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An Institute for Civil Services

WEEKLY UPDATES

DATE : (25th Aug- 31st Aug)

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POLITY

Parliamentary Committees: Backbone of Parliamentary Democracy

📌 **Syllabus Mapping**
✅ **GS Paper II – Polity & Governance**: Parliament, Parliamentary Committees, Functioning of Democracy
✅ **GS Paper II – Governance**: Accountability, Transparency, Institutional Reforms

Context

- Lok Sabha Speaker (Aug 2025) at the *National Conference of Chairpersons of Committees of Parliament and State Legislatures on the Welfare of SCs & STs* described **Parliamentary Committees as the backbone of parliamentary democracy**.
- Reflects the importance of **committee system** in ensuring accountability, expertise, and detailed scrutiny.

Role of Parliamentary Committees

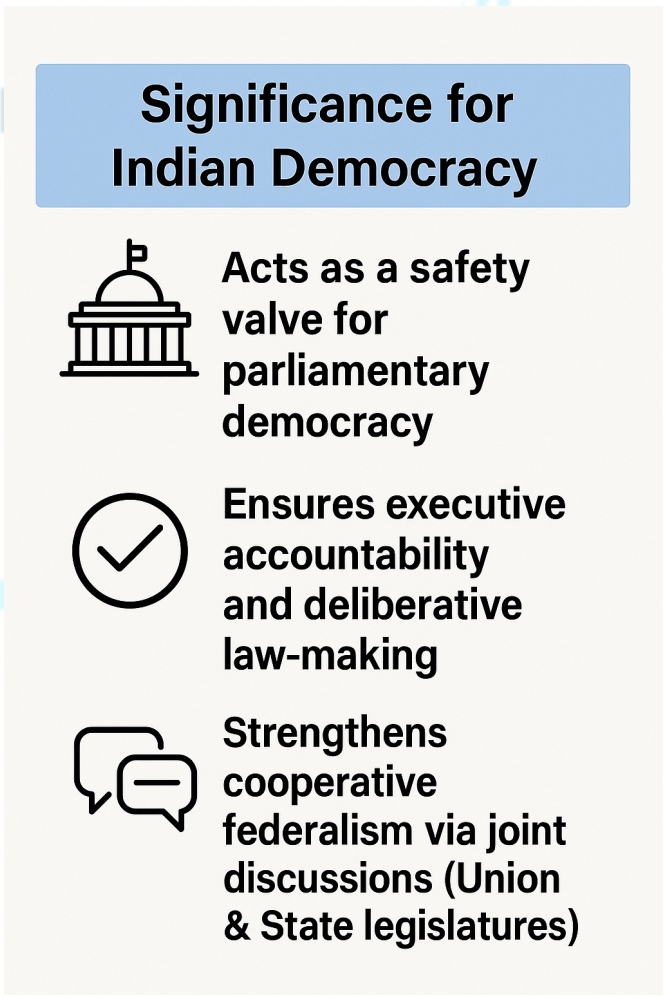
1. **Non-Partisan Functioning & Consensus Building**
   - Brings MPs from different parties together → fosters **cross-party consensus**.
   - *Example*: All-party discussion in Standing Committees on Education during NEP review.
2. **Domain Expertise & Technical Scrutiny**
   - Committees bring **specialized knowledge** for complex issues.
   - *Example*: **Committee on Health** examined the *Surrogacy (Regulation) Bill, 2016*.
3. **Ensures Government Accountability**
   - Acts as a **watchdog** over executive functioning.
   - *Example*: **Public Accounts Committee (2024)** flagged excess spending by four ministries.
4. **Focus on Developmental Issues**
   - Highlights gaps in welfare & development schemes.
   - *Example*: **Committee on Rural Development** flagged declining allocations to Panchayati Raj Institutions.
5. **Strengthening Legislative Process**
   - Enhances quality of bills through **detailed scrutiny & stakeholder consultations**.
   - *Example*: **Personal Data Protection Bill, 2019** was revised based on Joint Committee recommendations.

Challenges in Functioning

1. **Declining Referral of Bills**
   - Referral to Committees is **not mandatory**.
   - Trend: 15th LS (71%) → 16th LS (28%) → 17th LS (16%).
2. **Low Participation & Engagement**
   - Average attendance in Committees: ~50% (vs. 84% in House sittings).
3. **Lack of Research & Expert Support**
   - Committees lack **full-time expert advisors and research staff**.
   - Limits depth of analysis.
4. **Limited Transparency**
   - Committee proceedings are often confidential.
   - Govt. not bound to accept recommendations.

Reforms & Way Forward

- **Make Referral Mandatory**
  - As in the **UK**, every bill should be referred to a Committee.
- **Increase Transparency**
  - Publish reasons when govt. rejects Committee recommendations.
- **Enhance Research Support**
  - Committees should have **permanent research staff & expert advisors**.
  - Collaboration with think tanks & universities.
- **Encourage Participation**
  - Stronger norms for attendance.
  - Use of technology (digital hearings, e-consultations).



Practice Questions

Prelims

Q. Consider the following statements about Parliamentary Committees in India:

1. **The referral of bills to Parliamentary Committees is mandatory under the Constitution.**
2. **Public Accounts Committee is chaired by a member of the ruling party.**
3. **The Committee on Estimates examines how funds authorized by Parliament are being spent.**

Which of the above is/are correct?
(a) 1 and 2 only
(b) 2 and 3 only
(c) 3 only
(d) None

✅ **Answer: (c)**

Mains

Q. *"Parliamentary Committees are the lifeblood of Indian parliamentary democracy, yet their potential remains underutilized." Critically discuss with examples.*

SC at Full Strength with 34 Judges

📌 **Syllabus Mapping**
✅ **GS Paper II – Polity**: Structure, organization and functioning of the Judiciary; Appointment of judges; Separation of powers
✅ **GS Paper II – Governance**: Issues with institutions, reforms needed in appointments

Context

- With the appointment of two new judges, the **Supreme Court of India now functions at its sanctioned full strength of 34 judges** (including the CJI).
- This highlights the importance of the **Collegium system**, which continues to govern judicial appointments.

About the Collegium System

- **Definition**: A system of judicial appointments and transfers evolved through Supreme Court judgments (not mentioned in the Constitution).
- **Constitutional Articles**:
  - **Article 124** – Appointment of SC judges.
  - **Article 217** – Appointment of HC judges.
- **Composition**:
  - **Supreme Court appointments** → CJI + 4 senior-most judges of SC.
  - **High Court appointments** → CJI + 2 senior-most judges of SC.
- **Process**: Recommendations of the Collegium are sent to the Government, which may send them back for reconsideration once. If reiterated, Government must accept.

Evolution of the Collegium System in India

Case / Period	Key Development	Outcome
Pre-1980s	Appointments dominated by **Executive** (President in consultation with CJI).	Executive primacy.
First Judges Case (1981)	"Consultation ≠ Concurrence"	Executive had primacy.
Second Judges Case (1993)	"Consultation = Concurrence"	Birth of Collegium; CJI + 2 senior-most judges.
Third Judges Case (1998)	Expanded Collegium	CJI + 4 senior-most judges.
Fourth Judges Case (2015)	Struck down **NJAC & 99th Amendment**	Restored Collegium as sole system.

Significance of Collegium System

- Ensures **judicial independence** from executive interference.
- Maintains **separation of powers**, a part of the **basic structure** of the Constitution.
- Promotes continuity and stability in judicial appointments.

Challenges in the System

- **Opacity**: Collegium's decisions are not fully transparent.
- **No formal criteria**: Lacks objective guidelines for selection.
- **Delays**: Pending appointments → judicial vacancies.
- **Executive–Judiciary friction**: Govt sometimes delays Collegium recommendations.

Reform Suggestions

- **Greater transparency**: Publish criteria & reasons for selection/rejection.
- **Wider consultation**: Include Bar Council, eminent jurists.
- **Institutional mechanism**: A revised NJAC-like body with safeguards for judicial independence.
- **Parliamentary committee oversight** (like in USA/UK models).

Practice Questions

Prelims

Q. Consider the following statements about the Collegium system:

1. **It is explicitly mentioned in the Constitution of India under Article 124.**
2. **It was established through the Second Judges Case (1993).**
3. **The Fourth Judges Case (2015) struck down the NJAC Act and restored the Collegium system.**

Which of the above are correct?
(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

✅ **Answer: (b)**

Mains

Q. *"The Collegium system has ensured judicial independence but has failed on the front of transparency and accountability." Critically examine with suitable examples.*

SC Boosts Consumer Forums' Powers

📌 **Syllabus Mapping:**
✅ **GS Paper II – Governance:** Statutory bodies, rights-based legislations, consumer protection
✅ **GS Paper II – Polity:** Powers of tribunals, quasi-judicial bodies
✅ **GS Paper III – Economy:** Consumer rights, fair trade practices, market regulation

Context

The **Supreme Court of India** has ruled that **Consumer Forums can enforce all their orders, not just interim ones**, and such orders must be treated like **civil court decrees**. This judgment corrects the anomaly introduced by the **2002 amendment to the Consumer Protection Act (CPA), 1986**, which had curtailed the enforcement powers of consumer redressal forums.

The ruling has contemporary significance under the **Consumer Protection Act, 2019**, which replaced the 1986 Act and introduced new institutional mechanisms for consumer welfare.

Background

- **Consumer Protection Act, 1986 (CPA 1986):**
  - Established **consumer forums at district, state, and national levels**.
  - Empowered forums to adjudicate disputes and protect consumer rights.
- **2002 Amendment:**
  - Narrowly interpreted forums' enforcement powers, restricting them mainly to interim orders.
- **Supreme Court Ruling (2025):**
  - Forums' orders—**final or interim—carry the same weight as civil court decrees**, ensuring better compliance and consumer justice.

Consumer Protection Act, 2019 – Key Features

1. **Central Consumer Protection Authority (CCPA):**
   - A **regulatory authority** to promote, protect, and enforce consumer rights.
   - Powers to recall unsafe goods, stop unfair trade practices, and penalise misleading advertisements.
2. **Simplified Adjudication Process:**
   - **E-filing of complaints**, territorial jurisdiction based on consumer's residence.
   - Mediation as an **alternative dispute resolution mechanism**.
3. **Product Liability:**
   - Manufacturers and service providers are held accountable for defective goods/services.
4. **Stronger Penalties:**
   - Stricter action against misleading ads, celebrity endorsements, and unfair practices.

Significance of the Judgment

- **Strengthens Consumer Forums:** Removes ambiguity about enforcement powers.
- **Ensures Compliance:** Traders, corporations, and service providers must comply with **final consumer forum orders**.
- **Boosts Consumer Confidence:** Reinforces the idea that **consumer is king**, as envisaged in economic democracy.
- **Reduces Litigation Burden:** Orders being treated as decrees avoids unnecessary escalation to higher courts.

Analysis

- **Positive Implications:**
  - Greater **enforceability** of consumer rights.
  - Aligns with the **objective of CPA 2019** to create a strong, responsive consumer justice system.
- **Challenges Ahead:**
  - Consumer forums are often plagued by **vacancies, delays, and infrastructure gaps**.
  - Awareness of rights is still low in rural areas.
  - Corporate pushback against strict enforcement may lead to **appeals and litigation delays**.
- **Global Comparison:**
  - Countries like the **USA and EU** have **class-action suits** and strong **consumer watchdogs**.
  - India's CCPA is still evolving and needs more autonomy and resources.

Way Forward

- Strengthen **institutional capacity** of forums by filling vacancies and modernising infrastructure.
- Increase **consumer awareness campaigns**.
- Empower CCPA with **financial independence and enforcement autonomy**.
- Introduce **collective redressal mechanisms** (class actions) for faster resolution.

Practice Questions

Prelims (Objective):

1. **Which of the following statements about the Consumer Protection Act, 2019 is correct?**
   - **(a) It abolished the Central Consumer Protection Authority.**
   - **(b) It introduced mediation as an alternate dispute resolution mechanism.**
   - **(c) It does not apply to e-commerce transactions.**
   - **(d) It applies only to goods and not services.**

Mains :

Q1. Discuss the significance of the Supreme Court's recent ruling equating consumer forum orders with civil court decrees. How does this strengthen consumer justice in India?

Q2. Evaluate the role of the Consumer Protection Act, 2019 in addressing the challenges of modern consumerism, especially in the digital economy.

SC Narrows Scope of Free Speech

📌 **Syllabus Mapping:**
✅ **GS Paper II – Polity:** Fundamental Rights, Freedom of Speech and Expression, Judicial Review
✅ **GS Paper II – Governance:** IT Act, regulation of online content, accountability of social media influencers
✅ **GS Paper IV – Ethics:** Ethical responsibility in communication, media ethics

Context

The **Supreme Court of India** recently ruled that **commercial speech and prohibited speech are not part of fundamental rights under Article 19(1)(a)**. The judgment arose from a case involving **social media comedians accused of making insensitive jokes about persons with disabilities**, raising the issue of misuse of free speech in the digital age.

Key Judicial Observations

1. **Commercial & Prohibited Speech Not Protected**
   - **Commercial speech:** Advertising or communication with economic intent is **not absolute** under free speech.
   - **Prohibited/Hate speech:** Expressions that promote **enmity, hatred, or violence** based on religion, caste, race, or ethnicity are excluded.
2. **Accountability of Influencers**
   - Social media influencers with large followings must act **responsibly**, given their impact on public opinion.
3. **Penal Action & Compensation**
   - Suggested punitive action under **IT Rules** and **Cinematograph Act** against violators.
4. **Social Media Guidelines**
   - Directed the government to draft **comprehensive guidelines for regulating online content**.

Important SC Precedents on Free Speech

- **Amish Devgan v. Union of India (2020):** Differentiated between **free speech and hate speech**, held that wide-reach speakers (like anchors/influencers) bear **greater responsibility**.
- **Shreya Singhal v. Union of India (2015):** Struck down **Section 66A of the IT Act**, upheld that speech cannot be curtailed unless it poses **imminent harm or incitement**.

Legal Framework for Online Content Regulation in India

- **IT Act, 2000:** Governs online content; **Section 69A** empowers govt. to block unlawful websites.
- **Cinematograph Act, 1952:** Restricts films and content that **malign, defame, or incite hatred**.
- **IT Rules, 2021:** Intermediaries and platforms required to take down flagged content, provide grievance redressal.

Analysis

- **Balancing Free Speech vs. Regulation**
  - Article 19(1)(a) is subject to **reasonable restrictions** under **Article 19(2)** (public order, morality, defamation, incitement).
  - Social media amplifies harmful content, making regulation necessary.
- **Influencers' Ethical Responsibility**
  - Given their **wide reach**, influencers must uphold **ethical standards in speech**, avoiding content that stigmatises vulnerable groups.
- **Challenges**
  - Defining **hate speech** without curbing dissent.
  - Ensuring **regulation without overreach** (avoiding chilling effect on legitimate expression).
  - Handling **cross-border digital content**.
- **Comparative Perspective**
  - **US:** Strong protection under First Amendment, but restrictions on "imminent lawless action."
  - **EU:** Stricter rules under **Digital Services Act (2022)** for online platforms.
  - India lies in between → stronger than the US but less stringent than EU.

Way Forward

- Draft **clear, transparent guidelines** for social media regulation.
- Strengthen **self-regulation** by influencer associations and digital platforms.
- Promote **digital literacy** to empower users against harmful content.
- Balance **free speech and societal harmony** through proportionate penalties.

Practice Questions

Prelims (Objective):

Which of the following are NOT protected under Article 19(1)(a) as per recent SC rulings?

1. **Hate speech that incites violence**
2. **Commercial advertising with economic intent**
3. **Artistic expression through films and theatre**

Select the correct answer:

- **(a) 1 only**
- **(b) 2 only**
- **(c) 1 and 2 only**
- **(d) 2 and 3 only**

Mains (Analytical):

Q1. "Freedom of speech is not absolute." Discuss with reference to Supreme Court judgments on commercial and prohibited speech.

Q2. Evaluate the challenges of regulating social media content in India. Suggest a framework that balances free expression, accountability, and digital governance.

GOVERNANCE

SC on Sand Mining: Clearance Linked to Replenishment Study

📌 **Syllabus Mapping:**
✅ **GS Paper II – Governance:** Role of judiciary in environmental governance, NGT, SC rulings
✅ **GS Paper III – Environment:** Conservation, environmental impact assessment, natural resources management
✅ **GS Paper I – Geography:** Distribution of natural resources, river systems

Context

The **Supreme Court** has upheld the **National Green Tribunal (NGT)**'s decision to cancel a 2022 environmental clearance for sand mining in Jammu & Kashmir. The Court ruled that **replenishment studies**—which assess the natural recharge of sand in riverbeds—are **mandatory prerequisites** for granting approval, in addition to a **District Survey Report (DSR)**.

This judgment reinforces the principle of **sustainable sand mining**, ensuring ecological balance and aligning with India's commitments to environmental conservation.

Key Supreme Court Observations

1. **Replenishment Study is Essential**
   - Without replenishment data, a DSR is **incomplete and defective**.
   - Such studies help determine **safe and sustainable extraction limits**.
2. **Natural Regeneration Analogy**
   - The Court likened it to forestry: *"Just as trees must regrow before felling, sand in rivers must replenish before extraction."*
3. **Environmental Risks Highlighted**
   - Citing the landmark **Deepak Kumar v. State of Haryana (2012)** case, the Court warned that unregulated mining:
     - Causes **riverbank erosion** and **habitat destruction**
     - Lowers **groundwater tables**, damaging aquifers
     - Endangers **biodiversity**, especially fish breeding grounds
     - Increases **flood vulnerability** by destabilising riverbeds
     - Degrades **water quality** and raises turbidity

Sand Mining in India: An Overview

- **Definition:** Removal of sand and related materials (stones, minerals) from riverbeds, floodplains, and land surfaces.
- **Demand Driver:** Construction and infrastructure sectors—India is one of the world's largest sand consumers.
- **Ecological Role of Sand:**

- Maintains **river hydrology**
- Supports **aquatic biodiversity**
- Regulates **groundwater recharge**

Legal and Policy Framework

1. **Environment (Protection) Act, 1986** – Umbrella legislation for ecological safeguards.
2. **Supreme Court in Deepak Kumar Case (2012):** Made **environmental clearance compulsory** for all minor minerals, including sand.
3. **EIA Notification (2016 Amendment):**
   - Introduced **cluster-based environmental assessments**.
   - Mandated **replenishment studies** in DSR.
4. **Sustainable Sand Mining Management Guidelines (2016):**
   - Emphasized **annual replenishment rate calculations**.
   - Aimed to balance **economic demand with ecological sustainability**.
5. **Enforcement & Monitoring Guidelines (2020):** Strengthened surveillance and compliance through technology (e.g., drones, remote sensing).

Analysis & Contemporary Relevance

- **Judicial Activism:** The ruling reflects India's trend of **judicial intervention** in environmental issues (e.g., forest conservation, air pollution).
- **Balancing Development and Ecology:** While construction needs sand, **unchecked extraction leads to ecological collapse**.
- **Governance Challenges:** Despite guidelines, **illegal sand mining mafia** remains a serious governance and law-and-order problem in states like Uttar Pradesh, Bihar, and Tamil Nadu.
- **Sustainability Imperative:** Aligns with **SDG 15 (Life on Land)** and **SDG 6 (Clean Water and Sanitation)**.
- **Global Context:** Similar restrictions exist in countries like **Indonesia and Malaysia**, where excessive sand mining led to coastal erosion and habitat loss.

