distribution System (PDS)
  - Transparency, accountability, and use of technology in governance
- **GS Paper III** – Indian Economy
  - Infrastructure and logistics
  - Food security and supply-chain efficiency

Introduction

Efficient warehousing and transparent food-grain distribution are central to India's **food security architecture**. In this context, the launch of multiple **digital initiatives to modernise warehousing operations and strengthen the Public Distribution System (PDS)** marks a decisive step toward **technology-driven, citizen-centric governance**. These reforms aim to reduce leakages, improve logistics efficiency, and enhance real-time decision-making across the food supply chain.

Why in News?

The Union Minister of Consumer Affairs, Food & Public Distribution recently launched **major digital platforms** to modernise warehousing, improve supply-chain visibility, and strengthen transparency in the **Public Distribution System (PDS)**.

Key Digital Initiatives Launched

1. Bhandaran 360

- Introduced by the **Central Warehousing Corporation**
- A **cloud-based Enterprise Resource Planning (ERP)** platform

Core Features

- Integrates:
  - Human resources
  - Finance and accounting
  - Warehouse management
  - Contract monitoring

Key Benefits

- **Real-time monitoring** of warehouse operations
- **Standardisation of processes** across all CWC warehouses
- Improved **operational efficiency and auditability**

2. Smart EXIM Warehouse System

- Developed by the **Central Warehousing Corporation** for:
  - Container Freight Stations (CFS)
  - Inland Container Depots (ICDs)
  - General warehouses

Technologies Used

- Artificial Intelligence (AI)
- Internet of Things (IoT)
- FASTag
- OCR / ANPR (Automatic Number Plate Recognition)
- GNSS (Global Navigation Satellite System)

Key Benefits

- **Gate automation and yard management**
- End-to-end **cargo tracking**
- **Smart inventory management**
- Reduced dwell time and logistics costs

3. ANNA DARPAN Platform

- Introduced by the **Food Corporation of India**
- A **microservices-based, mobile-first platform**
- Replaces the earlier **Depot Online System**

Integrated Functions

- Procurement
- Storage
- Movement and transportation
- Sales and distribution
- Labour and contract management

Key Benefits

- **Real-time dashboards** for policymakers
- Faster and data-driven decision-making
- Enhanced coordination across the food-grain supply chain

4. ASHA Platform (Anna Sahayata Holistic AI Solution)

- Launched by the **Department of Food and Public Distribution**
- An **AI-enabled citizen feedback system**

Key Features

- Beneficiaries can provide feedback on ration distribution through:
  - AI-enabled voice calls
  - Preferred regional language

Key Benefits

- Strengthens **last-mile accountability**
- Enables **grievance redressal based on real beneficiary experience**
- Promotes **citizen participation** in welfare governance

Significance of These Digital Reforms

1. Enhanced Transparency in PDS

- Real-time tracking of:
  - Food-grain stocks
  - Movement and delivery
- Reduces diversion, pilferage, and ghost beneficiaries

2. Improved Supply-Chain Efficiency

- Integration of AI, IoT, and ERP systems:
  - Optimises storage and movement
  - Minimises delays and wastage
- Supports **Just-in-Time logistics** for food grains

3. Better Governance and Decision-Making

- Unified digital dashboards enable:
  - Evidence-based policy decisions
  - Faster response to shortages or disruptions

4. Citizen-Centric Welfare Delivery

- ASHA platform institutionalises **beneficiary voice**
- Moves PDS from a **top-down delivery model** to a **feedback-driven system**

5. Alignment with Digital India and Ease of Living

- Reinforces:
  - Digital India Mission
  - Minimum government, maximum governance
- Improves trust in state-run welfare systems

Challenges and Areas for Caution

- **Digital Divide**: Limited digital literacy and connectivity in remote areas
- **Data Security and Privacy**: Protection of beneficiary data is critical
- **Capacity Building**: Training of personnel at warehouse and fair-price-shop levels
- **Inter-operability**: Seamless integration with state-level PDS systems

Conclusion

The rollout of platforms such as **Bhandaran 360, Smart EXIM Warehouse System, ANNA DARPAN, and ASHA**represents a **paradigm shift in food-grain logistics and PDS governance**. By embedding **digital intelligence, automation, and citizen feedback** into warehousing and distribution, India

is strengthening transparency, efficiency, and trust in its food-security framework. Sustained success, however, will depend on **last-mile digital inclusion, institutional capacity, and robust data governance**, ensuring that technology meaningfully enhances welfare outcomes.

Mains Practice Question

"Digital initiatives in warehousing and the Public Distribution System (PDS) can significantly improve transparency and efficiency." Discuss the recent digital reforms launched in India and examine their potential impact on food security and welfare delivery.

National Industrial Classification (NIC)–2025

📌 Syllabus Mapping

- **GS Paper III** – Indian Economy
  - Growth and development
  - Structural transformation of the economy
  - Data, statistics, and policy planning
- **GS Paper II** – Governance
  - Evidence-based policymaking
  - Role of institutions

Introduction

A modern economy requires a **robust statistical architecture** to accurately capture structural change, emerging sectors, and evolving modes of production. In this context, the release of **National Industrial Classification (NIC)–2025** marks a significant upgrade in India's economic classification system. By aligning domestic classifications with global standards and incorporating new-age sectors, NIC–2025 strengthens the foundation for **data-driven policymaking, economic research, and governance**.

Why in News?

The **Ministry of Statistics and Programme Implementation (MoSPI)** released **NIC–2025**, an updated industrial classification framework that replaces **NIC–2008** and aligns India's statistical system with international best practices.

What is National Industrial Classification (NIC)?

- NIC is a **standardised system for classifying economic activities**
- It is used in:
  - National accounts
  - Economic censuses
  - Statistical surveys
  - Policy formulation and research

📌 Historical Evolution

- First introduced in **1962**
- Periodically revised to reflect structural changes in the economy
- **NIC–2025** is the latest revision

International Alignment

- NIC–2025 is aligned with the **United Nations Statistics Division**'s **International Standard Industrial Classification of All Economic Activities (ISIC) – Revision 5**

➡️ Ensures **global comparability of Indian economic data**, improving India's integration into international statistical and policy frameworks.

Major Changes Introduced in NIC–2025

1. Structural Shift in Coding Framework

- Transition from a **5-digit code (NIC–2008)** to a **6-digit coding structure**
- Enables:
  - Greater **granularity**
  - Better **representation of niche and emerging activities**
  - Enhanced analytical flexibility for policymakers

2. Recognition of Indigenous and Traditional Sectors

- Explicit inclusion of:
  - **AYUSH-based healthcare systems**
  - **Handloom and traditional industries**

➡️ Reflects India's **cultural economy** and supports targeted policy interventions.

3. Inclusion of Emerging and Sunrise Sectors

NIC–2025 formally classifies:

- **Renewable energy**
- **Fintech**
- **E-commerce**
- **Digital intermediation and platform-based services**

➡️ Addresses gaps in capturing the **digital and innovation-driven economy**.

Salient Features of NIC–2025

1. Enhanced Classification of Intermediation Services

- New activity classes introduced for intermediaries in:
  - Power and energy markets
  - Retail and logistics
  - Healthcare and education

➡️ Acknowledges the growing role of **intermediary-led economic models**.

2. Improved Representation of the Digital Economy

- Distinct classification for:
  - Cloud infrastructure services
  - Blockchain-based activities
  - Platform economy
  - Web search portals and digital services

➡️ Enables accurate measurement of **India's digital GDP**.

3. Integration of Environmental and Green Economy Activities

- Expanded coverage of:
  - Carbon capture and storage
  - Waste management
  - Environmental remediation

➡️ Aligns statistical systems with:

- **Sustainable Development Goals (SDGs)**
- India's climate and sustainability commitments

4. Technology-Agnostic Classification

- Activities classified **by nature of economic activity**, not by:
  - Traditional vs modern production methods

➡️ Prevents obsolescence and ensures long-term relevance of the classification system.

Significance of NIC–2025

1. Better Policy Design and Targeting

- Enables:
  - Sector-specific policy interventions
  - Accurate identification of growth and employment trends

2. Improved Quality of Economic Data

- Supports:
  - National income estimation
  - Employment statistics
  - Industrial productivity analysis

3. Capturing Structural Transformation

- Reflects India's transition from: Agriculture → Manufacturing → Services → Digital & Green Economy

4. Global Comparability and Credibility

- Alignment with ISIC enhances:
  - International reporting
  - Cross-country economic comparisons

Challenges and Way Forward

- **Transition Management**: Reclassification may create short-term data discontinuities
- **Capacity Building**: Training of statistical staff and survey agencies
- **Awareness**: Ensuring adoption across states and research institutions

➡️ A phased rollout with harmonised back-series data will be critical.

Conclusion

NIC–2025 represents a **quiet but foundational reform** in India's economic governance framework. By expanding granularity, recognising indigenous and emerging sectors, and aligning with global standards, it equips India with a **future-ready statistical system**. In an era of digitalisation, green transition, and platform economies, NIC–2025 will play a crucial role in shaping **evidence-based policy, inclusive growth strategies, and long-term economic planning**.

Mains Practice Question

"National Industrial Classification (NIC)–2025 reflects India's evolving economic structure and policy priorities." Discuss its key features and examine its significance for economic planning and governance.

AGRICULTURE

PPV&FR Act, 2001

📌 Syllabus Mapping

- **GS Paper II** – Governance & Polity
  - Statutory bodies
  - Farmers' rights
  - International treaties and obligations
- **GS Paper III** – Agriculture & Economy
  - Agricultural innovation
  - Intellectual Property Rights
  - Food security and biodiversity

Introduction

Balancing **intellectual property protection**, **agricultural innovation**, and **farmers' rights** remains a critical governance challenge in a biodiversity-rich country like India. The **Protection of Plant Varieties and Farmers' Rights (PPV&FR) Act, 2001**, which has completed **25 years of its enactment**, represents a **distinctive Indian approach** to plant variety protection—one that simultaneously rewards breeders, empowers farmers, and preserves genetic diversity.

Why in News?

The **Silver Jubilee celebrations** of the **PPV&FR Act, 2001** were recently observed, marking 25 years of India's unique **sui generis system** for protecting plant varieties in compliance with global intellectual property obligations.

International Context and Rationale

- India enacted the PPV&FR Act to comply with the **World Trade Organization**'s **TRIPS Agreement**, which allows countries to protect plant varieties through:
  - Patents
  - A **sui generis system**
  - Or a combination of both
- A **sui generis system** refers to a **custom-designed legal framework**, suited to domestic socio-economic realities.

➡️ **India deliberately rejected plant patents**, opting instead for a farmer-centric sui generis regime to safeguard food security and biodiversity.

About the PPV&FR Act, 2001

Objective

- To establish an effective system for:
  - Protection of plant varieties
  - Rights of farmers and breeders
  - Promotion of research and development in plant breeding

International Alignment

- The Act broadly aligns with **International Union for the Protection of New Varieties of Plants**, while going beyond it by explicitly recognising **farmers' rights**—a feature absent in most global IPR regimes.

Registration of Plant Varieties

A plant variety is eligible for registration if it satisfies the **DUS criteria**:

- **Distinctiveness** – Clearly distinguishable from existing varieties
- **Uniformity** – Consistent expression of essential traits
- **Stability** – Traits remain unchanged over successive generations

Rights Conferred under the Act

1. Breeders' Rights

- Exclusive rights to:
  - Produce
  - Sell
  - Market
  - Distribute
  - Import or export the registered variety

➡️ Encourages private and public sector investment in plant breeding.

2. Researchers' Rights

- Researchers may:
  - Use any registered variety for research and experimentation
  - Use it as an initial source for developing new varieties

⚠️ **Repeated use** for commercial breeding requires prior permission of the breeder.

3. Farmers' Rights (Core Innovation of the Act)

Farmers are entitled to:

- **Register farmer varieties** and enjoy protection similar to breeders
- Register **extant varieties** (existing or traditionally known varieties)
- **Save, use, sow, resow, exchange, share, and sell farm-saved seed**
- Receive **recognition and rewards** for conserving:
  - Landraces
  - Wild relatives of economic plants

🚫 Restriction: Farmers **cannot sell branded seed** of a protected variety.

4. Benefit Sharing

- If a breeder or organisation uses a **farmer's variety** for:
  - Commercial breeding
  - Production or development

➡️ The farmer/community must receive a **share of benefits or profits**.

Categories of Plant Varieties

1. Extant Varieties

- Varieties notified under the Seeds Act, 1966
- Varieties already in the public domain

2. Farmers' / Community Varieties

- Traditionally cultivated and evolved by farmers
- Includes:
  - Landraces
  - Wild relatives conserved by communities

3. Essentially Derived Varieties (EDVs)

- Predominantly derived from an initial variety
- Retain essential characteristics but are distinguishable for at least one trait

Institutional Framework: PPV&FR Authority

Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA)

- **Ministry**: Ministry of Agriculture & Farmers' Welfare
- **Headquarters**: New Delhi

Composition

- Chairperson + 15 members
- Representation from:
  - Farmers
  - Tribal organisations
  - Seed industry
  - Women's organisations

Key Institutional Mechanisms

- **National Register of Plant Varieties**
  - Records all registered varieties and breeders' rights
- **National Gene Bank**
  - Stores seed material and parental lines of registered varieties
- **National Gene Fund**
  - Used for:
    - Benefit sharing
    - Compensation to farmers
    - Conservation and sustainable use of genetic resources

Significance of the PPV&FR Act

- Protects **agricultural biodiversity**
- Encourages **public sector plant breeding**
- Recognises farmers as **innovators and conservers**, not mere users
- Aligns IPR with **food security, equity, and sustainability**

As noted by **Vandana Shiva**, *"Seed sovereignty is the foundation of food sovereignty."*

Limitations and Challenges

1. Procedural Complexities

- Registration process is:
  - Technically demanding
  - Cost-intensive
- DUS testing often inaccessible to small farmers without institutional support

2. Benefit-Sharing Disputes

- Challenges in:
  - Identifying rightful beneficiaries
  - Quantifying benefit shares

3. Weak Enforcement

- Limited awareness among farmers
- Inadequate institutional capacity for monitoring violations

4. Risk of Market Concentration

- Large seed companies may:
  - Dominate registrations
  - Marginalise small and traditional breeders

5. Erosion of Traditional Knowledge

- Insufficient incentives for:
  - Indigenous breeding practices
  - Climate-resilient traditional seeds

Conclusion

At 25 years, the **PPV&FR Act, 2001** stands as a **globally unique legal framework** that harmonises **TRIPS compliance with farmers' rights and biodiversity conservation**. However, to unlock its full transformative potential, India must focus on **simplifying registration procedures, strengthening enforcement, expanding farmer outreach, and ensuring transparent benefit-sharing mechanisms**. In an era of climate change and food insecurity, the Act can become a cornerstone of **sustainable, farmer-led agricultural innovation**.

Mains Practice Question

"The Protection of Plant Varieties and Farmers' Rights Act, 2001 represents a sui generis Indian approach to balancing intellectual property rights with farmers' welfare." Critically examine its objectives, key provisions, and implementation challenges.

Draft Seeds Bill, 2025

📌 Syllabus Mapping

- **GS Paper III** – *Agriculture, Agricultural Inputs, Food Security, Biotechnology*
- **GS Paper II** – *Government Policies, Governance, Farmer Welfare*
- **GS Paper I** – *Indian Agriculture – Cropping Systems & Resources*

Introduction

Seeds are the **foundational input of agriculture**, directly influencing productivity, resilience, and farm incomes. Recognising gaps in India's outdated seed regulatory framework, the Union Government released the **Draft Seeds Bill, 2025**, aiming to modernise seed governance in line with **technological change, farmer protection, and market transparency**.

Why in News?

- The **Department of Agriculture and Farmers Welfare** released the **Draft Seeds Bill, 2025**, proposing to replace:
  - **Seeds Act, 1966**
  - **Seeds (Control) Order, 1983**

This signals a shift from **limited regulation** to a **comprehensive, technology-enabled seed ecosystem**.

Draft Seeds Bill, 2025: Core Objectives

- **Ensure quality, traceability, and reliability** of seeds and planting material.

- **Create a uniform national regulatory framework** for all commercially traded seeds.
- **Balance innovation with farmer rights**, especially in the context of hybrids and biotechnology.

Key Provisions of the Draft Seeds Bill, 2025

1. Mandatory Registration of Seeds

- No seed shall be sold unless **registered**, except:
  - **Farmers' varieties**
  - Seeds produced **exclusively for export**
- Existing notified varieties under the old Act are **deemed registered**.

2. Digital Traceability through SATHI Portal

- Compulsory onboarding on **SATHI (Seed Traceability, Authentication and Holistic Inventory)** portal.
- Enables **end-to-end traceability** from seed production to farmer delivery.
- Developed by the Ministry of Agriculture & Farmers Welfare with **National Informatics Centre (NIC)**.

3. Quality Regulation

- Seed varieties must comply with **Indian Minimum Seed Certification Standards**.
- Emphasis on:
  - Germination capacity
  - Varietal purity
  - Digital labelling and QR-based information

4. Institutional Architecture

- **Central Seed Committee**
  - Advisory role on seed policy, planning, production, certification, storage, exports, and imports.
- **State Seed Committees**
- **Registration Sub-Committees**
  - Scrutinise performance claims before recommending seed registration.

5. National Register of Seed Varieties

- Centralised register under the **Registrar of Seeds**.
- Acts as the **authoritative database** of all registered seed varieties.

6. Protection of Farmers' Rights

- Farmers retain the right to: **Save, use, exchange, and sell seeds**, including traditional varieties.
- Restriction: Such seeds **cannot be sold under a brand name**.
- Aligns with principles of **seed sovereignty** and the **Protection of Plant Varieties and Farmers' Rights (PPV&FR) Act, 2001**.

7. Strengthened Enforcement Mechanism

- Establishment of **Central and State Seed Testing Laboratories**.
- Appointment of **Seed Analysts and Inspectors**.
- **Three-tier penalty system**:
  - *Trivial, Minor, Major offences* with substantially higher fines than the 1966 Act.

Seeds Act, 1966 vs Draft Seeds Bill, 2025 (Analytical Comparison)

Dimension	Seeds Act, 1966	Draft Seeds Bill, 2025
Regulatory Scope	Limited to notified varieties	Covers all commercially sold seeds
Registration	Not mandatory for all varieties	Mandatory pre-market registration
Quality Assurance	Basic germination standards	Advanced labs, QR codes, traceability
Farmer Rights	Weak compensation mechanisms	Explicit right to save & exchange seeds
Market Oversight	Minimal monitoring	Digital enrolment & labelling
Penalties	Low, outdated fines	Tiered and deterrent penalties
Technology	No biotech focus	Covers hybrids, biotech & imports

Overview of India's Seed Sector

- **5th largest seed industry globally** (after the USA).
- **Seed exports**: ~USD **150 million** (2023–24), less than **1% of the USD 15 billion global market**.
- Follows a **limited generation seed multiplication system**.

Seed Multiplication System in India

1. Breeder Seed

- Progeny of nucleus seed.
- Produced by originating or sponsored breeders.
- Promoted by **Indian Council of Agricultural Research** through NSC, SFCI, KVKs.

2. Foundation Seed

- Progeny of breeder seed.
- Produced by NSC, SFCI, State Seed Corporations, private producers.

3. Certified Seed

- Progeny of foundation seed.
- Supplied directly to farmers.

Key Challenges in India's Seed Ecosystem

1. Low Seed Replacement Rate (SRR)

- In food grains and oilseeds, SRR often **below 25–30%**.
- High dependence on traditional or farm-saved seeds.

2. Market Concentration

- Dominance of multinational corporations such as **Bayer** and **Monsanto**.
- Limits farmer choice and local seed diversity.

3. Production & Distribution Constraints

- Difficulty in ensuring **timely availability** across diverse agro-climatic zones.
- Inefficient post-harvest handling, storage, and logistics.

4. Quality Concerns

- Poor-quality seeds lead to:
  - Low germination
  - Yield instability
  - Income loss for farmers

Major Government Initiatives

- **Sub-Mission on Seeds & Planting Materials**
- **National Seeds Policy, 2002**
- **PPV&FR Act, 2001**
- **Seed Village Programme (Beej Gram Yojana)**
- **National Seed Reserve**
- **National Seeds Project – Phase III**
- **Seed Management 2.0 System**

Way Forward

1. Promote Biotechnological Innovation

- Climate-resilient, high-yield, nutrient-rich seeds.
- Genome editing example:
  - ICAR-developed rice varieties *(DRR Rice 100 – Kamala; Pusa DST Rice 1)*.

2. Strengthen Community-Level Institutions

- **Community Seed Banks** to conserve indigenous varieties.
- **Seed hubs** for region-specific seed production.

3. Increase Seed Replacement Rate

- Target regionally adapted varieties.
- Timely and affordable access to certified seeds.

4. Upgrade Quality Assurance

- Modernise laboratories.
- Enforce digital traceability and strict standards.

5. Improve Post-Harvest Seed Management

- Scientific storage, processing, and distribution infrastructure.

Conclusion

The **Draft Seeds Bill, 2025** represents a **systemic overhaul of India's seed governance**, shifting from fragmented regulation to **quality assurance, transparency, and farmer-centricity**. If effectively implemented, it can boost **agricultural productivity, seed innovation, and climate resilience**, thereby strengthening the foundations of India's food security.

Keywords: *Seed governance, Farmer rights, Quality assurance, Biotech innovation, Food security*

Mains Practice Question

"The Draft Seeds Bill, 2025 seeks to modernise India's seed sector by balancing regulation, innovation, and farmers' rights. Critically analyse its potential benefits and implementation challenges."

SOFA 2025

Syllabus Mapping

- **GS Paper III** – *Agriculture, Food Security, Environment, Sustainable Development*
- **GS Paper I** – *Geography – Soil Degradation, Land Use*
- **GS Paper II** – *International Organisations, Global Development Reports*

Introduction

The **State of Food and Agriculture (SOFA) 2025 Report**, released by the **Food and Agriculture Organization of the United Nations (FAO)**, places **land degradation** at the centre of the global food security debate. The report demonstrates how deteriorating land systems are eroding **agricultural productivity, ecosystem services, and human development outcomes**, particularly in densely populated developing regions.

Why in News?

- FAO released **SOFA 2025**, providing a comprehensive assessment of:
  - The **drivers and impacts of land degradation**
  - Its convergence with **food insecurity, malnutrition, and productivity slowdown**
  - Policy pathways for **sustainable land use** and **resilient food systems**

Understanding Land Degradation (Conceptual Clarity)

Land Degradation is defined as a **long-term decline in land's capacity** to deliver essential **ecosystem functions and services**, including:

- Soil fertility
- Water regulation
- Carbon sequestration
- Biodiversity support

Drivers of Land Degradation

- **Natural Factors:**
  - Soil erosion
  - Salinization
- **Anthropogenic Factors:**
  - Deforestation
  - Overgrazing

- Unsustainable cropping patterns
- Improper irrigation practices

Key Findings of SOFA 2025

1. Regional Burden: Asia Most Affected

- Asian countries face **disproportionately high impacts** due to:
  - Accumulated **degradation debt**
  - **High population density** and land pressure
- Implications for countries like **India**, where small landholdings intensify stress on soil and water resources.

2. Ecosystem-Wide Impacts

- Land degradation undermines:
  - **Livestock productivity** in rangelands
  - **Forest ecosystems**, largely due to agricultural expansion
- Results in:
  - Biodiversity loss
  - Disrupted rainfall and climate regulation

3. Crop Yield Losses

- Around **1.7 billion people** live in regions where: Crop yields are **10% lower** due to **human-induced land degradation**
- This directly threatens:
  - Farmer incomes
  - National food availability
  - Price stability

4. Declining Agricultural Productivity

- **Total Factor Productivity (TFP)** growth has **slowed since the 2000s**, especially in the **Global South**.
- Indicates that: Technological gains are being offset by land and resource degradation.
- Aligns with **Bosch–Hayami hypothesis** on induced innovation failing under ecological stress.