Way Forward

- **Strict Implementation:** States must integrate **replenishment studies** into all clearances.
- **Technological Monitoring:** Use **drones, satellite mapping, and blockchain tracking** for transparency.
- **Community Participation:** Involve **local communities and Panchayats** in river resource management.
- **Alternative Materials:** Promote **manufactured sand (M-sand)** and recycling of construction debris.
- **Inter-State Coordination:** Since rivers flow across boundaries, a **national regulatory authority** may be needed.

Practice Questions

Prelims (Objective):

1. With reference to sand mining in India, consider the following statements:

1. **The Supreme Court in *Deepak Kumar v. State of Haryana (2012)* made environmental clearance mandatory for all minor mineral extractions.**
2. **Replenishment studies are required under the Sustainable Sand Mining Management Guidelines, 2016.**
3. **District Survey Report (DSR) can be approved without replenishment studies if mining is below 5 hectares.**

Which of the above statements is/are correct?

- **(a) 1 and 2 only**
- **(b) 2 and 3 only**
- **(c) 1 only**
- **(d) 1, 2, and 3**

Mains (Analytical):

Q1. Discuss the environmental and governance challenges associated with sand mining in India. How has the judiciary intervened to ensure sustainable practices?

Q2. Sand is often described as a "common-pool resource." Critically examine the role of legal frameworks, technological interventions, and community participation in ensuring sustainable sand mining.

Rising Female Workforce & Women-Led Development

📌 **Syllabus Mapping:**
✅ **GS Paper II – Governance:** Welfare schemes, women empowerment, gender budgeting
✅ **GS Paper III – Economy:** Employment trends, entrepreneurship, MSMEs, inclusive growth
✅ **Essay Paper:** Women-led development, social transformation in India

Context

Recent **Periodic Labour Force Survey (PLFS)** data highlights a significant **surge in female workforce participation in India**, accompanied by rising **women-led entrepreneurship**. This trend represents a **paradigm shift from "women's development" to "women-led development"**, aligning with the vision of **Viksit Bharat @2047**.

Key Findings: Female Workforce Participation (2017–2024)

- **Workforce Participation Rate (WPR):** Increased from **22% in 2017–18** to **40.3% in 2023–24**.
- **Unemployment Rate:** Declined from **5.6% to 3.2%** in the same period.
- **Rural–Urban Divide:**
  - Rural female employment grew by **96%**.
  - Urban female employment grew by **43%**.

Women-Led Entrepreneurship

1. **Self-Employment:**
   - Rose by **30%** (from 51.9% in 2017–18 to 67.4% in 2023–24).
2. **Startups:**
   - Nearly **50% of DPIIT-registered startups** have at least one woman director.
3. **Access to Finance:**
   - Women received **68% of MUDRA loans**.
   - They constitute **44% of PM SVANidhi beneficiaries**.
4. **MSMEs:**
   - Women-led MSMEs nearly doubled: from **1 crore in 2010–11 to 1.92 crore in 2023–24**.
   - Generated **89 lakh+ jobs for women**.
5. **Gender Budgeting:**
   - Increased by **429% in the last decade** → clear move towards **women-led development**.

Women's Development vs. Women-Led Development

- **Women's Development:**
  - Programmes designed **for women**, often without their participation in **planning, implementation, or evaluation**.
- **Women-Led Development:**
  - Recognises women as **leaders, decision-makers, and innovators**.
  - Places women at the **centre of development strategy**, ensuring inclusive growth.

Analysis

- **Positive Trends:**
  - Sharp rise in WPR signals **greater economic inclusion**.
  - Growth in women-led enterprises enhances **financial independence and job creation**.
  - Government's focus on **gender budgets** strengthens policy support.
- **Challenges Remain:**
  - Persistent **gender wage gap**.
  - Concentration of women in **low-paying, informal sector jobs**.
  - Barriers of **safety, mobility, and patriarchal norms**.
  - Limited participation in **STEM fields and corporate leadership**.
- **Global Comparisons:**
  - India's female labour force participation (~40%) still lags behind countries like **China (61%)** and **Vietnam (73%)**.
  - Indicates potential for further expansion.

Way Forward

- Expand **skill training and digital literacy** for women in emerging sectors (AI, green economy).
- Encourage **women in leadership roles** in governance, corporate boards, and startups.
- Ensure **gender-sensitive infrastructure** (safe transport, crèches, flexible work).

- Strengthen **financial inclusion** through targeted credit support and mentoring.
- Promote **social awareness campaigns** to challenge stereotypes and encourage equal sharing of care work.

Practice Questions

Prelims (Objective):

1. **Consider the following schemes/programmes:**
    1. **MUDRA Yojana**
    2. **PM SVANidhi**
    3. **Gender Budgeting**
    4. **Stand-Up India**

    Which of the above directly promote women's entrepreneurship?

    - **(a) 1, 2, and 3 only**
    - **(b) 1, 2, and 4 only**
    - **(c) 2 and 3 only**
    - **(d) 1, 2, 3, and 4**

Mains (Analytical):

Q1. "India is witnessing a transition from women's development to women-led development." Discuss this statement in light of recent data on female workforce participation and entrepreneurship.

Q2. Evaluate the challenges and opportunities in achieving 70% female workforce participation as a pillar for Viksit Bharat @2047.

Gram Sabhas to Draft CFR Management Plans

📌 **Syllabus Mapping:**
✅ **GS Paper II – Governance:** Decentralisation, role of Gram Sabhas, rights-based legislation
✅ **GS Paper III – Environment:** Forest governance, sustainable development, tribal livelihoods
✅ **GS Paper I – Society:** Role of tribal communities, inclusion, social justice

Context

The **Ministry of Tribal Affairs (MoTA)** has clarified that **Gram Sabhas**, through their **Community Forest Resource (CFR) Management Committees**, have the **sole authority to prepare CFR Management Plans (CFRMPs)** under the **Forest Rights Act (FRA), 2006**.

This clarification came after the **Chhattisgarh Forest Department** attempted to designate itself as the nodal agency for CFR rights, contradicting the provisions of FRA which recognises **community-led forest governance**.

Forest Rights Act (FRA), 2006

- Enacted to correct **historical injustices** faced by forest-dwelling communities.
- Recognises the rights of **Scheduled Tribes and Other Traditional Forest Dwellers (OTFDs)** over forest land and resources.
- Secures **livelihood, food security, and cultural identity** of forest communities.

Community Forest Resource (CFR) Management Plans

- **Purpose:** Empower communities to sustainably manage forests under their jurisdiction.
- **Principles:**
    - Involve **marginalised groups (women, youth, tribal communities)** in decision-making.
    - Tailor plans to local **ecological, cultural, and socio-economic contexts**.
- **Significance:**
    - Promotes **social equity** and **environmental justice**.
    - Strengthens Gram Sabhas as **custodians of forests**, contrasting with earlier **top-down forest management**approaches.

Government Support Mechanism

- **Dharti Aba Janjatiya Gram Utkarsh Abhiyaan (2023):**
    - Union government initiative to facilitate CFR management planning.
    - Allows states to **empanel NGOs** to support Gram Sabhas in preparing CFRMPs.
    - Aims to ensure **capacity building and inclusivity** in forest governance.

Analysis

- **Decentralisation of Governance:** Positions Gram Sabhas as **grassroots decision-makers** in natural resource management.
- **Livelihood Security:** CFR rights enable forest-dependent households to engage in **minor forest produce collection, eco-tourism, and sustainable harvesting**.
- **Conflict Reduction:** Reduces friction between **forest bureaucracy and local communities** by legally empowering the latter.
- **Challenges:**
  - Resistance from **state forest departments** unwilling to cede control.
  - Lack of awareness among Gram Sabhas regarding their legal rights.
  - Need for **capacity building, financial support, and technical assistance**.

Way Forward

- Strengthen **capacity-building programmes** for Gram Sabhas.
- Ensure **coordination between MoTA, state governments, and forest departments**.
- Promote **community-based monitoring** of forest resources.
- Integrate CFRMPs with **climate adaptation strategies and REDD+ goals**.
- Provide **direct financial assistance** to Gram Sabhas for implementation.

Practice Questions

Prelims (Objective):

1. **Under the Forest Rights Act, 2006, the authority to prepare Community Forest Resource (CFR) Management Plans rests with:**
   - **(a) State Forest Departments**
   - **(b) Ministry of Tribal Affairs**
   - **(c) Gram Sabhas through CFR Management Committees**
   - **(d) Panchayati Raj Ministry**

Mains (Analytical):

Q1. Critically examine the role of Gram Sabhas under the Forest Rights Act, 2006 in ensuring sustainable forest governance. How does it contrast with traditional state-led forest management?

Q2. Discuss the significance of Community Forest Resource Management Plans in promoting both livelihood securityand ecological sustainability.

Guidelines/SOPs for Animal Blood Transfusion and Blood Banks

📌 **Syllabus Mapping**
✅ **GS Paper II – Governance:** Policy interventions for health and animal welfare
✅ **GS Paper III – Science & Technology:** Biotechnology in animal health, One Health approach
✅ **GS Paper III – Environment:** Zoonotic diseases, veterinary public health

Context

- The **Department of Animal Husbandry & Dairying (DAHD)** released **Guidelines/Standard Operating Procedures (SOPs) for Animal Blood Transfusion and Blood Banks**.
- This is the **first national framework** to standardize veterinary transfusion practices in India.

Importance of Animal Blood Transfusion

- **Life-saving intervention**: Used in trauma cases, severe anaemia, surgical blood loss, infectious diseases, and coagulation disorders.
- **Comparative global practice**: Already established in advanced veterinary care in countries like the U.S. and EU.
- **Relevance for India**: With rising pet ownership, livestock management needs, and zoonotic disease concerns, such guidelines are critical.

Key Highlights of Guidelines

1. **National Standards**
   - Donor selection criteria (species, health screening, ethical considerations).
   - Safe procedures for blood collection, storage, and transfusion protocols.
2. **One Health Principles**
   - Focus on preventing **zoonotic disease transmission** during blood transfusion.
   - Integrates veterinary health with public health security.

3. **Veterinary Blood Bank Network**
    - Foundation laid for a **national network of veterinary blood banks**.
    - Encourages infrastructure at state and institutional levels.
4. **Education, Training & Research**
    - Veterinary colleges to integrate **transfusion medicine** into curriculum.
    - Encourages **R&D** in animal transfusion technologies.

Significance

- **Animal Welfare:** Improves survival rates in livestock, pets, and working animals.
- **Public Health:** Reduces zoonotic risk, aligns with India's **One Health Mission**.
- **Capacity Building:** Enhances skills of veterinarians and para-veterinary staff.
- **Economic Impact:** Healthier livestock = higher productivity in dairy, poultry, and meat sectors.

Way Forward

- Establish **regional veterinary blood banks** across India.
- Public-private partnership (PPP) to ensure affordability and reach.
- Integration with **digital animal health monitoring systems**.
- Collaboration with international agencies (OIE/WOAH, FAO) for global best practices.

Practice Questions

Prelims

Q. The recently released *Guidelines/SOPs for Animal Blood Transfusion and Blood Banks* in India were issued by:
(a) Ministry of Health & Family Welfare
(b) Department of Animal Husbandry & Dairying (DAHD)
(c) Indian Council of Medical Research (ICMR)
(d) Food Safety and Standards Authority of India (FSSAI)

✅ **Answer: (b)**

Mains

Q1. Discuss the significance of adopting *One Health principles* in veterinary transfusion medicine in India.

Q2. How can veterinary blood banks contribute to both animal welfare and public health security in India?

India–WFP Collaboration to Address Global Hunger Crisis

📌 **Syllabus Mapping**
✅ **GS Paper II – International Relations:** India's role in multilateral institutions, global partnerships
✅ **GS Paper II – Governance:** Welfare schemes, food security, poverty alleviation
✅ **GS Paper III – Economy:** Agriculture, food distribution, SDGs

Context

- The **Government of India** and the **World Food Programme (WFP)** have announced a **new collaboration** to tackle the **global hunger crisis**.
- This step reinforces India's role as a **proactive contributor** to global food security, while aligning with SDG-2 (**Zero Hunger by 2030**).

About United Nations WFP

- **Established:** 1961 (headquarters in Rome, Italy).
- **Mandate:** Largest humanitarian agency focusing on food aid, nutrition, and resilience-building.
- **Functions:**
    - Provides **emergency food assistance** during conflicts, disasters, and climate shocks.
    - Helps communities rebuild through **school meals, nutrition support, livelihood programmes**.
    - Partners with governments for **technical assistance** in food supply chains and social protection.
- **Presence:** Operates in **120+ countries**, including India.
- **Recognition:** Awarded the **Nobel Peace Prize (2020)** for combating hunger and contributing to peace in conflict areas.

India's Engagement with WFP

- India has been a **recipient** (in earlier decades) and now a **donor-partner**.
- Contributions include:
  - **Rice & wheat donations** to countries in Asia, Africa, and the Middle East.
  - **Collaboration in India**: Strengthening the **Targeted Public Distribution System (TPDS)**, digital reforms, and nutritional fortification.
- India's humanitarian food aid (wheat/rice shipments) to **Afghanistan, Yemen, Sudan, Sri Lanka** often routed through WFP.

Significance of Collaboration

- **Global Food Crisis:** Conflicts (Ukraine war, Middle East), climate change, and rising food prices have worsened hunger worldwide.
- **India's Soft Power:** Positions India as a **leader in South-South cooperation** and a reliable partner for humanitarian diplomacy.
- **Sustainable Development:** Supports **SDG-2 (Zero Hunger)** and **SDG-17 (Global Partnerships)**.
- **Domestic Benefits:** India can leverage WFP's expertise in **supply chain resilience, fortification, and nutritional interventions**.

Way Forward

- **Strengthen Fortification Initiatives:** Scaling up fortified rice in PDS/ICDS with WFP's support.
- **Humanitarian Diplomacy:** Use food aid as part of **India's G20 & Global South leadership**.
- **Innovation in Supply Chains:** Adopt AI/blockchain for transparent food distribution with WFP expertise.
- **Regional Leadership:** Position India as a **food hub** for South Asia, Africa, and disaster-hit nations.

Contemporary Relevance

Climate change & hunger nexus – Erratic rainfall, floods and droughts increasing hunger risks

Geopolitics of food security – WFP facing funding shortages; India's grain surplus offers timely support

Women & Children
WFP programmes target maternal & child malnutrition, aligning with India's Poshan Abhiyaan

Practice Questions

Prelims

Q. With reference to the World Food Programme (WFP), consider the following statements:

1. **It is headquartered in Geneva, Switzerland.**
2. **It was awarded the Nobel Peace Prize in 2020.**
3. **It operates only in conflict-affected countries.**

Which of the above is/are correct?
(a) 2 only
(b) 1 and 3 only
(c) 2 and 3 only
(d) 1, 2 and 3

✅ **Answer: (a) 2 only**

Mains

Q. "India's collaboration with the World Food Programme highlights the country's transition from a food-deficient to a food-surplus nation." Discuss the significance of this partnership in strengthening global food security.

National Designated Authority (NDA) for Carbon Trading

📌 **Syllabus Mapping**
✅ **GS Paper II – Governance, International Agreements**: Paris Agreement, Climate Policy
✅ **GS Paper III – Environment**: Conservation, Climate Change, Carbon Markets
✅ **GS Paper III – Economy**: Market Mechanisms, Green Finance

Context

- The **Ministry of Environment, Forest and Climate Change (MoEF&CC)** has announced a **National Designated Authority (NDA)** to operationalise **Article 6.4 of the Paris Agreement (2015)**.
- This is essential for enabling India's participation in **global carbon markets**.

Article 6 of Paris Agreement

- Provides for **voluntary cooperation** among countries to achieve **Nationally Determined Contributions (NDCs)**.
- Establishes **international compliance carbon markets**.
- **Article 6.4 – Paris Agreement Crediting Mechanism (PACM):**
  - Enables transfer of carbon credits across countries.
  - Credits come from verified GHG reduction/removal projects.

About NDA/DNA

- **Definition:** An organisation designated by a country to authorise and approve participation in **Article 6.4 projects**.
- **India's NDA:**
  - **Composition:** 21-member body chaired by **Secretary, MoEF&CC**.
  - **Functions:**
    - Recommend list of eligible projects/activities for emission trading.
    - Authorise Indian participation in **carbon credit projects**.

Eligible Activities Identified by India

- **GHG Mitigation:** Renewable energy, green hydrogen.
- **Alternate Materials:** Green Ammonia.
- **Removal Activities:** Carbon Capture, Utilisation & Storage (CCUS).

About Carbon Markets

- A **market-based tool** to control greenhouse gas emissions by providing economic incentives.
- **1 Carbon Credit = 1 tonne of CO_2 (or equivalent GHGs) reduced/avoided/sequestered.**
- **Purpose:**
  - Allow industries/individuals to offset emissions.
  - Promote investments in green projects.

Significance for India

- Strengthens **climate diplomacy** and India's leadership in carbon markets.
- Provides **financial flows** for renewable energy, hydrogen, and CCUS projects.
- Helps meet **NDC commitments** and achieve **net-zero by 2070**.
- Positions India as a **major supplier of carbon credits** in global markets.

Practice Questions

Prelims

Q. Under the Paris Agreement, Article 6.4 is related to:
(a) Adaptation finance for developing countries
(b) Mechanism for transfer of carbon credits through international markets
(c) Establishing global fund for biodiversity protection
(d) Climate-resilient agriculture practices

✅ **Answer: (b) Mechanism for transfer of carbon credits through international markets**

Mains

Q. *"Carbon markets represent both an opportunity and a challenge for India's climate strategy."* Discuss the role of the newly established National Designated Authority (NDA) in this context.

Green Mobility: PM Launches EV & Battery Push in Gujarat

📌 **Syllabus Mapping**
✅ **GS Paper II – Governance**: Government Schemes, Centre–State coordination in infrastructure
✅ **GS Paper III – Economy**: Infrastructure, Manufacturing, Make in India, Energy Security
✅ **GS Paper III – Environment**: Sustainable Development, Pollution, Renewable Energy

Context

- PM inaugurated **Green Mobility Initiatives** at **Hansalpur, Gujarat**.
- Flagged off **"e-VITARA"**, Suzuki's first **Made-in-India global strategic Battery Electric Vehicle (BEV)** → to be exported to **100+ countries**.
- Inaugurated **local production of hybrid battery electrodes** at TDS Lithium-Ion Battery plant → ensures **80% of battery value added in India**.

About Battery Electric Vehicles (BEVs)

- **Definition:** Vehicles that run entirely on a **battery-powered electric drivetrain**, charged via the electricity grid.
- **Main Components:** Electric motor, inverter, battery, control module, drivetrain.
- **Working:** Converts **DC battery power → AC** to drive the electric motor.

Challenges in EV Adoption

1. **Operational Issues** – Limited driving range, inadequate charging infra.
2. **High Upfront Costs** – Battery = ~40% of EV cost.
3. **Awareness Gap** – Among consumers & stakeholders.
4. **Environmental Concerns** – Battery waste, recycling, rare earth dependency.
5. **Grid Stress** – Higher electricity demand for EV charging.

Steps Needed

- **Finance:**
  - Battery leasing → reduce upfront cost.
  - Blended fund → lower cost of capital for e-trucks & e-buses.
- **Technology & R&D:**
  - Invest in new battery chemistries (solid-state, sodium-ion).
  - Reduce dependence on imported **rare earth minerals**.
- **Infrastructure:**
  - Strategically scale charging infra with viability assessment.
  - Encourage PPP models for charging networks.
- **Policy Push:**
  - Strict battery recycling norms.
  - Promote urban EV adoption (last-mile delivery, e-buses).

Green Mobility Initiatives in India

- **National Electric Mobility Mission Plan (NEMMP) 2020** – Accelerate EV adoption.
- **PLI-Auto Scheme** – Boost domestic EV & auto-component manufacturing.
- **PLI-ACC Battery Storage Scheme** – Advanced chemistry cells for India's EV future.
- **India Electric Mobility Index (IEMI), NITI Aayog** – Tracks state-wise EV adoption.
- **FAME Scheme (Faster Adoption & Manufacturing of Hybrid & EVs)** – Subsidies for EV buyers and charging infra.

Significance

- Strengthens **Atmanirbhar Bharat** in EV sector.
- Positions India as a **global EV manufacturing hub**.
- Contributes to **climate goals & net-zero pathway**.
- Reduces **oil import dependency** & enhances **energy security**.
- Creates **jobs & R&D ecosystem** in green technologies.

Practice Questions

Prelims

Q. Which of the following constitutes the highest share of the capital cost of an Electric Vehicle?
(a) Electric motor
(b) Control module
(c) Battery
(d) Drivetrain

✅ **Answer: (c) Battery**

Mains

Q. *India's transition to green mobility faces both technological and economic challenges.* Discuss the recent steps taken by the government to promote Battery Electric Vehicles and suggest measures to overcome barriers.

NGT Jurisdiction & SC's Key Observations

📌 **Syllabus Mapping**
✅ **GS Paper II – Polity & Governance**: Tribunals, Judicial review, Separation of powers
✅ **GS Paper III – Environment**: Environmental governance, Institutions, Conservation

Context

- The **Supreme Court** criticized the **National Green Tribunal (NGT)** for ordering an **Enforcement Directorate (ED) probe**, stating it was a clear **jurisdictional overreach** and **violation of law**.
- The SC underlined that while NGT plays a critical role in **environmental adjudication**, it cannot assume powers **not conferred by its parent statute (NGT Act, 2010)**.

About NGT

- **Establishment:** 2010 under the **National Green Tribunal Act, 2010**.
- **Objective:** Effective & expeditious disposal of cases relating to:
  - Environmental protection
  - Forest conservation
  - Natural resource management
- **Time-bound disposal:** Applications/appeals to be disposed of within **6 months**.
- **Procedural Flexibility:** Not bound by **CPC, 1908**; guided by **principles of natural justice**.

Structure & Benches

- **Principal Bench:** New Delhi
- **Other Benches:** Bhopal, Pune, Kolkata, Chennai
- **Composition:** Chairperson + Judicial & Expert Members (must have environmental/scientific expertise).

Jurisdiction & Powers

- **Jurisdiction:** Civil cases where a substantial question of environment is involved, linked to laws such as:
  - Water Act, 1974
  - Air Act, 1981
  - Environment (Protection) Act, 1986
  - Biological Diversity Act, 2002
  - Forest Conservation Act, 1980, etc.
- **Powers:**
  - Issue relief and compensation orders
  - Provide restitution of damaged environment
  - Impose penalties for non-compliance
- **Limitations:**
  - Cannot take up matters outside its statutory mandate.
  - No criminal prosecution powers like ED or CBI.

Supreme Court's Observation (2025)

- **NGT exceeded jurisdiction** by directing **ED probe**.
- Such powers rest only with **Parliament-enacted statutes** (e.g., **PMLA, 2002** for ED).
- Court stressed the principle of **separation of powers** – specialized tribunals cannot assume functions of enforcement agencies.

Significance of NGT

✅ Strengthened **environmental jurisprudence** in India.
✅ Provides a **speedy, accessible forum** for environmental disputes.
✅ Reduced burden on constitutional courts (SC & HC).

Challenges & Criticisms

- **Overreach:** As highlighted in the SC verdict.
- **Enforceability:** Some orders remain difficult to implement.
- **Vacancies & Delays:** Shortage of expert members affects efficiency.
- **Limited Jurisdiction:** Excludes wildlife protection laws like Wildlife (Protection) Act, 1972.

Way Forward

- Clearly define **jurisdictional boundaries** of tribunals.
- Strengthen coordination between **NGT, CPCB, SPCBs, and MoEF&CC**.
- Ensure **capacity-building** with more expert members.
- Legislative clarity on overlap between **NGT, ED, and other regulatory agencies**.

Practice Questions

Prelims

Q. Consider the following statements about the **National Green Tribunal (NGT):**

1. It was established under the Environment (Protection) Act, 1986.
2. It is not bound by the Code of Civil Procedure, 1908, but guided by principles of natural justice.
3. It has the power to direct the Enforcement Directorate (ED) to investigate financial frauds linked to environmental issues.

Which of the above is/are correct?
(a) 1 and 2 only
(b) 2 only
(c) 1 and 3 only
(d) 2 and 3 only

✅ **Answer:** (b) 2 only

Mains

Q. *Examine the role of the National Green Tribunal (NGT) in strengthening environmental governance in India. Do recent criticisms of judicial overreach undermine its credibility?*

WHO–UNICEF Report on Water & Sanitation (2000–24)

📌 **Syllabus Mapping**
✅ **GS Paper II – Governance**: Welfare Schemes, Social Justice, Health, Human Development
✅ **GS Paper III – Environment**: Conservation of Resources, Sustainable Development
✅ **Essay**: *"Water is life's matter and matrix."*

Context

- WHO & UNICEF released a **global progress report (2000–2024)** on **Household Drinking Water, Sanitation & Hygiene (WASH)**.
- The report highlights **inequalities in access** which hinder achieving **SDG 6 (Clean Water & Sanitation for All by 2030)**.

Key Global Findings

- **Open Defecation:**
  - Still **4 times higher in low-income countries** vs global average.
- **Sanitation Access:**
  - Safe sanitation coverage: **58% globally**.
- **Drinking Water:**
  - Safely managed water coverage ↑ from **68% (2015) → 74% (2024)**.
- **Gender Dimension:**
  - Women disproportionately bear burden of **fetching water**.
  - **Menstrual Health:** Data from **70 countries** shows gaps across all income levels.

India-specific Findings

- **Open Defecation:**
  - Significant decline post **Swachh Bharat Mission**.
  - Residual issues persist in **rural & marginalised groups**.
- **Sanitation:**
  - **Near universal access** achieved.
  - But challenges of **slippage, waste management quality** remain.
- **Drinking Water:**
  - **Tap water access expanded** under Jal Jeevan Mission.
  - Yet, **safely managed water coverage** below universal levels.
- **Equity Concerns:**
  - **Tribal groups & poorest households** lag in access & service quality.

India's WASH Initiatives

1. **Swachh Bharat Mission (SBM):**
   - Eliminated open defecation (ODF).
   - Co-benefits: women's safety, reduced child mortality, behaviour change.
2. **Jal Jeevan Mission (JJM):**
   - Target: **Har Ghar Jal** – functional household tap connections by 2024.
   - Focus on **quality, adequacy, and equitable access**.

Significance for India

- Improved WASH → **health outcomes, reduced diarrhoea, improved nutrition & productivity**.
- Supports **women empowerment** by reducing drudgery of water collection.
- Helps in achieving **SDG 6**, with spillover to **SDG 3 (health), SDG 5 (gender equality), and SDG 10 (reducing inequalities)**.

Challenges Ahead

- **Behavioural Slippage:** Toilets built but not always used.
- **Water Quality:** Arsenic, fluoride contamination in groundwater.
- **Sustainability:** Operation & maintenance of village-level infrastructure.
- **Equity:** Marginalised communities still excluded.

Way Forward

- Strengthen **community-led WASH governance**.
- Enhance **water quality monitoring** & safe waste management.
- Integrate **menstrual health management** in WASH policies.
- **Targeted schemes** for tribal & vulnerable groups.
- Promote **climate-resilient water systems** (rainwater harvesting, greywater recycling).

Practice Questions

Prelims

Q. With reference to the **WHO–UNICEF WASH Report (2025)**, which of the following statements is/are correct?

1. Open defecation remains highest in low-income countries compared to global average.
2. India has achieved universal safely managed drinking water access.
3. Menstrual health data reveals widespread gaps across income levels.

(a) 1 only
(b) 1 and 3 only
(c) 2 and 3 only
(d) 1, 2 and 3

✅ **Answer:** (b)

Mains

Q. *"Despite progress in sanitation and water access, equity and quality gaps remain critical barriers to SDG 6 in India." Discuss with reference to SBM and JJM.*

State Energy Efficiency Index (SEEI) 2024

📌 **Syllabus Mapping**
✅ **GS Paper II – Governance**: Government policies and interventions for development
✅ **GS Paper III – Economy**: Energy, Growth and Development, Environment
✅ **GS Paper III – Environment**: Conservation, Pollution, Environmental impact assessment

About SEEI

- **Developed by**: Bureau of Energy Efficiency (BEE) + Alliance for an Energy Efficient Economy (AEEE)
- **Objective**: To track and measure progress of **energy efficiency (EE) initiatives** across 36 States/UTs.
- **Approach**: Provides a **data-driven framework** for monitoring, encourages **best practice sharing**, and fosters **healthy competition**.

Classification of States (Performance Categories)

- **Front Runners** → > 60%
- **Achievers** → 50 – 60%
- **Contenders** → 30 – 50%
- **Aspirants** → < 30%

Top Performers (2024 edition):

- **Maharashtra, Andhra Pradesh, Assam, Tripura** (in their respective categories)

Significance of SEEI

- **Policy Planning**: Helps states design **State Energy Efficiency Action Plans**.
- **Sectoral Integration**: Targets EE in **key energy-intensive sectors** (industry, buildings, transport, agriculture, power distribution).
- **Climate Action**: Supports India's **Nationally Determined Contributions (NDCs)** under Paris Agreement.
- **Economic Benefits**: Lower energy intensity improves productivity, reduces costs, and enhances competitiveness.
- **Best Practice Repository**: Promotes **inter-state learning** (e.g., Maharashtra's EE in industries, Andhra's agriculture pump-set programs).

Way Forward

- **Strengthen capacity of states** to implement EE programs.
- **Ensure funding and incentives** for EE projects.
- **Link SEEI results with performance-based grants**.
- **Promote private sector and startup participation** in EE innovations.

Practice Questions

Prelims

Q. The *State Energy Efficiency Index (SEEI)* is prepared by:
(a) NITI Aayog
(b) Bureau of Energy Efficiency & AEEE
(c) Central Electricity Authority
(d) Ministry of New and Renewable Energy

✅ **Answer**: (b) Bureau of Energy Efficiency & AEEE

Mains

Q. *Energy efficiency is often termed as India's "first fuel." In this context, evaluate the role of the State Energy Efficiency Index (SEEI) in promoting sustainable development across states.*

INTERNATIONAL RELATIONS

India–Japan: Vision Plan & Key Pacts for Next Decade

📌 **Syllabus Mapping**
✅ **GS Paper II – International Relations: India & its Neighborhood, Strategic Partnerships**
✅ **GS Paper III – Economy: Investment, Technology, Innovation**
✅ **Essay / GS Paper II – Multilateralism & Global Cooperation**

Context

- At the **15th India–Japan Annual Summit (2025)**, both countries unveiled a **Joint Vision for the Next Decade**, targeting **10 trillion yen Japanese investment in India over 10 years.**
- The summit focused on **strategic, economic, technological, and cultural cooperation**.

Key Outcomes of the Summit

1. Joint Vision for the Next Decade

- 10-year framework across **8 areas**:
  - Economic partnership
  - Economic security
  - Mobility & human exchange
  - Technology & innovation
  - Energy transition
  - Space cooperation
  - Cultural linkages
  - Strategic collaboration

2. Security & Economic Security

- **Joint Declaration on Security Cooperation** → strengthens defense & strategic partnership.
- **Economic Security Initiative launched**.

3. Human Resource & Mobility Exchange

- **Action Plan** → 500,000 two-way exchanges, including **50,000 skilled/semi-skilled Indians** in Japan (Next-Gen Mobility Partnership).

4. Climate & Sustainability

- **Joint Crediting Mechanism (JCM):** Promote Japanese green investment in India.
- MoUs on **clean hydrogen, ammonia (Sustainable Fuel Initiative), wastewater management.**

5. Technology & Digital Partnership

- **India–Japan Digital Partnership 2.0** → AI, 5G/6G, semiconductors, quantum.
- **India–Japan AI Initiative** launched for joint R&D.

6. Other Agreements

- **Mineral resources cooperation** (critical minerals).
- **Joint Lunar Polar Exploration Mission (space collaboration).**
- **Cultural exchanges** to deepen people-to-people ties.

Significance of India–Japan Relations

Strategic Convergence

- Common concerns on **China's assertiveness in Indo-Pacific**, especially South China Sea.
- Both partners in **Quad, G20, G4 (UNSC reform push).**

Defence Cooperation

- **ACSA (Acquisition & Cross-Servicing Agreement).**
- Regular exercises: **Dharma Guardian, Shinyuu Maitri, JIMEX.**

Economic & Industrial Development

- **India–Japan Industrial Competitiveness Partnership.**
- SME collaboration → Japan supporting India's *Atmanirbhar Bharat*.

Multilateralism & Reform Agenda

- Push for **UNSC reforms** and rule-based global order.
- Cooperation in **supply chains, green finance, climate action.**

Way Forward

- Balance **economic growth with security concerns** in Indo-Pacific.
- Expand **critical tech partnerships** (AI, semiconductors).
- Harness **human capital exchange** for mutual demographic needs.
- Strengthen **regional cooperation via Quad, IPEF, SCO, BRICS+ frameworks.**

Practice Questions

Prelims

Q. Which of the following exercises are conducted between India and Japan?

1. Dharma Guardian
2. Shinyuu Maitri
3. JIMEX
4. Yudh Abhyas

Options:
(a) 1, 2 and 3 only
(b) 1 and 4 only
(c) 2 and 3 only
(d) 1, 2, 3 and 4

✅ **Answer: (a)**

Mains

Q. *India–Japan relations are witnessing a paradigm shift from an economic partnership to a comprehensive strategic global partnership. Discuss in light of the 15th Annual Summit outcomes.*

India–Myanmar Border: Free Movement Regime (FMR) Recast

📌 **Syllabus Mapping:**
✅ **GS Paper II – Governance & IR:** India's neighborhood relations, border management, internal security challenges
✅ **GS Paper III – Security:** Cross-border migration, insurgency, demographic issues
✅ **GS Paper I – Society:** Impact on borderland communities, tribal ties

Context

The **Assam Rifles** recently mapped that over **42,000 Myanmar nationals** have entered India under the **Free Movement Regime (FMR)**. Originally intended to strengthen **tribal and cultural ties** along the India–Myanmar border, FMR has now come under scrutiny due to **security and demographic concerns**.

About Free Movement Regime (FMR)

- **Definition:** A bilateral arrangement between India and Myanmar allowing tribal communities living along the border to cross without passports or visas.
- **Formalisation:** 2018, under the **Agreement on Land Border Crossing**.
- **Provision:** Permitted **free movement up to 16 km** on either side of the border.
- **Withdrawal:** In **Feb 2024**, the Union Home Minister announced withdrawal due to:
  - **Illegal migration**
  - **Security threats** (insurgents and smugglers exploiting FMR)
  - **Demographic concerns** in North-Eastern states (esp. Manipur and Mizoram).
- **Status:** Formal scrapping yet to be notified.

New System Introduced (Dec 2024)

- **Issuing Authority: Assam Rifles**.
- **Pass Type: Single-entry passes**, valid for 7 days.
- **Movement Limit:** Restricted to **10 km from the border**.
- **Compliance:** Pass must be returned at the **same crossing point**.
- **Security Layer:** Each crossing manned by **Assam Rifles, police, and health officials**.

Implications of FMR and Its Withdrawal

1. **Security Concerns:**
   - FMR routes exploited by **insurgents, arms smugglers, and narcotics traffickers**.
   - Post-2021 Myanmar coup, influx of refugees increased.
2. **Demographic Stress:**
   - Sharp rise in **illegal settlements**, creating ethnic tensions in Manipur and Mizoram.
   - Strains on **local resources**.
3. **Impact on Border Tribes:**
   - Tribes like **Chin, Kuki, and Naga** live on both sides.
   - FMR was a **cultural and economic lifeline** for cross-border families.
   - Withdrawal risks alienating local communities.
4. **India–Myanmar Relations:**
   - Stricter border controls may affect **diplomatic goodwill**.
   - Balancing **national security vs cultural continuity** becomes critical.

Analysis

- **Strategic Rationale:** India's border with Myanmar (1,643 km) is crucial for both **security and connectivity projects** (Kaladan Multimodal Project, Act East Policy).
- **Balancing Act:** While withdrawal addresses insurgency and migration concerns, it risks **alienating borderland communities** who traditionally depended on cross-border ties.
- **Comparative Angle:** Similar arrangements exist in **EU Schengen zone**, but unlike Europe, India's region is conflict-prone, making FMR more risky.

Way Forward

- **Smart Border Management:** Deploy **tech-based surveillance** (drones, AI monitoring) to regulate movement.
- **Tribal Engagement:** Ensure **alternative livelihood and cultural exchange mechanisms** for affected tribes.
- **Diplomatic Coordination:** Work with Myanmar (despite its internal instability) to prevent **illegal migration and insurgent safe havens**.
- **Humanitarian Balancing:** Differentiate between **refugees** and **illegal migrants** to uphold humanitarian obligations.

Practice Questions

Prelims (Objective):

1. The Free Movement Regime (FMR) between India and Myanmar, formalised in 2018, allowed:
   - (a) Free movement of up to 50 km on either side without passports/visas
   - (b) Free movement of up to 16 km on either side without passports/visas
   - (c) Visa-free entry for 30 days
   - (d) No limit on distance, only identity proof required

Mains (Analytical):

Q1. Critically evaluate the Free Movement Regime (FMR) in the context of India's border management. How can India balance **security imperatives** with the **cultural and economic needs** of borderland tribes?

Q2. Discuss the challenges and opportunities for India in managing the India–Myanmar border amidst the withdrawal of the Free Movement Regime.

Trump's Intel Deal: Rise of U.S. State Capitalism

📌 **Syllabus Mapping**
✅ **GS Paper II – International Relations:** Global economic trends, US foreign policy shifts
✅ **GS Paper III – Economy:** Industrial policy, capitalism models, state intervention
✅ **Essay Paper:** Role of the state in economy, capitalism vs socialism

Context

- In 2025, the **U.S. government acquired a 10% stake in Intel**.
- The stake is **passive and non-voting**, but marks a significant **shift from free-market capitalism to a state-led capitalist model**.
- Reflects U.S. concerns about **technological security, semiconductor dominance, and competition with China**.