5. Convergence with Food and Nutrition Insecurity

- **47 million children under five** suffering from **stunting** live in: Regions where **malnutrition overlaps with severe yield losses**
- Highlights the **nutrition–environment nexus**, where degraded land perpetuates intergenerational poverty.

Analytical Perspective

Development–Environment Trade-off

- Short-term agricultural intensification has led to: Long-term ecological decline
- Echoes **Amartya Sen's capability approach**—land degradation constrains human capabilities through food insecurity.

Global South Vulnerability

- Developing countries face:
  - Higher exposure
  - Lower adaptive capacity
- Reinforces principles of **equity and sustainability** in global development discourse.

Policy Options for Sustainable Land Use (SOFA 2025)

1. Regulatory Policies

- Land-use zoning
- Deforestation bans
- Soil conservation mandates

Strength: Strong enforcement potential
Limitation: Requires institutional capacity

2. Incentive-Based Policies

- Payments for ecosystem services (PES)

- Financial rewards for sustainable farming

Strength: Flexibility and farmer acceptance
Limitation: Fiscal sustainability concerns

3. Cross-Compliance Mechanisms

- Linking subsidies and public support to: Environmental and soil health standards

Example (India): Conditional fertiliser subsidies, natural farming incentives.

4. Land Degradation Neutrality (LDN) Framework

- **Hierarchy: Avoid → Reduce → Reverse** land degradation
- Aligns with:
  - **SDG 15 (Life on Land)**
  - **UNCCD commitments**

India-Specific Relevance

- Over **30% of India's land** is degraded (various national estimates).
- Direct implications for:
  - Doubling farmers' income
  - Nutrition security
  - Climate resilience
- Need to integrate:
  - **Soil Health Cards**
  - **Natural Farming**
  - **Watershed Development**

  into a coherent land restoration strategy.

Way Forward

- **Mainstream land restoration** into agricultural and rural development planning.
- Promote **climate-smart and regenerative agriculture**.
- Strengthen **data systems** for land health monitoring.
- Scale up **LDN-aligned national targets**.
- Foster **community-led land stewardship**.

Conclusion

The **SOFA 2025 Report** makes it clear that **land degradation is not merely an environmental issue but a structural threat to food security, productivity, and human development**. Reversing this trend requires **policy coherence, sustainable incentives, and long-term ecological thinking**, ensuring that land continues to support both **present and future generations**.

Keywords: *Land degradation, Food security, Total factor productivity, Land Degradation Neutrality, Sustainable agriculture*

Mains Practice Question

"The State of Food and Agriculture 2025 Report highlights land degradation as a critical threat to food security and agricultural productivity. Analyse the drivers and impacts of land degradation and discuss policy measures required for achieving sustainable land use in developing countries like India."

ETHICS

Ethics of the Neuro-Technology Revolution

📌 Syllabus Mapping

- **GS Paper IV** – *Ethics and Human Interface, Applied Ethics, Science & Technology*
- **GS Paper III** – *Science & Technology, Emerging Technologies*
- **Essay Paper** – *Ethics of Technological Disruption*

Introduction

The rapid evolution of **neurotechnology**—driven by advances in **artificial intelligence, neural engineering, and minimally invasive implants**—is redefining human interaction with the brain and nervous system. While it offers **unprecedented therapeutic benefits**, it simultaneously raises **deep ethical, legal, and philosophical concerns**, especially regarding **mental privacy, autonomy, consent, and human dignity**.

What is Neurotechnology?

Definition

- Neurotechnology refers to **technologies that enable direct interaction between the human nervous system and digital or mechanical systems**.
- Examples include **Brain–Computer Interfaces (BCIs)** and neural implants.

Mechanism

- Detection of **neural signals** → algorithmic interpretation → translation into commands for devices (prosthetics, computers, speech tools).

Key Applications

- **Motor restoration:** Brain–spine bridges enabling paralysed individuals to walk.
- **Thought-to-speech systems:** AI decoders restoring speech in ALS patients.
- **Sensory prosthetics:** Bionic limbs restoring touch and reducing phantom pain.

Regulatory Gap

- Medical uses are regulated, but **non-medical and consumer uses remain weakly governed**, despite continuous collection of **highly sensitive neural data**.

Stakeholders and Ethical Tensions

Stakeholder	Core Interests	Ethical Dilemmas
Patients & Persons with Disabilities	Mobility, speech, dignity, quality of life	Data misuse, dependency, affordability
Medical Professionals	Scientific progress, patient welfare	Consent vs commercial pressure
Tech Companies	Innovation, profit, data ownership	Monetisation of neural data
Governments	Public safety, innovation	Surveillance vs rights
Military	Cognitive enhancement	Coercion, weaponisation

Core Ethical Issues

1. Mental Privacy & Freedom of Thought

- BCIs can **infer emotions, intentions, and cognitive states**.
- Risk of **unauthorised access to thoughts**, undermining free will.

2. Autonomy & Personal Identity

- Algorithmic mediation of cognition may **shape decisions**, eroding individuality.

3. Monetisation of Neural Data

- Neural data is **far more intimate than behavioural data**.
- Commercial exploitation raises consent and dignity concerns.

4. Surveillance & Manipulation

- Potential for **state or corporate monitoring** of attention and emotions.

5. Dual-Use Risks

- Therapeutic tools may be repurposed for **military or intelligence applications**.

Global Normative Guidance

UNESCO (2025) – Ethics of Neurotechnology

Key recommendations:

- **Cognitive Liberty & Mental Privacy** as non-negotiable rights.
- **Human agency:** Humans must remain *"in the loop"*.
- **Protection of vulnerable groups**, especially children.
- **Transparency & explainability** of devices and data practices.
- **Non-discrimination & inclusion** to avoid neuro-based inequality.
- **Robust governance frameworks**, banning coercive and surveillance uses.
- Classification of **neural data as sensitive personal data**.

Way Forward

- Enact **neuro-rights-based legislation** (mental privacy, cognitive liberty).
- Establish **regulatory sandboxes** for ethical testing.
- Mandatory **ethics review boards** for neuro-tech deployment.
- Public funding and pricing regulation for **equitable access**.
- Global cooperation on **dual-use and military limits**.

Conclusion

Neurotechnology holds the promise to **restore human capabilities and dignity**, but without ethical guardrails it risks becoming a tool of **surveillance, inequality, and control**. Balancing **innovation with autonomy, equity, and human rights** is essential to ensure that the neuro-tech revolution remains **human-centred and ethically grounded**.

Keywords: *Mental privacy, Cognitive liberty, Human dignity, Dual-use technology, Applied ethics*

SOCIETY AND SOCIAL ISSUES

Juvenile Justice System in India

📌 Syllabus Mapping

- **GS Paper II** – *Governance, Social Justice, Child Rights*
- **GS Paper I** – *Indian Society – Vulnerable Sections*
- **GS Paper IV** – *Ethics, Human Values, Compassion in Governance*

Introduction

A decade after the enactment of the **Juvenile Justice (Care and Protection of Children) Act, 2015**, the performance of India's juvenile justice architecture has come under renewed scrutiny. The report *"Juvenile Justice and Children in Conflict with the Law: A Study of Capacity at the Frontlines"* by the **India Justice Report** assesses whether the system has evolved from a **procedural framework** to a **child-centric, rehabilitative ecosystem**.

Why in News?

- The **India Justice Report** evaluated the functioning of the juvenile justice system **ten years after the JJ Act, 2015**, highlighting **capacity deficits, rising pendency, and uneven implementation** across States.

Juvenile Justice System in India: Legal Framework

Statutory Basis

- **Juvenile Justice (Care and Protection of Children) Act, 2015**
  - Replaced JJ Act, 2000
  - Amended by **JJ (Amendment) Act, 2021**

Core Objective

- To **consolidate and amend laws** relating to:
  - **Children in conflict with law**
  - **Children in need of care and protection**
- Emphasis on **care, development, rehabilitation, and social reintegration**.

Key Definitions under the JJ Act

- **Child:** A person **below 18 years**.
- **Juvenile:** A child who has not completed 18 years.
- **Child in Conflict with Law:** A child **alleged or found to have committed an offence** below 18 years.

Institutional Architecture under the JJ Act, 2015

1. Juvenile Justice Board (JJB)

- Mandatory **district-level body** to handle cases of children in conflict with law.
- Comprises:
  - Metropolitan/Judicial Magistrate
  - Two social workers (including at least one woman)

2. Preliminary Assessment for Heinous Offences

- For children **above 16 years** accused of **heinous offences**:
  - JJB conducts assessment of:
    - Mental capacity
    - Physical capacity
    - Ability to understand consequences
- **Children's Court** may decide whether the child is to be tried as an adult.

3. Child Welfare Committee (CWC)

- Constituted in every district.
- Handles **children in need of care and protection**.
- Powers include:
  - Declaring fit persons/facilities
  - Foster care placement
  - Rehabilitation planning

4. Monitoring and Oversight

- **National Commission for Protection of Child Rights** (National level)
- **State Commissions for Protection of Child Rights** (State level)

Performance Assessment: Key Issues Identified

1. Inadequate Institutional Coverage

- **707 JJBs across 765 districts** (2023–24).
- Only **18 States and J&K** had a JJB in **every district**.

2. Uneven Functional Capacity

- Of **470 operational JJBs**, **24%** functioned **without a full bench**.
- Leads to:
  - Delayed adjudication
  - Longer institutional stays
  - Reduced child-sensitive decision-making

3. Rising Case Pendency

- **55% of cases** pending across **362 JJBs** (as of Oct 31, 2023).
- Inter-state variation:
  - **Odisha:** 83% pendency
  - **Karnataka:** 35% pendency

4. Weak Oversight of Custodial Institutions

- Statutory mandate: **Monthly inspections** of Child Care Institutions (CCIs).
- Actual performance:
  - **810 inspections** conducted
  - Against **1,992 mandated inspections** across 14 States and J&K

5. Excessive Institutionalisation

- **~83%** of children in custodial facilities placed in **Observation Homes**.
- Reflects:
  - Prolonged inquiries
  - Inadequate non-institutional alternatives

6. Poor Data Transparency

- Absence of a **central public data repository** for juvenile cases.
- No equivalent of **National Judicial Data Grid (NJDG)** for juveniles.

7. Underutilisation of Funds

- JJ funds remain **under-spent** due to:
  - Capacity gaps
  - Delayed disbursement
  - Weak financial planning at State level

Key Judicial Pronouncements

Sheela Barse v. Union of India (1986)

- Directed **regular inspections** by District and Sessions Judges.
- Emphasised protection of **constitutional and human rights** of juveniles in custody.

Sampurna Behura v. Union of India (2005)

- Directed States/UTs to:
  - Establish and operationalise **JJBs and CWCs**
  - Prevent case backlogs and institutional delays

Analytical Perspective

- The JJ system reflects a **tension between rehabilitation and retribution**.
- Persistent capacity gaps risk:
  - Violating **Article 21** (Right to Life with dignity)
  - Undermining India's commitments under the **UN Convention on the Rights of the Child (UNCRC)**.
- Over-institutionalisation contradicts the **principle of last resort** in child custody.

Way Forward: Strengthening the Juvenile Justice System

India Justice Report Recommendations

1. Strengthen JJB Capacity

- Fill vacancies:
  - Magistrates
  - Probation officers
  - Counsellors
  - Legal aid counsel

2. Leverage Technology

- Digital case-management systems.
- Centralised database linking:
  - Police
  - JJBs
  - CCIs
- Ensures **tracking, transparency, and best-interest determination**.

3. Fast-Track Juvenile Courts

- Reduce prolonged detention.
- Time-bound disposal of juvenile cases.

4. Training as a Force Multiplier

- Periodic training for:
  - Police
  - JJB members
  - Child care staff
- Emphasis on **trauma-informed and child-sensitive approaches**.

5. Accountability & Oversight

- Strict monitoring of CCIs.
- Independent audits to prevent abuse and rights violations.

6. Specialised Juvenile Handling Units

- Dedicated juvenile units within police stations and courts.
- Ensures **procedural fairness and dignity**.

Conclusion

India's juvenile justice system stands at a critical juncture. Moving beyond **formal compliance**, the focus must shift to a **rights-based, rehabilitative, and child-centric framework**. Strengthening institutional capacity, leveraging technology, and ensuring effective oversight can transform the system into one that truly **restores childhood rather than criminalises it**.

Keywords: *Child-centric justice, Rehabilitation, Institutional capacity, Juvenile rights, Due process*

📝 Mains Practice Question

"Despite a progressive legal framework, the juvenile justice system in India continues to face serious capacity and implementation challenges. Examine the key issues affecting its functioning and suggest measures to strengthen a child-centric justice delivery system."

AI in School Education

📌 Syllabus Mapping

- **GS Paper II** – *Government Policies, Education Reforms*
- **GS Paper III** – *Science & Technology, Skill Development*
- **GS Paper I** – *Indian Society – Education & Social Change*
- **Essay Paper** – *Technology and Human Development*

Introduction

In a landmark reform aligned with India's long-term education vision, the **Department of School Education & Literacy (DoSE&L)** under the **Ministry of Education** has announced the introduction of **Artificial Intelligence (AI) and Computational Thinking (CT)** in schools from **Class 3 onwards**, beginning **academic session 2026–27**. This move reflects a shift from rote learning towards **conceptual thinking, ethical awareness, and digital citizenship**, consistent with the aspirations of a **knowledge-based economy**.

Why in News?

- The Government will roll out **AI & Computational Thinking curriculum across all schools from Class 3**.
- The initiative operationalises the vision of:
  - **National Education Policy (NEP) 2020**
  - **National Curriculum Framework for School Education (NCF SE) 2023**

AI & CT Curriculum: Key Features

Policy Alignment

- Anchored in **NEP 2020**'s emphasis on:
  - Foundational learning
  - Experiential education
  - 21st-century skills
- Designed within the framework of **NCF SE 2023**.

Core Objectives

- Strengthen **learning, thinking, and teaching processes**.
- Gradually expand understanding towards **"AI for Public Good"**.
- Promote **ethical, responsible, and inclusive use of technology**.

Curriculum Development & Implementation

- **Curriculum Design:** Led by an expert committee constituted by the **Central Board of Secondary Education (CBSE)**.
- **Teacher Training & Resources:** Delivered through the **National Initiative for School Heads' and Teachers' Holistic Advancement(NISHTHA)** platform.

Role of AI & Computational Thinking in Education

1. Development of Computational Thinking

- **Computational Thinking (CT)** is a structured problem-solving approach enabling solutions executable by computers.
- **Four Core Techniques:**
  - **Decomposition** – breaking complex problems into smaller parts
  - **Pattern Recognition** – identifying similarities and trends
  - **Abstraction** – focusing on relevant information
  - **Algorithms** – step-by-step solution design

2. Strengthening Foundational & Meta-Skills

- Early exposure to AI builds:
  - Critical thinking
  - Logical reasoning
  - Ethical judgment
- Helps students **question technology**, not merely consume it.
- These meta-skills are increasingly as essential as **literacy and numeracy**.

3. Accessibility and Inclusion

- AI-driven adaptive learning can cater to:
  - Students with disabilities
  - Diverse learning speeds and styles
- Example:
  - **UNICEF's Accessible Digital Textbooks** initiative uses AI to create customisable learning resources for differently-abled learners.

4. Improving Learning Outcomes

- AI-enabled feedback mechanisms enhance foundational skills.
- Example:
  - **Brazil's Letrus Programme** uses AI-based writing feedback to improve literacy outcomes across socio-economic groups.

5. Personalised Learning & Mentorship

- AI enables **individualised learning pathways** based on learner proficiency.
- Example: **South Korea's Ministry of Education** is developing AI-powered digital textbooks tailored to student learning levels, reducing reliance on private coaching.

6. Future Workforce Readiness

- Automation is reshaping job markets.
- The **World Economic Forum** estimates that **40% of core job skills will change within five years**.
- Early AI literacy prepares students for **lifelong adaptability**.

Challenges in Implementing AI & CT in Schools

1. Risk of "Dis-education"

- Over-reliance on AI tools may reduce:
  - Deep learning
  - Inter-generational knowledge transfer
- Risk of **cognitive dependency** if learning becomes answer-centric.

2. Teacher Upskilling

- Over **one crore educators** require:
  - Digital literacy
  - Pedagogical adaptation
- Wide variation in technological exposure remains a constraint.

3. Infrastructure Deficit

- Many schools lack:
  - Electricity
  - Computers
  - Internet connectivity
- Around **9% of schools operate with only one teacher**, limiting curriculum expansion.

4. Language and Localisation Barriers

- AI tools are often unavailable or inaccurate in **Indian languages**, affecting inclusivity.

5. Curriculum Obsolescence

- Rapid technological change makes static syllabi ineffective.
- Skills like **prompt engineering** may lose relevance quickly.

6. Psychological & Privacy Concerns

- Students sharing personal information with AI chatbots raises:
  - Data protection issues
  - Emotional dependency risks

Existing AI-in-Education Initiatives in India

- **Skilling for AI Readiness (SOAR):** AI as a skill subject in CBSE schools (Class 6–12).
- **National Centre of Excellence in AI for Education:** Announced in **Union Budget 2025–26**.
- **Skill India Mission (SIM):** Integration of AI and digital learning.
- **Skill India Digital Hub (SIDH):** Industry-relevant AI/ML courses.
- **Pradhan Mantri Kaushal Vikas Yojana (PMKVY) 4.0:** Focus on futuristic skills including AI.
- **YUVA AI for ALL:** Launched by **Ministry of Electronics and Information Technology** under IndiaAI Mission to impart foundational AI skills to **1 crore citizens**.

Way Forward

1. Curriculum Design

- Treat AI as a **universal foundational skill**, linked to **The World Around Us (TWAU)**.
- Ensure alignment with **NCF SE 2023**.

2. "Unplugged" Pedagogy

- Use **non-digital methods** (games, physical objects) to teach CT in low-infrastructure areas.

3. Interdisciplinary Integration

- Embed AI concepts in:
  - Mathematics
  - Science
  - Social sciences
- Example: Uruguay's **Ceibal Computational Thinking Programme**.

4. AI Entrepreneurship & Applied Skills

- For Classes 9–12: Focus on innovation, problem-solving, and local enterprise.
- Example: **Kabakoo Academies (West Africa)** use AI for continuous mentoring and business creation.

5. Ethical & Safety Frameworks

- Define **minimum safety thresholds** for children's interaction with AI.
- Strong data protection and age-appropriate safeguards.

Conclusion

Introducing **AI and Computational Thinking from early schooling** represents a strategic investment in India's human capital. If implemented equitably and ethically, this reform can **democratise technological competence**, bridge future skill gaps, and empower learners not merely to **use AI**, but to **shape it for inclusive growth and public good** in a rapidly evolving digital world.

Keywords: *AI literacy, Computational thinking, Meta-skills, Inclusive education, Future readiness*

📝 Mains Practice Question

"Introducing Artificial Intelligence and Computational Thinking in school education can transform India's human capital for the digital age. Analyse its potential benefits and implementation challenges, and suggest a way forward aligned with India's education policy objectives."

World Summit on Social Development

📌 Syllabus Mapping

- **GS Paper II** – *International Organisations, Global Governance, Social Justice*
- **GS Paper I** – *Social Issues, Poverty, Employment, Inequality*
- **GS Paper III** – *Inclusive Growth, Human Development*
- **Essay Paper** – *Social Development, Global Inequality*

Introduction

The **Second World Summit for Social Development**, concluded in **Doha, Qatar**, marks a critical moment in global efforts to re-centre **social development** amid rising inequality, poverty, job insecurity, and demographic transitions. With the adoption of the **Doha Political Declaration**, the international community reaffirmed its commitment to the principles first articulated at the **1995 Copenhagen World Summit**, while aligning them with the contemporary challenges of the **2030 Agenda for Sustainable Development**.

Why in News?

- The **Second World Summit for Social Development** concluded with the adoption of the **Doha Political Declaration of the "World Social Summit"**.
- The Summit sought to **recommit, review, and revitalise** the implementation of the **Copenhagen Declaration on Social Development and Programme of Action**.

About the Second World Summit for Social Development

Convening Authority

- Convened by the **United Nations General Assembly**
- Mandated through **UNGA Resolutions 78/261 and 78/318**

Historical Context

- **First World Summit for Social Development (1995):**
  - Held in **Copenhagen, Denmark**
  - Established a global consensus on **poverty eradication, employment generation, and social integration**

Core Aim of the 2nd Summit

- Address implementation gaps in social development commitments
- Reaffirm and update the **Copenhagen Declaration**
- Provide renewed momentum for achieving the **2030 Agenda and SDGs**

Copenhagen Declaration on Social Development: Core Commitments

The Declaration rests on **10 interlinked commitments**, including:

1. **Creating an enabling environment** for social development
2. **Eradicating absolute poverty**
3. **Promoting full, productive employment**
4. **Advancing social integration**
5. **Achieving gender equality and equity**
6. **Universal access to education and health services**
7. **Accelerating development in Africa and LDCs**
8. **Integrating social goals into economic reforms**
9. **Mobilising adequate resources for social development**
10. **Strengthening international cooperation**

These commitments form the **normative foundation** of global social policy.

Major Outcomes of the Doha Political Declaration

1. Renewed Commitment to Copenhagen Framework

- Reaffirms the **Copenhagen Declaration and Programme of Action** as the cornerstone of global social development.

2. Three Pillars of Social Development Re-emphasised

The Declaration reiterates social development as a function of **three mutually reinforcing pillars**:

- **Poverty eradication**
- **Full and productive employment and decent work for all**
- **Social inclusion**

3. Institutional Follow-up and Monitoring

- The **UN Commission for Social Development**, under **ECOSOC**, retains **primary responsibility** for:
  - Monitoring
  - Review
  - Policy guidance on implementation

4. Financing for Social Development

- Reaffirms the **Addis Ababa Action Agenda (AAAA)** on Financing for Development.
- Welcomes the **Sevilla Commitment**, aimed at renewing the global financing framework.

Key Emphasis:

- Reforming the **global financial architecture**
- Ensuring **equitable access to development and climate finance**
- Supporting developing countries facing **debt distress**

Key Side Events and Their Significance

1. Global Alliance Against Hunger and Poverty

- First high-level meeting of the Alliance.
- Launched under **Brazil's G20 Presidency (2024)**.
- Focus: Coordinated global action against hunger and extreme poverty.

2. Private Sector Forum

- Co-hosted by:
  - **International Organisation of Employers**
  - **UN Global Compact**
  - **UN DESA**
- Explored how businesses can promote:
  - Inclusive growth
  - Decent work
  - Social responsibility

Analytical Perspective

Relevance in a Post-Pandemic World

- Rising inequality, informalisation of labour, and demographic stress have weakened social cohesion.
- The Summit reflects a shift from **growth-centric** to **people-centric development**.

Global South Perspective

- Strong emphasis on:
  - Africa
  - Least Developed Countries (LDCs)
- Aligns with India's consistent advocacy for **equity, debt relief, and development finance reform**.

Link with SDGs

- Directly supports:
  - **SDG 1 (No Poverty)**
  - **SDG 8 (Decent Work)**
  - **SDG 10 (Reduced Inequalities)**
  - **SDG 16 (Inclusive Institutions)**

India's Stakes and Relevance

- India's priorities such as:
  - Poverty alleviation
  - Employment generation
  - Social inclusion
- Are aligned with:
  - **Copenhagen commitments**
  - **Doha Declaration**
- Reinforces India's role as a **voice of the Global South** in shaping inclusive global governance.

Challenges Ahead

- Translating political declarations into **measurable outcomes**
- Financing gaps for social protection
- Fragmented global governance mechanisms
- Rising geopolitical tensions diverting attention from social agendas

Way Forward

- **Integrate social development goals** into macroeconomic and fiscal planning.
- Reform **international financial institutions** for fair access to finance.
- Strengthen **social protection systems**, especially for vulnerable groups.
- Foster **multi-stakeholder partnerships**, including private sector and civil society.
- Enhance **data-driven monitoring** under ECOSOC mechanisms.