About State-led Capitalism

- **Definition:** An economic model where the **state plays an active role** in guiding or controlling key sectors while still allowing markets to function.
- **Mechanisms:**
  - Direct ownership of enterprises
  - Strategic subsidies and resource allocation
  - Industrial policies promoting national champions

Historical Examples

- **Europe (1960s):** France & UK intervened in **computers and aerospace** to counter U.S. tech dominance.
- **India (Post-Independence):** Creation of **PSUs** to drive industrialisation, control strategic sectors (steel, power, railways), and balance regional development.
- **China (1980s onwards):** Hybrid model of market reforms + strong state enterprises (Huawei, Sinopec, CNOOC).

About Free Market Capitalism

- **Definition:** Economic system where **private ownership** dominates, minimal state intervention, and markets (supply & demand) determine outcomes.
- **Prominent in:** U.S. since the post-WWII period, with neoliberal reforms in the 1980s (Reaganomics, Thatcherism).

Pros & Cons

Model	Pros	Cons
State-led Capitalism	- Ensures control over strategic sectors (defense, semiconductors). - Helps create global champions (Airbus, ISRO). - Can promote inclusive & regional development.	- Risk of inefficiency & bureaucratisation. - Cronyism & rent-seeking possible. - May distort competition & innovation.
Free Market Capitalism	- Efficient resource allocation. - Encourages innovation & entrepreneurship. - Attracts global investment.	- Vulnerable to market failures & monopolies. - Neglects social equity. - Exposes economy to global shocks.

Analysis of U.S. Shift

- **Strategic Imperatives:**
  - Rising competition with **China in semiconductors & AI**.
  - Securing supply chains post-COVID disruptions.
  - Preventing **technological dependency** on foreign firms.
- **Policy Implication:**
  - Reinvention of **American state capitalism** → balancing free markets with strategic intervention.
  - Comparable to **CHIPS and Science Act (2022)** that subsidised domestic semiconductor production.

Wider Implications

- **For U.S.:** May strengthen industrial resilience but challenge free-market ideology.
- **For India:** Provides validation of **state intervention in strategic sectors** (semiconductors, defense, AI).
- **Global:** Blurring boundaries between capitalism & state control → moving towards **"neo-mercantilism."**

Practice Questions

Prelims

Q. Which of the following best describes *State-led Capitalism*?
(a) A system where the state owns all means of production and distribution.
(b) A market-based system where the state plays no role in the economy.
(c) A hybrid system where the state actively controls or guides strategic sectors while markets operate.
(d) A system entirely driven by private corporations with state support only in infrastructure.

✅ **Answer:** (c)

Mains

Q1. The U.S. acquisition of a stake in Intel reflects a shift towards state-led capitalism. Discuss the significance of this development in the context of global economic competition and industrial security.

Q2. Compare and contrast **Free Market Capitalism** and **State-led Capitalism** with examples. Which model do you think is better suited for India's growth trajectory?

U.S. Tariffs on India: Implications & Way Forward

📌 **Syllabus Mapping**
✅ **GS Paper II – International Relations**: India–USA Relations, Trade Tensions
✅ **GS Paper III – Economy**: External Sector, Exports, FDI, Global Trade

Context

- The **USA imposed an additional 25% tariff** on Indian imports.
- These tariffs are in addition to earlier 25% duties, now covering nearly **two-thirds of India's exports to the US (by value)**.
- This coincides with the **India-USA 2+2 Intersessional Dialogue** (MEA & MoD), where both sides discussed defence cooperation and a **new 10-year framework for the Major Defense Partnership**.

Impact on India

1. Exports

- **GTRI estimates**: Indian exports to the US may decline to **$49.6 bn in 2025–26** from **$87 bn in 2024–25**.
- **Most affected sectors** (low-margin, labour-intensive):
  - Gems & Jewellery
  - Textiles & Apparel
  - Shrimp & Marine Products
  - Auto Components

2. Competitiveness

- Indian products lose cost advantage.
- Competing nations like **Vietnam, Bangladesh, Mexico** (with lower/no duties) will benefit.

3. Capital Flows

- **FDI inflows** into export-oriented industries may decline.
- **FPI inflows** may reduce, adding volatility to Indian equity & debt markets.

Way Forward for India

Domestic Support Measures

- Reinstate **Interest Equalisation Scheme** → Low-cost export credit for MSMEs.
- Introduce **targeted credit lines** for most affected sectors (shrimp, apparel, jewellery, handicrafts).
- Enhance **Export Incentive Schemes**: RoDTEP, ROSCTL → Improve liquidity.
- Rationalise duties on **critical raw materials** (cotton, leather, gem inputs).

Strategic Diversification

- Diversify export markets → Africa, Latin America, ASEAN.
- Promote **sector-specific trade missions**.
- Strengthen FTAs (EU, UK, GCC) to reduce dependence on US.

Diplomatic Engagement

- Use **bilateral trade negotiations** to push for tariff rollback.
- Leverage **defence cooperation** and strategic convergence to balance trade frictions.

Significance

- Test of balancing **India–US Strategic Partnership** (defence, Indo-Pacific, Quad) with **trade frictions**.
- Highlights India's **structural export vulnerabilities** (concentration in low-margin sectors).
- Reinforces urgency of **market diversification & competitiveness reforms**.

Practice Questions

Prelims

Q. Which of the following Indian export sectors is most affected by the recent 25% additional US tariffs?
(a) IT services and pharmaceuticals
(b) Textiles, gems & jewellery, shrimp, auto components
(c) Defence equipment and space technology
(d) Renewable energy equipment

✅ **Answer:** (b) Textiles, gems & jewellery, shrimp, auto components

Mains

Q. *India's trade ties with the United States reflect both deep interdependence and recurring friction.* Examine the impact of the latest **25% US tariffs** on Indian exports and suggest a policy roadmap for India.

India Hosts 3GPP Meet on 6G Standardization

📌 **Syllabus Mapping**
✅ **GS Paper II – International Relations**: Global cooperation in technology governance
✅ **GS Paper III – Science & Tech**: ICT, Telecom Sector, Emerging Technologies (5G/6G)
✅ **GS Paper III – Economy**: Digital Infrastructure, Innovation

Context

- India hosted its **first-ever 3GPP (3rd Generation Partnership Project) RAN meeting on 6G standardization**, through the **Telecommunications Standards Development Society, India (TSDSI)**.
- Marks India's rising role in **global telecom standard-setting**, ensuring Indian needs are integrated into future ICT architecture.

About 3GPP

- **Established:** 1998.
- **Mandate:** Develop technical specifications for **mobile communications technologies**.
- **Scope:** 3G → 4G → 5G → now evolving **6G standards**.
- **Significance:** 3GPP standards are the **backbone of global mobile networks** used in 700+ operators worldwide.

India's Role

- **Host:** TSDSI – India's recognized **Standards Development Organization (SDO)**.
- **Work:** Develops standards for **access, backhaul, and ICT infrastructure** tailored to India's requirements.
- **Benefit:** India's **large user base** and **low-cost innovation ecosystem** can shape **affordable, inclusive global telecom standards**.

Why Standardization Matters for India

1. **Strategic Autonomy** – Avoid dependence on foreign tech monopolies.
2. **Economic Growth** – Standards determine **IPR (Intellectual Property Rights) ownership**, boosting domestic firms.

3. **Security Concerns** – Indigenous standards reduce risks of external surveillance & cyber threats.
4. **6G Leadership** – India aims to position itself as a **rule-shaper** in the upcoming **6G era (expected by 2030)**.

Way Forward

- Strengthen **public–private R&D partnerships** for 6G (similar to Bharat 6G Mission, 2023).
- Invest in **semiconductor and telecom equipment manufacturing** under Atmanirbhar Bharat.
- Collaborate with **Quad, BRICS, EU, and ITU** to align standards with global systems.
- Promote **IPR creation** by Indian firms to capture value in global supply chains.

Practice Questions

Prelims

Q. With reference to 3GPP, consider the following statements:

1. It was established to develop global standards for satellite navigation.
2. India's Telecommunications Standards Development Society (TSDSI) participates in its activities.

Which of the statements is/are correct?
(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

✅ **Answer:** (b) 2 only

Mains

Q. *Discuss the significance of India hosting the 3GPP RAN meeting on 6G standardization. How does participation in global telecom standard-setting advance India's strategic and economic interests?*

International Atomic Energy Agency (IAEA)

📌 **Syllabus Mapping**
✅ **GS Paper II – International Relations**: Multilateral bodies, UN agencies, Global governance
✅ **GS Paper III – Science & Technology, Security**: Nuclear energy, Non-proliferation, Global peace

Context

- Inspectors from the IAEA have begun work at **Bushehr nuclear sites in Iran**, highlighting the agency's role in **nuclear monitoring and safeguards**.

About IAEA

- **Established:** 1957 (in the aftermath of U.S. President Eisenhower's *"Atoms for Peace"* proposal, 1953).
- **Nature:** World's central **intergovernmental forum** for scientific and technical cooperation in the nuclear field.
- **HQ:** Vienna, Austria.
- **Award:** Nobel Peace Prize (2005) for efforts against nuclear proliferation.

Functions

- Ensures **safe, secure, and peaceful uses** of nuclear science and technology.
- Works for:
  - Nuclear **safety and security**.
  - Application of nuclear technology for **health, food security, environment, energy**.
  - **Verification** of nuclear programs → safeguards to prevent misuse for weapons.
- Contributes to **international peace, security, and SDGs**.

Governance

- **General Conference:** All member states.
- **Board of Governors:** 35-member executive body (formulates policy, approves safeguards).
- **Secretariat:** Headed by Director-General (currently Rafael Mariano Grossi).

Relevance to India

- India is a **founding member**.
- After **India-US Civil Nuclear Deal (2008)**, IAEA approved India-specific safeguards.
- India uses IAEA support in:
  - Nuclear power generation.
  - Cancer therapy using radiation.
  - Isotope applications in agriculture & water management.

Challenges & Issues

- Accused of being influenced by **major powers** (e.g., Iran Nuclear Deal disputes).
- Limited enforcement power → depends on **UN Security Council**.
- Balancing peaceful nuclear use vs **non-proliferation obligations**.

Significance

- Acts as **global nuclear watchdog**.
- Prevents **nuclear weapons proliferation** (NPT, safeguards).
- Helps achieve **SDG 7 (Affordable & Clean Energy)** and **SDG 3 (Health)** via nuclear applications.

Practice Questions

Prelims

Q. Which of the following statements is/are correct about the **IAEA**?

1. It is a specialized agency of the United Nations.
2. It monitors nuclear programs of countries under the Non-Proliferation Treaty (NPT).
3. It was awarded the Nobel Peace Prize in 2005.

(a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

✅ **Answer:** (b)

Mains

Q. *"The IAEA plays a crucial role in balancing nuclear energy needs with non-proliferation concerns. Examine its role and limitations with special reference to India."*

UNGA Initiatives for Global AI Governance

📌 **Syllabus Mapping**
✅ **GS Paper II – International Relations: Multilateralism, UN Reforms, Global Cooperation**
✅ **GS Paper III – Science & Tech: Artificial Intelligence, Emerging Technologies, Ethics in AI**
✅ **Essay Paper – Technology & Ethics, Global Governance in a Digital Age**

Context

- The **United Nations General Assembly (UNGA)** has announced the creation of **two new mechanisms** to strengthen **global AI governance**.
- This initiative builds upon the **"Pact for the Future" (2024)** and the **"Global Digital Compact"**, both of which aimed at making digital and AI ecosystems more inclusive, ethical, and sustainable.
- The move signals growing recognition of AI as a **global common concern**, requiring **multilateral cooperation** to mitigate risks such as bias, surveillance misuse, weaponisation, and inequality.

New Mechanisms for AI Governance

1. Independent International Scientific Panel on AI

- Mandate:
  - Promote **scientific understanding** of AI.

  - Issue **evidence-based scientific assessments** synthesising existing research.
  - Analyse **risks, opportunities, and socio-economic impacts** of AI.
- Parallel to: **IPCC model for Climate Change** – aims to depoliticise debates by relying on scientific consensus.

2. Global Dialogue on AI Governance

- Mandate:
  - Serve as a **platform for international cooperation**.
  - Facilitate **open, transparent, and inclusive discussions** on governance frameworks.
  - Share **best practices & regulatory models** across countries.

Other UN Mechanisms on AI Governance

- **Pact for the Future (2024)**:
  - Adopted at the **Summit of the Future**;
  - A roadmap to achieve **SDGs** & tackle emerging tech challenges.
- **Global Digital Compact (2024)**:
  - Annexed with Pact for the Future.
  - Sets a **comprehensive framework for digital cooperation** & AI ethics.
- **AI for Good Global Summit (since 2017, ITU)**:
  - Showcases AI applications for **SDGs (healthcare, climate, education, disaster response)**.
- **UNESCO Recommendation on the Ethics of AI (2021)**:
  - First **global normative instrument** on AI ethics, focusing on transparency, accountability, fairness.

Significance of UNGA's Move

- **Global Recognition**: Positions AI as a **shared global challenge** similar to climate change.
- **Bridging Gaps**: Helps harmonise **fragmented national AI policies** (e.g., US, EU AI Act, China's regulations, India's DPDP Act 2023).
- **South-South Participation**: Ensures voices from **developing nations** are included in shaping rules.
- **Non-Military Focus**: Distinguishes governance of AI for **civilian and developmental uses**, excluding weaponisation debates.

Challenges in Global AI Governance

- **Fragmentation of standards** – different regulatory models (EU AI Act vs US voluntary guidelines vs China's state-led model).
- **Big Tech dominance** – risks of **digital colonialism** and concentration of AI resources.
- **Geopolitical rivalry** – US-China AI competition may affect consensus.
- **Enforcement gap** – unlike climate treaties, **no global enforcement mechanism** yet.
- **Ethical divergence** – varying perceptions of privacy, surveillance, and data rights across cultures.

Way Forward

- **Adopt an IPCC-style framework** – evidence-driven, periodic assessments on AI risks.
- **Inclusive governance** – integrating voices from **Global South**.
- **Promote Responsible AI** – ensuring equity, accessibility, and sustainability.
- **AI & SDGs** – prioritise AI's role in **healthcare, climate resilience, agriculture, education**.
- **Link AI governance with cyber security** – addressing risks of disinformation, weaponisation, and cyber warfare.

Practice Questions

Prelims

Q. With reference to **Global AI Governance**, consider the following statements:

1. The **UNESCO Recommendation on the Ethics of AI (2021)** was the first global standard-setting instrument on AI ethics.
2. The **Global Digital Compact** was adopted at the Summit of the Future in 2024.
3. The newly announced **Independent International Scientific Panel on AI** will work on the military applications of AI.

Which of the above statements is/are correct?
(a) 1 and 2 only
(b) 1 and 3 only
(c) 2 and 3 only
(d) 1, 2 and 3

✅ **Answer: (a)**

Mains

Q. *"Artificial Intelligence has become a new frontier for global governance, similar to climate change and nuclear technology." Critically analyse the significance of UN-led initiatives in AI governance, highlighting the challenges and opportunities for India.*

LNG Deal: UAE–IOC 15-Year Agreement

📌 **Syllabus Mapping**
✅ **GS Paper II – International Relations (India-UAE Energy Cooperation)**
✅ **GS Paper III – Economy (Energy Security, Infrastructure)**
✅ **Prelims – Fuels & Energy Sources**

Context

- **Abu Dhabi National Oil Company (ADNOC)** has signed a **15-year agreement with Indian Oil Corporation (IOC)** to supply **1 million tonnes per annum of LNG** to India.
- This comes at a time when India is diversifying energy imports and pushing for a **gas-based economy (target: 15% in energy mix by 2030).**

About Liquefied Natural Gas (LNG)

- **Definition**: Natural gas cooled to **–260°F (–162°C)** → becomes liquid.
- **Liquefaction**: Reduces volume by **~600 times**, making it feasible for **long-distance shipping & storage**.
- **Advantages**:
  - Transportable via ships (not dependent on pipelines).
  - Cleaner than coal and oil (low CO_2 emissions).
  - Facilitates storage for seasonal demand.

Global Scenario

- **Top LNG Exporters**: USA (largest), Australia, Qatar.
- **Top Importers**: China, Japan, South Korea, India (4th largest).
- LNG trade is expanding due to **energy transition** and **geopolitical disruptions** (e.g., Europe post-Ukraine war).

India's LNG Profile

- **Dependency**: India imports ~50% of its natural gas needs.
- **Major suppliers**: Qatar, USA, Russia, UAE.
- **Infrastructure**: 6 LNG terminals (Dahej, Hazira, Kochi, Ennore, Dabhol, Mundra).
- **Policy push**: National Gas Grid, City Gas Distribution (CGD), gas-based industries.

Significance of the UAE Deal

- **Energy Security**: Ensures stable LNG supply at a time of volatile global prices.
- **Strategic Partnership**: Strengthens India-UAE ties (already strong in oil, remittances, and trade under CEPA 2022).
- **Diversification**: Reduces dependence on Qatar (India's primary LNG supplier).
- **Economic**: Supports industries, fertilizers, and power sector with cheaper clean fuel.

Practice Questions

Prelims

Q. LNG, often seen in the news, is:
(a) Natural gas cooled to liquid state at very low temperature
(b) Liquefied petroleum gas mixed with methane
(c) Natural gas converted into synthetic oil
(d) A mixture of hydrogen and natural gas under pressure

✅ **Answer: (a)**

Mains

Q. *Energy security is central to India's growth trajectory. In this context, critically analyze the role of LNG imports and international agreements in achieving India's clean energy and economic goals.*

Interpol Issues First Purple Notice (ED Request)

📌 **Syllabus Mapping**
✅ **GS Paper II – International Relations**: Important International Institutions, agencies and fora—their structure and mandate
✅ **GS Paper III – Security**: Linkages between organized crime and terrorism, role of international agencies in crime prevention

About Purple Notice

- **Definition**: One of the **eight types of Interpol notices**, issued to collect or provide information on **modus operandi, objects, devices, or concealment methods used by criminals**.
- **Issued by**: **Interpol (International Criminal Police Organization)**, headquartered in Lyon, France.
- **Purpose**: Helps law enforcement agencies share operational information to tackle **organized crime, trafficking, smuggling, cybercrime, etc.**

Other Types of Interpol Notices

Notice	Purpose
Red	To seek arrest/extradition of fugitives.
Blue	To collect information about a person's identity/location.
Green	To warn about criminal activities of a person.
Yellow	To locate missing persons or identify persons unable to identify themselves.
Black	To seek information on unidentified bodies.
Orange	To warn about dangerous materials, objects, or criminal acts.
Purple	To provide modus operandi, objects, devices, concealment methods used by criminals.
Silver (Pilot Phase)	To trace assets, properties, or equipment of criminals.
Special Notice (UNSC)	For individuals/entities under **UN Security Council sanctions**.

Significance of India issuing Purple Notice

- **First time**: Marks India's proactive role in **global intelligence sharing**.
- **Relevance for ED**: Helps track money laundering, terror financing, drug trade, and transnational organized crime.
- **International cooperation**: Strengthens India's role in global law enforcement and **cross-border crime prevention**.

Practice Question

Prelims

Q. Which of the following Interpol Notices is used to track the *modus operandi* of criminals?
(a) Red Notice
(b) Purple Notice
(c) Blue Notice
(d) Orange Notice

✅ **Answer**: (b) Purple Notice

Mains

Q. *Discuss the significance of Interpol notices, especially the Purple Notice, in strengthening international cooperation against transnational organized crime.*

India Invokes UNTOC & UNCAC in Extradition Case

📌 **Syllabus Mapping**
✅ **GS Paper II – International Relations**: UN treaties, global cooperation mechanisms
✅ **GS Paper III – Internal Security**: Organized crime, money laundering, corruption

Context

- India recently invoked **UNTOC (United Nations Convention against Transnational Organized Crime)** and **UNCAC (United Nations Convention against Corruption)** in its **extradition request of a fugitive offender**.
- Reflects India's increasing reliance on **multilateral legal instruments** to strengthen domestic law enforcement and international cooperation.

United Nations Convention against Transnational Organized Crime (UNTOC)

- **Adopted**: 2000 (Palermo, Italy) → **Entered into force**: 2003.

- **Also known as**: **Palermo Convention**.
- **Objective**: First and only **global legally binding instrument** against organized crime.
- **Secretariat**: UN Office on Drugs and Crime (UNODC).
- **Supplementary Protocols**:
    1. **Protocol to Prevent, Suppress and Punish Trafficking in Persons, especially Women & Children.**
    2. **Protocol against the Smuggling of Migrants by Land, Sea and Air.**
    3. **Protocol against the Illicit Manufacturing of and Trafficking in Firearms.**

United Nations Convention against Corruption (UNCAC)

- **Adopted**: 2003 (Merida, Mexico) → **Entered into force**: 2005.
- **Objective**: Only **legally binding universal anti-corruption instrument**.
- **Focus Areas**:
    - **Prevention** → Integrity systems, codes of conduct.
    - **Criminalization** → Bribery, embezzlement, abuse of functions.
    - **International Cooperation** → Mutual legal assistance & extradition.
    - **Asset Recovery** → Repatriation of stolen assets to victim states.

India's Relevance & Engagement

- **Signatory to both UNTOC & UNCAC**.
- Uses them in **extradition, money laundering, and asset recovery cases**.
- Aligns with **domestic laws**:
    - Prevention of Money Laundering Act (PMLA), 2002.
    - Benami Transactions Act.
    - Fugitive Economic Offenders Act, 2018.

Significance

- Strengthens India's fight against **transnational organized crime** and **corruption**.
- Enhances **credibility of extradition requests** in foreign courts.
- Supports India's stand on **global governance reforms** and rule-based international order.

Practice Questions

Prelims

Q. UNTOC, sometimes seen in news, is also known as:
(a) Kyoto Protocol
(b) Palermo Convention
(c) Cartagena Protocol
(d) Washington Convention

✅ **Answer**: (b) Palermo Convention

Mains

Q. *Discuss the significance of UNTOC and UNCAC in strengthening India's fight against transnational organized crime and corruption. How do they complement India's domestic legal framework?*

SECURITY & DEFENCE

SEBI's Cybersecurity & Resilience Framework (CCSRF)

📌 **Syllabus Mapping**
✅ **GS Paper II – Governance: Regulatory Bodies, SEBI**
✅ **GS Paper III – Security: Cybersecurity, Cyber Resilience, Technology in Governance**
✅ **Prelims – Financial Market Institutions, SEBI**

Context

- **SEBI clarified** that its **Cybersecurity and Cyber Resilience Framework (CCSRF)** applies **only to the systems of entities regulated by SEBI.**
- If regulated entities already follow **RBI or other regulators' equivalent cybersecurity rules**, SEBI will **accept them as compliance.**

About CCSRF

- **Introduced**: 2015 (for **Market Infrastructure Institutions – MIIs** like stock exchanges, clearing corporations, depositories).
- **Objective**:
  - Strengthen **cybersecurity** measures in the Indian securities market.
  - Build **resilience** against cyber incidents/attacks.
  - Ensure **continuity of operations** and investor protection.

Scope / Applicability

- **Entities Covered**:
  - **Market Infrastructure Institutions (MIIs)**
  - **Stock Brokers & Depository Participants**
  - **Mutual Funds / Asset Management Companies (AMCs)**
  - **KYC Registration Agencies (KRAs)**
  - **Portfolio Managers**
- **Core Requirements**:
  - Periodic **vulnerability assessment & penetration testing (VAPT)**.
  - Cybersecurity audits and incident reporting.
  - Establishing **Security Operations Centres (SOC)**.
  - Business continuity and disaster recovery mechanisms.

Recent Clarification (2025)

- SEBI's framework applies only to **regulated entities' systems**.
- **Cross-acceptance**: If entities comply with **RBI or IRDAI's equivalent rules**, SEBI will treat it as **compliance** → avoids **duplication and regulatory burden.**

Significance

- **Investor Confidence**: Cyber resilience reduces risk of frauds, breaches, and loss of investor data.
- **Systemic Stability**: Ensures smooth functioning of markets (critical for economy).
- **Regulatory Harmonization**: Prevents overlap/conflict between SEBI, RBI, IRDAI frameworks.
- **Global Standards Alignment**: Brings Indian financial markets closer to **IOSCO, BIS, G20 cybersecurity principles**.

Practice Questions

Prelims

Q. The Cybersecurity and Cyber Resilience Framework (CCSRF), sometimes seen in news, is related to:
(a) RBI guidelines for banks
(b) SEBI guidelines for securities market entities
(c) CERT-In framework for cyber incident reporting
(d) Ministry of Defence's cyber command regulations

✅ **Answer: (b)**

Mains

Q. *Cybersecurity has emerged as a systemic risk for financial markets. Discuss the significance of SEBI's Cybersecurity and Cyber Resilience Framework (CCSRF) in safeguarding India's securities market while ensuring regulatory harmonization.*

CDS Releases 3 Joint Doctrines for Armed Forces

📌 **Syllabus Mapping**
✅ **GS Paper II – Governance & Polity**: National Security, Defence Policy
✅ **GS Paper III – Internal Security & Defence**: Tri-Services Jointness, Modernisation, Theatre Commands
✅ **Essay/GS II**: Whole-of-Nation Approach to Security

Context

- On **28 August 2025**, the **Chief of Defence Staff (CDS)** released **three joint doctrines** aimed at enhancing **jointness, integration, and theatreisation** of the Indian Armed Forces.
- This move reflects India's growing emphasis on **multi-domain preparedness** amidst evolving geopolitical and technological challenges.

Overview of the Three Doctrines

1. Joint Doctrine for Special Forces (SF) Operations

- Common framework for **Para-SF (Army)**, **MARCOS (Navy)**, and **Garuds (IAF)**.
- Focus on:
  - Common **terminologies & procedures**.
  - **Joint training** to reduce duplication.
  - Integration of **future weapon profiles**.
  - **Command & control strategies** across land, maritime, and air.

2. Joint Doctrine for Airborne (AB) & Heliborne (HB) Operations

- Standardisation of **air mobility & insertion missions**.
- Ensures **seamless coordination** among Army, Navy, and Air Force.
- Focus on:
  - Bridging **doctrinal gaps**.
  - **Planning & execution protocols**.
  - Integration of **advanced air mobility assets** (transport aircraft, helicopters, tiltrotors).
  - Use of **unmanned aerial systems (UAS)** for surveillance & support.

3. Joint Doctrine for Multi Domain Operations (MDO)

- Expands warfare to **Land, Sea, Air, Cyber, Space, and Cognitive domains**.
- Emphasises:
  - **Whole-of-Nation Approach (WONA)** – synergy between military and non-military national capabilities.
  - **Integration with civilian agencies**, industry, academia, and diplomatic arms.
  - Aligning military operations with **politico-military objectives**.

About Chief of Defence Staff (CDS)

- **Permanent Chairman** of the Chiefs of Staff Committee.
- **Principal Military Adviser** to Defence Minister on tri-services matters.
- Key role: Driving **jointness, integration, and theatreisation** in Indian defence forces.

Significance of the Move

1. **Strengthening Jointness**
   - Prevents duplication of efforts across services.
   - Optimises resources and enhances interoperability.
2. **Operational Preparedness**
   - Better coordination for **special ops & rapid deployment**.
   - Integrated responses in **high-tech & hybrid warfare scenarios**.
3. **Multi-Domain Readiness**
   - Incorporates **cyber, space & cognitive warfare** → critical in 21st century conflicts.
   - Aligns India with **global practices** (e.g., US, NATO doctrines).
4. **Strategic Advantage**

- Supports **theatre command structures** under planning in India.
- Enhances deterrence against adversaries with integrated operations.

Challenges Ahead

- **Resistance from Services** over turf & autonomy.
- **Doctrinal adaptation** to Indian conditions (terrain, technology gaps).
- Need for **advanced joint training infrastructure**.
- **Civil-military integration** in cognitive & cyber domains still evolving.

Way Forward

- Gradual **operationalisation of theatre commands**.
- Institutionalising **joint training academies** for tri-service personnel.
- Investing in **indigenous multi-domain tech** (AI, quantum, hypersonics).
- Strengthening **civil-military fusion** through academia, industry & diplomacy.

Practice Questions

Prelims

Q. Which of the following domains are covered under India's new Joint Doctrine for Multi-Domain Operations?

1. Land
2. Sea
3. Air
4. Cyber
5. Space
6. Cognitive

(a) 1, 2, 3 only
(b) 1, 2, 3, 4, 5 only
(c) 1, 2, 3, 4, 5, 6
(d) 2, 4, 5 only

✅ **Answer:** (c)

Mains

Q. *Discuss the significance of India's recently released Joint Doctrines in advancing military theatreisation and multi-domain warfare preparedness.*

DRDO Tests Integrated Air Defence Weapon System (IADWS)

📌 **Syllabus Mapping:**
✅ **GS Paper III – Security:** Defence technology, indigenisation of defence, role of DRDO
✅ **GS Paper II – International Relations:** Border security, strategic installations, technological deterrence
✅ **GS Paper III – Science & Technology:** Emerging technologies – Directed Energy Weapons, missile systems

Context

On **25th August 2025**, the **Defence Research and Development Organisation (DRDO)** successfully conducted the **maiden flight-tests of the Integrated Air Defence Weapon System (IADWS)**. This marks a significant milestone in India's quest for **self-reliant multi-layered air defence systems** capable of countering diverse threats ranging from **long-range ballistic missiles to UAVs**.

About IADWS

Nature of the System

- **Multi-layered Defence:** Designed to provide **comprehensive protection** of borders and critical infrastructure.
- **Integration:** Combines **surveillance, threat identification, and neutralisation systems** under a single command structure.

Key Components

1. **Quick Reaction Surface-to-Air Missile (QRSAM):**

- Developed by **DRDO**.
- **Range:** 5–30 km.
- Protects **mobile armoured formations** on the move.
- Mounted on a **mobile launch platform** for flexible deployment.

2. **Very Short Range Air Defence System (VSHORADS):**
   - Developed by **Research Centre Imarat (RCI)**.
   - **Type:** Man-portable air defence system (MANPADS).
   - Neutralises **low-altitude aerial threats** such as helicopters, drones, and low-flying aircraft.
3. **Directed Energy Weapon (DEW):**
   - Developed by **Centre for High Energy Systems and Sciences (CHESS)**.
   - Uses **high-energy laser beams** to strike at the **speed of light**.
   - Capable of causing **structural failure of aerial platforms** or neutralising warheads.
4. **Command and Control Centre:**
   - Developed by **Defence Research & Development Laboratory (DRDL)** (the **nodal agency** of the programme).
   - Integrates all components for **coordinated response and real-time decision-making**.

Strategic Significance

1. **Strengthening Air Defence Architecture:**
   - Provides **layered protection** similar to advanced systems like **Israel's Iron Dome** or **Russia's S-400**.
   - Crucial for securing **critical infrastructure, border areas, and urban centres**.
2. **Boost to Atmanirbhar Bharat (Self-Reliance):**
   - Reduces dependence on foreign defence imports.
   - Positions India as a **defence technology innovator**.
3. **Countering Emerging Threats:**
   - Addresses **drone warfare** (as seen in Ukraine conflict, 2022–23).
   - Enhances capability against **ballistic missile threats** from neighbouring states.
4. **Geo-Strategic Advantage:**
   - Strengthens **deterrence posture** along sensitive borders with **China and Pakistan**.
   - Enhances India's **export potential** in defence systems.

Analysis

- **Technological Leap:** Introduction of **laser-based DEWs** brings India into the league of countries experimenting with next-gen weaponry (USA, China, Israel).
- **Challenges:**
  - High development cost and long gestation periods.
  - Integration with existing Indian Air Defence Systems (like Akash, S-400).
  - Ensuring **interoperability across armed forces**.
- **Future Scope:**
  - Possible integration with **AI-based threat detection** and **space-based sensors**.
  - Potential export under the **Defence Production and Export Promotion Policy (DPEPP) 2020**.

Practice Questions

Prelims (Objective):

1. Consider the following pairs related to India's air defence systems:
   - QRSAM – Protection of mobile armoured formations
   - VSHORADS – Developed by DRDL
   - Directed Energy Weapon – Uses laser beams for target neutralisation

   Which of the above pairs is/are correctly matched?

   - (a) 1 and 2 only
   - (b) 1 and 3 only
   - (c) 2 and 3 only
   - (d) 1, 2, and 3

Mains (Analytical):

Q1. Discuss the strategic and technological significance of the Integrated Air Defence Weapon System (IADWS) in strengthening India's national security.

Q2. "Directed Energy Weapons (DEWs) represent the future of modern warfare." Evaluate this statement in the context of India's defence preparedness.

ISRO's First Integrated Air Drop Test for Gaganyaan

📌 **Syllabus Mapping:**
✅ **GS Paper III – Science & Technology:** Space technology, indigenisation, achievements of Indian scientists
✅ **GS Paper II – International Relations:** India's rise in space diplomacy, strategic partnerships
✅ **GS Paper I – Geography:** Space research and exploration, role of technology in national development

Context

On **25th August 2025**, the **Indian Space Research Organisation (ISRO)** successfully conducted the **first Integrated Air Drop Test (IADT-01)** for the **Gaganyaan Mission**. The trial was a joint effort of **ISRO, the Indian Air Force, DRDO, Indian Navy, and Indian Coast Guard**—a collaborative demonstration of India's multi-agency approach towards achieving **human spaceflight capability**.

This success marks a crucial step towards India's maiden crewed mission and strengthens the broader **Vision 2047 roadmap** of placing India among global space powers.

Integrated Air Drop Test (IADT-01)

- **Objective:** End-to-end demonstration of the **parachute-based deceleration system**.
- **Significance:**
  - Validates the **safe recovery mechanism** for astronauts.
  - Ensures the crew module can withstand re-entry and land securely.
- **Future Tests:**
  - **Test Vehicle Demonstration 2 (TV-D2)**.
  - **First uncrewed Gaganyaan mission (G1)**.

About the Gaganyaan Mission

1. **Vision:** To demonstrate India's capability in **human spaceflight**.
   - Mission: **Three astronauts**, 400 km orbit, **3-day mission**, safe return.
   - If successful, India becomes the **4th nation** (after the **US, Russia, and China**) to launch humans into space.
2. **Launch Vehicle – HLVM3:**
   - Human-rated version of **LVM3 (formerly GSLV Mk-III)**.
   - **Three-stage rocket:** Solid + Liquid + Cryogenic stage.
   - Modified to meet **stringent human safety standards**.
3. **Safety Focus:**
   - **Crew Escape System** for emergency evacuation.
   - Redundant life-support and power systems.

India's Future Space Roadmap

Announced on **National Space Day (23rd August 2025):**

- **Bharat Antariksh Station:** To be established by **2035**.
- **Manned Lunar Mission by 2040:** Astronaut on the Moon—marking India's symbolic stride towards **Viksit Bharat 2047**.
- **Other Upcoming Missions:**
  - **Chandrayaan-4** (lunar exploration).
  - **Mission to Venus** (atmospheric studies).
  - Expansion of **space-based applications in defence, agriculture, and communication**.

Strategic Significance

1. **Technological Milestone:** Positions India as a **spacefaring nation with human capability**.
2. **Global Standing:** Elevates India into an **elite club of 4 nations** in human spaceflight.
3. **National Security & Diplomacy:** Enhances India's role in **space cooperation forums** (BRICS, QUAD, Artemis Accords).
4. **Economic Impact:** Boosts **space economy**, encourages **private participation** under the Indian National Space Promotion and Authorisation Centre (IN-SPACe).
5. **Societal Impact:** Inspires youth, strengthens STEM education, and aligns with the **Atmanirbhar Bharat** vision.

Analysis

- **Strengths:**
  - Indigenous development of crew module and life-support systems.
  - Multi-agency collaboration improves operational readiness.

  - Strong political backing with defined timelines till 2047.
- **Challenges:**
  - **Cost escalation** and long gestation periods.
  - **Human safety** standards demand rigorous testing and redundancies.
  - Competition from private giants (SpaceX, Blue Origin) in commercial space domain.
- **Way Forward:**
  - Strengthen **international partnerships** (e.g., NASA, ESA, JAXA).
  - Build **private sector ecosystem** for space startups.
  - Focus on **spin-off benefits**—AI, robotics, material sciences, and energy.

Practice Questions

Prelims (Objective):

1. With reference to India's Gaganyaan Mission, consider the following statements:
   1. The launch vehicle for the mission is a human-rated version of LVM3.
   2. The mission plans to place astronauts in an orbit of 400 km for 3 days.
   3. The Integrated Air Drop Test (IADT-01) was primarily meant to test the crew escape system.

   Which of the above statements is/are correct?

   - (a) 1 and 2 only
   - (b) 2 and 3 only
   - (c) 1 and 3 only
   - (d) 1, 2, and 3

Mains (Analytical):

Q1. Gaganyaan is not just a technological project but a strategic mission. Discuss its significance for India's space capabilities, national security, and diplomacy.

Q2. Critically examine the challenges India faces in executing human spaceflight missions and suggest measures to strengthen India's long-term space roadmap.

AI-Enabled X-Guard FOTD: Boosting Air Defence

📌 **Syllabus Mapping:**
✅ **GS Paper III – Security:** Defence technology, AI in modern warfare, electronic warfare systems
✅ **GS Paper II – International Relations:** India-Israel defence cooperation
✅ **GS Paper III – Science & Tech:** Emerging military technologies, AI integration in security systems

Context

India is reported to have deployed the **AI-enabled X-Guard Fibre-Optic Towed Decoy (FOTD) system** during **Operation Sindoor**. Developed by **Israel's Rafael Advanced Defense Systems**, this technology enhances the survivability of fighter aircraft against **modern radar-guided missile threats**.

About the X-Guard FOTD System

1. **Developer:** Israel's **Rafael Advanced Defense Systems**.
2. **Function:** Works in sync with an aircraft's **Electronic Warfare (EW) suite** to **confuse and mislead enemy radars**.
3. **Operational Capabilities:**
   - Effective across **low to high altitudes**.
   - Functions at **subsonic to supersonic velocities**.
   - Can be deployed proactively (before entering hostile airspace) or reactively (on imminent missile threat).
4. **Key Features:**
   - **AI-enabled decision support** for faster deployment.
   - **Retractable in-flight**, allowing reuse.
   - Maintains **continuous electrical and fibre-optic link** during the mission.
   - Provides **360° protection** against advanced radar-guided missiles.