Conclusion

The **Second World Summit for Social Development** and the **Doha Political Declaration** represent a renewed global consensus that **economic growth without social justice is unsustainable**. By reaffirming the Copenhagen commitments and adapting them to contemporary realities, the Summit seeks to rebuild the **global social compact**—placing **people, dignity, and inclusion** at the heart of development in an increasingly unequal world.

Keywords: *Social development, Poverty eradication, Decent work, Social inclusion, Global governance*

📝 Mains Practice Question

"The Doha Political Declaration adopted at the Second World Summit for Social Development seeks to revitalise the global social development agenda. Examine its key commitments and assess their relevance for achieving inclusive and sustainable development in the Global South."

GEOGRAPHY AND DISASTER

Cryosphere Report 2025

📌 Syllabus Mapping

- **GS Paper III** – *Climate Change, Environment, Disaster Risk*
- **GS Paper I** – *Physical Geography (Cryosphere, Ocean Currents, Glaciation)*
- **GS Paper II** – *International Reports, Global Environmental Governance*

Introduction

The **State of the Cryosphere Report 2025**, released by the **International Cryosphere Climate Initiative (ICCI)**, presents compelling scientific evidence that Earth's frozen systems are undergoing **rapid, non-linear, and potentially irreversible changes**. The report highlights the cascading global impacts of cryosphere degradation on **sea level rise, water security, climate stability, and human livelihoods**.

Why in News?

- ICCI released the **State of the Cryosphere Report 2025**, assessing the condition of **five critical cryosphere components** and their implications for global climate systems.
- The findings reinforce that **warming beyond 1.5°C poses existential risks** to cryosphere-dependent natural and human systems.

Understanding the Cryosphere

The **cryosphere** includes all forms of **frozen water** on Earth, such as:

- Ice sheets
- Glaciers and snow cover
- Sea ice
- Permafrost
- Polar oceans (interacting ice–ocean systems)

It acts as a **planetary thermostat**, reflecting solar radiation (albedo effect) and regulating **ocean circulation and climate feedbacks**.

Key Findings of the State of the Cryosphere Report 2025

1. Ice Sheets (Greenland & Antarctica)

Findings: Ice loss from **Greenland and Antarctic ice sheets** has **quadrupled since the 1990s**.

Impacts

- Accelerated **global sea-level rise**.
- Permanent inundation risks for:
  - Coastal cities
  - Agricultural deltas
  - Island nations
- Loss of infrastructure, housing, and livelihoods.

UPSC Angle: Threat to coastal India, especially **Sundarbans, Odisha coast, Mumbai Metropolitan Region**.

2. Polar Oceans

Findings

- Rising greenhouse gas concentrations are weakening the oceans' role as:
  - Heat absorbers
  - Carbon sinks
  - Drivers of global circulation
- Two critical circulation systems have slowed:
  - **Antarctic Overturning Circulation (AOC)**
  - **Atlantic Meridional Overturning Circulation (AMOC)**

Cause: Freshwater influx from ice melt reduces salinity and density, disrupting circulation.

Impacts

- Altered global climate patterns
- Increased extreme weather events
- Long-term climate instability

3. Mountain Glaciers and Snow

Findings

- Global glacier ice loss is accelerating exponentially.
- **273 gigatonnes per year** lost between **2000–2023**.

Impacts

- Severe risks to:
  - **Water security** (glacier-fed rivers)
  - **Food security** (irrigation-dependent agriculture)
  - **Economic stability** (hydropower, tourism)
  - **Political stability** (transboundary river disputes)

India-Specific Relevance: Himalayan glacier retreat affects **Indus, Ganga, and Brahmaputra basins**.

4. Sea Ice

Findings: Sea ice **extent and thickness declined by 40–60%** at both poles since **1979**.

Impacts

- **Arctic amplification** due to reduced albedo.
- Threats to ice-dependent species (polar bears, seals).
- Disruption of:
  - Atmospheric circulation
  - Ocean currents
- Indirect contribution to sea-level rise through ice-sheet destabilisation.

5. Permafrost

Findings: Over **210,000 km² of permafrost thawing per decade** since current warming began.

Impacts

- Release of vast amounts of **ancient organic carbon**:
  - Nearly **three times more than current atmospheric carbon**.
- Shrinking global carbon budget.
- Damage to infrastructure in polar and sub-polar regions.

Climate Feedback: Creates a **positive feedback loop**, accelerating warming.

Cross-Cutting Implications

- **Climate Feedback Loops:** Cryosphere loss accelerates warming → warming accelerates cryosphere loss.
- **Global Inequality:** Least responsible regions (developing countries, small islands) face **disproportionate impacts**.
- **Security Dimension:** Water stress, migration, and food insecurity raise risks of **climate-induced conflicts**.

Analytical Perspective

- Reinforces **precautionary principle** and **intergenerational equity**.
- Demonstrates limits of adaptation beyond certain warming thresholds.
- Highlights urgency of **mitigation-first climate strategy**.

As climate economist **Nicholas Stern** notes, *"The costs of inaction are far greater than the costs of action."*

Way Forward

- **Limit warming to 1.5°C** through deep emission cuts.

- Integrate cryosphere risks into:
  - National climate policies
  - Disaster management plans
- Strengthen **early warning systems** for glacial lake outburst floods (GLOFs).
- Enhance **international climate cooperation**, especially polar research.
- Increase **adaptation finance** for cryosphere-dependent regions.

Conclusion

The **State of the Cryosphere Report 2025** delivers an unequivocal message: **Earth's frozen systems are nearing irreversible tipping points**. Protecting the cryosphere is no longer a distant environmental concern but a **central pillar of climate stability, human security, and sustainable development**. Immediate and ambitious climate action remains the **only viable pathway** to avert catastrophic consequences.

Keywords: *Cryosphere, Ice-sheet loss, AMOC slowdown, Permafrost thaw, Climate tipping points*

📝 Mains Practice Question

"The State of the Cryosphere Report 2025 highlights rapid and irreversible changes in Earth's frozen systems. Examine the implications of cryosphere degradation for global climate stability and human security, with special reference to developing countries like India."

HISTORY, ART & CULTURE

Decolonising the Indian Mind

📌 Syllabus Mapping

- **GS Paper I** – *Modern Indian History, Cultural Developments*
- **GS Paper II** – *Governance, Constitution, Public Policy*
- **GS Paper IV** – *Ethics, Values, Social Justice*
- **Essay Paper** – *Culture, Identity, Decolonisation*

Introduction

The call for **decolonising the Indian mind** has regained national prominence following the Prime Minister's appeal for a **10-year national pledge** to shed the **colonial mindset** rooted in the intellectual and administrative legacy of **Thomas Babington Macaulay**. The discourse goes beyond symbolism and addresses the **deep psychological, institutional, and epistemic imprints** left by colonial rule on Indian society.

Why in News?

- The Prime Minister urged sustained efforts to remove **colonial intellectual conditioning**, arguing that colonial policies deliberately **detached Indians from their civilisational confidence**.
- The reference point remains **Macaulay's 19th-century reforms**, particularly in education and law, which shaped India's modern institutions.

Macaulay's Role in Colonial Administration

1. Educational Reforms

- As President of the **Committee of Public Instruction**, Macaulay ended the debate between:
  - **Orientalists** (Indian languages and knowledge systems)
  - **Anglicists** (Western education through English)
- His **Minute on Education (1835)**:
  - Established **English as the medium of instruction**
  - Prioritised Western science and literature over indigenous learning
- Objective: Create an intermediary class

"Indian in blood and colour, but English in taste, opinions, morals, and intellect."

Downward Filtration Theory

- Focused on educating a **small English-educated elite**, assuming knowledge would trickle down.
- Result: Neglect of **mass elementary education**.

2. Legal and Administrative Reforms

- First **Law Member of the Governor-General's Council** (1834–38) under the Charter Act, 1833.
- As Chairman of the **First Law Commission (1835)**:
  - Codified criminal law → **Indian Penal Code (1860)**
  - **Civil Procedure Code (1859)**
  - **Criminal Procedure Code (1861)**
- Removed legal privileges of British settlers.

3. Civil Services

- **Macaulay Committee (1854)** introduced **merit-based competitive examinations**, replacing patronage.
- Emphasised generalist education, favouring graduates from **Oxford and Cambridge**.

4. Social Liberalism (Contradictory Legacy)

- Advocated:
  - Freedom of the press
  - Abolition of slavery
  - Women's property rights
  - Free trade and movement
- Yet these reforms coexisted with **cultural hierarchy and racial superiority**.

Colonial Mindset: Key Dimensions

1. Psychological Inferiority

- Indigenous knowledge systems in **science, philosophy, medicine, and arts** were delegitimised.
- Resulted in a **loss of civilisational self-confidence**.

2. Language Hierarchy

- English became the language of:
  - Courts
  - Higher education
  - Social mobility
- Accessibility concern:
  - Former CJI **D. Y. Chandrachud** noted that *legal English is incomprehensible to 99.9% of citizens*.

3. Cultural Westernisation

- Western dress, food habits, etiquette, and art equated with "professionalism" and "modernity".
- Indigenous cultural expressions were often seen as inferior or informal.

4. Laws and Institutions

- Colonial laws (IPC, forest laws, sedition) prioritised **control over citizen welfare**.
- Institutional culture remained **command-and-control oriented**.

5. Economic and Knowledge Systems

- Colonial economic models encouraged **resource extraction and private capital**, contributing to impoverishment.
- Traditional medicine systems like **Ayurveda and Siddha** were labelled unscientific, while Western medicine was institutionalised.

Impacts of the Colonial Mindset

- **Bureaucratic Overreach:** License-permit raj, intrusive policing.
- **Foreign Validation Syndrome:** Over-reliance on Western benchmarks in academia and policy.
- **Colourism:** Preference for lighter skin linked to colonial racial hierarchies.
- **Social Rigidities:** Colonial census practices hardened caste identities.

Historical Movements Against Colonial Conditioning

Socio-Cultural Reform

- **Arya Samaj (1875)** – *"Back to the Vedas"*.
- **Ramakrishna Mission (1897)** – Universalism and Indian spirituality.

Economic & Cultural Resistance

- **Swadeshi Movement (1905–08)** – Indigenous goods, art, and industry.
- **Mahatma Gandhi** viewed swadeshi as economic self-reliance.

Art & Historiography

- **Bengal School of Art** led by **Abanindranath Tagore** rejected Western realism.
- Nationalist historians like **R. C. Majumdar** and **M. G. Ranade** reclaimed Indian historical agency.

Post-Independence & Contemporary Initiatives

Legal and Institutional Reforms

- Repeal of **1,500+ obsolete colonial laws**.
- Replacement of IPC, CrPC, Evidence Act with:
  - **Bharatiya Nyaya Sanhita (BNS)**
  - **Bharatiya Nagarik Suraksha Sanhita (BNSS)**
  - **Bharatiya Sakshya Adhiniyam (BSA)**

Education & Knowledge Revival

- **National Education Policy (NEP) 2020**:
  - Emphasis on **mother-tongue instruction**
  - Promotion of Indian knowledge systems
- Establishment of **WHO Global Centre for Traditional Medicine (2022)** at Jamnagar.
- India to co-host **WHO Global Summit on Traditional Medicine (Dec 2025)**.

Symbolic and Cultural Measures

- Renaming:
  - **Rajpath → Kartavya Path**
  - **Race Course Road → Lok Kalyan Marg**
- **New Naval Ensign** removing St George's Cross.
- **Biplobi Bharat Gallery** at Victoria Memorial, Kolkata.

Way Forward: Towards Cognitive Decolonisation

1. Panch Pran Vision

- Developed India
- Removing colonial mindset
- Pride in heritage
- Unity
- Citizen duty

2. Cognitive & Epistemic Renewal

- Promote **Indian languages**, plural knowledge systems.
- Encourage **epistemic de-linking** and **epistemic reconstruction** (accepting multiple ways of knowing).

3. Behavioural and Economic Shift

- Self-reliant innovation
- Sustainable lifestyles (e.g., **Mission LiFE**)
- Community-centred development

4. Cultural Revival with Constitutional Balance

- Revive traditions while upholding:

- **Scientific temper**
- **Social justice**
- **Constitutional morality**

Conclusion

Decolonising the Indian mind is not a rejection of modernity but a **reclaiming of intellectual autonomy**. It requires dismantling inherited hierarchies in **language, knowledge, governance, and culture**, while harmonising **civilisational pride with constitutional values**. True decolonisation lies in building a confident India that **engages the world on its own terms**.

Keywords: *Colonial mindset, Cognitive decolonisation, Macaulayism, Indigenous knowledge, Epistemic plurality*

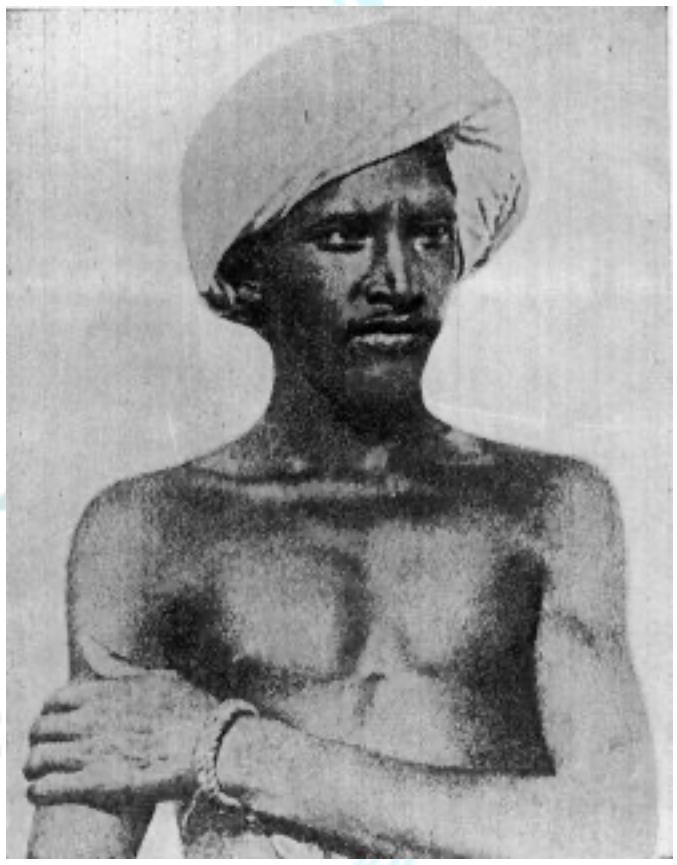
📝 Mains Practice Question

"Colonial rule in India left behind not only administrative structures but also a lasting psychological and epistemic imprint. Examine the nature of the colonial mindset and evaluate contemporary efforts aimed at decolonising the Indian mind."

Birsa Munda and Tribal Resistance

📌 Syllabus Mapping

- **GS Paper I** – *Modern Indian History, Tribal Movements*
- **GS Paper II** – *Social Justice, Scheduled Tribes*
- **GS Paper IV** – *Ethics: Social Reform, Leadership*
- **Essay Paper** – *Indigenous Resistance and Nation-Building*



Introduction

The observance of **Janjatiya Gaurav Divas** commemorating the **150th birth anniversary** of **Bhagwan Birsa Munda**underscores India's renewed emphasis on recognising **tribal contributions to the freedom struggle**. Birsa Munda emerged as a charismatic leader who fused **spiritual reform with political resistance**, challenging colonial exploitation and asserting indigenous rights over land and culture.

Why in News?

- India marked **Janjatiya Gaurav Divas (15 November)** to honour **Bhagwan Birsa Munda**, a seminal tribal leader and freedom fighter revered as **"Dharti Aaba" (Father of the Earth)**.

Early Life and Social Background

- **Born:** 1875, **Ulihatu**, Khunti district (present-day **Jharkhand**).
- **Community:** Belonged to the **Munda tribe** of the **Chhotanagpur plateau**.
- Grew up amid **rapid socio-economic disruptions** caused by colonial land policies, missionary activity, and the intrusion of outsiders (*dikus*).

Teachings and Religious-Social Reform

Monotheism and Birsait Movement

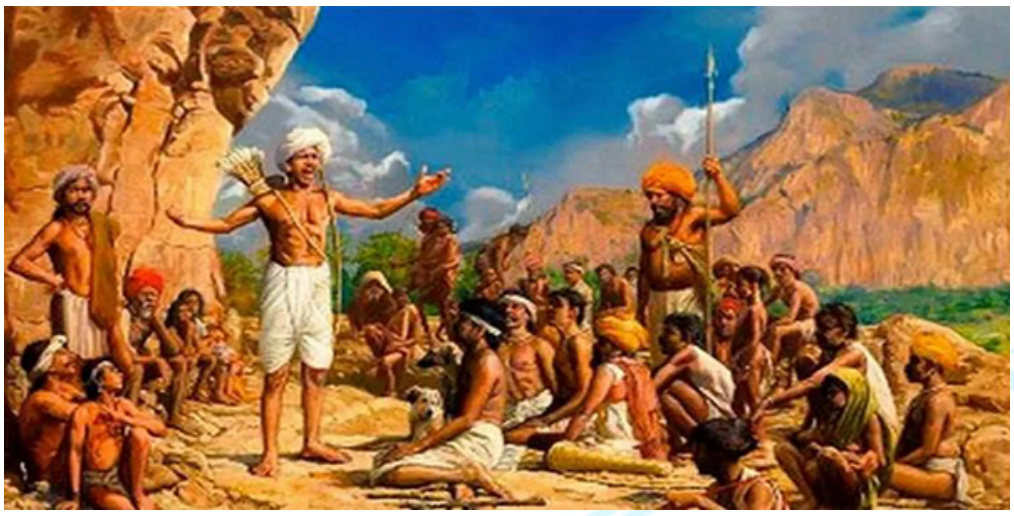
- Founded the **Birsait sect**, advocating **belief in one God**.
- Sought **religious revivalism** rooted in indigenous traditions, resisting missionary influence.

Moral and Social Discipline

- Emphasised:
  - **Cleanliness and hard work**
  - **Abstinence from alcohol**
  - **Personal and social purity**
- His reformist message aimed to **restore tribal dignity and cohesion**.

Colonial Resistance: The Ulgulan (Munda Rebellion)

- **Nature of the Movement:** Launched the **Ulgulan (Great Tumult)** in **1899**, a mass tribal uprising against British rule.
- **Slogan:** *"Abua Raj Setarjana, Maharani Raj Tundujana"*
  (**End the Queen's rule; establish our own rule**)



Causes of the Munda Rebellion

Land Alienation: **Permanent Settlement Act, 1793** undermined the **khuntkatti system** (communal clan-based land ownership of forest clearers).

Erosion of Traditional Institutions: Replacement of **tribal councils** with colonial courts weakened customary justice.

Economic Exploitation

- **Beth Begari:** Forced and unpaid labour.
- Dependence on **moneylenders**, leading to indebtedness and loss of land.

Objectives of the Revolt

- Overthrow **colonial authority** in Munda regions.
- Expel **dikus**—zamindars, moneylenders, and colonial agents.
- Restore **tribal control over land** by reviving the **khuntkatti system**.
- Establish **"Birsa Raj"**, an autonomous Munda polity free from British laws.

Outcomes and Legacy

Immediate Impact

- Although the uprising was suppressed, it compelled colonial authorities to **reconsider tribal policies**.

Structural Reforms

- **Reduction of Begar system** (forced labour).
- **Chotanagpur Tenancy Act, 1908**:
  - Prohibited transfer of tribal land to non-tribals.
  - Provided long-term legal protection to Adivasi land rights.

Death and Enduring Legacy

- **Died:** 1900, **Ranchi Jail**, due to cholera, at a young age.
- Revered as **Bhagwan** and remembered as **Dharti Aaba**.
- **15 November** is celebrated nationally as **Janjatiya Gaurav Divas**, symbolising **tribal pride and resistance**.

Analytical Perspective

- **Tribal Nationalism:** Birsa's movement represented an early form of **indigenous nationalism**, distinct from mainstream elite-led movements.
- **Socio-Religious Mobilisation:** Combined **spiritual reform with political resistance**, akin to later mass movements.
- **Constitutional Continuity:** His struggle informs contemporary debates on **tribal land rights**, **Fifth Schedule protections**, and **forest governance**.

Conclusion

Bhagwan Birsa Munda stands as a symbol of **tribal assertion, ecological stewardship, and resistance to exploitation**. His legacy transcends rebellion—shaping legal safeguards for tribal communities and enriching India's freedom narrative with an indigenous, grassroots dimension grounded in **justice, dignity, and self-rule**.

Keywords: *Ulgulan, Khuntkatti, Tribal resistance, Dharti Aaba, Land rights*

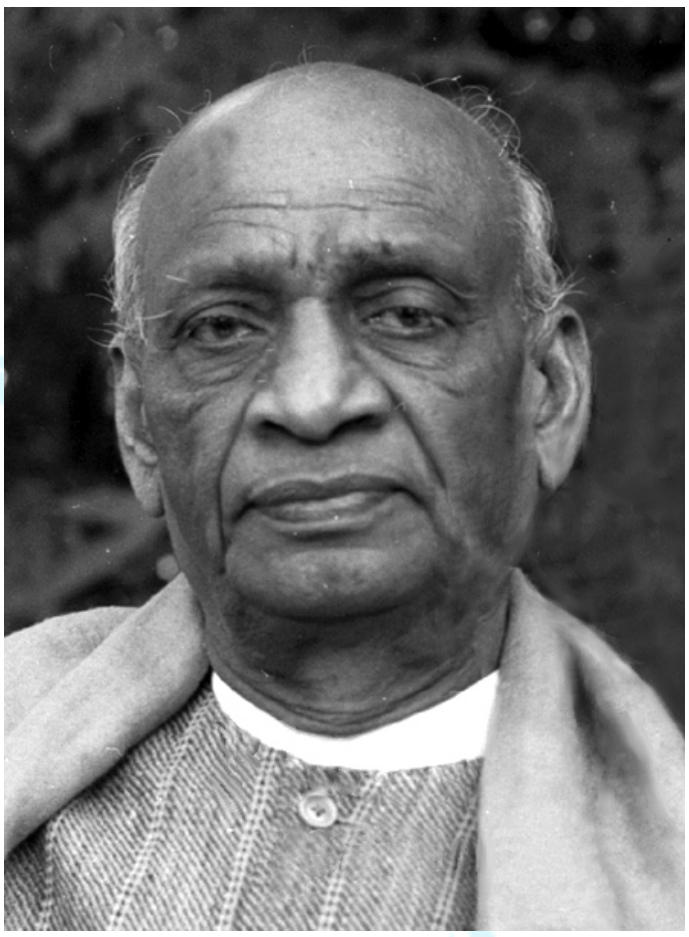
📝 Mains Practice Question

"Bhagwan Birsa Munda's movement was both a socio-religious reform and a political uprising. Analyse the causes, objectives, and legacy of the Ulgulan in the context of India's tribal resistance to colonial rule."

Sardar Vallabhbhai Patel: The Architect of India's Unity

📌 Syllabus Mapping

- **GS Paper I** – *Modern Indian History (Freedom Struggle, Integration of Princely States)*
- **GS Paper II** – *Governance, Constitution, Federalism*
- **GS Paper IV** – *Ethics: Leadership, Integrity, Public Service*
- **Essay Paper** – *National Integration and Leadership*



Introduction

The 150th birth anniversary of **Sardar Vallabhbhai Patel** rekindles national attention on a leader whose **decisive statesmanship and administrative firmness** ensured India's territorial integrity at a critical historical juncture. Observed since 2014 as **Rashtriya Ekta Diwas (National Unity Day)**, the occasion underscores Patel's enduring relevance to **unity, governance, and public service**.

Why in News?

- The Prime Minister paid tributes to Sardar Patel on his **150th birth anniversary**.
- **31 October** is observed as **National Unity Day**, commemorating Patel's role as the **Consolidator of India**.

Early Life and Career

- **Born:** 31 October 1875, **Nadiad, Gujarat**
- **Family background:** His father, Jhaverbhai Patel, served in **Rani Lakshmibai's army** during the **1857 Revolt**.
- **Education & Profession:**
  - Matriculated in 1897; studied law in England.
  - Returned in 1913 to establish a successful legal practice in **Ahmedabad**.

Political Rise and Key Offices

- **Municipal Leadership:**
  - Elected to **Ahmedabad Municipal Corporation** (1917) as Sanitation Commissioner.
  - President, **Ahmedabad Municipal Board** (1924).
- **Congress Leadership:**
  - President, **Gujarat Pradesh Congress Committee** (1920).
  - President, **Karachi Session of the Congress (1931)**—adopted resolutions on **Fundamental Rights** and **Economic Policy**.
- **Constitution-Making:**
  - Member, **Constituent Assembly** (Bombay).
  - Chairman, **Provincial Constitution Committee**.
  - Member, **Advisory Committee on Fundamental Rights, Minorities, Tribal and Excluded Areas**.
- **Executive Roles:**
  - **Home and Information & Broadcasting Minister**, Interim Government.
  - **First Home Minister and Deputy Prime Minister of Independent India**.
- **Honours:** Posthumously awarded **Bharat Ratna (1991)**.

Role in the Freedom Struggle

- **Kheda Satyagraha (1918):** Led peasants in refusing land revenue amid famine; marked Patel's **first major mass victory** and close association with **Mahatma Gandhi**.
- **Non-Cooperation Movement (1919–20):** Organised the movement in Gujarat; helped institutionalise grassroots mobilisation through **Satyagraha Sabha**.
- **Bardoli Satyagraha (1928):** Orchestrated a successful tax resistance; earned the title **"Sardar" (Leader)** for resolute yet disciplined leadership.

Integration of Princely States: Nation-Building in Action

- At Independence, **over 560 princely states** (≈40% of territory and population) faced accession choices under the **Indian Independence Act, 1947**.
- Patel combined **persuasion, diplomacy, and firm action** to avert balkanisation:
  - **Junagadh (1948):** Accession via **plebiscite**.

  - **Jammu & Kashmir (1947):** Accession through **Instrument of Accession** amid external aggression.
  - **Hyderabad (1948):** Integrated through **Operation Polo**.
- This resolute consolidation earned him the sobriquet **"Iron Man of India."**

Institutional Contributions

All India Services: Championed IAS/IPS as the **"steel frame of India"**—professional, neutral, and integrity-driven administration.

Cooperative Movement: Pioneered cooperatives in Gujarat; instrumental in **Kaira District Cooperative Milk Producers' Union (Amul's precursor)**.

Ek Bharat Shreshtha Bharat (EBSB)

- Launched on **31 October 2015**, reflecting Patel's vision to:
  - Strengthen emotional bonds,
  - Foster inter-state engagement,
  - Celebrate cultural diversity, and
  - Promote best-practice exchange.

Statue of Unity: Inaugurated in **2018 at Kevadia, Gujarat**, as a national symbol of unity and leadership.

Values and Administrative Philosophy

- **Co-existence:** Balanced industrial growth with village and cottage industries.
- **Mediation:** Favoured dialogue in labour–industry relations.
- **Democracy:** Upheld liberty, equality, justice; supported autonomous institutions.
- **Administrative Firmness:** Advocated integrity and accountability in civil services.
- **Decentralisation:** Supported **Panchayati Raj**—later constitutionalised via **73rd & 74th Amendments**.
- **Education:** Emphasised mother-tongue instruction and holistic learning.

Analytical Perspective

- **Federalism & Unity:** Patel's integration strategy balanced **federal accommodation with national consolidation**.
- **Governance:** His insistence on professional civil services remains foundational to state capacity.
- **Ethics:** Demonstrates **principled pragmatism—**ends pursued through lawful, firm means.

Conclusion

Sardar Vallabhbhai Patel (d. 15 December 1950) left an indelible imprint as the **Consolidator of India**. His legacy—**unity with diversity, firm governance with democratic values, and service with integrity**—offers enduring guidance for contemporary challenges of federal balance, internal security, and administrative reform.

Keywords: *National integration, Princely states, Iron Man of India, All India Services, Federalism*

📝 Mains Practice Question

"Sardar Vallabhbhai Patel's leadership was crucial to the political integration of India after Independence. Examine his methods and assess their relevance for managing federal challenges in contemporary India."

150 Years of Arya Samaj

📌 Syllabus Mapping

- **GS Paper I** – *Modern Indian History, Socio-religious Reform Movements*
- **GS Paper II** – *Social Justice, Education*
- **GS Paper IV** – *Ethics: Social Reform, Values*
- **Essay Paper** – *Reform Movements and Nation-Building*

Introduction

The commemoration of **150 years of the Arya Samaj** alongside the **200th birth anniversary of Maharshi Dayanand Saraswati** has renewed attention to one of India's most influential **socio-religious reform movements**. Founded in 1875, the Arya Samaj sought to regenerate Hindu society through **Vedic revivalism, rational inquiry, and social equality**, leaving a lasting imprint on education, nationalism, and social reform.

Why in News?

- The Prime Minister addressed the **International Arya Summit 2025** during the **Jñāna Jyoti Festival**, marking:
  - **150 years of the Arya Samaj**
  - **200 years since the birth of Dayanand Saraswati**

About the Arya Samaj

Foundation and Nature

- **Founded:** 1875, Bombay (Mumbai)
- **Founder:** Maharshi Dayanand Saraswati
- **Ideology:** A **revivalist reform movement** advocating a return to the **Vedas** as the pure source of religious truth.
- **Motto:** *Krinvanto Vishvam Aryam* — **"Make the world noble."**

Organisational Structure

- **Decentralised units:** Each local Samaj functioned autonomously in villages and towns.
- **Democratic governance:** Executive committees elected annually by ballot.
- **Inclusive membership:** Open irrespective of caste; acceptance of **ten core tenets**, modest financial contribution (≈1% income), and participation in activities.

Global Presence

- Active branches across **Asia, Africa, Europe, North America, and Australia**.

Core Tenets (Essence)

- **Monotheism** and **authority of the Vedas**
- **Rejection of idol worship** and ritual excess
- **Rationalism and scientific temper**
- **Social equality**, including opposition to caste discrimination
- **Education for all**, including women

Key Contributions of the Arya Samaj

1. Religious Reform

- Advocated **Vedic monotheism** and ethical living.
- Initiated **Śuddhi (purification)** to reconvert those who had left Hinduism.
- Disseminated Vedic teachings through campaigns like **Kumbh Ved Abhiyaan**.

2. Social Reform

- Early opposition to **untouchability**; inclusion of marginalised groups.
- Campaigns against **superstition, child marriage**, and social dogma.
- **Hyderabad Satyagraha (1938–39):** Protested restrictions on Vedic propagation under the Nizam; its role acknowledged during Hyderabad's integration.

3. Women's Emancipation

- Established girls' institutions such as **Kanya Mahavidyalaya (Jalandhar)** and **Hans Raj Mahila Mahavidyalaya**.
- Promoted **women's education**, widow remarriage, and gender equality.

4. Educational Reform

- **DAV (Dayanand Anglo-Vedic) Movement:** Blended modern science with Vedic ethics (first DAV school, Lahore, 1886).
- **Gurukul Kangri (1902):** Residential model emphasising Vedic learning and discipline.

5. National Movement

- Though non-political by claim, it catalysed **national awakening**:
  - Support for **Hindi**, **Swadeshi**, **Khadi**, and civil resistance.
- Inspired leaders like **Lala Lajpat Rai**, **Bhagat Singh**, **Swami Shraddhanand**, **Ram Prasad Bismil**, and others.

6. Humanitarian Service

- Relief during famines (Bikaner 1895; Awadh 1907–08) and disasters (e.g., Gujarat earthquake, 2001).

Dayanand Saraswati: The Ideologue

Life and Thought

- **Born:** 1824, Morbi (Kathiawar, Gujarat)
- **Education:** Sanskrit and Vedic learning; disciple of **Swami Virjanand Saraswati**.
- **Call: "Back to the Vedas."**
- **Work:** *Satyarth Prakash* — argued for monotheism, rational faith, and social reform.
- **Social Vision:** Gender equality; opposition to child marriage; advocacy of education in **Hindi (Devanagari)**.
- **Nationalism:** Credited with early use of **"Swaraj"** (1875).
- **Legacy:** Called a **"maker of modern India"** by Dr. S. Radhakrishnan.

Contemporary Relevance

- **Rationalism:** Countering superstition through critical inquiry.
- **Social Justice:** Ongoing struggle against caste discrimination.
- **Sustainable Living:** Vedic ethics informing **environmental consciousness**; aligns with **Mission LiFE**.
- **Women Empowerment:** Resonates with present-day leadership across sectors.
- **Education for Dignity:** Emphasis on inclusive, value-based learning.

Conclusion

After 150 years, the **Arya Samaj** remains a potent force for **ethical reform, education, and social equality**. Its synthesis of **Vedic wisdom with modern rationalism**, and its role in shaping national consciousness, continue to offer guidance for addressing contemporary challenges—making it a **living tradition** in India's socio-cultural landscape.

Keywords: *Vedic revivalism, Social reform, DAV movement, Rationalism, National awakening*

📝 Mains Practice Question

"The Arya Samaj played a pivotal role in India's socio-religious reform and national awakening. Critically examine its contributions and assess its relevance in contemporary Indian society."

Lucknow: Creative City of Gastronomy

📌 Syllabus Mapping

- **GS Paper I** – *Indian Culture, Art Forms, Architecture, Heritage*
- **GS Paper II** – *International Organisations, UNESCO*
- **GS Paper III** – *Tourism, Inclusive Urban Development*
- **Essay Paper** – *Culture-led Development*

Introduction

The designation of **Lucknow** as a **UNESCO 'Creative City of Gastronomy'** marks a significant recognition of India's **living culinary heritage**. It positions gastronomy as a driver of **culture-led urban development**, linking heritage preservation with livelihoods, tourism, and sustainable cities.

Why in News?

- Lucknow has been designated a **Creative City of Gastronomy** by UNESCO, becoming **India's second city** after **Hyderabad** to receive this honour.

Historical and Cultural Context of Lucknow

Nawabi Legacy

- In **1775**, **Nawab Asaf-ud-daulah** shifted the Awadh capital to Lucknow, elevating it into a centre of **refinement and courtly culture**.
- The city earned epithets such as **"Shiraz-i-Hind"** and **"Constantinople of the East"** for excellence in **poetry, music, arts, and cuisine**.

Culinary Evolution

- Royal kitchens patronised **bawarchis** and **rakabdars**, perfecting the **Dum Pukht** technique—slow cooking in sealed vessels.
- Signature dishes include **kebabs, kormas, biryanis, sheermal, and shahi tukda**, reflecting a blend of **Mughlai and Awadhi traditions**.

Tangible and Intangible Heritage Assets

Architectural Synthesis (Tangible)

- Iconic monuments: **Bara Imambara, Chota Imambara, Rumi Darwaza, Bhul Bhulaiya**.
- Distinctive Nawabi features: **fish motifs**, **baradari (twelve-door pavilion)**, **chhattars**, and **lakhauri bricks**—a fusion of Mughal and Awadhi styles.

Cultural Practices (Intangible)

- **Lucknowi cuisine**, **Urdu poetry and ghazals**, **Kathak dance**, and **Chikankari embroidery** form the city's living cultural ecosystem.

About the UNESCO Creative Cities Network (UCCN)

- **Established:** 2004
- **Nature:** UNESCO's flagship city programme
- **Fields Covered (8):** Architecture, Crafts & Folk Art, Design, Film, **Gastronomy**, Literature, Music, Media Arts.
- **Objectives:**
  - Promote **culture- and creativity-driven urban development**.
  - Place culture at the centre of **inclusive, resilient, and sustainable cities**.
  - Align with **SDG 11 (Sustainable Cities and Communities)**.
- **Process:** City nominations are routed via State Tourism → Ministry of Culture → UNESCO's biennial Call for Applications.

Significance of the Designation

1. **Cultural Diplomacy:** Enhances India's **soft power** by showcasing regional cuisines on a global platform.
2. **Urban Development:** Integrates **heritage conservation** with **urban planning**, supporting place-based development.
3. **Livelihoods and MSMEs:** Improves **market access, training, and branding** for local chefs, vendors, and artisans.
4. **Tourism Diversification:** Enables **food-led tourism circuits**, reducing seasonality and dispersing tourist flows.

Challenges to Leverage the Tag

- Risk of **commercialisation** diluting authenticity.
- Need for **food safety, standardisation**, and skill upgradation.
- Ensuring **inclusive benefits** for street vendors and small entrepreneurs.

Way Forward

- Create **culinary clusters** and incubators for local food entrepreneurs.
- Document and certify **traditional recipes and techniques**.
- Link gastronomy with **heritage walks**, crafts, and performance arts.
- Promote **sustainable sourcing** and waste reduction in food tourism.

Conclusion

Lucknow's recognition as a **UNESCO Creative City of Gastronomy** is both an honour and an opportunity—to safeguard a **living culinary tradition**, catalyse **inclusive urban growth**, and position food as a bridge between **heritage and modern livelihoods**. Strategic governance and community participation can ensure that gastronomy becomes a sustainable engine of development.

Keywords: *Awadhi cuisine, Dum Pukht, Creative Cities, Cultural heritage, Food tourism*

📝 Mains Practice Question

"UNESCO's Creative Cities Network uses culture as a lever for sustainable urban development. In this context, examine the significance of Lucknow's designation as a Creative City of Gastronomy for heritage conservation and local livelihoods."

ENVIRONMENT & ECOLOGY

UNFCCC COP-30: From Climate Pledges to Climate Delivery

📌 Syllabus Mapping

- **GS Paper III** – Environment & Climate Change
  - Climate change mitigation and adaptation
  - International environmental agreements
- **GS Paper II** – International Relations
  - Global governance
  - North–South cooperation
  - Multilateral institutions

Introduction

The **30th Conference of Parties (COP-30)** to the **United Nations Framework Convention on Climate Change(UNFCCC)**, held in **Belém, Brazil**, marked a decisive moment in global climate governance. Coinciding with the **10th anniversary of the Paris Agreement**, COP-30 represented a strategic shift from **ambition-setting to implementation**, particularly addressing long-standing demands of the **Global South** related to adaptation, forests, and finance.

Why in News?

COP-30 concluded with the adoption of the **Belém Package** by all **195 Parties**, finalising multiple action platforms, financial roadmaps, and sector-specific initiatives. The summit was also aligned with the **2025 deadline for submission of NDC 3.0**, making it a critical inflection point for climate action.

Context and Character of COP-30

- Hosted in the **Amazon region**, symbolising the centrality of forests
- Branded as:
  - **"COP of Implementation"**
  - **"COP of Truth"**
  - **"Forest COP"**
- Key meetings:
  - COP-30 (UNFCCC)
  - CMP-20 (Kyoto Protocol)
  - CMA-7 (Paris Agreement)

Major Outcomes of COP-30 (Belém Package)

1. Implementation and Mitigation

Belém Mission to 1.5°C

- Action-oriented platform under the **COP29–COP31 Troika (UAE, Azerbaijan, Brazil)**
- Focus:
  - Strengthening mitigation ambition
  - Scaling investment
  - Bridging implementation gaps

Global Implementation Accelerator (GIA)

- Voluntary initiative to support execution of:
  - **NDCs**
  - **National Adaptation Plans (NAPs)**

2. Adaptation: Elevating Global South Priorities

NAPs Implementation Alliance

- Launched as a **Plan to Accelerate Solutions (PAS)**
- Objective:

  - Convert adaptation plans into **investment-ready pipelines**
- Partners include:
  - UNDP, Italy, Germany, NDC Partnership

Tripling Adaptation Finance

- Adaptation finance target raised to **USD 120 billion per year**
- Embedded within the **New Collective Quantified Goal (NCQG)**

3. Climate Finance and Economic Transition

Baku–Belém Roadmap to USD 1.3 Trillion

- Official pathway to mobilise **USD 1.3 trillion/year by 2035**
- Led by **COP-29 and COP-30 Presidencies**

FINI Initiative

- Develops **USD 1 trillion adaptation investment pipelines by 2028**
- 20% targeted from **private capital**
- Supported by:
  - Green Climate Fund
  - Inter-American Development Bank

4. Forests, Nature and Agriculture

Tropical Forest Forever Facility (TFFF)

- Proposed **USD 125 billion** fund
- Pays countries for:
  - Preserving tropical and subtropical forests
- **At least 20% of payouts to Indigenous Peoples & Local Communities**
- Trustee: **World Bank**

Scaling J-REDD+ Coalition

- Mobilise **USD 3–6 billion annually by 2030**
- Focus:
  - Jurisdictional forest protection
  - High-integrity results-based finance

RAIZ Accelerator

- Restore **3 million hectares** of degraded farmland
- Blended finance model involving FAO, CGIAR, World Bank

5. Energy and Infrastructure Transition

- **Plan for Grid Expansion & Resilience** → Renewable-powered grid systems
- **Plan to Accelerate Coal Transitions (PACT)** → Managed exit from coal
- **Belém 4x Pledge on Sustainable Fuels**
  → Quadrupling hydrogen, biofuels and e-fuels by 2035
  → Tracked by **International Energy Agency**

6. Social, Health and Equity Dimensions

Belém Health Action Plan

- World's first climate adaptation plan for health
- **USD 300 million** initial funding

Belém Gender Action Plan (2026–2034)

- Implements **Lima Work Programme on Gender**

Declaration on Information Integrity on Climate Change

- First-ever recognition of **climate disinformation** as a structural risk
- Anchors climate action in scientific trust

Belém Declaration on Hunger and Poverty

- Links climate action with:
  - Food security
  - Vulnerability
  - Equity

Significance of COP-30

1. **Shift from Promises to Delivery:** Emphasis on **execution frameworks**, not just targets
2. **Adaptation Mainstreamed:** Operationalisation of adaptation finance and planning tools
3. **Forest-Centric Climate Governance:** TFFF creates a **non-market, scalable conservation model**
4. **Climate Finance Breakthrough:** USD 1.3 trillion/year target is the most ambitious ever
5. **Multilateral Resilience:** Consensus achieved despite geopolitical fragmentation

Way Forward

- **Strengthen NDC 3.0**: Economy-wide absolute emission targets
- **Ensure Finance Delivery**: Clear contribution pathways under NCQG
- **Operationalise Adaptation Metrics**: Finalise Global Goal on Adaptation indicators
- **Equity and CBDR**: Finance and timelines aligned with responsibility and capacity
- **Resolve Trade–Climate Frictions**: Mutual recognition of carbon pricing systems
- **Engage Non-State Actors**: Regulatory clarity for private and community-led initiatives

Conclusion

COP-30 in Belém marked a **structural evolution in climate governance**, embedding adaptation, finance, forests, and equity into the heart of implementation. The **Belém Package** transforms the Paris Agreement from aspiration to action. The real test now lies in **executing finance commitments, operationalising forest mechanisms, and translating plans into measurable outcomes**, especially for climate-vulnerable nations.

Mains Practice Question

"COP-30 represents a decisive shift from climate ambition to climate implementation." Critically examine the significance of the Belém Package in addressing mitigation, adaptation, finance, and equity concerns of developing countries.

India at COP-30

📌 Syllabus Mapping

- **GS Paper III** – Environment & Climate Change
  - Climate change mitigation and adaptation
  - Climate finance and technology transfer
- **GS Paper II** – International Relations
  - Global environmental governance
  - North–South divide and multilateral negotiations

Introduction

At the **30th Conference of Parties (COP-30)** to the **United Nations Framework Convention on Climate Change**, held in Belém, Brazil, India adopted a **principled yet implementation-centric negotiating stance**. Rather than engaging in symbolic ambition-setting, India consistently foregrounded **climate justice, equity, and operational delivery**, reflecting the priorities of the developing world in the post-Paris phase.

Why in News?

India's interventions at COP-30—articulated through **G77+China, BASIC, and Like-Minded Developing Countries (LMDC)** platforms—sharply focused on **translating climate commitments into enforceable obligations**, especially with respect to **finance, adaptation, and technology access**.

Core Negotiating Philosophy

India's position was anchored in **non-negotiable principles** that have historically guided its climate diplomacy:

- **Equity**
- **Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC)**
- **Multilateralism**

- **Developmental fairness**

Key Pillars of India's Position at COP-30

1. Equity and Climate Justice

- Reaffirmed **Equity and CBDR-RC** as the **foundational pillars** of the global climate regime.
- Asserted that: Countries with **least historical responsibility** cannot be expected to bear **disproportionate mitigation burdens**.
- Warned against the **silent dilution of equity** through uniform mitigation expectations.

➡️ **UPSC relevance:** Reinforces the Global South's resistance to "one-size-fits-all" climate targets.

2. Climate Finance as a Legal Obligation

- Emphasised that **Article 9.1 of the Paris Agreement** creates a **legal duty**, not voluntary charity, for developed countries to provide climate finance.
- Highlighted that: **Inadequate and uncertain finance** remains the single largest barrier to enhanced ambition in developing countries.
- Called for: A **clear, universally accepted definition of climate finance**, to prevent accounting inflation and greenwashing.

➡️ **Key concept:** Finance as *enabling condition* for mitigation and adaptation.

3. Adaptation and Global Goal on Adaptation (GGA)

- Asserted that **COP-30 must be remembered as the "COP of Adaptation"**.
- Welcomed progress on GGA indicators, while:
  - Supporting a **minimum common framework**
  - Insisting on **flexibility for national circumstances**
- Highlighted adaptation as:
  - An **existential priority** for vulnerable countries, not a secondary pillar.

4. Just Transition Mechanism

- Welcomed the establishment of the **Just Transition Mechanism** as a **critical milestone** in operationalising equity.
- Emphasised that:
  - Transition pathways must be **people-centric**, not market-centric.
- Called for:
  - **Action-oriented institutional arrangements**, not declaratory frameworks.

➡️ **Link to ethics:** Climate action must protect livelihoods, jobs, and social stability.

5. Mitigation Responsibilities and Net-Zero Timelines

- Reiterated that:
  - **Developed countries must reach net-zero earlier** to preserve **equitable carbon space** for developing nations.
- Urged developed economies to:
  - Invest more aggressively in **negative emissions technologies**, given their historical emissions.

➡️ **Conceptual anchor:** *Carbon budget equity*.

6. Opposition to Unilateral Trade Measures

- Firmly opposed **Unilateral Trade-Restrictive Climate Measures** (e.g., carbon border taxes).
- Characterised them as:
  - **Disguised protectionism**
  - Inconsistent with equity and multilateral trade norms.
- Warned that such measures: Shift mitigation costs onto developing exporters.

7. Technology Transfer and Intellectual Property

- Asserted that:
  - **Technology access is a right, not a bargaining chip**.
- Highlighted the need to remove:
  - Intellectual property barriers
  - Market-access constraints
- Called for:
  - Affordable, timely diffusion of climate-critical technologies.

8. Multilateralism and Diplomatic Engagement

- Reaffirmed faith in **multilateral climate governance**.
- Praised Brazil's presidency for leadership grounded in:
  - **"Mutirão"** – cooperation, inclusion, and balance.
- Emphasised consensus-based solutions over fragmented climate clubs.

India's Negotiating Platforms at COP-30

Grouping	Composition & Role
G77 + China	Largest developing-country coalition (134 members); primary platform for equity and finance demands
LMDC	Core group including India, China, Bolivia, Egypt, Iran; firm stance on CBDR-RC
BASIC	Brazil, South Africa, India, China – bridges emerging economies with Global South priorities

Conclusion

India's position at COP-30 reflected **continuity with principle and evolution in strategy**. By shifting focus from abstract ambition to **implementation, finance credibility, and justice-based transitions**, India emerged as a **norm-defender for the Global South**. Its insistence on equity, legal climate finance obligations, and technology access reinforces the idea that **effective climate action must be fair, inclusive, and development-compatible**.