Strategic Significance for India

1. **Enhanced Aircraft Survivability:** Protects frontline fighters (likely Su-30 MKI, Rafale, or Tejas) against advanced **Beyond Visual Range (BVR) missile threats**.

2. **Force Multiplier in Operations:** Critical during high-risk missions in contested airspaces, e.g., along the **Western and Northern borders**.
3. **AI Integration in Defence:** Reflects India's shift towards **intelligent warfare systems**, reducing pilot workload and reaction time.
4. **Indo-Israel Defence Cooperation:** Strengthens strategic ties in high-tech domains, complementing existing collaborations in **missiles (Barak, Spike)** and **UAV technologies**.

Analysis

- **Global Comparisons:**
  - Similar to NATO's **ALE-55 FOTD system (US)** and **BAE's BriteCloud decoys (UK)**.
  - Reflects India's effort to bridge **EW capability gaps** vis-à-vis **China and Pakistan**.
- **AI in Warfare:**
  - AI allows **real-time threat recognition and decoy deployment**, far faster than human reaction.
  - Represents the **next frontier in electronic warfare**.
- **Challenges:**
  - High costs and maintenance requirements.
  - Integration with India's diverse fleet (MiG-29, Su-30, Rafale, Tejas) requires calibration.
  - Dependence on foreign systems → need for **Atmanirbhar Bharat in EW tech**.

Way Forward

- **Indigenous Development:** Encourage DRDO to develop **home-grown AI-enabled EW systems**.
- **Joint Ventures:** Expand Indo-Israel defence R&D collaborations.
- **Pilot Training:** Ensure Indian Air Force (IAF) pilots are trained for **seamless deployment** of AI-assisted EW tools.
- **Integration with Network-Centric Warfare:** Link FOTD systems with **AWACS & satellite intelligence** for maximum effectiveness.

Practice Questions

Prelims (Objective):

1. The X-Guard Fibre-Optic Towed Decoy (FOTD) system is primarily used for:
   - (a) Air-to-air combat enhancement
   - (b) Protecting aircraft against radar-guided missile threats
   - (c) Increasing aircraft fuel efficiency
   - (d) Satellite-based navigation

Mains (Analytical):

Q1. Discuss the role of AI-enabled electronic warfare systems like the X-Guard FOTD in modern air combat. How do such technologies enhance India's defence preparedness?

Q2. Evaluate India-Israel defence cooperation in the context of emerging high-technology systems such as electronic warfare, missile defence, and UAVs.

Project 17A – Stealth Frigates of Indian Navy

📌 **Syllabus Mapping**
✅ **GS Paper II – International Relations**: Defence preparedness, Maritime Security
✅ **GS Paper III – Internal Security**: Defence Technology, Indigenisation of defence production
✅ **Essay/Interview**: Blue Economy, Indian Ocean Strategy, Aatmanirbhar Bharat in Defence

Context

- Two **multi-mission stealth frigates – INS Udaygiri and INS Himgiri** – were commissioned into the **Indian Navy**under **Project 17A**.
- These are state-of-the-art **stealth warships**, enhancing India's maritime capabilities amidst growing security challenges in the Indian Ocean and Indo-Pacific.

About Project 17A

- **Follow-on project** to the **Shivalik-class (Project 17)** frigates.
- **Indigenisation push:** Seven frigates being built at
  - **Mazagon Dock Shipbuilders Ltd (MDL), Mumbai**
  - **Garden Reach Shipbuilders & Engineers (GRSE), Kolkata**
- **Stealth Features:** Low radar cross-section, reduced infrared & acoustic signatures.
- **Propulsion: CODOG (Combined Diesel or Gas)** system – Diesel engine (cruise) + Gas turbine (high speed).
- **Weapons:**

- Supersonic **Surface-to-Surface Missiles (likely BrahMos)**
- **Medium-Range Surface-to-Air Missiles (MR-SAM)**
- Rapid-fire gun systems for close-in defence.

Significance of Project 17A

1. **Strategic Autonomy:** Boosts India's **indigenous defence production** under *Atmanirbhar Bharat*.
2. **Maritime Security:** Enhances fleet protection in the **Indian Ocean Region (IOR)** against piracy, hostile navies, and grey-zone threats.
3. **Power Projection:** Multi-mission capability (anti-submarine, anti-air, anti-surface warfare) strengthens **blue-water navy** ambitions.
4. **Regional Balance:** Counters China's expanding presence in IOR (*PLA Navy bases in Djibouti, Gwadar, Hambantota*).

Way Forward

- Enhance **indigenous weapons integration** (BrahMos, DRDO SAMs, torpedoes).
- Accelerate **Project 75(I) submarines** to complement surface fleet.
- Strengthen **India–Quad naval interoperability** for Indo-Pacific balance.
- Continuous R&D for **next-gen stealth & electronic warfare systems**.

Practice Questions

Prelims

Q. With reference to Project 17A Frigates, consider the following statements:

1. They are being built by Mazagon Dock Shipbuilders and Garden Reach Shipbuilders.
2. They use nuclear propulsion technology.
3. They are follow-on ships of Project 17 Shivalik-class frigates.

Which of the above is/are correct?
(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

✅ **Answer:** (c) 1 and 3 only

Mains

Q. *Discuss the significance of Project 17A frigates for India's maritime security in the context of Indo-Pacific strategic challenges.*

Exercise Bright Star: Multilateral Tri-Service Drill

📌 **Syllabus Mapping**
✅ **GS Paper II – International Relations (India's bilateral, regional & global groupings)**
✅ **GS Paper III – Security (Defence Preparedness, Tri-Service Exercises)**

Context

- The **Indian Armed Forces** and **Headquarters Integrated Defence Staff (IDS)** will participate in **Multilateral Exercise Bright Star 2025**, showcasing India's growing military diplomacy and interoperability in the West Asia–North Africa region.

About Exercise Bright Star

- **Origin**: Conceived after the **Camp David Accord (1977)** between Egypt and Israel, as a **bilateral US–Egypt military exercise**.
- **First Edition**: 1980, Egypt.
- **Expansion**: Since 1995, it evolved into a **multinational tri-service exercise**.
- **Nature**: Among the **largest tri-service military exercises** in the Middle East–North Africa region.

Key Features of Bright Star

- **Tri-Service Participation**: Involving Army, Navy, and Air Force.
- **Participants**: USA, Egypt, India, and several other nations.
- **Focus Areas**:
  - Counter-terrorism operations

  - Amphibious operations
  - Joint planning & coordination
  - Air defence & maritime security
- **Venue**: Conducted biennially in **Egypt**.

Significance for India

- **Strategic Engagement**: Enhances military ties with **Egypt, USA, and regional powers**.
- **Operational Exposure**: Gives Indian forces exposure to **tri-service multinational operations**.
- **Geopolitical Significance**: Strengthens India's presence in **West Asia–North Africa (WANA)**, a region critical for **energy security** and diaspora welfare.
- **Defence Diplomacy**: Builds on India's vision of **'Security and Growth for All in the Region' (SAGAR)** and broader Indo-Abrahamic cooperation.

Previous Participation

- **India's debut**: 2023 (Bright Star-23), when contingents from the Army, Navy, and Air Force participated.

Practice Questions

Prelims

Q. *Exercise Bright Star, recently in news, was originally conceived as a bilateral exercise between:*
(a) USA and Israel
(b) USA and Egypt
(c) Egypt and Saudi Arabia
(d) India and USA

✅ **Answer:** (b) USA and Egypt

Mains

Q. *"Multilateral military exercises are instruments of both military preparedness and diplomacy." Discuss with reference to India's participation in Exercise Bright Star.*

Extended Range Attack Munitions (ERAMs)

📌 **Syllabus Mapping**
✅ **GS Paper II – International Relations (Global Arms Supply & Conflicts)**
✅ **GS Paper III – Security (Defense Technology & Strategic Affairs)**
✅ **Prelims – Defence Technology, Missiles**

Context

- The **United States has approved delivery of Extended Range Attack Munitions (ERAMs) to Ukraine**, aimed at strengthening Ukraine's deep-strike capability against Russian infrastructure and supply lines.

About ERAMs

- **Category**: Next-generation **air-launched, precision-guided missile**.
- **Range**: 240 – 450 km (deep strike capability).
- **Warhead**: 500-pound **high-explosive** (can destroy hardened bunkers, fuel depots, ammunition storage).
- **Guidance System**:
  - GPS (Global Positioning System).
  - Inertial Navigation System (INS).
  - Terminal seeker → ensures **high precision (~10 m accuracy)**.

Strategic Significance

- **For Ukraine**:
  - Enhances strike capability against **critical Russian supply hubs, logistics bases, and command centers**.
  - Extends reach beyond current **HIMARS/GMLRS** (~80 km) and even **ATACMS** (~300 km).
- **For the US**:
  - Strengthens commitment to Ukraine without direct troop involvement.

    - Demonstrates advanced US **defense exports and missile technology**.
- **For Russia**:
    - May escalate conflict as deep strikes inside Russian territory could provoke retaliation.

Global Dimensions

- **Arms Race Angle**: Advanced long-range munitions add to growing **precision-strike competition**.
- **International Law**: Raises concerns under **UN Charter on proportionality and escalation**.
- **India's Relevance**:
    - India develops long-range strike systems (e.g., **BrahMos, Nirbhay**) → lesson in integrating **multi-guidance systems**.
    - Shows trend towards **precision over mass destruction**, useful for India's doctrine.

Practice Questions

Prelims

Q. The Extended Range Attack Munition (ERAM), recently in news, is:
(a) A space-based laser system for missile defense
(b) An air-launched precision-guided missile with extended range
(c) A naval torpedo system
(d) A hypersonic glide vehicle

✅ **Answer: (b)**

Mains

Q. *Discuss the strategic significance of Extended Range Attack Munitions (ERAMs) in the context of modern warfare. How do such systems impact the balance of power in conflicts like the Russia-Ukraine war?*

Indian Ocean Naval Symposium (IONS)

📌 **Syllabus Mapping**
✅ **GS Paper II – International Relations**: Regional groupings, Maritime diplomacy
✅ **GS Paper III – Internal Security**: Maritime security, Naval cooperation

Context

- Recently, an **Emerging Leaders Panel Discussion** was held under **IONS** at **Kochi**.
- India will **chair IONS during 2025–27**, providing it a leadership role in shaping maritime security in the Indian Ocean Region (IOR).

About IONS

- **Launch**: 2008, New Delhi (initiative of Indian Navy).
- **Nature**: A **voluntary and inclusive forum** for discussion and cooperation.
- **Aim**: To enhance **maritime cooperation** among navies of the **Indian Ocean littoral states**.
- **Membership**:
    - **25 Member States**
    - **9 Observers**
- **Eligibility**: Any state with **permanent territory bordering the Indian Ocean** and having a **navy or maritime agency**.
- **Chairmanship**: Rotates every **2 years** (India → 2025–27).

Significance of IONS

- **Strategic Cooperation**: Builds trust and interoperability among IOR navies.
- **Maritime Security**: Tackles piracy, trafficking, Illegal, Unreported & Unregulated (IUU) fishing.
- **Disaster Relief**: Enhances coordination in **Humanitarian Assistance & Disaster Relief (HADR)**.
- **Geo-Political Value**: Counters China's expanding influence in the Indian Ocean.
- **Alignment with SAGAR**: Supports India's vision of *Security and Growth for All in the Region*.

Practice Questions

Prelims

Q. The Indian Ocean Naval Symposium (IONS), recently seen in the news, was launched by:
(a) Indian Coast Guard
(b) Indian Navy
(c) Ministry of External Affairs
(d) SAARC Secretariat

✅ **Answer**: (b) Indian Navy

Mains

Q. *"The Indian Ocean Naval Symposium (IONS) reflects India's aspiration to be a net security provider in the Indian Ocean Region." Discuss.*

ECONOMY

Low Cattle & Buffalo Productivity: Parliamentary Report

📌 **Syllabus Mapping:**
✅ **GS Paper III – Economy:** Agriculture, allied activities, animal husbandry, dairy sector
✅ **GS Paper II – Governance:** Government policies and interventions (Rashtriya Gokul Mission, NDDB role)
✅ **GS Paper III – Science & Technology:** Biotechnology in livestock breeding, genomic selection tools

Context

The **Parliamentary Standing Committee on Agriculture, Animal Husbandry and Food Processing** has flagged India's **low milk productivity of cattle and buffaloes**, despite being the world's largest milk producer. The report critically assessed the **National Dairy Development Board (NDDB)** and its role in implementing schemes like the **Rashtriya Gokul Mission (RGM)** to improve indigenous breeds.

Status of Indigenous Breeds

- **Officially Recognised Breeds:**
  - 53 indigenous cattle breeds
  - 21 indigenous buffalo breeds
- **Average Daily Milk Productivity (2023–24):**
  - **Indigenous cattle:** 3.54 kg/day
  - **Buffaloes:** 5.92 kg/day
  - **Crossbred/Exotic cattle:** 8.52 kg/day
- **Global Comparison (2022):**
  - **Israel:** 13,656 kg/year
  - **USA:** 10,954 kg/year
  - India lags significantly behind **international benchmarks**.

Reasons for Low Productivity

1. **Limited Artificial Insemination (AI) Coverage**
   - Only **30% of breedable bovines** covered under AI programmes.
2. **Shortage of AI Technicians**
   - Requirement: **2,02,469 technicians**
   - Availability: Only **1,16,586** → shortage hampers outreach.
3. **Smallholder Dominance**
   - **80% of low-yielding indigenous animals** are reared by **small and marginal farmers** and landless labourers.
   - Limits economies of scale in breed improvement programmes.

Key Recommendations of the Committee

1. **Revised Criteria for Critical Breeds:**
   - Minimum **50,000 animals** for classification to ensure **sufficient genetic base** and protection against disease-linked extinction.
2. **Inclusive Breed Improvement:**

   - All states' **dominant indigenous breeds** should be included to avoid replacement by a few high-yielding varieties.
3. **Fix Accountability:**
   - Address **shortfalls in semen production and distribution**.
   - Promote **sex-sorted semen technology** to increase female calf population.

Government Initiatives for Breed Development

- **Rashtriya Gokul Mission (RGM):** Launched in 2014 for **conservation and development** of indigenous breeds.
- **Accelerated Breed Improvement Programmes:**
  - Use of **IVF and embryo transfer technology**.
  - Deployment of **sex-sorted semen**.
- **Genomic Tools:**
  - **GAUCHIP** (for cattle) and **MAHISHCIP** (for buffaloes) to speed up **genetic selection**.
- **Digital Monitoring:**
  - **Bharat Pashudhan App** – platform for livestock **identification, breeding, and health management**.

Analysis & Contemporary Relevance

- **Economic Impact:**
  - Low productivity reduces **farmer income** despite India's large bovine population.
  - Milk demand is projected to rise sharply due to **urbanisation and dietary diversification**.
- **Social Dimension:**
  - Dairy is a **major livelihood source** for small farmers and women in rural areas.
  - Low yields worsen **rural income inequality**.
- **Technological Angle:**
  - Adoption of **IVF, genomic selection, and AI-driven breed mapping** can accelerate improvements.
  - Lessons from **Israel and Netherlands** show how technology-driven dairy systems ensure higher productivity.
- **Policy Concerns:**
  - Schemes like RGM need **better monitoring and accountability**.
  - Indigenous breeds have **climate resilience and disease resistance**; replacing them solely with crossbreeds may threaten **biodiversity**.
- **Sustainability Lens:**
  - Excessive focus on exotic breeds may lead to **fodder stress** and environmental challenges.
  - Balance between **productivity and conservation** is crucial.

Way Forward

- Expand **AI coverage** to at least 70% of breedable bovines.
- Bridge manpower gap by **training rural youth** as AI technicians.
- Strengthen **breed-specific cooperatives** for local improvement.
- Scale up **digital livestock databases** for real-time monitoring.
- Promote **public-private partnerships** in dairy R&D.

Practice Questions

Prelims (Objective):

1. With reference to indigenous cattle and buffalo productivity in India, consider the following statements:
   1. India officially recognises 53 cattle and 21 buffalo breeds.
   2. The Rashtriya Gokul Mission was launched in 2014 for the conservation of indigenous breeds.
   3. Israel and USA have higher milk productivity per cow compared to India.

   Which of the above statements are correct?

   - (a) 1 and 2 only
   - (b) 2 and 3 only
   - (c) 1 and 3 only
   - (d) 1, 2, and 3

Mains (Analytical):

Q1. Despite being the world's largest milk producer, India's cattle and buffalo productivity remains far below global standards. Discuss the reasons and suggest measures to improve dairy productivity while conserving indigenous breeds.

Q2. Critically evaluate the role of technology (AI, IVF, genomic selection, digital platforms) in enhancing India's livestock productivity. How can these be made accessible to small and marginal farmers?

India's Path to Becoming a Product Nation

📌 **Syllabus Mapping:**
✅ **GS Paper III – Economy:** Industrial policy, Make in India, production-linked growth
✅ **GS Paper II – Governance:** Policy interventions, institutional frameworks
✅ **GS Paper III – Science & Tech:** Innovation, IP-driven growth, AI & emerging technologies
✅ **Essay Paper:** Economic development, role of technology in nation-building

Context

In light of growing **geopolitical disruptions**—trade wars, supply chain realignments, unilateral tariffs—there is an increasing consensus that **India must transition from being a service-dominant economy to a "Product Nation."**While India's IT and service sector has been globally competitive, the next leap requires **manufacturing and IP-driven product innovation** to ensure strategic resilience and global competitiveness.

What is a Product Nation?

- A country that **designs, manufactures, and exports high-value goods** at scale.
- Moves from being a **net importer** to a **net producer and exporter**.
- Relies on **intellectual property (IP)-driven solutions**—not just low-cost labour or services.

Examples:

- **Taiwan** dominates global **semiconductor chip production**.
- **China** controls **rare earth minerals** critical to advanced technologies.

Why India Needs the Transition

1. **Strategic Leverage:**
   - Nations controlling **critical products** (chips, rare earths, green tech) gain geopolitical influence.
   - India must build similar **strategic economic assets**.
2. **Stronger Role in Global Supply Chains:**
   - Branded Indian products → boost exports in **electronics, semiconductors, defence, biotech, green energy**.
3. **Economic Resilience:**
   - Over-reliance on services leaves India vulnerable to **global downturns**.
   - A **manufacturing + innovation economy** is more shock-absorbent.
4. **Employment Generation:**
   - Manufacturing and product-based industries create **large-scale jobs**, especially for **semi-skilled youth**.

Government Initiatives Supporting Product Nation Vision

- **Production Linked Incentive (PLI) Scheme:**
  - Covers **14 key sectors** including semiconductors, electronics, pharma, and EVs.
- **Design Linked Incentive Scheme (DLI):**
  - Incentives for **semiconductor design innovation**.
- **Innovation Missions:**
  - **Atal Innovation Mission** – grassroots innovation.
  - **IndiaAI Mission** – leadership in artificial intelligence.
  - **National Quantum Mission** – frontier R&D in quantum technologies.
- **National Logistics Policy (2022):**
  - Targets **cost reduction** and **global competitiveness** in supply chains.