Mains Practice Question

"India's approach at COP-30 underscores the centrality of equity and implementation in global climate governance." Critically analyse India's negotiating stance with reference to climate finance, adaptation, and mitigation responsibilities.

Minamata Convention on Mercury

📌 Syllabus Mapping

- **GS Paper III** – *Environment, Pollution, International Environmental Agreements*
- **GS Paper II** – *International Conventions, Global Governance*
- **GS Paper I** – *Physical Geography – Environmental Pollution*

Introduction

Mercury pollution represents a **serious global environmental and public health challenge** due to its **persistence, long-range transport, and high toxicity**. In this context, the **Minamata Convention on Mercury** has emerged as a critical multilateral framework to control mercury emissions and protect human health and ecosystems.

Why in News?

- The **COP-6 of the Minamata Convention**, held in **Geneva**, agreed to:
  - **End the use of dental amalgam by 2034**
  - **Intensify global action against mercury-added skin-lightening products**
- These decisions signal a shift from **partial restriction to phase-out** of non-essential mercury uses.

Minamata Convention on Mercury: Overview

- **Nature:** Global, legally binding environmental treaty
- **Adopted:** 2013 (Kumamoto, Japan)
- **In Force:** 2017
- **Named After:** *Minamata disease* (Japan), caused by industrial mercury poisoning
- **Objective:** Protect human health and the environment from **anthropogenic mercury emissions and releases**

Key Decisions at COP-6 (Geneva)

1. Phase-out of Dental Amalgam

- Agreement to **end use by 2034**
- Encourages transition to **mercury-free dental alternatives**
- Major public health gain, particularly for **children and pregnant women**

2. Crackdown on Mercury-Added Skin-Lightening Products

- Strengthened measures to:
  - Eliminate production and trade
  - Address informal markets and cross-border smuggling

- Addresses **toxic exposure linked to cosmetic use**, especially in developing countries

Understanding Mercury: Scientific Background

Physical and Chemical Properties

- **Mercury (Hg)**:
  - Atomic number **80**
  - **Silvery-white, heavy transition metal**
  - **Liquid at room temperature** (unique among metals)
  - Conducts **heat and electricity**
  - Ductile and malleable

Sources of Mercury

Natural Sources

- Volcanic eruptions
- Oceanic emissions
- Weathering of rocks

Anthropogenic Sources

- **Artisanal and small-scale gold mining (ASGM)**
- Fossil fuel combustion
- Cement and metal production
- Industrial waste discharge

Uses of Mercury (Historical & Current)

- Thermometers and barometers
- Fluorescent lamps
- Batteries and switches
- **Dental amalgams**
- Certain cosmetics and pharmaceuticals (now restricted)

Toxicity and Environmental Pathways

Transformation into Methylmercury

- Atmospheric mercury deposits on land and water.
- Microorganisms convert it into **methylmercury**, the most toxic form.

Bioaccumulation and Biomagnification

- Methylmercury accumulates in:
  - Fish and shellfish
  - Predatory animals higher up the food chain
- Humans exposed primarily through **seafood consumption**

Health Impacts

- Even trace exposure can damage:
  - **Nervous system** (especially foetal brain development)
  - Kidneys
  - Skin and eyes
  - Digestive and immune systems
- Classified as a **global neurotoxin**

Significance of the Minamata Convention

Environmental Dimension

- Reduces long-range transboundary mercury pollution.
- Protects aquatic ecosystems and biodiversity.

Public Health Dimension

- Addresses **chronic and invisible exposure pathways**.
- Protects vulnerable groups such as children and pregnant women.

Governance Dimension

- Embodies the **precautionary principle** and **polluter pays principle**.
- Strengthens **science-based multilateral environmental governance**.

India and the Minamata Convention

- India is a **Party** to the Convention.
- Key relevance:
  - Regulation of mercury use in **healthcare and industry**
  - Addressing mercury from **coal-based power plants**
  - Tackling illegal mercury-containing cosmetic products
- Aligns with India's commitments under:
  - **SDG 3 (Good Health)**
  - **SDG 12 (Responsible Consumption)**
  - **SDG 14 (Life Below Water)**

Challenges in Implementation

- Informal and illegal markets
- Limited awareness among consumers
- High transition costs for small industries
- Weak enforcement capacity in developing countries

Way Forward

- Accelerate **mercury-free alternatives** in healthcare and manufacturing.
- Strengthen **customs and market surveillance**.
- Enhance **public awareness campaigns**, especially on cosmetic safety.
- Support developing countries through **technology transfer and finance**.
- Integrate mercury control with **climate and pollution policies**.

Conclusion

The decisions at **COP-6 of the Minamata Convention** mark a decisive step toward **eliminating avoidable mercury exposure**. Phasing out dental amalgam and toxic cosmetic products reflects a shift from **containment to prevention**, reinforcing the Convention's core objective of safeguarding **human health and ecological integrity** in an interconnected world.

Keywords: *Mercury pollution, Minamata Convention, Bioaccumulation, Global environmental governance, Public health*

📝 Mains Practice Question

"The Minamata Convention on Mercury represents a global effort to address a transboundary toxic pollutant. Examine the significance of recent COP-6 decisions and discuss the challenges and opportunities for effective implementation in developing countries like India."

Tiger Reserves and Supreme Court

📌 Syllabus Mapping

- **GS Paper III** – *Environment, Biodiversity, Conservation, Human–Wildlife Conflict*
- **GS Paper II** – *Judiciary, Environmental Governance, Federalism*
- **GS Paper I** – *Indian Geography – Protected Areas*

Introduction

Rising **Human–Wildlife Conflicts (HWCs)** around tiger landscapes—driven by **habitat degradation, unregulated tourism, and fragmented corridors**—prompted the **Supreme Court of India** to issue a comprehensive set of directions to reinforce tiger conservation while ensuring **human safety, ecological integrity, and uniform compensation** across States.

Why in News?

- The Supreme Court issued **binding directions** to curb activities aggravating HWCs and to standardise **planning, zoning, and relief mechanisms** in and around tiger reserves.
- The measures aim to restore **habitat continuity**, reduce disturbance, and strengthen **institutional accountability**.

Key Directions Issued by the Supreme Court

1. Regulation of Tourism

- **Tiger safaris** permitted **only in buffer zones** and strictly on **non-forest or degraded forest land**.
- **Absolute prohibition** of safaris in **core/critical habitats** and **designated tiger corridors**.
- **Night tourism** banned in **core/critical tiger habitats**.

Rationale: Minimise disturbance during sensitive hours; reduce stress, poaching risks, and collision incidents.

2. Prohibited Activities in Buffer/Fringe Areas

- **Commercial mining**, **polluting industries**, and **major hydropower projects** barred.
- Ban on **introduction of exotic species**, **low-flying aircraft**, and **commercial firewood extraction**.

Rationale: Prevent habitat degradation, noise/light pollution, and invasive threats that escalate HWCs.

3. Eco-Sensitive Zones (ESZs)

- All tiger reserves must **notify ESZs** in accordance with **2018 guidelines** issued under the **Environment Protection Act**, 1986.

Rationale: Create graded protection buffers to regulate land-use change and reduce edge conflicts.

4. Tiger Conservation Plans (TCPs)

- States to **prepare/revise TCPs** within stipulated timelines.
- **Core and buffer areas** must be **notified within six months**.

Rationale: Ensure science-based zoning, corridor protection, and adaptive management.

5. Human–Wildlife Conflict as a Natural Disaster

- States directed to **treat HWCs as a natural disaster** to enable **rapid relief, standard operating procedures, and fiscal prioritisation**.

6. Uniform Compensation Framework

- **Ex-gratia of ₹10 lakh** for **human deaths** caused by HWCs, uniformly across States.

Rationale: Address inter-State disparities; provide timely and dignified relief to affected families.

7. National HWC Mitigation Guidelines

- **National Tiger Conservation Authority (NTCA)** to draft **national HWC mitigation guidelines** within **six months**.
- Mandatory **implementation by all States**.

Rationale: Standardise prevention, early warning, response, and compensation mechanisms nationwide.

Tiger Reserves: Institutional & Zonal Framework

Definition: **Tiger Reserves** are legally protected landscapes notified under **Project Tiger (1973)** for **long-term tiger conservation**, comprising **core** and **buffer** zones.

Zonation

- **Core Areas (Critical Tiger Habitat):**
  Inviolable; **no tourism or commercial activity**.
- **Buffer Areas (Sustainable Use Zone):**
  Regulated **eco-development** and **limited tourism** compatible with conservation.

Governance: Reserves are **approved and notified by NTCA** (statutory authority under the Wildlife (Protection) Act, 1972); **States propose sites**.

Coverage: 58 tiger reserves across India.

Analytical Significance of the Directions

Environmental Governance

- Reasserts **precautionary principle** and **public trust doctrine**.
- Strengthens **Centre–State coordination** via NTCA-led standardisation.

Biodiversity Conservation

- Protects **corridors** and **landscape connectivity**, essential for genetic flow.
- Prioritises **grasslands and buffers**, often neglected yet conflict-prone.

Social Justice & Federal Equity

- Uniform compensation and disaster classification enhance **procedural fairness**.
- Faster relief reduces social backlash against conservation.

Implementation Challenges

- **Tourism pressure** and local economic dependence.
- **ESZ notifications** facing land-use contestations.
- **Capacity constraints** in monitoring night bans and corridor integrity.
- Ensuring **community buy-in** alongside strict regulation.

Way Forward

- **Community-centric conservation:** Incentives, alternative livelihoods, and coexistence models.
- **Early-warning systems:** AI-enabled alerts, fencing at hotspots, rapid response teams.
- **Corridor restoration:** Land acquisition, voluntary relocation, and habitat enrichment.
- **Transparent tourism policy:** Carrying-capacity based permits and benefit-sharing.
- **Periodic audits:** Independent evaluation of TCPs and ESZ effectiveness.

Conclusion

The Supreme Court's directions mark a **decisive recalibration of tiger conservation**—from fragmented protection to **landscape-level governance**—by tightening tourism controls, mandating ESZs, standardising compensation, and institutionalising national HWC mitigation. Effective implementation can simultaneously **secure habitats, reduce conflicts, and sustain public support** for conservation.

Keywords: *Human–Wildlife Conflict, Tiger corridors, Eco-Sensitive Zones, Public trust doctrine, Landscape conservation*

📝 Mains Practice Question

"The Supreme Court's recent directions on tiger reserves seek to reconcile wildlife conservation with human safety. Analyse their significance, implementation challenges, and the way forward for reducing human–wildlife conflict in India."

Dumpsite Remediation Programme

📌 Syllabus Mapping

- **GS Paper III** – *Urbanisation, Environment, Solid Waste Management*
- **GS Paper II** – *Government Policies, Urban Governance*
- **GS Paper I** – *Urban Geography & Environmental Issues*

Introduction

India's rapid urbanisation has resulted in the accumulation of **legacy municipal solid waste**, posing serious threats to **public health, groundwater, and urban ecosystems**. To accelerate the clean-up of such sites, the Government has launched the **Dumpsite Remediation Accelerator Programme (DRAP)** under **Swachh Bharat Mission–Urban (SBM-U) 2.0**, reinforcing the national commitment to achieve **Lakshya Zero Dumpsites by September 2026**.

Why in News?

- The **Dumpsite Remediation Accelerator Programme (DRAP)** has been launched as a **time-bound, focused initiative** to hasten the remediation of India's largest and most hazardous dumpsites.
- It aligns with the broader objective of **Garbage-Free Cities** under SBM-U 2.0.

Swachh Bharat Mission–Urban (SBM-U) 2.0: Context

- **Launched:** 2021
- **Objective:**
  - Achieve **Garbage-Free Status** for all cities
  - **Remediate all legacy dumpsites** and convert them into **green or productive urban spaces**
- Focuses on **scientific waste management**, source segregation, and circular economy principles.

Dumpsite Remediation Accelerator Programme (DRAP)

Nature of the Programme

- **Duration:** One-year targeted intervention
- **Administrative Ministry: Ministry of Housing and Urban Affairs (MoHUA)**
- **Mission Linkage:** SBM-U 2.0

Objectives

- Prioritise **high-impact dumpsites** across urban India.
- Address approximately **8.8 crore metric tonnes (MT)** of legacy waste.
- Fast-track the achievement of **Zero Dumpsites** milestone.

Understanding Legacy Waste

- **Legacy Waste** refers to **aged municipal solid waste** accumulated over decades in open dumps or landfills.
- Composition includes:
  - Partially or fully decomposed biodegradable waste
  - Plastics, inert material, construction debris
- **Spatial Concentration:**
  - **~80% of legacy waste** located in **214 dumpsites** across **202 Urban Local Bodies (ULBs)**.

Eligibility under DRAP

- **Eligible Entities:** All **States and Union Territories** with ongoing legacy waste remediation projects.
- **Priority Criteria:** Dumpsites containing **more than 45,000 MT** of legacy waste.
- **Special Provision No minimum threshold** for **UTs and North-Eastern States**, recognising capacity and geographical constraints.

Status of Dumpsite Remediation in India

- **Total sites under remediation:** 1,428
- **Fully remediated sites:** 1,048
- Indicates progress, yet highlights the **scale and urgency** of the remaining challenge.

Environmental Risks from Dumpsites

1. Leachate Formation

- Polluted liquid generated at the base of dumpsites.
- Contaminates **soil and groundwater** with heavy metals and pathogens.

2. Landfill Gas Emissions

- Anaerobic decomposition produces:
  - **Methane (CH_4)** – potent greenhouse gas
  - **Carbon dioxide (CO_2)**
- Contributes to **climate change**, fire hazards, and odour pollution.

Key Technologies for Dumpsite Management

1. Biocapping

- **Concept:** Dumpsite covered and converted into green spaces such as **parks or green belts**.
- **Advantages:**
  - Improves urban aesthetics
  - Limits surface exposure
- **Limitations:**
  - Leachate and landfill gas generation continues
  - Requires **monitoring and maintenance for at least 15 years**

2. Biomining

- **Concept:** Use of **microorganisms** and mechanical processes to recover soil-like material, recyclables, and inert fractions.
- **Advantages:**
  - Permanent solution to leachate and gas issues
  - **No long-term monitoring** required after complete reclamation
  - Land becomes reusable for urban development
- **Preferred Approach** under SBM-U 2.0 and DRAP.

Analytical Significance of DRAP

Environmental Dimension

- Reduces groundwater contamination and methane emissions.
- Supports India's **climate mitigation commitments**.

Urban Governance

- Enhances ULB accountability and performance-based prioritisation.
- Encourages **data-driven remediation planning**.

Economic & Social Benefits

- Reclaimed land can be used for:
  - Green zones
  - Public infrastructure
  - Affordable housing
- Improves urban liveability and public health outcomes.

Challenges in Implementation

- High **financial and technical requirements** for biomining.
- Capacity gaps in smaller ULBs.
- Managing secondary waste streams post-biomining.
- Ensuring **post-remediation land-use planning**.

Way Forward

- **Scale up biomining expertise** through regional centres of excellence.
- **Strengthen ULB capacity** via technical handholding and funding support.
- Integrate **circular economy principles** to reuse recovered materials.
- Ensure **robust monitoring dashboards** under SBM-U for transparency.
- Promote **community engagement** to prevent re-emergence of dumpsites.

Conclusion

The **Dumpsite Remediation Accelerator Programme (DRAP)** represents a decisive shift from incremental clean-up to **mission-mode remediation** of India's most hazardous urban waste sites. By combining **technological solutions, prioritised funding, and institutional accountability**, DRAP can transform legacy dumpsites into **environmentally safe and socially productive urban spaces**, accelerating India's journey towards **Garbage-Free Cities**.

Keywords: *Legacy waste, Biomining, Zero dumpsites, Urban sustainability, SBM-U 2.0*

Mains Practice Question

"The Dumpsite Remediation Accelerator Programme (DRAP) marks a mission-mode approach to urban solid waste management in India. Examine its objectives, technological choices, and implementation challenges in achieving Lakshya Zero Dumpsites."

Urban Air Pollution in India

Syllabus Mapping

- **GS Paper III** – Environment & Ecology
  - Environmental pollution and degradation
  - Climate change and public health
- **GS Paper II** – Governance
  - Role of institutions and cooperative federalism

Introduction

Urban air pollution has emerged as one of India's most severe **public health, environmental, and economic crises**. Recent data from global air-quality assessments and the invocation of **Stage-III of the Graded Response Action Plan (GRAP)** across the National Capital Region (NCR) underline the persistence and intensity of the problem. Despite multiple policy interventions, India's cities continue to experience **chronic and episodic pollution**, demanding a shift from **reactive firefighting to sustained structural solutions**.

Why in News?

- Global assessments such as the **IQAir Report** highlighted the alarming extent of air pollution in Indian cities.
- The **Commission for Air Quality Management (CAQM)** enforced **Stage-III GRAP** across the entire NCR, reflecting worsening air quality conditions.

Graded Response Action Plan (GRAP)

Overview

- **GRAP** is an **emergency air-pollution response framework** based on Air Quality Index (AQI) thresholds in Delhi-NCR.
- Origin: Implemented pursuant to Supreme Court directions in **M.C. Mehta vs. Union of India**.
- Implementing authority: **CAQM**.

GRAP Stages

Stage	AQI Category	AQI Range
Stage I	Poor	201–300
Stage II	Very Poor	301–400
Stage III	Severe	401–450
Stage IV	Severe+	451+

➡️ **UPSC angle:** GRAP is a *symptom-control mechanism*, not a substitute for long-term pollution abatement.

Causes of Urban Air Pollution

1. Meteorological Factors

- **Temperature inversion** and **low wind speeds** during winters trap pollutants near the surface (e.g., Delhi).
- **Pre-monsoon dust transport** from the Thar Desert and Middle East affects northern cities.

2. Urban and Industrial Sources

- **Industrial emissions:** Cement plants, steel units, refineries, brick kilns
  - Example: Chemical and refinery clusters in Mumbai's Chembur area
- **Vehicular emissions:** Vehicle numbers in Delhi have **more than doubled since 2005**.
- **Construction & demolition (C&D):** Rapid urban growth (e.g., Gurugram's Golf Course Road).

3. Urban Design Constraints

- **Street-canyon effect:** Narrow roads with tall buildings restrict dispersion.
- **Loss of green/blue spaces:** Reduces natural filtration of pollutants.

4. Transboundary and Regional Pollution

- **Stubble burning** in neighbouring states contributes significantly to NCR pollution.
- Long-range aerosol transport affects coastal cities such as Chennai.

5. Other Sources

- **Ground-level ozone** formation from NOx and VOCs.
- **Firecrackers**, **open waste burning**, and **landfill fires** (Bhalswa, Ghazipur).

Impacts of Urban Air Pollution

1. Health Impacts

- Increased incidence of **cardiovascular diseases, respiratory infections, eye irritation**.
- Air pollution linked to **~15% of all deaths in Delhi (2023)**.

2. Environmental Impacts

- **Climate forcing:** Black carbon and ozone accelerate warming.
- **Acid rain:** SO_2 and NOx damage crops, soils, and monuments.
    - Example: Surface corrosion of the **Taj Mahal**.

3. Economic Costs

- India lost economic output equivalent to **9.5% of GDP in 2022** due to air pollution (Lancet Countdown 2025).

4. Social Consequences

- School closures, reduced outdoor activity, poor visibility.
- Disproportionate burden on **children, elderly, and the urban poor**.

Policy Measures Undertaken

1. National-Level Programmes

- **National Clean Air Programme (NCAP):** Target: **40% reduction in PM levels by 2026** in 131 cities.
- **CAQM Act, 2021:** Statutory framework for NCR air-quality governance.

2. Vehicular Emission Control

- Nationwide rollout of **BS-VI norms (2020)**.
- **E20 ethanol blending**, RFID tolling, and pollution charges.
- Promotion of EVs under **PM E-DRIVE** and **EMPS 2024**.
- **SATAT** initiative for compressed bio-gas (CBG).

3. Monitoring and Forecasting

- **National Air Quality Index (AQI)** (2015).
- **OCEMS** in red-category industries.
- **SAFAR** portal for air-quality forecasting.

4. Waste and Dust Management

- C&D waste management rules (2017).
- **Biomining and bioremediation** of legacy landfills.
- Mandatory **zig-zag technology** for brick kilns in NCR.

Key Challenges

Policy and Governance Gaps

- **Transboundary nature:** ~30% of urban pollution originates outside city limits.
- **Fragmented governance:** Multiple agencies across Centre, States, CPCB, and CAQM.
- **Reactive bias:** Dependence on GRAP and temporary measures.

Monitoring and Standards

- Sparse monitoring in smaller towns and rural areas.
- India's standards remain **less stringent than WHO guidelines**:

Pollutant	WHO (2021)	India (NAAQS)
PM2.5	5 µg/m^3	40 µg/m^3
PM10	15 µg/m^3	60 µg/m^3
NO_2	10 µg/m^3	40 µg/m^3

Structural Constraints

- Slow electrification of public transport.
- Continued reliance on coal-based power.
- MSMEs lack resources for pollution-control technologies.
- Public underestimation of chronic exposure risks.

Way Forward

1. Agricultural & Regional Measures

- Incentivise alternatives to stubble burning (price support, biomass markets).
- Real-time crop and residue mapping.
- Unified national bioenergy policy.

2. Governance Reforms

- Grant **statutory backing to NCAP**.
- Shift to **airshed-based planning** with inter-state coordination.
- Convert GRAP into **year-round city-specific clean air plans**.

3. Economic and Technological Tools

- **AI-based predictive pollution modelling**.
- Stable financing via **green bonds and pollution taxes**.
- Risk-sharing mechanisms for clean technologies.

4. Learning from Best Practices

- **Surat Emissions Trading Scheme:** 20–30% industrial PM reduction.
- **Urban greening:** Miyawaki forests (Tirunelveli).
- **Global models:** London congestion pricing; Paris car-free days; Beijing's electric bus transition.

Conclusion

India's urban air pollution challenge demands a **paradigm shift from episodic crisis management to continuous, coordinated, and technology-driven governance**. Strengthening institutions, integrating regional planning, tightening standards, and ensuring sustainable financing are essential to secure **clean air as a public good**. Only a **long-term, data-backed, and multi-sectoral strategy** can deliver healthier cities and resilient urban futures.

Mains Practice Question

"Urban air pollution in India is no longer a seasonal problem but a structural governance challenge." Examine the causes and impacts of urban air pollution and suggest long-term policy measures beyond emergency responses like GRAP.

India's Renewable Energy Transition

📌 Syllabus Mapping

- **GS Paper III** – *Energy, Infrastructure, Climate Change, Sustainable Development*
- **GS Paper II** – *Government Policies, International Environmental Agreements*
- **GS Paper I** – *Geography (Resource Distribution – Solar, Wind Potential)*

Introduction

India's renewable energy (RE) sector crossed a **structural turning point in 2025**, as clean energy not only expanded in capacity but also began **meeting a majority share of actual electricity demand**. This marks a decisive shift from capacity-led growth to **usage-led energy transition**, strengthening India's climate leadership and energy security.

Why in News? (2025 Milestones)

- **51.5% of total electricity demand met by renewable energy** (July 2025).
- **51% of installed electricity capacity from non-fossil fuel sources** (September 2025).
- India achieved its **NDC target of 50% non-fossil installed capacity by 2030 five years in advance**.

Renewable Energy: Conceptual Overview

Renewable Energy (RE) refers to energy derived from **naturally replenishing sources**, such as:

- **Solar**
- **Wind**
- **Hydropower**
- **Bioenergy**
- **Geothermal**
- **Ocean energy**

These sources are central to **low-carbon growth**, **inter-generational equity** (Brundtland Commission), and **climate resilience**.

India's Policy Commitments & Targets

1. International Commitments

- **Updated Nationally Determined Contributions (2022)**
  → *50% of cumulative installed electricity capacity from non-fossil sources by 2030* (achieved early).

2. Panchamrita Targets (COP26)

- **50% of energy requirements from renewables**
- **500 GW non-fossil energy capacity by 2030**
- Net-zero emissions by **2070**

Current Status of India's Renewable Energy Sector

Installed Capacity (September 2025)

- **Total non-fossil installed capacity** (RE + Hydro + Nuclear): **256.09 GW**

Global Standing (International Renewable Energy Agency – RE Statistics 2025)

- **4th** in overall renewable energy installed capacity
- **3rd** in solar power capacity
- **4th** in wind power capacity
- **3rd largest ethanol producer globally**

Growth Trajectory (2014–2025)

- **~3× increase** in total renewable energy capacity
- **~40× growth** in solar energy capacity
- **30% rise** in wind energy capacity (2020–24)
- **13-fold jump** in ethanol blending
  (1.5% in 2014 → 20% in 2025)

Leading Renewable Energy States

- **Rajasthan**
- **Gujarat**
- **Tamil Nadu**
- **Karnataka**
- **Maharashtra**

Significance of Renewable Energy Expansion

1. Climate Action

- Alignment with **Paris Agreement**, **SDGs (7 & 13)**, and climate justice principles.

2. Energy Security

- Reduced dependence on imported fossil fuels.
- Diversification of energy basket.

3. Economic & Social Gains

- Job creation in manufacturing, installation, and O&M.
- Decentralised energy → **inclusive development**.

Key Drivers Behind India's RE Growth

A. Natural Endowments

- **300+ sunny days annually** across tropical regions.
- Long coastline and elevated terrains enabling wind energy.

B. Policy & Institutional Support

Strategic Policies

- Offshore Wind Energy Policy (2015)
- National Wind–Solar Hybrid Policy (2018)
- National Policy on Biofuels (2018)

Infrastructure Development

- **Green Energy Corridor (GEC)** for transmission
- **PM Surya Ghar Muft Bijli Yojana**
  → ~10 lakh rooftop solar installations by March 2025

Market & Regulatory Reforms

- **Renewable Purchase Obligation (RPO)**
- **Indian Carbon Market (2024)** under Energy Conservation Act, 2001
- **Green Open Access Rules (2022)** enabling pan-India RE procurement

Dedicated Flagship Missions

- **National Green Hydrogen Mission** (5 MMT target by 2030)
- **Ethanol Blended Petrol Programme** (20% blending)
- National Solar Mission
- National Bio-Energy Programme (2021–26)
- Waste-to-Energy Programme

C. Investment & Manufacturing Push

- **100% FDI** under automatic route
- RE under **Priority Sector Lending**
- **Sovereign Green Bonds**
- **PLI Scheme for Solar PV Modules**
  - Solar module capacity rose from **38 GW to 74 GW (FY 2024–25)**

D. Global Leadership & Collaboration

- **International Solar Alliance** – mobilising global solar finance.
- **One Sun, One World, One Grid (OSOWOG)** – vision of a global solar grid.

Persistent Challenges

1. Financial Constraints

- Clean-energy transition needs **~USD 10 trillion by 2070**.
- **DISCOM distress** due to losses, delayed tariffs, weak billing.

2. Infrastructure & Technical Issues

- **Intermittency** of solar and wind.
- **Transmission congestion** in high-RE states (e.g., Tamil Nadu).
- **High storage costs** (₹5–6/unit).
- **Land acquisition conflicts**
  (Solar requires ~300× more land than nuclear – Economic Survey 2023-24).

3. Manufacturing & Supply Chain Risks

- **80–90% import dependence** on solar cells/modules (China).
- Concentration of critical minerals supply:
  - China controls ~60% of production and ~80% of processing.

4. Governance & Environmental Concerns

- Weak enforcement of RPOs
- Policy inconsistency in net-metering
- Ecological impact of mining critical minerals

Way Forward

- **DISCOM Reforms**: Smart metering, tariff rationalisation, loss reduction.
- **Domestic Manufacturing**: Solar, wind, batteries, green hydrogen components via PLI.
- **Advanced Storage Solutions**: ACC batteries, pumped-storage, RE hybrids.
- **Unified Renewable Energy Law**: Clear norms for PPAs, land, grid access.
- **Innovative Financing**: Green bonds, blended finance, multilateral funds.
- **Just Transition Strategy**: Reskilling and alternative livelihoods in coal-dependent regions.
- **Grid Modernisation**: Smart grids using **AI/ML-based forecasting and load management**.

Conclusion

India's renewable energy journey reflects a shift towards **climate-responsible growth**, **energy self-reliance**, and **global leadership in clean energy**. Sustaining this momentum requires **institutional reforms, domestic manufacturing, grid integration, and financial innovation**, ensuring a **just and inclusive energy transition**.

Keywords: *Energy transition, Non-fossil capacity, Climate commitments, Grid integration, Just transition*

📝 Mains Practice Question

"India has moved from capacity-centric to consumption-centric renewable energy growth. Examine the drivers, challenges, and policy measures required to sustain this transition in the context of India's climate commitments."

Climate Finance Platforms

📌 Syllabus Mapping

- **GS Paper III** – Environment & Climate Change
  - Climate change mitigation and adaptation
  - Climate finance, technology transfer
- **GS Paper II** – International Relations
  - North–South divide
  - Multilateral institutions and global governance

Introduction

Adequate and predictable **climate finance** is the backbone of effective global climate action. Recognising persistent gaps in delivery, access, and equity, India—along with twelve other developing countries and the African Island States Climate Commission (AISCC)—announced the creation of **Country**

or Regional Platforms for Climate and Nature Finance at **COP-30**. This initiative signals a shift from fragmented project-based funding to **country-driven, programmatic climate finance architecture**.

Why in News?

At the **30th Conference of Parties (COP-30)** to the **United Nations Framework Convention on Climate Change**, held in Belém, Brazil, India and partner countries unveiled plans to operationalise **Country Platforms** supported by the **Green Climate Fund (GCF)**.

What are Country / Regional Climate Finance Platforms?

Concept and Design

- **Country Platforms** are **nationally led coordination mechanisms** that:
  - Translate climate priorities into **investment-ready programmes**
  - Align **public finance, private capital, and multilateral support**
- Aim to replace **isolated project funding** with **coherent national pipelines**

Key Features

- Country ownership and alignment with **NDCs and National Adaptation Plans**
- Coordination of:
  - Domestic institutions
  - Multilateral development banks
  - Private investors
  - Philanthropic and bilateral donors

Funding Support

- Backed by the **GCF Readiness Programme**, the world's largest climate capacity-building facility for developing countries
- Existing models:
  - **Brazil Country Platform**
  - **Caribbean Regional Platform**

Countries Participating

The 12 developing countries include: **Cambodia, Colombia, Kazakhstan, Lesotho, Mongolia, Nigeria, Oman, Panama, Rwanda, Dominican Republic, Togo, and South Africa**, along with **India** and AISCC.

Normative Perspectives on Climate Finance

1. Historical Responsibility

- Developed countries account for the **major share of cumulative emissions**
- Yet, **public climate finance contributions remain inadequate**

2. Distributional Inequality

- **LDCs, SIDS, and Indigenous Peoples** face:
  - Highest climate vulnerability
  - Least access to affordable finance

3. Intergenerational Equity

- Postponing large-scale finance to **2035** undermines long-term resilience
- Adaptation delays amplify future costs

4. India's Position

- Reaffirmed **Equity and CBDR-RC**
- Opposed shifting climate responsibility onto **private and market-only finance**

Structural Issues in Global Climate Finance

1. Ambition–Delivery Gap

- Developing countries need **~USD 1.3 trillion annually**

- However, the **NCQG** agreed at COP-29 stands at only **USD 300 billion per year**
- Heavy reliance on **voluntary pledges** weakens predictability

2. Concessionality and Access Constraints

- **LDCs and SIDS** face:
  - Complex accreditation processes
  - Risk of debt from blended finance
- Grant elements often diluted

3. Overdependence on Private Capital

- Private finance prefers:
  - Bankable mitigation projects
- **Adaptation and Loss & Damage** require:
  - Public, grant-based support

4. Green Climate Fund Bottlenecks

- Over **USD 19 billion committed** across 134 countries
- Yet, **only ~40% disbursed** for projects under implementation
- Procedural rigidity and compliance burden remain major concerns

5. Transparency and Additionality

- Risk of:
  - Double counting
  - Relabelling existing ODA as climate finance
- Lack of clarity on what qualifies as "mobilised" finance

Climate Finance and India

India's Estimated Climate Finance Needs (TERI)

- **Net Zero by 2070**: ~USD **10.1 trillion**
- **NDC implementation (2015–2030)**: ~USD **2.5–6/8 trillion**

Domestic Initiatives to Mobilise Climate Finance

- **Sovereign Green Bonds**:
  - FY23: ₹16,000 crore
  - FY24: ₹20,000 crore
- **Carbon Credit Trading Scheme (CCTS)**:
  - Creation of **Indian Carbon Market**
  - GHG intensity targets notified
- **RBI Initiatives**:
  - Draft climate risk disclosure framework
  - Green Deposit Framework to prevent greenwashing
- **IFSC, GIFT City**:
  - Emerging as a **sustainable finance hub**

Way Forward for India and the Global South

- **Predictable Public Finance**:
  - Clear timeline for achieving USD 300 billion target
- **Protect Concessionality**:
  - Grants for adaptation and Loss & Damage
  - Avoid debt-creating instruments
- **Standardise Accounting Rules**:
  - Transparent methodologies for "mobilised" finance
- **Strengthen Domestic Ecosystems**:
  - Align taxonomies with global standards (ISSB)
- **Develop Bankable Pipelines**:
  - Sovereign-led projects with social and environmental safeguards
- **South–South Cooperation**:
  - Regional blended finance facilities aligned with public interest

Conclusion

The **Country Platform initiative** reflects a decisive attempt by the **Global South to reclaim leadership in climate finance governance**. While **COP-30** provided political legitimacy and institutional space, the credibility of Belém now depends on **implementation, transparency, and concessional delivery**. For climate finance to be transformative, it must remain **predictable, public-led, and equity-driven**, ensuring that vulnerable countries are empowered—not indebted—in their climate transition.

Mains Practice Question

"Climate finance remains the weakest link in global climate action." Examine the rationale behind country-driven climate finance platforms and assess their potential to address equity, access, and delivery challenges faced by developing countries.

Cheetah Reintroduction in India

📌 Syllabus Mapping

- **GS Paper III** – *Environment, Biodiversity, Conservation*
- **GS Paper II** – *International Relations, Bilateral Cooperation*
- **GS Paper I** – *Indian Geography – Wildlife Distribution*

Introduction

The formal announcement of cheetah translocation from **Botswana** to **India** marks a significant step in India's ambitious wildlife restoration efforts. As part of **Project Cheetah**, this agreement reinforces India's commitment to **biodiversity conservation, ecological restoration, and global environmental cooperation**.

Why in News?

- India and Botswana announced the **translocation of eight African cheetahs** to India.
- The move is part of the ongoing **Project Cheetah**, aimed at reintroducing cheetahs into Indian grassland ecosystems after their extinction in 1952.

Project Cheetah: An Overview

About the Project

- **Launched:** 2022
- **Objective:** Reintroduce cheetahs into suitable habitats in India to restore **lost ecological functions**.
- **Global Significance:** World's **first intercontinental translocation of a large carnivore**.

Previous Translocations

- **2022:** Eight cheetahs translocated from **Namibia** to **Kuno National Park**.
- **2023:** Twelve cheetahs brought from **South Africa**.
- **2025:** Proposed induction of eight cheetahs from Botswana to diversify the gene pool.

Institutional Framework

Implementing Authority

- **National Tiger Conservation Authority (NTCA)**
  - Statutory body under the **Wildlife (Protection) Act, 1972** (amended in 2006).
  - Functions under the **Ministry of Environment, Forest and Climate Change (MoEFCC)**.

Governance Mechanism

- **Cheetah Project Steering Committee (2023)**
  - Established by NTCA.
  - Responsible for **monitoring, evaluation, and adaptive management**.
- Operates under the broader framework of **Project Tiger** (renamed *Project Tiger and Elephant* from 2023–24).

Rationale Behind Cheetah Reintroduction

Ecological Dimensions

- Cheetah acts as a **keystone species** in grassland and savanna ecosystems.
- Helps regulate prey populations and maintain **trophic balance**.
- Enhances conservation focus on **neglected grassland biomes**.

Conservation & Biodiversity

- Restores a species **locally extinct due to hunting and habitat loss**.
- Aligns with India's commitments under:
  - **Convention on Biological Diversity (CBD)**
  - **Global Biodiversity Framework (GBF)**

Socio-economic Significance

- Boosts **eco-tourism** and local livelihoods.
- Strengthens community participation in conservation.

India–Botswana Cooperation: Strategic Significance

- Botswana has the **largest population of wild cheetahs in Africa**.
- Collaboration ensures:
  - **Genetic diversity** of translocated cheetahs.
  - Knowledge-sharing on **large carnivore management**.
- Reflects India's expanding **environmental diplomacy** with African nations.

Challenges in Project Cheetah

Ecological & Biological

- Adapting African cheetahs to Indian ecological conditions.
- High initial mortality risk due to:
  - Disease
  - Stress
  - Human–wildlife conflict

Habitat Constraints

- Fragmented grasslands.
- Limited availability of **large prey-rich landscapes**.

Governance Issues

- Long-term monitoring demands high institutional capacity.
- Coordination between Centre, States, and local communities.

Way Forward

- **Landscape-level Conservation:** Develop multiple cheetah habitats beyond Kuno.
- **Community Integration:** Incentives and awareness to reduce conflict.
- **Scientific Monitoring:** GPS collars, adaptive management, veterinary surveillance.
- **Grassland Policy Focus:** Recognise grasslands as critical ecosystems.
- **International Collaboration:** Continued partnerships with African nations for expertise and genetic support.

Conclusion

The India–Botswana cheetah translocation agreement represents a **landmark in global conservation history**, combining **science, diplomacy, and ecological vision**. If managed with ecological sensitivity and institutional rigour, Project Cheetah can emerge as a **model for species restoration** in the Anthropocene era.

Keywords: *Species reintroduction, Grassland conservation, Keystone species, Environmental diplomacy, Project Cheetah*

Mains Practice Question

"Project Cheetah represents a novel approach to biodiversity conservation through intercontinental species translocation. Analyse its ecological rationale, challenges, and significance for India's environmental governance."

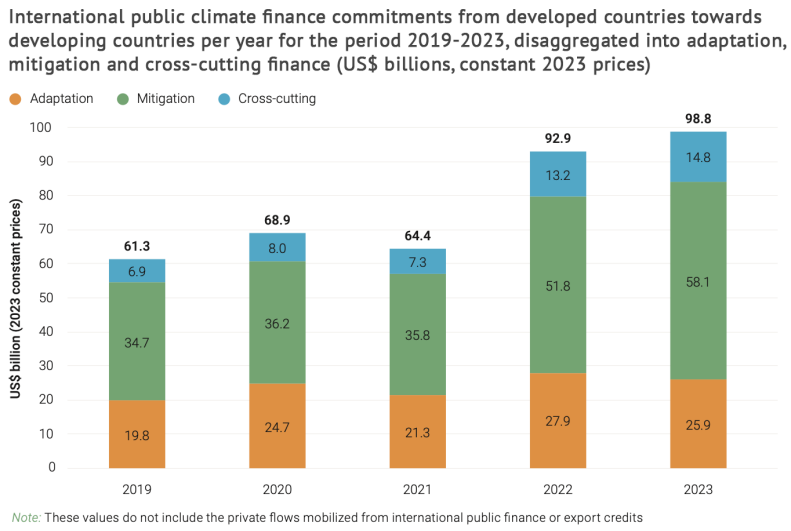
Adaptation Gap Report 2025

Syllabus Mapping

- **GS Paper III** – *Climate Change, Disaster Management, Environmental Economics*
- **GS Paper II** – *International Organisations, Global Climate Governance*
- **GS Paper I** – *Geography – Climate Hazards and Vulnerability*

Introduction

The **UNEP Adaptation Gap Report 2025** underscores a widening chasm between **climate risks** and **adaptation responses**, particularly in developing countries. As climate impacts intensify, the report warns that inadequate finance and weak implementation threaten **lives, livelihoods, and development gains**, calling for an urgent recalibration of global climate action towards **resilience and adaptation**.



Why in News?

- The **United Nations Environment Programme (UNEP)** released its **Adaptation Gap Report 2025**, highlighting:
  - A **massive shortfall in adaptation finance**
  - Persistent **implementation and quality gaps** in national adaptation efforts
  - The need for **innovative finance and stronger resilience planning**

Key Findings of the Adaptation Gap Report 2025

1. Mounting Adaptation Finance Gap

- **Required: USD 310–365 billion per year** by the **mid-2030s** for developing countries.
- **Available:** Only **USD 26 billion globally** for adaptation.
- **Implication:** Current flows meet **less than 10%** of projected needs.

2. Persistent Implementation Deficit

- Most countries have formulated **National Adaptation Plans (NAPs)**.
- However:
  - Execution remains **slow and uneven**
  - Project quality and local relevance are often weak
- Indicates a shift from **planning compliance** to **outcome-based resilience** is needed.

3. Urgent Call for Scaled-Up Action

- UNEP stresses:
  - **Rapid scaling of public and private finance**
  - Deployment of **innovative financial instruments**
  - Integration of **adaptation into development planning**

India's Position in the Report

Progress Made

- Strengthened **National Adaptation Fund for Climate Change (NAFCC)**.
- Implementation of **State Action Plans on Climate Change (SAPCCs)** across States.

Continuing Vulnerabilities

- **Heat stress:** Rising frequency and intensity of heatwaves.
- **Erratic monsoons:** Affecting agriculture and water security.
- **Coastal flooding:** Threatening livelihoods and infrastructure in low-lying regions.

Assessment: Despite institutional progress, **high exposure and sensitivity** keep India among the most climate-vulnerable countries.

Analytical Dimensions

Climate Justice Perspective

- Adaptation gap reflects **historical responsibility asymmetry**.
- Developing countries face higher risks with **lower fiscal capacity**.

Economic Implications

- Underinvestment in adaptation raises:
  - Disaster recovery costs
  - Health expenditures
  - Productivity losses
- Aligns with **Nicholas Stern's argument** that early climate action is economically rational.

Governance Challenges

- Fragmented funding channels
- Limited sub-national capacity
- Weak monitoring and evaluation of adaptation outcomes

Way Forward Suggested by UNEP

- **Scale Up Finance:** Fulfil and exceed global adaptation finance commitments.
- **Innovative Instruments:** Blended finance, climate-resilience bonds, insurance-based tools.
- **Mainstream Adaptation:** Embed resilience into urban planning, agriculture, health, and infrastructure.
- **Strengthen Local Capacity:** Community-led adaptation and indigenous knowledge integration.
- **Improve Quality & Accountability:** Robust metrics to track adaptation effectiveness.

Conclusion

The **Adaptation Gap Report 2025** sends a clear warning: **adaptation is lagging far behind climate realities**. Bridging this gap demands **adequate finance, effective implementation, and resilient development pathways**, especially for vulnerable countries like India. Without decisive action, climate impacts risk **reversing decades of development progress**.

Keywords: *Adaptation finance gap, Climate resilience, Vulnerability, Climate justice, Sustainable development*

📝 Mains Practice Question

"The UNEP Adaptation Gap Report 2025 highlights a critical mismatch between climate risks and adaptation responses. Examine the causes of the adaptation gap and suggest measures to strengthen climate resilience in developing countries, with special reference to India."

Emissions Gap Report 2025

📌 Syllabus Mapping

- **GS Paper III** – *Climate Change, Environmental Pollution, Sustainable Development*
- **GS Paper II** – *International Environmental Agreements, Global Governance*
- **GS Paper I** – *Geography – Global Warming and Climate Systems*

Introduction

The **Emissions Gap Report 2025**, titled *"Off Target"*, released by the **United Nations Environment Programme(UNEP)**, presents a stark assessment of global climate action. It highlights the widening gap between **current emission trajectories** and the reductions required to meet the **Paris Agreement temperature goals**, underscoring the urgency for transformational mitigation efforts.

Why in News?

- UNEP released the **Emissions Gap Report 2025**, evaluating whether current **Nationally Determined Contributions (NDCs)** are sufficient to limit global warming.
- The report concludes that **existing pledges are inadequate**, placing the world on a **high-warming pathway**.

Key Findings of the Emissions Gap Report 2025

1. Temperature Trajectory Remains Alarmingly High

- Even with **updated NDCs**, global average temperature is projected to rise by **2.3–2.5°C** by the end of the century.
- This overshoots the **Paris Agreement goal** of:
  - *Well below 2°C*, and
  - *Pursuing efforts to limit warming to 1.5°C*.

2. Global Emissions Continue to Rise

- **Global GHG emissions increased by 2.3% in 2024**.
- Total emissions reached **57.7 gigatonnes of CO_2 equivalent ($GtCO_2e$)**.
- Indicates a **structural failure** to decouple economic growth from emissions.

3. Required Emission Reductions for 1.5°C Pathway

- To remain within the **1.5°C limit**:
  - Global emissions must decline by **55% by 2035**.
- Current policies and pledges fall **far short** of this reduction pathway.

4. Country-Level Emission Trends

- **India and China** recorded the **highest absolute increase** in total GHG emissions.
- However:
  - **India's per capita emissions remain below the global average**, reflecting developmental needs and equity considerations.

Analytical Interpretation

Mitigation Gap Explained

- The **emissions gap** refers to the difference between:
  - Emissions under current policies and pledges, and
  - Emissions consistent with temperature goals.
- The gap is widening due to:
  - Delayed policy action
  - Continued fossil fuel dependence
  - Insufficient clean energy transition pace

Equity and Climate Justice Dimension

- Developed countries:
  - Have **historically contributed the most** to cumulative emissions.
  - Possess higher mitigation capacity.
- Developing countries like India:
  - Face **developmental imperatives**.
  - Emit less on a **per capita basis**, reinforcing the principle of **Common but Differentiated Responsibilities (CBDR)**.

Economic and Developmental Risks

- Overshooting 1.5°C increases risks of:
  - Extreme weather events
  - Food and water insecurity
  - Economic losses and displacement
- Echoes **Nicholas Stern's** argument that **climate inaction is costlier than action**.

India's Position: Opportunities and Constraints

Positive Aspects

- Low per capita emissions.
- Expansion of renewable energy capacity.
- Commitments towards **net-zero by 2070**.

Challenges

- Rising absolute emissions due to:

  - Urbanisation
  - Industrial growth
  - Energy demand
- Need to balance **developmental goals with climate mitigation**.

UNEP's Recommended Way Forward

- **Strengthen NDC Ambition**: Align pledges with science-based pathways.
- **Accelerate Energy Transition**: Phase down coal, scale renewables and green hydrogen.
- **Carbon Pricing & Market Instruments**: Internalise environmental costs.
- **Technology Transfer**: Enable developing nations to leapfrog to clean technologies.
- **Behavioural Change**: Promote sustainable consumption patterns.

Conclusion

The **Emissions Gap Report 2025** serves as a **global wake-up call**, revealing that the world is **dangerously off track** to meet the Paris Agreement goals. Bridging the emissions gap requires **deep, immediate, and coordinated mitigation efforts**, grounded in **equity, climate justice, and sustainable development**. Without decisive action, the window to limit warming to **1.5°C** may soon close.

Keywords: *Emissions gap, Paris Agreement, 1.5°C pathway, Climate mitigation, CBDR*

📝 Mains Practice Question

"The Emissions Gap Report 2025 highlights that current global mitigation efforts are insufficient to meet the Paris Agreement targets. Analyse the reasons for the widening emissions gap and discuss the implications for developing countries like India."