Analysis & Contemporary Relevance

- **Strengths:**
  - Large domestic market → demand for indigenous products.
  - Strong IT base → advantage in **design and R&D-driven manufacturing**.
  - Young demographic dividend.
- **Weaknesses:**
  - **Low R&D expenditure** (~0.7% of GDP vs. >2% in developed nations).
  - High dependence on **imported semiconductors, electronics, and critical minerals**.
  - Regulatory bottlenecks and high logistics costs (~13–14% of GDP).
- **Opportunities:**
  - **China+1 Strategy** – global firms looking for alternatives to China.
  - **Green technologies** (EVs, hydrogen, solar) → India can become global hub.
  - Leverage **digital infrastructure (UPI, Aadhaar stack)** to create exportable product ecosystems.

- **Threats:**
  - Intense competition from East Asian economies.
  - Risk of **premature deindustrialisation** if services remain dominant.

Way Forward

1. **Enhance R&D Investment:**
   - Raise R&D spending to at least **2% of GDP**.
   - Encourage **public-private-academia collaboration**.
2. **Global Partnerships:**
   - Collaborate with **Taiwan, Japan, EU, USA** for high-tech manufacturing.
3. **Human Capital Development:**
   - **Skill training, STEM education**, vocational programmes aligned with industry 4.0.
4. **Policy Reforms:**
   - Simplify regulations, ensure **ease of doing business**.
   - Incentivise startups to scale globally.
5. **Sustainability & IP Creation:**
   - Focus on **eco-friendly products** and **IP-driven innovation**.
   - Build Indian global brands in **pharma, semiconductors, green tech, defence, biotech**.

Practice Questions

Prelims (Objective):

1. Which of the following best defines a "Product Nation"?
   - (a) A country where services dominate GDP contribution
   - (b) A country that primarily exports agricultural commodities
   - (c) A country that designs, manufactures, and exports high-value IP-driven goods
   - (d) A country dependent on imported products for consumption
2. Which of the following schemes is directly related to semiconductor product development in India?
   - (a) Rashtriya Krishi Vikas Yojana
   - (b) Production Linked Incentive (PLI)
   - (c) Design Linked Incentive (DLI)
   - (d) Pradhan Mantri Krishi Sinchai Yojana

Mains (Analytical):

Q1. India's economic rise has largely been service-driven. Critically analyse the need for transitioning to a "Product Nation" in the current global context.

Q2. Evaluate the role of government initiatives such as the PLI Scheme, DLI Scheme, and National Quantum Mission in transforming India into a product-driven economy.

Rare Earth Magnets: Strategic Importance

📌 **Syllabus Mapping**
✅ **GS Paper III – Economy:** Industrial Policy, Infrastructure, Make in India
✅ **GS Paper III – Science & Tech:** Rare Earth Elements, Strategic Materials
✅ **GS Paper II – International Relations:** Critical Minerals & Strategic Security

Context

- Automakers are facing disruptions due to a **shortage of rare earth magnets**, forcing them to cut features and explore alternatives.
- Highlights India's dependency on imports and the **strategic importance of Rare Earth Elements (REEs)**.

About Rare Earth Magnets

- **Definition:** Permanent magnets made from alloys of **rare earth elements (REEs)**.
- **REE Set:** 17 elements (15 lanthanides + Scandium + Yttrium).

Properties

- **High density & conductivity**
- **Exceptional magnetic strength**
- **High energy density** → compact but powerful

Types

- **Neodymium (NdFeB):** Most widely used, strong magnetic field, but vulnerable to corrosion.
- **Samarium-Cobalt (SmCo):** High resistance to heat & corrosion, used in aerospace/defense.

Applications

- **Electronics:** Smartphones, speakers, hard drives.
- **Clean Energy:** Wind turbines, EVs (electric motors).
- **Healthcare:** MRI machines, medical devices.
- **Automotive Industry:** EVs, hybrid engines, sensors.
- **Defence:** Precision-guided munitions, radars.

Strategic & Geopolitical Dimension

- **China controls ~60–70% of global REE supply** → weaponizes dominance (e.g., 2010 dispute with Japan).
- **India:** Has ~6% of global reserves but limited processing capacity.
- **Policy push:**
  - Draft **Critical Minerals Policy (2023)** – strategic sourcing & processing.
  - Partnerships with Australia, US, and Quad countries on REE supply chain.

Practice Questions

Prelims

Q. With reference to **Rare Earth Magnets**, consider the following statements:

1. They are mainly alloys of lanthanides.
2. Neodymium magnets are more heat-resistant than Samarium-Cobalt magnets.
3. They are critical for clean energy technologies.

Which of the statements is/are correct?
(a) 1 and 3 only
(b) 2 only
(c) 1 and 2 only
(d) 1, 2 and 3

✅ **Answer:** (a) 1 and 3 only

Mains

Q. Rare earth magnets are the backbone of modern industries but also a source of strategic vulnerabilities. Discuss with reference to India's critical mineral strategy.

India's $50 Billion Energy Storage Requirement by 2032

📌 **Syllabus Mapping**
✅ **GS Paper III – Economy**: Infrastructure, Investment, Energy Security
✅ **GS Paper III – Environment**: Renewable Energy, Climate Change Commitments
✅ **GS Paper II – Governance**: Policy Initiatives, International Cooperation

Context

- A report by **India Energy & Climate Centre** highlights India's urgent need for **$50 billion new investment in Energy Storage Systems (ESS) by 2032**.
- This is critical to achieve the **clean energy target of 500 GW non-fossil capacity by 2030** (Paris Agreement, COP26 Glasgow pledge).

India's Energy Storage Needs

- **Current capacity (2025):** 6 GW (mostly pumped hydro).
- **Target by 2030:** 61 GW.
- **Target by 2032:** 97 GW.
- **Trend: Battery storage** expected to dominate due to falling costs.

About Energy Storage Systems (ESS)

- **Definition:** ESS store renewable energy (solar, wind, etc.) and release it during **peak demand**.
- **Types of ESS:**
  - **Battery Energy Storage Systems (BESS)** (Li-ion, Sodium-ion, Flow batteries).
  - **Pumped Hydro Storage**.
  - **Compressed Air & Flywheels**.
  - **Thermal Storage**.

Significance of ESS for India

1. **Higher Renewable Penetration** – Facilitates smooth integration of **Variable Renewable Energy (VRE)**.
2. **Grid Stability** – Maintains frequency, voltage, and power quality.
3. **Electric Mobility Push** – Supports large-scale EV charging infra.
4. **Reduced Fossil Dependence** – Enhances energy security and import substitution.
5. **Climate Goals** – Helps India move towards **Net Zero by 2070**.

Policy & Regulatory Recommendations

- **Adding Storage to Existing RE Projects** – Maximize grid efficiency, reduce transmission bottlenecks.
- **Mandatory Co-located Storage for New RE Projects** – Avoid curtailment, balance demand-supply.
- **Viability Gap Funding (VGF) Expansion** – Extend subsidies to standalone **BESS** and solar+storage projects.
- **Domestic Manufacturing Push** –
  - Expand **PLI scheme** for **Advanced Chemistry Cells (ACC)**.
  - Strengthen R&D ecosystem.
- **Strategic Investments in Supply Chains** – Secure lithium, cobalt, rare earths via global partnerships (Australia, Chile, Africa).

Way Forward

- Scale **public–private partnerships** in storage infra.
- Develop a **National Energy Storage Mission**.
- Explore **alternative chemistries** (sodium-ion, zinc-air) to reduce lithium dependency.
- Integrate ESS with **smart grids** and **AI-driven demand forecasting**.
- Promote **Green Hydrogen–ESS synergy** for long-term storage.

Practice Questions

Prelims

Q. Which of the following is the largest contributor to India's current Energy Storage capacity (2025)?
(a) Battery Storage
(b) Pumped Hydro
(c) Flywheel Storage
(d) Thermal Storage

✅ **Answer:** (b) Pumped Hydro

Mains

Q. *Energy Storage Systems are the backbone of India's renewable energy transition. Discuss their role in achieving India's 500 GW clean energy target by 2030. Suggest policy measures to boost domestic capacity.*

Annual Survey of Industries (ASI) 2023–24 Results Released

📌 **Syllabus Mapping**
✅ **GS Paper III – Indian Economy**: Growth, Development, Industrial Policy, Employment
✅ **GS Paper II – Governance**: Statistical Systems, Data Collection
✅ **Prelims**: Economy – Concepts (GVA, NVA, Fixed Capital, Working Capital)

Context

- Released on **28 August 2025** by **Ministry of Statistics and Programme Implementation (MoSPI)**.
- Provides insights into the **composition, growth, and structure** of India's **manufacturing industries** → crucial for industrial policy, labour reforms, and economic planning.

About ASI

- **Statutory Basis**: Conducted annually under **Collection of Statistics (Amendment) Act, 2017**.
- **Coverage**:
  - Factories registered under the **Factories Act, 1948**.
  - **Bidi & cigar units** under Bidi and Cigar Workers (Conditions of Employment) Act, 1966.
  - Electricity undertakings not registered with CEA.
- **Exclusions**: Defence establishments, oil storage/distribution depots, departmental units (e.g., railway workshops, gas storage).
- **Output**: Results prepared at **State level** & **Major industry level**.

Key Highlights (2023–24)

1. **Top 5 Industries (by GVA contribution)**
   - Basic Metals
   - Motor Vehicles
   - Chemical & Chemical Products
   - Food Products
   - Pharmaceutical Products
2. **Top 5 States (by employment)**
   - Tamil Nadu
   - Gujarat
   - Maharashtra
   - Uttar Pradesh
   - Karnataka
3. **Growth Indicators**
   - **Gross Value Added (GVA):** +11.89% (YoY).
   - **Industrial Output:** +5.80% (YoY).
   - **Average Emoluments per worker:** +5.6% over 2022–23.

Concepts & Definitions

Gross Value Added (GVA): GVA=Total Output–Total Input GVA=Total Output–Total Input
Represents additional value created in production.

- **Net Value Added (NVA):**
  NVA=TotalOutput–(TotalInput+Depreciation)NVA=TotalOutput–(TotalInput+Depreciation)
  Reflects net contribution after accounting for depreciation.
- **Fixed Capital:**
  - Value of **long-term assets** (land, buildings, machinery).
  - Supports long-term production capacity.
- **Working Capital:**
  - Short-term funds to run **day-to-day operations**.
  - E.g., raw materials, wages, operational liquidity.

Significance of ASI

- **Policy Formulation**: Inputs for **industrial, trade & labour policies**.
- **Employment Mapping**: Identifies states & industries with highest workforce participation.
- **Industrial Performance**: Measures output, productivity & wages → links to **MSME growth & Make in India**.
- **Regional Balance**: Shows **state-level disparities** in industrial development.

Challenges / Limitations

- Excludes **informal/unorganised sector**, which dominates Indian economy.
- **Lag in data release** → restricts real-time policy usage.
- Possible **under-reporting** in small industries due to compliance burdens.

Way Forward

- Integrate ASI with **digital compliance platforms** (GSTN, MCA21).
- Broaden coverage to **informal units** via hybrid surveys.
- Use ASI insights for **PLI schemes, employment-intensive sectors**, and **regional industrial corridors**.

Practice Questions

Prelims

Q. Which of the following are covered under the Annual Survey of Industries (ASI)?

1. Defence establishments
2. Factories registered under the Factories Act, 1948
3. Bidi and Cigar units
4. Oil storage depots

(a) 1 & 2 only
(b) 2 & 3 only
(c) 2, 3 & 4 only
(d) 1, 2, 3 & 4

✅ **Answer:** (b)

Mains

Q. *How does the Annual Survey of Industries (ASI) help in understanding the structural transformation of the Indian economy? Discuss its significance and limitations.*

Purchasing Power Parity (PPP) & India's Growth Projection

📌 **Syllabus Mapping**
✅ **GS Paper I – Economic Geography (Distribution of key resources, World Economy)**
✅ **GS Paper III – Indian Economy (Growth, Development, Economic Indicators)**

Context

- As per a **recent EY study (2025)**, **India is projected to become the world's second-largest economy in Purchasing Power Parity (PPP)**, reflecting its rising global economic weight.

About Purchasing Power Parity (PPP)

- **Definition**: PPP is an **economic theory and tool** used to compare **economic productivity, cost of living, and standards of living** between countries.
- **Method**:
  - Uses a **"basket of goods and services"** approach to compare currencies.
  - Example: If a basket costs ₹100 in India and $2 in the US, then PPP exchange rate = 1 USD = ₹50.
- **Theoretical Basis**:
  - Under free trade (no tariffs, quotas, restrictions), **exchange rates should adjust** so that the **same product costs the same** in all countries (Law of One Price).

India's PPP Status

- India already ranks **3rd globally in PPP terms** (after China and USA).
- By **2030s**, India is expected to overtake the USA to become **2nd largest economy (PPP)**.
- Reflects India's **large population, rising domestic demand, and expanding services sector**.

Significance of PPP Measurement

- **More realistic than Nominal GDP**: PPP adjusts for price level differences; nominal GDP is skewed by exchange rates.
- **Living Standards**: Better reflects **consumption capacity** of citizens.
- **Policy Making**: Used by institutions like **World Bank, IMF, UNDP (Human Development Index calculations)**.
- **Global Influence**: Higher PPP ranking strengthens India's position in **G20, BRICS, IMF quota reforms**.

Challenges / Limitations of PPP

- Basket of goods may **not reflect true consumption patterns**.
- Does not capture **quality differences** in services and products.
- International price comparisons are **difficult to standardize**.
- For trade, **exchange rate GDP** still matters more than PPP GDP.

Practice Questions

Prelims

Q. *Purchasing Power Parity (PPP) is used for which of the following purposes?*

1. Comparing economic productivity across nations
2. Measuring standard of living
3. Assessing currency depreciation trends

Options:
(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

✅ **Answer:** (a) 1 and 2 only

Mains

Q. *Explain the significance of Purchasing Power Parity (PPP) in measuring India's economic rise. How does it differ from Nominal GDP as an indicator of growth?*

Index of Industrial Production (IIP) – July 2025

📌 **Syllabus Mapping**
✅ **GS Paper III – Economy: Growth, Development & Industrial Policy**
✅ **Prelims – Indian Economy, Indices & Reports**

Recent Update (July 2025)

- Quick Estimates of IIP show **industrial growth of 3.5%** (YoY).
- Indicates **moderate expansion** in India's core industrial sectors.

About Index of Industrial Production (IIP)

- **Compiled by**: Central Statistical Organisation (CSO), Ministry of Statistics & Programme Implementation (MoSPI).
- **Nature**: Measures **real industrial growth** → reflects changes in volume of production.
- **Frequency**: **Monthly** (short-term indicator).
- **Base Year**: **2011–12**.

Coverage of IIP

- **Sectors included**:
  - **Mining**
  - **Manufacturing** (highest weight ~77.6%)
  - **Electricity** (lowest weight ~7.99%)
- **Sectors excluded**: Construction, gas, water supply (due to data constraints).

Significance of IIP

- **Macro-indicator**: Captures short-term fluctuations in industrial activity.
- **Policy tool**: Helps in **monetary and fiscal policy** formulation (inflation, demand trends).
- **Investment decisions**: Guides private sector, analysts, and global investors.
- **Employment linkage**: Reflects potential job creation trends in industry.

Challenges & Criticisms

- **Outdated base year**: 2011–12 may not reflect current industrial structure (need update).
- **Narrow scope**: Exclusion of construction, water supply, gas reduces comprehensiveness.
- **Volatility**: High monthly fluctuations reduce reliability for long-term policy.
- **Data quality**: Dependence on factory reporting → delays and underreporting issues.

Way Forward

- Update **base year** periodically to reflect structural changes.
- Expand coverage to include **construction & service-linked industry**.
- Integrate with **GST, e-way bills, and digital data sources** for real-time accuracy.
- Ensure **disaggregated data** (state-wise, sectoral) for targeted policymaking.

Practice Questions

Prelims

Q. Which of the following sectors carries the highest weight in the Index of Industrial Production (IIP)?
(a) Mining
(b) Manufacturing
(c) Electricity
(d) Construction

✅ **Answer: (b) Manufacturing**

Mains

Q. *Discuss the significance of the Index of Industrial Production (IIP) as an economic indicator. What are its limitations and how can it be improved to reflect India's changing industrial structure?*

WELFARE SCHEMES & POLICIES

PMJDY: 11 Years of Transformation

📌 **Syllabus Mapping**
✅ **GS Paper II – Governance: Welfare Schemes, Financial Inclusion**
✅ **GS Paper III – Economy: Inclusive Growth, Financial Sector Reforms**
✅ **Essay Paper – Inclusive Development, Banking & Financial Empowerment**

About PMJDY

- Launched: **28 August 2014**
- Implemented by: **Ministry of Finance**
- Objective: To ensure **universal access to banking facilities**, with at least one basic banking account for every household.
- Tagline: *"Mera Khata – Bhagya Vidhata"*
- Features: Zero-balance accounts, RuPay debit cards, accidental insurance cover, overdraft facility, and direct benefit transfer (DBT) linkage.

Major Achievements (as of 2025)

- **Accounts opened**: **56 crore**
- **Deposit balance**: **₹2.68 lakh crore**
- **RuPay cards issued**: **38 crore** (free-of-cost, facilitating digital transactions)
- **Rural reach**: **67% accounts** in rural/semi-urban areas
- **Women empowerment**: **56% accounts** held by women

Impact of PMJDY

1. Financial Inclusion

- Expanded **banking penetration** to rural & underserved regions.
- Reduced dependency on moneylenders and informal borrowing.

2. Women Empowerment

- Over half the account holders are women → **financial independence** and direct access to welfare benefits.

3. Digital & DBT Push

- Enabled **Aadhaar-linked Direct Benefit Transfer (DBT)** → subsidies reach beneficiaries directly (e.g., LPG subsidy, MGNREGA wages).
- Boosted India's **digital payments ecosystem**.

4. Social Security

- Linked with **PM Suraksha Bima Yojana**, **PM Jeevan Jyoti Bima Yojana**, **Atal Pension Yojana**, ensuring financial safety nets.

Challenges

- **Dormant accounts**: Some Jan Dhan accounts remain inactive.
- **Financial literacy gap**: Many account holders lack awareness about banking services.
- **Infrastructure issues**: Limited access to banking correspondents/ATMs in remote areas.
- **Overdraft underutilisation**: Many beneficiaries unable to avail credit facilities due to lack of regular income.

Way Forward

- **Strengthen financial literacy** programmes for rural & semi-urban populations.
- Promote **micro-credit & micro-insurance** through PMJDY accounts.
- Enhance **digital & mobile banking penetration** in remote areas.
- Leverage PMJDY for **women-led economic participation** (SHGs, micro-enterprises).