BIOTECHNOLOGY & HEALTH

NexCAR19: India's First Indigenous CAR-T Cell Therapy

📌 Syllabus Mapping

- **GS Paper III** – *Science & Technology, Biotechnology, Health*
- **GS Paper II** – *Public Health, Government Policies*
- **Essay Paper** – *Technology and Inclusive Healthcare*

Introduction

India has achieved a landmark in advanced cancer care with **NexCAR19**, the country's **first indigenously developed CAR-T cell therapy**. By translating cutting-edge immunotherapy into a **more affordable and locally scalable solution**, NexCAR19 marks a significant step towards **healthcare self-reliance (Aatmanirbharta)** and equitable access to life-saving treatments.

Why in News?

- **NexCAR19** received **market authorisation (2023)** from the **Central Drugs Standard Control Organisation(CDSCO)**.
- Developed for **B-cell blood cancers**, it is **India's first approved CAR-T therapy**.

About NexCAR19

- **Developer: ImmunoACT**
  - Incubated under **IIT Bombay** and **Tata Memorial Hospital**
- **Support:** Department of Biotechnology (DBT) and **BIRAC**
- **Indication:** Relapsed or refractory **B-cell malignancies**
- **Significance:** First **indigenous, clinically approved** CAR-T therapy in India

What is CAR-T Cell Therapy? (Conceptual Clarity)

CAR (Chimeric Antigen Receptor) T-Cell Therapy is a form of **personalised immunotherapy** that re-engineers a patient's own immune cells to target cancer.

Mechanism (Simplified Steps)

1. **Extraction:** T-cells (cytotoxic white blood cells) are collected from the patient.
2. **Genetic Engineering:** T-cells are modified in the lab to express **chimeric antigen receptors (CARs)** that recognise specific cancer antigens (e.g., CD19 on B-cells).
3. **Expansion:** Modified CAR-T cells are multiplied.
4. **Infusion:** CAR-T cells are infused back into the patient.
5. **Targeted Killing:** CAR-T cells identify and destroy cancer cells.

Clinical Utility of CAR-T Therapy

- Designed primarily for **specific blood cancers**.
- Used when:
  - Cancer has **relapsed**, or
  - Has **not responded** to first-line treatments like chemotherapy.

Benefits of NexCAR19

1. Shorter Treatment Duration

- Faster recovery compared to:
  - High-dose chemotherapy
  - Bone marrow/stem cell transplant

2. Sustained Therapeutic Effect

- CAR-T cells can **persist in the body**, providing long-term surveillance against relapse.

3. Improved Accessibility

- **Lower cost** than imported CAR-T therapies, expanding access in a resource-constrained setting.

4. Indigenous Capability

- Strengthens India's ecosystem in:
  - Cell and gene therapy
  - Precision medicine
  - Translational biotechnology

Challenges and Limitations

- **Cancer Specificity:**
  - Therapy effective only for **specific cancer types** (e.g., B-cell malignancies).
- **Adverse Effects:**
  - **Cytokine Release Syndrome (CRS)** – excessive immune activation
  - **Neurotoxicity** – nervous system effects
  - Increased **infection risk**
- **Infrastructure Needs:**
  - Requires advanced clinical and laboratory facilities.
- **Scalability:**
  - Personalised nature limits rapid mass deployment.

Analytical Perspective

- **Public Health:** Offers hope for otherwise treatment-resistant cancers.
- **Science & Technology:** Demonstrates India's ability to move from **import-dependence to innovation leadership**.
- **Equity:** Cost reduction is key to democratising access to advanced therapies.
- **Governance:** Highlights the role of **public funding, academic–industry collaboration, and regulatory support**.

Conclusion

NexCAR19 represents a transformative leap in India's cancer treatment landscape. By combining **cutting-edge immunotherapy with indigenous innovation**, it not only improves clinical outcomes for patients with resistant blood cancers but also strengthens India's position in the global **cell-and-gene therapy ecosystem**. Its success underscores the potential of **public–private–academic collaboration** in delivering high-impact, affordable healthcare solutions.

Keywords: *CAR-T therapy, Immunotherapy, Precision medicine, Indigenous biotechnology, Cancer care*

Mains Practice Question

"CAR-T cell therapy represents a paradigm shift in cancer treatment. Discuss the working of CAR-T technology and examine the significance of NexCAR19 for India's healthcare system and biotechnology ecosystem."

BIRSA-101 Gene Therapy

Syllabus Mapping

- **GS Paper III** – *Science & Technology, Biotechnology, Health*
- **GS Paper II** – *Government Policies, Public Health*
- **GS Paper I** – *Modern Indian History (Tribal Icons – Birsa Munda)*
- **Essay Paper** – *Technology and Inclusive Development*

Introduction

India has achieved a major milestone in biomedical innovation with the launch of **BIRSA-101**, its **first indigenously developed CRISPR-based gene-editing therapy** for **Sickle Cell Disease (SCD)**. The development reflects India's growing capability to translate **frontline genomic science into affordable public-health solutions**, particularly for diseases that disproportionately affect tribal and marginalised communities.

Why in News?

- India launched **BIRSA-101**, the country's **first indigenous CRISPR gene-editing therapy** for SCD.
- The therapy has been developed by **CSIR–Institute of Genomics & Integrative Biology (CSIR-IGIB)**.
- A **technology-transfer agreement** has been signed with **Serum Institute of India** to enable **scalable and affordable** deployment.

About BIRSA-101

Naming & Significance

- Named in honour of **Birsa Munda** on his **150th birth anniversary**.
- Symbolises the alignment of **advanced science with social justice**, as SCD has high prevalence among India's tribal populations.

Purpose

- To provide a **curative, gene-editing–based intervention** for Sickle Cell Disease, moving beyond symptomatic management.

CRISPR Technology: Conceptual Overview

What is CRISPR?

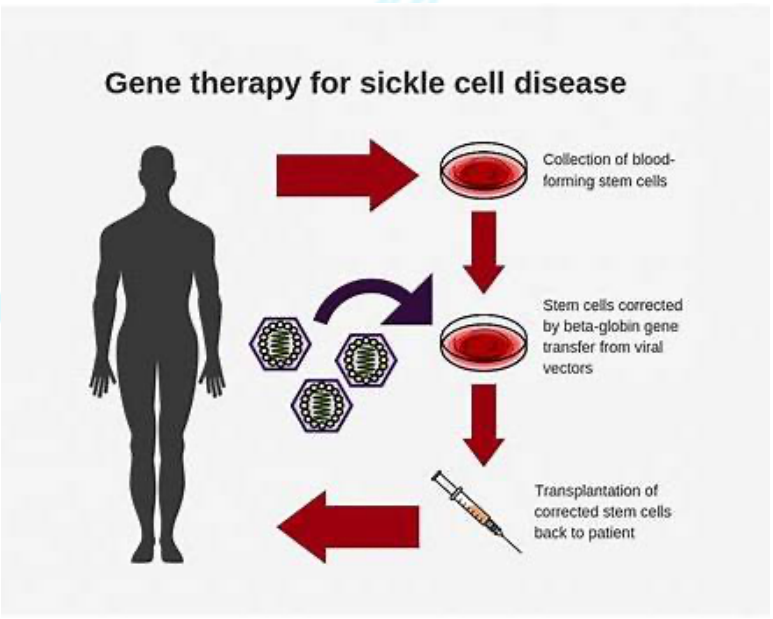
- **CRISPR** stands for **Clustered Regularly Interspaced Short Palindromic Repeats**.
- It is a **precision gene-editing technology** that enables targeted modification of DNA.

Biological Origin

- Derived from a **natural bacterial defence mechanism**:
  - Bacteria store fragments of viral DNA.
  - On re-infection, they deploy **CRISPR-associated proteins** to cut the invading viral DNA.

How CRISPR-Cas9 Works (Simplified)

- **Cas9 Protein:** Acts as **molecular scissors** that cut DNA.
- **Guide RNA (gRNA):** Directs Cas9 to the exact DNA sequence.
- Enables **highly specific genome editing** at predetermined locations.



Genome-Editing Tools: Comparative Perspective

Tool	Key Feature
CRISPR-Cas9	RNA-guided, precise, cost-effective
Meganucleases	Natural enzymes; highly specific but difficult to design
Zinc-Finger Nucleases (ZFNs)	Protein-DNA binding; complex engineering
TALENs	High specificity; bulky and harder to deliver

UPSC Angle: CRISPR stands out for **simplicity, scalability, and adaptability**.

Public Health Significance

Sickle Cell Disease in India

- Genetic blood disorder causing:
  - Chronic anaemia
  - Severe pain episodes
  - Reduced life expectancy
- High prevalence among **tribal communities** in central and eastern India.

Why BIRSA-101 Matters

- **Indigenous innovation** reduces dependence on costly imported therapies.
- Supports **National Sickle Cell Anaemia Elimination Mission (2047)**.
- Demonstrates **bench-to-bedside translation** within India.

Technology Transfer & Industrial Scaling

- Agreement between CSIR-IGIB and **Serum Institute of India** aims to:
  - Scale production
  - Lower treatment costs
  - Expand access beyond elite healthcare systems
- Reflects a **public–private partnership (PPP)** model in advanced therapeutics.

Related Advances in Genome Editing (India)

1. TnpB-Based Genome Editing

- Developed by **ICAR–Central Rice Research Institute (ICAR-CRRI)**.
- Uses **TnpB protein**:
  - Smaller than Cas9
  - Easier delivery into plant cells
- Significant for **agricultural biotechnology** and crop improvement.

2. GlowCas9

- Developed by **Bose Institute**, Kolkata.
- A CRISPR protein that **emits light during gene editing**.
- Enables:
  - Real-time monitoring
  - Higher precision and safety in gene-editing procedures

Ethical & Governance Dimensions

- **Equity:** Ensuring access beyond urban elite hospitals.
- **Ethics:** Germline vs somatic editing debates.
- **Regulation:** Need for robust oversight under India's biotechnology governance framework.
- **Tribal Health Justice:** Aligns advanced science with vulnerable populations.

Way Forward

- **Clinical Trials & Safety:** Rigorous long-term monitoring.
- **Affordability Frameworks:** Public procurement and insurance coverage.
- **Regulatory Capacity:** Strengthen CDSCO and ethics committees for gene therapies.
- **Genomic Ecosystem:** Invest in indigenous platforms for rare genetic diseases.
- **Awareness & Consent:** Community-centred communication in tribal regions.

Conclusion

BIRSA-101 marks a **historic leap in India's biotechnology journey**, demonstrating that **cutting-edge genomic science can be indigenised, scaled, and aligned with social priorities**. By combining innovation, affordability, and public purpose, it sets a precedent for **inclusive, sovereign, and ethical application of gene-editing technologies** in India's healthcare future.

Keywords: *CRISPR, Gene editing, Sickle Cell Disease, Indigenous biotechnology, Health equity*

📝 Mains Practice Question

"The launch of BIRSA-101 reflects India's growing capacity in advanced biotechnology. Explain the working of CRISPR-Cas9 technology and examine the significance of indigenous gene-editing therapies for public health in India."

National One Health Mission

📌 Syllabus Mapping

- **GS Paper II** – *Governance, Health Policy, Institutional Coordination*
- **GS Paper III** – *Science & Technology, Public Health, Disaster & Pandemic Preparedness*
- **GS Paper I** – *Human Geography – Health & Environment Interface*
- **Essay Paper** – *Public Health, Sustainable Development*

Introduction

The proposed **National One Health Mission (NOHM)** marks a paradigm shift in India's public health governance—from **sectoral silos** to **systems-based, anticipatory health security**. By integrating **human, animal, wildlife, and environmental health**, the Mission aims to strengthen **surveillance, diagnostics, and outbreak response**, reflecting lessons from COVID-19 and emerging zoonotic threats.

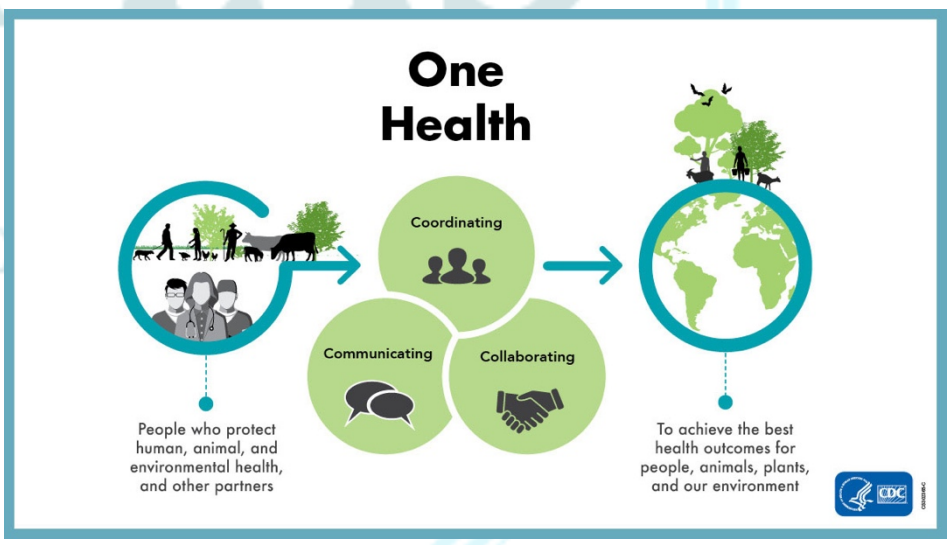
Why in News?

- The Government announced plans to **launch NOHM**, operationalising a **One Health framework** approved earlier by the **Prime Minister's Science, Technology, and Innovation Advisory Council (PM-STIAC)**.

National One Health Mission: Core Features

Nature & Vision

- **Multi-sectoral initiative** integrating health, livestock, wildlife, and environment.
- **Vision:** Build an **integrated disease control and pandemic preparedness system** that improves health outcomes, productivity, and biodiversity conservation.



Approval & Anchors

- **Approved:** 21st meeting of PM-STIAC (2022).
- **Nodal Agency: Indian Council of Medical Research (ICMR)** under the **Office of the Principal Scientific Adviser (PSA)**.
- **Anchor Institution: National Institute of One Health**, Nagpur.

Key Pillars of NOHM

1. **Research & Development**
   - Targeted R&D for **vaccines, diagnostics, therapeutics**, and genomic tools.
2. **Clinical Readiness**
   - Strengthening **clinical infrastructure**, surge capacity, and response protocols.
3. **Data Integration**
   - Seamless **data linkages** across human, animal, and environmental sectors for analytics and early warning.
4. **Community Engagement**
   - Participatory surveillance and **risk communication** to sustain readiness.

The 'One Health' Approach: Conceptual Clarity

- A **unifying framework** to optimise the health of **people, animals, and ecosystems**.
- Critical for **preventing, predicting, detecting, and responding** to complex threats—exemplified by COVID-19 and recurrent zoonoses.

Why India Needs NOHM

1. Zoonotic Risk Mitigation

- **~60% of emerging infectious diseases** are zoonotic.
- Early detection of **spillover events** at the human–animal–environment interface.

2. Pandemic Preparedness

- Shift from **reactive** to **preventive and predictive** public health architecture.

3. Antimicrobial Resistance (AMR)

- Misuse across **human health, livestock, aquaculture** accelerating resistance.
- One Health enables **coordinated stewardship**.

4. Climate Change & Vector Expansion

- Warming expands vectors (e.g., mosquitoes), increasing **dengue, malaria** risks.
- Integrated surveillance improves **climate-sensitive disease control**.

5. Livelihood & Ecosystem Security

- Healthier livestock → **higher farmer incomes**.
- Wildlife disease surveillance strengthens **biodiversity conservation**.

6. Global Alignment

- Aligns with the **One Health Quadripartite—World Health Organization**, **Food and Agriculture Organization**, **World Organisation for Animal Health (WOAH)**, and **United Nations Environment Programme**—positioning India as a **regional leader**.

Related One Health Initiatives in India

- **Centre for One Health (CoH)** at **National Centre for Disease Control**: Coordinates zoonoses programmes (Rabies, Leptospirosis, Snakebite).
- **One Health Supporting Unit** (Department of Animal Husbandry & Dairying): Multidisciplinary implementation support.
- **BSL-3/4 Laboratory Network**: High-security labs for rapid, cross-sector outbreak analysis.
- **One Health Joint Plan of Action (2022–26)**: Global framework by the Quadripartite alliance.

Analytical Perspective

- **Governance:** Institutional convergence reduces duplication and blind spots.
- **Science & Tech:** Genomics and real-time analytics enable **precision public health**.
- **Equity:** Community engagement ensures **last-mile surveillance**.
- **Sustainability:** Embeds health within **ecosystem stewardship**.

Way Forward

1. **Legal Mandate**
   - Establish a **statutory inter-sectoral authority** to institutionalise convergence.
2. **Capacity Building**
   - Train in **veterinary epidemiology, wildlife surveillance, genomics, field diagnostics**.
3. **State-Level Strengthening**
   - Create **State One Health Cells** with dedicated funds and manpower.
4. **Digital Integration**
   - Develop a **National One Health Digital Platform** for real-time data fusion and decision support.
5. **Climate-Adaptive Strategies**
   - Research climate–disease linkages; deploy adaptive control measures.
6. **Global Partnerships**
   - Deepen collaboration with Quadripartite agencies and regional networks.

Conclusion

The **National One Health Mission** signifies India's transition to **integrated, anticipatory health governance**. By unifying human, animal, and environmental systems, NOHM can enhance **early warning, rapid response, and resilience**—positioning India as a **global exemplar** in managing zoonotic, environmental, and emerging public-health threats.

Keywords: *One Health, Zoonoses, Pandemic preparedness, AMR, Integrated surveillance*

Mains Practice Question

"The National One Health Mission reflects a shift from siloed public health responses to integrated health governance. Examine its rationale, institutional framework, and challenges, and suggest measures to strengthen its implementation in India."

NAP-AMR 2.0

Syllabus Mapping

- **GS Paper II** – *Health Policy, Governance, Inter-ministerial Coordination*
- **GS Paper III** – *Public Health, Science & Technology, Environmental Pollution*
- **GS Paper I** – *Human Geography – Health & Environment Interface*

Introduction

Antimicrobial Resistance (AMR) has emerged as a **silent global pandemic**, undermining modern medicine, food systems, and environmental safety. Recognising the escalating threat, India has launched **NAP-AMR 2.0 (2025–29)**, signalling a shift from intent-based policy to **budgeted, accountable, and multisectoral action** anchored in the **One Health** paradigm.

Why in News?

- The **Union Minister for Health and Family Welfare** launched **NAP-AMR 2.0**, updating India's first AMR action plan with stronger governance, enforceability, and cross-sector integration.

NAP-AMR 2.0 (2025–29): Overview

Vision: Build a **sustainable ecosystem** for **humans, animals, plants, and the environment** by preventing the **emergence and spread of AMR** through an evidence-based **One Health approach**.

Conceptual Anchor – One Health

- Recognises that **human health, animal health, and environmental health are interlinked**, necessitating coordinated action across sectors.

Key Features of NAP-AMR 2.0

1. "Whole of Government" Approach

- AMR addressed across **health, animal husbandry, agriculture, environment, pharmaceuticals, and urban governance**.
- **Sustained funding** earmarked within each participating ministry/department.

2. Enforceable Accountability Framework

- **20+ ministries and departments** have submitted:
  - **Time-bound**
  - **Budgeted**
  - **Outcome-linked** action plans
- Marks a transition from advisory coordination to **executive accountability**.

3. Deepened One Health Integration

- **First-ever mandate** for:
  - Systematic **surveillance of antibiotic residues**
  - Monitoring **resistant pathogens in the environment** (water bodies, soil, effluents)

4. Institutional Coordination Mechanisms

- **Joint Working Groups** of domain experts.
- **National AMR Steering & Monitoring Committee** to:
  - Resolve inter-sectoral conflicts
  - Ensure policy coherence and strategic alignment.

5. Surveillance, Data & Stewardship

- **Genomic surveillance** to track resistance patterns.

- **Prescription audits** and **Antimicrobial Stewardship Programmes (AMSP)** in hospitals to guide rational, evidence-based prescribing.
- Enhanced **data sharing** across sectors to enable early warning and targeted interventions.

Analytical Significance

- **Public Health:** Tackles AMR across **clinical, veterinary, and environmental pathways**, reducing treatment failures and healthcare costs.
- **Governance Innovation:** Embeds AMR control into the **administrative DNA** of multiple ministries—an example of **collaborative federalism** and inter-ministerial convergence.
- **Environmental Dimension:** Addressing antibiotic residues curbs **environmental amplification of resistance**, a long-neglected driver of AMR.
- **Global Alignment:** Aligns with the One Health advocacy of the **World Health Organization**, **Food and Agriculture Organization**, **World Organisation for Animal Health**, and **United Nations Environment Programme** (Quadripartite).

Implementation Challenges

- Ensuring **last-mile compliance** in hospitals and farms.
- Capacity gaps in **laboratory infrastructure** and trained manpower.
- Behavioural change among prescribers and consumers.
- Coordinating diverse ministries with differing priorities.

Way Forward

- **Strengthen State-level AMR action plans** with dedicated funding.
- Scale up **laboratory and genomic capacity** nationwide.
- Incentivise **rational antibiotic use** in healthcare and agriculture.
- Integrate AMR indicators into **environmental regulation and urban planning**.
- Expand **international collaboration** for surveillance and technology transfer.

Conclusion

NAP-AMR 2.0 represents a **mature and forward-looking response** to one of the gravest threats to public health. By operationalising a **One Health, whole-of-government approach** with enforceable accountability, India aims to build a **resilient, preventive defence** against AMR—protecting lives, livelihoods, and ecosystems.

Keywords: *Antimicrobial resistance, One Health, Whole-of-government, Stewardship, Environmental surveillance*

📝 Mains Practice Question

"The National Action Plan on Antimicrobial Resistance 2.0 marks a shift from policy intent to enforceable action. Analyse its key features and examine how the One Health approach can strengthen India's response to the AMR challenge."

WHO TB Report 2025

📌 Syllabus Mapping

- **GS Paper II** – *Health, Governance, Government Programmes*
- **GS Paper III** – *Public Health, Science & Technology*
- **GS Paper I** – *Population & Social Issues*
- **Essay Paper** – *Public Health and Human Development*

Introduction

The **WHO Global Tuberculosis (TB) Report 2025**, released by the **World Health Organization**, presents a mixed picture of global TB control. While **India has achieved a significant 21% reduction in TB incidence**, the disease continues to be among the **top 10 causes of death worldwide**, underscoring the need for sustained, multi-sectoral action—especially in high-burden countries.

Why in News?

- As per the **WHO TB Report 2025**, **India's TB incidence (new cases per year) declined by 21%**.
- Despite progress, India continues to bear the **largest share of the global TB burden**.

Key Global Findings (WHO TB Report 2025)

- **Global TB deaths (2024): 1.23 million**
- **Global TB incidence: 12% net reduction (2015–2024)**
- **Global TB deaths: 29% net reduction (2015–2024)**
- TB remains the **leading cause of death from a single infectious agent** globally.

India-Specific Highlights

- **Incidence reduction: 21%**
- **Mortality rate:** Reduced from **28 per lakh (2015)** to **21 per lakh (2024)**
- **Global burden share:**
  - **25% of all TB cases worldwide**
  - **32% of global MDR/RR-TB cases (2024)**
  - **25% of TB deaths** (with and without HIV)

Tuberculosis: Conceptual Overview

Cause

- **Mycobacterium tuberculosis**
- **Airborne, preventable, and curable**

Types Based on Site of Infection

- **Pulmonary TB:**
  - Affects lungs; **highly contagious**
- **Extrapulmonary TB:**
  - Lymph nodes, bones, brain, kidneys, pleura; **less contagious**
- **Spinal TB (Pott's disease):**
  - Affects spine; can cause deformity and paralysis

Types Based on Drug Response

- **Drug-sensitive TB:** Responds to first-line drugs
- **Drug-resistant TB:** Poor response to standard therapy
- **MDR-TB:** Resistant to **isoniazid and rifampicin**
- **XDR-TB:** Resistant to multiple second-line drugs

Drivers of TB Control in India

1. Policy and Programme Interventions

- **National TB Elimination Programme (NTEP):**
  - Renamed from RNTCP in 2020
  - Target: **TB elimination by 2025**
- **National Strategic Plan (2017–25):**
  - Comprehensive roadmap for TB elimination

2. Patient-Centric Support

- **Pradhan Mantri TB Mukt Bharat Abhiyaan (2022):** Community and nutritional support
- **Nikshay Poshan Yojana (2018):** ₹1,000/month nutritional assistance per notified patient

3. Infrastructure & Technology

- Expansion of diagnostics and treatment centres
- **Nikshay Portal:** Digital case-based surveillance and monitoring
- **Universal Drug Susceptibility Testing (UDST)** for all diagnosed cases

4. Advanced Therapeutics

- **BPaLM regimen** (Bedaquiline + Pretomanid + Linezolid + Moxifloxacin)
  - Shorter, more effective treatment for MDR-TB

5. Modern Diagnostics

- **NAAT**, **Whole-Genome Sequencing (WGS)**, and **AI-based tools** for early detection and resistance mapping

Challenges in Eliminating TB in India

1. Diagnostic Gaps

- Limited access in **remote and rural areas**
- Example: Active case finding in **Gurez Valley (Kashmir)** detected **250 cases from 1,250 screened**

2. Digital Divide

- Inadequate IT infrastructure limits effective use of **Nikshay** in peripheral health facilities

3. Socio-Economic Determinants

- Disproportionate impact on:
  - Poor and malnourished populations
  - Migrant workers
  - Tribal communities
  - Urban slum dwellers

4. Malnutrition

- Severe malnutrition increases TB risk by **6–8 times**

5. High MDR/RR-TB Burden

- India contributes **over one-third** of global MDR/RR-TB cases

6. Drug Supply Constraints

- Periodic shortages of second-line drugs
  - Example: **Cycloserine shortage in Maharashtra (2023)**

7. Human Resource Gaps

- Vacancies:
  - **Microbiologists – 67%**
  - **Lab assistants – 43%**
- Shortage of TB health visitors and counsellors

8. Environmental & Co-morbidity Factors

- Poor ventilation and overcrowding (e.g., Mumbai housing complexes)
- High prevalence of **diabetes among TB patients** (Tamil Nadu studies)
- Impact of **natural disasters** and an **unregulated private sector**

Analytical Perspective

- TB elimination is not only a **medical challenge** but also a **developmental and governance issue**.
- Success depends on addressing **social determinants of health**, consistent with **Amartya Sen's capability approach**.
- India's 2025 target reflects **political will**, but sustainability demands **health system resilience**.

Way Forward

- **Strengthen last-mile diagnostics** in rural and tribal areas
- Ensure **uninterrupted drug supply chains**
- Integrate **nutrition, housing, and livelihood support** with TB care
- Expand **public–private partnership regulation**
- Invest in **human resources and digital infrastructure**
- Reduce stigma through **community engagement**

Conclusion

The **WHO TB Report 2025** recognises India's substantial progress in reducing TB incidence and mortality. However, the **scale of disease burden, MDR-TB prevalence, and socio-economic vulnerabilities** demand a **people-centred, technology-enabled, nutrition-focused, and multi-sectoral strategy**. Only sustained political commitment and systemic strengthening can translate current gains into **durable TB elimination**.

Keywords: *Tuberculosis, MDR-TB, NTEP, Nutrition, Public health governance*

📝 Mains Practice Question

"Despite a significant reduction in tuberculosis incidence, India continues to bear the highest global TB burden. Analyse the key findings of the WHO Global TB Report 2025 and discuss the challenges and strategies for achieving TB elimination in India."

PRIP Scheme

📌 Syllabus Mapping

- **GS Paper III** – *Science & Technology, Industrial Policy, Innovation*
- **GS Paper II** – *Government Policies and Interventions*
- **Essay Paper** – *Innovation, Research and Self-Reliance*

Introduction

India's ambition to move up the global value chain in **pharmaceuticals and medical devices** hinges on strong **research, innovation, and translational capability**. In this context, the **Promotion of Research and Innovation in Pharma & MedTech (PRIP) Scheme** is a flagship intervention to shift India from being primarily a **generic manufacturing hub** to a **global R&D-driven powerhouse**.

Why in News?

- The Union Government has **extended the deadline** for applications under the **PRIP Scheme**, signalling continued policy emphasis on strengthening **domestic R&D capacity** in the Pharma–MedTech sector.

About the PRIP Scheme

Implementing Authority: Launched by the **Department of Pharmaceuticals**, under the **Ministry of Chemicals and Fertilizers**.

Financial Outlay: ₹5,000 crore

Overall Aim: To **transform India into a global hub for pharmaceutical and medical technology R&D**, innovation, and high-value manufacturing.

Key Objectives

- Strengthen **research infrastructure** in pharma and medical devices.
- Promote **industry–academia collaboration**.
- Encourage **indigenous innovation** in:
  - New drugs
  - Complex generics
  - Biologics
  - Advanced medical devices
- Reduce India's dependence on **imported technologies**.
- Enhance India's **global competitiveness** in regulated markets.

Key Components of the PRIP Scheme

Component A: Strengthening Research Infrastructure

- Focuses on creating **Centres of Excellence (CoEs)**.
- To be established at **National Institute of Pharmaceutical Education and Research (NIPERs)**.
- Emphasis on:
  - State-of-the-art laboratories
  - Advanced instrumentation
  - Translational research ecosystems

- Expected outcome:
  - World-class academic and applied research capacity
  - Skilled human resource pipeline for pharma–MedTech R&D

Component B: Promotion of Research and Innovation

- Direct support for **industry-driven and collaborative R&D projects**.
- Encourages:
  - Development of **new chemical entities**
  - Complex formulations and delivery systems
  - Innovative medical devices and diagnostics
- Supports **start-ups, MSMEs, and established firms** to undertake high-risk, high-impact research.

Significance of PRIP Scheme

1. From "Pharmacy of the World" to "Innovation Hub"

- India dominates generic drug supply but lags in **original drug discovery**.
- PRIP addresses this structural gap.

2. Strategic Autonomy

- Reduces dependence on:
  - Imported Active Pharmaceutical Ingredients (APIs)
  - High-end medical devices
- Aligns with **Aatmanirbhar Bharat**.

3. Economic and Industrial Impact

- Promotes:
  - High-value jobs
  - Knowledge-intensive industries
- Enhances exports of **patented and technology-intensive products**.

4. Public Health Benefits

- Indigenous R&D can lower costs of:
  - Advanced therapies
  - Critical medical devices
- Improves access and affordability.

Challenges in Achieving PRIP Objectives

- Long gestation period for pharma R&D.
- High risk and uncertain returns.
- Limited private-sector investment in early-stage research.
- Need for:
  - Strong IP protection
  - Faster regulatory pathways
  - Skilled interdisciplinary manpower

Way Forward

- Ensure **timely and transparent fund disbursal**.
- Strengthen **academia–industry–startup linkages**.
- Integrate PRIP with:
  - Production Linked Incentive (PLI) schemes
  - Startup India and BioE3 policy initiatives
- Create enabling ecosystem for:
  - Clinical trials
  - Regulatory science
  - Commercialisation of research outcomes

Conclusion

The **PRIP Scheme** represents a strategic shift in India's pharmaceutical and MedTech policy—from scale-based manufacturing to **innovation-led growth**. By investing in research infrastructure and incentivising industry-driven innovation, the scheme can play a pivotal role in positioning India as a **global leader in affordable, high-quality, and cutting-edge healthcare solutions**.

Keywords: *Pharma R&D, MedTech innovation, Centres of Excellence, Aatmanirbhar Bharat, Knowledge economy*

Mains Practice Question

"The Promotion of Research and Innovation in Pharma & MedTech (PRIP) Scheme seeks to reposition India in the global pharmaceutical value chain. Examine its key features and discuss how it can strengthen India's innovation ecosystem in healthcare."

SCIENCE & TECHNOLOGY

GSAT-7R Satellite

Syllabus Mapping

- **GS Paper III** – *Science & Technology, Defence Technology, Space*
- **GS Paper II** – *National Security, Government Policies*
- **Essay Paper** – *Technology and National Security*

Introduction

India has taken a significant step in enhancing **defence satellite communications (SATCOM)** with the successful launch of **GSAT-7R (CMS-03)**. Designed primarily for the **Indian Navy**, the satellite strengthens **secure, real-time maritime connectivity** across the Indian Ocean Region (IOR), reinforcing India's push for **Aatmanirbharta** in strategic defence technologies.

Why in News?

- **GSAT-7R (CMS-03)** was successfully launched aboard **ISRO's LVM3** from **Satish Dhawan Space Centre**.
- The satellite is a dedicated **naval communication platform**, replacing the ageing **GSAT-7 (INSAT-4F Rukmini)**.

GSAT-7R (CMS-03): Key Features

Mission Profile

- **Series:** GSAT-7 (defence communication satellites)
- **User: Indian Navy**
- **Purpose:** Secure, resilient SATCOM for maritime operations

Technical Specifications

- **Mass:** ~4,400 kg
- **Orbit:**
  - Injected into **Geosynchronous Transfer Orbit (GTO)**
  - Final placement in **Geostationary Orbit (~35,786 km)**
- **Operational Life:** ~15 years

Coverage & Capability

- **Geographical Reach:**
  - Indian landmass
  - Indian Ocean Region
  - Up to ~2,000 km from India's coastline
- **Frequency Bands: UHF, S, C, Ku**
- **Services:** Secure **voice, video, and data** transmission
- **Users:** Naval ships, submarines, aircraft, and Maritime Operations Centres (MOCs)

Strategic Significance

1. Maritime Domain Awareness

- Enables **real-time coordination** across dispersed naval assets.
- Enhances surveillance and command-and-control in the IOR.

2. Secure Network-Centric Warfare

- Supports **encrypted, jam-resistant communications** essential for modern naval operations.

3. Aatmanirbharta in Defence

- Reduces reliance on **foreign SATCOM services**.
- Ensures operational autonomy during crises and conflicts.

GSAT-7 Series: Force-Wise Overview

Indian Navy

- **GSAT-7 (Rukmini)** – Operational since 2013; India's **first dedicated military satellite**.
  - Reportedly tracked Chinese **Yuan-class submarines** during the Doklam crisis.
  - Reduced dependence on foreign providers like Inmarsat.

Indian Air Force

- **GSAT-7A (Angry Bird)** – Launched in 2018; strengthens **IAF network-centric operations** by linking aircraft, UAVs, AWACS, missile units, and radars.
- **GSAT-7C (Upcoming)** – Planned with ground hubs for **real-time secure connectivity**.

Indian Army

- **GSAT-7B (Planned)** – To enhance **communication and surveillance** in border areas.

Analytical Perspective

- **Space as a Warfighting Domain:** GSAT-7R underlines the growing role of space assets in **deterrence and operational superiority**.
- **Jointness & Integration:** Complements tri-service SATCOM architecture, enabling **integrated theatre operations**.
- **Resilience:** Multi-band capability improves robustness against **jamming and interference**.

Conclusion

GSAT-7R (CMS-03) significantly upgrades India's **naval SATCOM capability**, ensuring **secure connectivity, enhanced maritime awareness, and strategic autonomy**. As the security environment in the IOR becomes more contested, such indigenous space assets are indispensable for **credible deterrence and effective naval power projection**.

Keywords: *SATCOM, GSAT-7R, Maritime security, Geostationary orbit, Aatmanirbharta*

Mains Practice Question

"Satellite-based communication has emerged as a critical enabler of modern military operations. Discuss the strategic significance of GSAT-7R in strengthening India's maritime security architecture."

Quantum Technology in India

Syllabus Mapping

- **GS Paper III** – *Science & Technology, Emerging Technologies, Cyber Security*
- **GS Paper II** – *National Security, Government Initiatives*
- **Essay Paper** – *Frontier Technologies and National Development*

Introduction

Quantum technology has emerged as a **strategic and transformative frontier** with far-reaching implications for **national security, computation, cryptography, and economic competitiveness**. Recent developments such as **QSIP (Quantum Security Chip)**, **India's first 25-qubit Quantum Processing Unit (QPU)**, and advances in **quantum information scrambling** signal India's gradual but decisive entry into the global quantum race.

Why in News?

- India has recorded notable progress in **quantum hardware and security applications**, including:
  - Development of **QSIP**, India's first quantum-certified security chip.
  - Creation of a **25-qubit quantum computing chip** by an Indian startup.
  - Experimental advances in **quantum information scrambling**, a marker of quantum advantage.

Key Developments in Quantum Technology

1. QSIP – Quantum Security Chip

What is QSIP?

- **QSIP (Quantum Random Number Generator System in Package)** is **India's quantum security chip**.
- It generates **quantum-certified random numbers** using inherent quantum uncertainty.

Why Randomness Matters

- Cryptographic systems rely on **true randomness** for:
  - Encryption keys
  - Secure communication
- Classical computers generate **pseudo-random numbers**, which may be predictable with sufficient computational power.

Quantum Advantage

- QSIP uses **quantum phenomena** to produce **non-deterministic randomness**, making it:
  - Resistant to cyber intrusions
  - Secure against **future quantum attacks**

Strategic Significance

- Enhances **cybersecurity** and **defence communication**
- Supports **post-quantum cryptography**
- Reduces dependence on foreign security hardware

2. 25-Qubit Quantum Processing Unit (QPU)

What is a QPU?

- A **Quantum Processing Unit (QPU)** is the core hardware of a quantum computer, analogous to a CPU in classical systems.
- Uses **qubits**, which can exist in **superposition** and **entanglement**.

India's First 25-Qubit Chip

- Developed by **QpiAI**
- Represents a major milestone in **indigenous quantum hardware development**

Significance

- Enables:
  - Complex simulations
  - Optimization problems
  - Quantum machine learning
- Positions India among a small group of nations with **home-grown multi-qubit processors**

3. Quantum Information Scrambling

Conceptual Understanding

- **Quantum information scrambling** refers to the **rapid spreading of information across a quantum system**.
- Information becomes **inaccessible to local measurements** (i.e., measuring only a part of the system).

Mechanism

- Occurs through **quantum entanglement**:
  - Data initially stored in one qubit spreads across many qubits.
  - Information is **hidden globally**, not destroyed.

Key Feature

- To retrieve the information, one must:
  - Measure the **entire quantum system**

- Local observation yields no meaningful data.

Analogy

- Like a **drop of dye dispersing in water**:
  - Initially visible
  - Eventually spread uniformly, invisible at any single point

Why It Matters

- Demonstrates **verifiable quantum advantage**
- Improves understanding of:
  - Quantum chaos
  - Black hole information paradox (theoretical physics)
- Crucial for **secure quantum communication** and **error-resilient quantum computing**

Analytical Perspective

National Security

- QSIP strengthens **quantum-safe encryption**, vital for defence and critical infrastructure.

Technological Sovereignty

- Indigenous QPU development supports **Aatmanirbharta** in frontier technologies.

Economic & Strategic Competition

- Quantum computing is expected to:
  - Disrupt pharmaceuticals, materials science, logistics, and finance
- Early movers gain **long-term strategic advantage**

Scientific Advancement

- Quantum information scrambling validates **India's research capability** in deep-theory and experimental quantum science.

Challenges Ahead

- **Scalability:** Moving from 25 qubits to fault-tolerant large-scale quantum computers.
- **Talent Gap:** Shortage of trained quantum physicists and engineers.
- **High Costs:** Infrastructure and cryogenic requirements.
- **Global Competition:** Dominance of US, China, and EU in quantum R&D.

Way Forward

- Strengthen implementation of the **National Quantum Mission (NQM)**.
- Promote **industry–academia–startup collaboration**.
- Invest in:
  - Quantum hardware
  - Post-quantum cryptography
  - Skilled human resources
- Develop **quantum-ready cybersecurity frameworks** for governance and defence.

Conclusion

Recent advances such as **QSIP**, **25-qubit QPU**, and breakthroughs in **quantum information scrambling** indicate that India is steadily building a **credible quantum technology ecosystem**. While challenges remain, sustained investment, policy support, and indigenous innovation can enable India to leverage quantum technologies for **secure communication, advanced computation, and strategic autonomy** in the coming decades.

Keywords: *Quantum computing, QPU, Quantum cryptography, Quantum advantage, Aatmanirbharta*

📝 Mains Practice Question

"Quantum technologies are emerging as a critical determinant of future economic and national security power. Discuss recent developments in quantum technology in India and analyse their strategic significance."

Satellite-Based Internet

📌 Syllabus Mapping

- **GS Paper III** – *Science & Technology, Infrastructure, Digital Connectivity*
- **GS Paper II** – *Governance, E-Governance, Inclusive Development*
- **GS Paper I** – *Human Geography – Infrastructure and Regional Development*
- **Essay Paper** – *Technology as an Enabler of Inclusive Growth*

Introduction

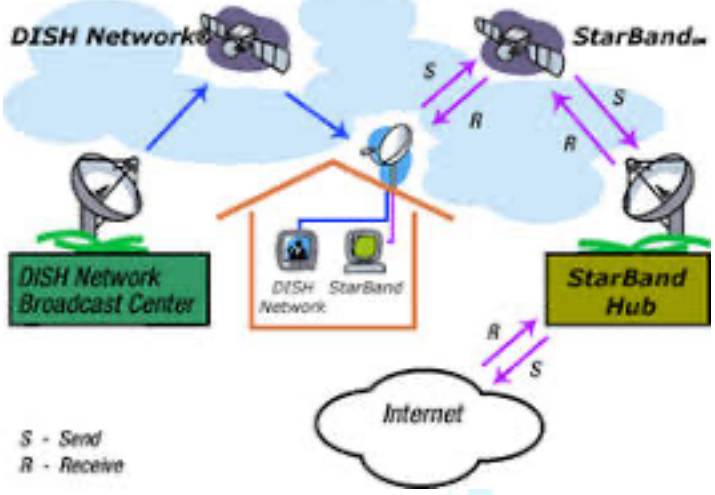
Satellite-based internet has emerged as a **disruptive technology** capable of bridging the digital divide in regions where terrestrial broadband remains economically or geographically unviable. Recent developments indicate a renewed policy and commercial focus on leveraging **Low Earth Orbit (LEO) satellite constellations** to provide **high-speed, low-latency internet** to remote and underserved areas.

Why in News?

- **Starlink**, owned by **Elon Musk**, has signed an agreement with the **Government of Maharashtra** to deliver **satellite-based internet connectivity** to remote and underserved regions of the State.
- The move aligns with India's broader goals of **digital inclusion and last-mile connectivity**.

What is Satellite-Based Internet?

Definition: Satellite internet is a form of **wireless broadband** delivered via **communication satellites orbiting the Earth**, enabling data transmission without dependence on ground-based physical cables.



How It Works

1. User's device connects to a **satellite dish/terminal**.
2. Data is transmitted from the dish to a **satellite in orbit**.
3. The satellite relays data to **ground stations** connected to the global internet.
4. The process works bidirectionally, enabling real-time communication.

Satellite Internet vs Terrestrial Broadband

Aspect	Satellite Internet	Fibre/Cable/DSL
Infrastructure	Space-based	Ground-based cables
Coverage	Global, remote areas	Limited to wired regions
Deployment Time	Rapid	Slow and capital-intensive
Reliability	Weather-sensitive	Relatively stable
Last-mile Reach	Very high	Often limited

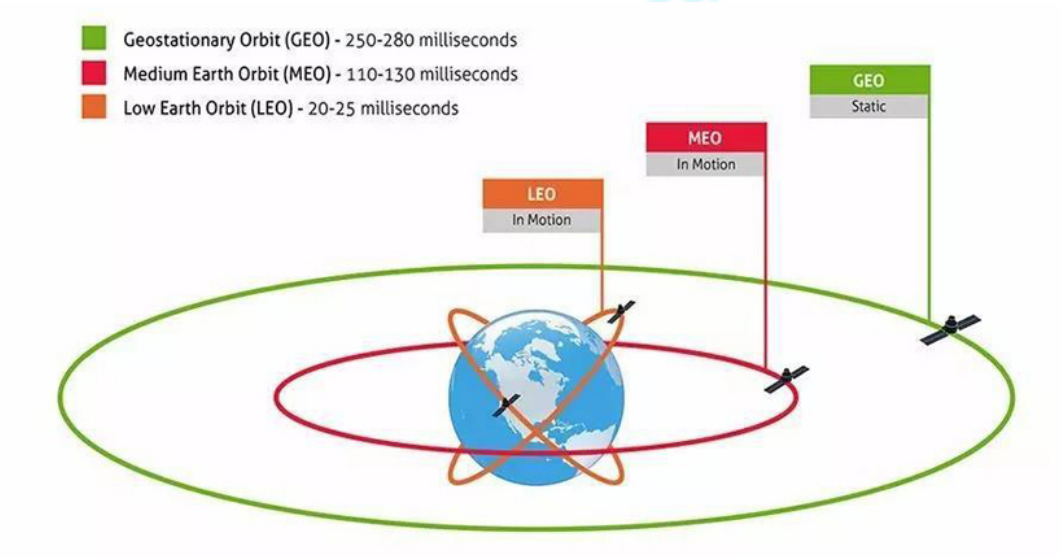
Role of Low Earth Orbit (LEO) Satellites

LEO Characteristics

- Orbit altitude: **~500–2,000 km**
- Example: **Starlink constellation**

Advantages over Geostationary Satellites (GEO)

- **Lower latency** due to shorter signal travel distance
- **Higher speeds** suitable for:
  - Video conferencing
  - Online education
  - Telemedicine
- Better support for **real-time applications**



Significance for India

1. Bridging the Digital Divide

- Enables connectivity in:
  - Hilly terrains
  - Tribal and forested regions

    - Islands and disaster-prone areas

2. Governance and Public Service Delivery

- Strengthens:
    - E-governance
    - Telemedicine
    - Online education
    - Digital financial inclusion

3. Disaster Resilience

- Satellite internet remains functional when:
    - Terrestrial networks fail due to floods, earthquakes, or cyclones

4. Economic and Social Inclusion

- Supports:
    - Rural entrepreneurship
    - Remote work
    - Skill development
- Aligns with **Digital India** and **Aspirational Districts Programme** objectives.

Challenges and Concerns

Regulatory Issues

- Spectrum allocation
- Licensing under India's telecom framework
- National security and data sovereignty concerns

Cost and Affordability

- User terminals and subscriptions may remain expensive for poorer households.

Space Sustainability

- Growing LEO constellations raise concerns about:
    - Space debris
    - Orbital congestion

Competition with Domestic Capabilities

- Need to balance foreign providers with **indigenous SATCOM initiatives**.

Analytical Perspective

- **Technology & Equity:** Satellite internet can act as a **leveller**, but only if affordability and access are ensured.
- **Strategic Autonomy:** Heavy reliance on foreign constellations may pose **strategic vulnerabilities**.
- **Policy Imperative:** Requires a robust **SATCOM policy framework** integrating telecom, space, and security considerations.

Way Forward

- Finalise a **comprehensive satellite communication policy**.
- Encourage **public–private partnerships** and indigenous alternatives.
- Provide **targeted subsidies or shared-access models** for remote regions.
- Strengthen coordination between **DoT, ISRO, and security agencies**.
- Address **space sustainability norms** through international cooperation.

Conclusion

Satellite-based internet, particularly through **LEO constellations**, has the potential to **transform digital connectivity** in geographically challenging regions. The Maharashtra–Starlink agreement highlights how such technologies can complement terrestrial networks. However, realising its full potential in India will depend on **regulatory clarity, affordability, security safeguards, and integration with national digital goals**.

Keywords: *Satellite internet, LEO satellites, Digital inclusion, Connectivity, Space-based broadband*

Mains Practice Question

“Satellite-based internet has emerged as a viable solution for last-mile digital connectivity. Examine its working, advantages, and challenges, and discuss its relevance for inclusive development in India.”