Practice Questions

Prelims

Q. Which of the following are features of the **Pradhan Mantri Jan Dhan Yojana (PMJDY)**?

1. Zero-balance bank account
2. Issuance of RuPay Debit Card
3. Direct Benefit Transfer (DBT) linkage
4. Universal access to health insurance

Options:
(a) 1 and 2 only
(b) 1, 2 and 3 only
(c) 2, 3 and 4 only
(d) 1, 2, 3 and 4

✅ **Answer: (b)**

Mains

Q. *Financial inclusion is a key driver of inclusive growth. Discuss the significance of Pradhan Mantri Jan Dhan Yojana (PMJDY) in promoting financial inclusion and examine the challenges in ensuring its sustainability.*

PM SVANidhi: 2025 Restructuring & Extension

📌 **Syllabus Mapping**
✅ **GS Paper II – Governance**: Welfare Schemes for Vulnerable Sections, Government Policies & Interventions
✅ **GS Paper III – Economy**: Financial Inclusion, MSMEs, Informal Economy
✅ **Prelims**: Flagship Schemes, Urban Development

Context

- On **28 August 2025**, the **Union Cabinet approved restructuring & extension** of **PM Street Vendor's AtmaNirbhar Nidhi (PM SVANidhi)**.
- Lending period extended to **31 March 2030** (earlier 31 Dec 2024).
- Aims to benefit **1.15 crore vendors**, including **50 lakh new beneficiaries**.

Key Features of the Restructured Scheme

1. Enhanced Loan Limits

- **1st tranche:** ₹15,000 (↑ from ₹10,000)
- **2nd tranche:** ₹25,000 (↑ from ₹20,000)

- **3rd tranche:** ₹50,000 (unchanged)

2. UPI-linked RuPay Credit Card

- Issued after repayment of 2nd loan.
- Ensures **quick access to emergency credit**.

3. Digital Incentives

- **Cashback up to ₹1,600** on UPI-based retail/wholesale transactions.
- Pushes **Digital India + financial inclusion** agenda.

4. Capacity Building & Support

- **Financial literacy, digital skills, entrepreneurship, marketing.**
- **Hygiene & safety training** (with **FSSAI partnership**).

About PM SVANidhi Scheme

- **Launched:** June 2020 (COVID-19 AtmaNirbhar Bharat package).
- **Type:** Central Sector Scheme.
- **Nodal Ministry:** Ministry of Housing & Urban Affairs (MoHUA).
- **Implementation:**
  - **MoHUA** (policy & monitoring).
  - **Department of Financial Services (DFS):** Loan facilitation through banks/financial institutions.

Objectives

- Provide **working capital loans** to street vendors.
- Promote **financial inclusion** and **digital transactions**.
- Provide **identity & recognition** to street vendors.

Target Beneficiaries

- **Street vendors/hawkers** in **urban areas**, vending **on or before 24 March 2020**.

Significance of Extension

- **Inclusive Growth:** Supports **urban poor & informal sector workers**.
- **Financial Inclusion:** Brings street vendors into **formal credit ecosystem**.
- **Digital Push:** Encourages UPI adoption & digital literacy.
- **Social Security:** Provides stability against exploitative moneylenders.
- **Entrepreneurship Boost:** Empowers vendors to expand business.

Challenges

- **Awareness gap** among vendors → many remain outside scheme.
- Risk of **over-indebtedness** without financial literacy.
- **Digital divide** may exclude some beneficiaries.
- Weak **monitoring** in states/ULBs.

Way Forward

- Strengthen **convergence** with schemes like **Jan Dhan Yojana, PM Mudra, PM Svanidhi Se Samriddhi (social security)**.
- Ensure **timely disbursal & simplified procedures**.
- Improve **vendor registration database** with Urban Local Bodies.
- Promote **capacity building** → entrepreneurship, digital payments, hygiene standards.

Practice Questions

Prelims

Q. The PM SVANidhi scheme is implemented by which of the following?

1. Ministry of Housing & Urban Affairs
2. Department of Financial Services

3. NITI Aayog

(a) 1 only
(b) 1 and 2 only
(c) 2 and 3 only
(d) 1, 2 and 3

✅ **Answer:** (b)

Mains

Q. *Street vending is one of the largest sources of self-employment in urban India, but vendors face challenges of identity, credit access, and digital inclusion. Critically evaluate the role of PM SVANidhi in addressing these issues.*

AGRICULTURE

Horticultural Diversification: A Pathway to Agricultural Resilience

📌 **Syllabus Mapping**
✅ **GS Paper III – Agriculture**: Cropping patterns, e-technology in agriculture, issues of buffer stocks & food security
✅ **GS Paper III – Economy**: Inclusive growth & rural development
✅ **GS Paper II – Governance**: Government policies & interventions for development

Context

- As per a recent **RBI Bulletin (Aug 2025)**, diversifying agriculture towards **high-value horticultural crops** can strengthen **agricultural resilience** and boost **rural incomes**.
- Horticulture is emerging as a **key driver of growth**, complementing traditional foodgrain production.

About the Horticulture Sector

- Encompasses **fruits, vegetables, flowers, ornamental plants, medicinal & aromatic plants**.
- India: **2nd largest producer of fruits & vegetables** globally (after China).
- Contributes **33% to Agriculture GVA**, though cultivated on a smaller share of gross cropped area.

Key Trends in Horticultural Diversification

1. **Primary Engine of Agricultural Growth**
   - High-value returns compared to cereals.
   - Expanding role in **GDP contribution & exports**.
2. **Shifting Dietary Preferences**
   - Rising share of **fruits & vegetables** in food expenditure (rural + urban).
   - Driven by **income growth, urbanisation, health consciousness**.
3. **Small & Marginal Farmer Participation**
   - Increased land allocation to horticulture due to higher profitability.
   - Provides an avenue for **risk mitigation** compared to mono-cropping.

Challenges in Horticultural Sector

- **Yield Fluctuations**: e.g., decline in grape & sapota yields (1992–2021).
- **Post-Harvest Losses**: ~₹1.5 trillion annually due to inadequate storage & processing.
- **Price Volatility**: Seasonal/weather-driven fluctuations in Tomato–Onion–Potato (TOP).
- **Infrastructure Deficit**: Weak cold chains, grading, packaging, export hubs.
- **Climate Sensitivity**: Vulnerability to heatwaves, erratic monsoon, pests.

Future Policy Considerations

1. **Strengthen Market Linkages**
   - Integrate with **e-NAM, contract farming, FPO-led marketing**, and **export hubs**.
2. **Intercropping & Crop Diversification**
   - Combining horticultural + non-horticultural crops → improves **soil health & incomes**.
3. **Agri-Research & Innovation**

   - Climate-resilient varieties, pest-resistant crops, AI-based pest monitoring.
4. **Agro-Processing & Value Addition**
   - Cold chains, food parks, mega-processing hubs → reduce losses & expand exports.
5. **Government Schemes**
   - **Mission for Integrated Development of Horticulture (MIDH)**, **Operation Greens (TOP to TOTAL)**, **PM Formalisation of Micro Food Processing Enterprises (PM-FME)**.

Significance for India

- **Farmers' Income**: High-value crops help double farmers' income.
- **Employment Generation**: Processing, logistics, retail → rural non-farm jobs.
- **Food & Nutritional Security**: Meets growing demand for diverse & healthy diets.
- **Exports**: Expands India's share in global agri-trade.
- **Resilience**: Provides **climate & income stability** in agriculture.

Practice Questions

Prelims

Q. With reference to horticulture in India, consider the following statements:

1. India is the largest producer of fruits and vegetables in the world.
2. The Mission for Integrated Development of Horticulture (MIDH) provides support for post-harvest management infrastructure.
3. Tomato, Onion, and Potato (TOP) are included under "Operation Greens".

Which of the statements are correct?
(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

✅ **Answer: (b)**

Mains

Q. *"Horticultural diversification holds the key to agricultural transformation in India." Discuss in the context of income security, nutritional needs, and climate resilience.*

SOCIETY, SOCIAL JUSTICE AND SOCIAL ISSUES

Karen and Karenni Ethnic Groups

📌 **Syllabus Mapping**
✅ **GS Paper I – Society**: Ethnic groups, migration, and refugees
✅ **GS Paper II – International Relations**: India and its neighborhood; Refugee issues in Southeast Asia
✅ **GS Paper II – Governance**: Rights of refugees, human rights issues

Context

- **Thailand** has granted **work rights** to long-term refugees from Myanmar belonging to the **Karen** and **Karenni (Kayah/Red Karen)** ethnic groups.
- This marks a significant step in addressing refugee livelihood rights amid Myanmar's ongoing conflict and political instability.

About Karen

- One of the **largest and most dispersed ethnic groups** of Southeast Asia.
- **Origins**: Traced back to the **Gobi Desert, Mongolia, or Tibet** (migrated south over centuries).

- **Current presence**: Primarily in **Myanmar (Karen State)** and **Thailand**.
- Known for **distinct languages, culture, and animist-Buddhist-Christian beliefs**.

About Karenni (Kayah / Red Karen)

- A **minority ethnic group** in Myanmar, mainly in **Kayah State**.
- Also referred to as **Red Karen**.
- Distinct identity but culturally related to the Karen.
- Have faced **longstanding persecution** and displacement due to Myanmar's military conflicts.

Significance of Thailand's Move

- Provides **legal work rights** → reduces vulnerability to exploitation.
- Strengthens **refugee protection framework** in Southeast Asia.
- Sets precedent for **regional cooperation on refugee rights**, especially relevant amid Myanmar's ongoing humanitarian crisis.

Practice Questions

Prelims

Q. The terms *Karen* and *Karenni* recently in the news refer to:
(a) Buddhist sects in Sri Lanka
(b) Indigenous tribes of Central India
(c) Ethnic groups of Southeast Asia
(d) Traditional clans of Tibet

✅ **Answer**: (c) Ethnic groups of Southeast Asia

Mains

Q. *Discuss the challenges faced by ethnic groups like the Karen and Karenni in Southeast Asia. How do refugee rights intersect with regional security and humanitarian concerns?*

Tribal Ministry Seeks Separate Census for PVTGs

📌 **Syllabus Mapping**
✅ **GS Paper I – Society:** Tribal communities, diversity of India
✅ **GS Paper II – Governance & Welfare:** Vulnerable sections, policies, government interventions
✅ **GS Paper III – Economy & Development:** Inclusive growth, socio-economic development of marginalised groups

Context

- The **Ministry of Tribal Affairs** has proposed a **separate enumeration of Particularly Vulnerable Tribal Groups (PVTGs)** in the upcoming **Census 2027**.
- If finalised, the **Registrar General and Census Commissioner of India (RGI)** will **count PVTGs independently**for the first time.

Need for a Separate Census

- **Underrepresentation in Official Data:** Many PVTGs were **not distinctly enumerated** in the 2011 Census.
- **Fragmentation within STs:** Around **40 of 75 PVTGs** are already listed as Scheduled Tribes (STs), while others remain invisible in aggregated ST data.
- **Policy Targeting:** Lack of granular data hampers design of targeted welfare schemes such as **PM-JANMAN Programme (2023)**, meant to bridge socio-economic gaps in over 200 districts.
- **Data-driven Development:** Clear enumeration is crucial for monitoring **literacy, health, livelihoods, and population trends** among PVTGs.

About PVTGs

- **Background:** Recognised by **Dhebar Commission (1960s)** as the most deprived tribal sections.
- **Total Groups:** 75 across **18 States and 1 UT (Andaman & Nicobar Islands)**.
- **Population:** ~45.56 lakh (habitation-level survey, 2024).
  - **Largest Populations:** Madhya Pradesh (12.28 lakh), Maharashtra (6.2 lakh), Andhra Pradesh (4.9 lakh).
- **Criteria for Identification:**
  - Pre-agricultural level of technology
  - Low literacy

- Economic backwardness
- Declining or stagnant population

Registrar General & Census Commissioner of India (RGI)

- **Established:** 1949, under **Ministry of Home Affairs**.
- **Functions:**
  - **Population Census** (Census Act, 1948).
  - **Civil Registration System (CRS):** Births & Deaths (RBD Act, 1969).
  - **Sample Registration System (SRS):** Provides vital rates (birth, death, IMR, MMR).
  - **National Population Register (NPR):** As per Citizenship Rules, 2003.
  - **Mother Tongue Survey:** Records linguistic diversity.

Analysis & Significance

Positives of Separate Census

- Enables **accurate policy targeting** for schemes like PM-JANMAN.
- Helps monitor **population health, literacy & economic indicators**.
- Strengthens **tribal empowerment** and ensures inclusivity in Viksit Bharat 2047 roadmap.

Challenges

- **Logistical Issues:** Remote habitations, lack of infrastructure.
- **Political Sensitivity:** Risk of overlapping identities within larger ST groups.
- **Data Quality:** Ensuring reliability amid **low literacy and mobility**.

Way Forward

- **Capacity Building:** Training enumerators in **tribal languages & cultural contexts**.
- **Digital Integration:** Use of **geo-tagging & biometric tools** for accuracy.
- **Community Participation:** Involve **Gram Sabhas, NGOs, and tribal leaders** in data collection.
- **Policy Alignment:** Link census data directly with **SDGs, gender budgeting, and social audits**.

Practice Questions

Prelims

1. Which of the following is **not a criterion** for identifying Particularly Vulnerable Tribal Groups (PVTGs)?
   - (a) Pre-agricultural level of technology
   - (b) Low level of literacy
   - (c) Dependence on shifting cultivation
   - (d) Declining or stagnant population

Answer: (c)

Mains

Q1. Discuss the significance of conducting a **separate Census for PVTGs**. How will it strengthen India's inclusive development framework?

Q2. Critically evaluate the challenges in implementing welfare schemes for PVTGs. Suggest measures to bridge the socio-economic gaps.

Comprehensive Modular Survey: Education (CMS:E), 2025

📌 **Syllabus Mapping**
✅ **GS Paper II – Governance, Social Justice:** Education, Welfare Schemes
✅ **GS Paper III – Economy:** Human Capital Development, Public Expenditure
✅ **GS Paper II – Polity & Governance:** Role of MoSPI, Data for Policy

Context

- The **Ministry of Statistics & Programme Implementation (MoSPI)** released the **Comprehensive Modular Survey: Education (CMS:E), 2025**.
- Conducted by the **National Statistics Office (NSO)** under the **80th round of the National Sample Survey (NSS)**.

- First large-scale survey focused on **household expenditure on school education** in both rural and urban India.

Key Highlights

1. Government Schools

- Account for **55.9% of total enrolments**.
- **Rural areas:** 66% enrolment.
- **Urban areas:** 30.1% enrolment.
  ➡️ Indicates dependence on public schooling in rural areas, while urban India leans more towards private schooling.

2. Expenditure on Education

- **Rural India:** ₹8,382 (average annual expenditure per student).
- **Urban India:** ₹23,470.
  ➡️ Wide **rural-urban disparity** in cost of education.

3. Private Coaching

- **27% students** reported taking private coaching.
- Higher in **urban (30.7%)** vs **rural (25.5%)**.
  ➡️ Reflects **shadow education economy** and exam-centric learning culture.

4. Funding for Education

- **95% students' education funded by households.**
- Only **1.2%** reported government scholarships as the primary funding source.
  ➡️ Shows **low penetration of scholarships** despite policy push.

About National Sample Survey (NSS)

- Conducted by **National Statistics Office (NSO), MoSPI**.
- Launched in **1950**, among the world's largest sample surveys.
- Covers diverse fields: **employment, industry, education, consumption, health, prices**.
- Major surveys include:
  - **Annual Survey of Industries (ASI)**
  - **Periodic Labour Force Survey (PLFS)**
  - **Household Consumption Expenditure Survey (HCES)**

Significance of CMS:E

- Provides **data-driven insights** into:
  - Household burden of education expenditure.
  - Gaps in public financing & scholarships.
  - Trends in **private coaching dependence**.
- Supports **policy formulation** for NEP 2020 goals & **SDG 4 (Quality Education)**.

Practice Questions

Prelims

Q. The **Comprehensive Modular Survey: Education (CMS:E), 2025**, conducted by the National Sample Survey Office, primarily focuses on:
(a) Teacher training and quality standards
(b) Educational expenditure of student households
(c) Gross enrolment ratio in higher education
(d) Learning outcomes in government schools

✅ **Answer:** (b) Educational expenditure of student households

Mains

Q. The findings of the Comprehensive Modular Survey: Education (CMS:E), 2025, highlight persistent disparities in access and expenditure on education in India. Discuss their implications for achieving the goals of the National Education Policy (NEP) 2020.

Unified District Information System for Education Plus (UDISE+)

📌 **Syllabus Mapping**
✅ **GS Paper II – Governance, Education, Policies & Interventions**
✅ **GS Paper II – Social Justice (Education, Human Resource Development)**

Context

- **UIDAI** and **Ministry of Education** have partnered to facilitate pending **Mandatory Biometric Updates (MBU)** in **Aadhaar** through the **UDISE+ application**.
- This integration is expected to enhance **accuracy, transparency, and efficiency** in education data management.

About UDISE+

- **Type**: Educational Management Information System (EMIS).
- **Launched by**: Department of School Education & Literacy, Ministry of Education.
- **Objective**: To collate **credible, real-time, and comparable educational data** across the country.

Key Features

- **Centralized digital platform**: Schools upload their data directly.
- **Data Capture Format (DCF)**: Standardized format ensures uniformity.
- **Coverage**: Collects data on
  - School profile (infrastructure, facilities)
  - Student enrolment (gender, caste, disability, dropouts)
  - Teacher profile (qualifications, training, deployment).
- **Real-time monitoring**: Unlike earlier UDISE (manual), UDISE+ is **online & real-time**.

Significance

- **Policy Planning**: Forms backbone for initiatives like *Samagra Shiksha Abhiyan*, *NEP 2020 monitoring*, and *PM SHRI schools*.
- **Data-driven governance**: Helps track progress on **SDG-4 (Quality Education)**.
- **Transparency**: Reduces discrepancies in education statistics.
- **Inclusion**: Aadhaar linkage ensures authentic student records, minimizing *fake enrolments*.

Challenges

- **Digital divide**: Schools in remote areas face connectivity issues.
- **Data accuracy**: Dependence on self-reporting by schools.
- **Privacy concerns**: Aadhaar integration raises issues of **data security** and **consent**.

Way Forward

- Strengthen **cybersecurity & data protection** safeguards.
- Capacity-building for teachers & administrators in **data entry and digital tools**.
- Integrating UDISE+ with other platforms like **Diksha, NDEAR, and PM eVidya** for holistic monitoring.

Practice Questions

Prelims

Q. *Consider the following statements with reference to UDISE+:*

1. It is maintained by the Ministry of Electronics & IT.
2. It provides real-time data on schools, students, and teachers across India.
3. It is linked to SDG-4 (Quality Education).

Which of the statements given above is/are correct?
(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

✅ **Answer:** (b) 2 and 3 only

Mains

Q. *Discuss the role of UDISE+ in transforming education governance in India. What challenges does it face in ensuring reliability, inclusiveness, and data security?*

Road Accidents in India 2023 Report – MoRTH

📌 **Syllabus Mapping**
✅ **GS Paper II – Governance: Policies, Welfare Schemes, Human Resource Issues**
✅ **GS Paper III – Infrastructure: Transport, Disaster Management, Safety**
✅ **Essay Paper – Social Issues, Urbanization, Public Health**

Context

- The **Ministry of Road Transport and Highways (MoRTH)** released the *Road Accidents in India – 2023 Report*.
- It highlights trends, causes, and government measures on **India's road safety crisis**.

Key Statistics (2023)

- **Total Road Accidents**: **480,583** (↑ 4.2% vs 2022).
- **Fatalities**: Highest among **young adults (18–45 years) → 66.4% of victims**.
- **State-wise**:
  - **Tamil Nadu** → Highest number of accidents.
  - **Madhya Pradesh** → Second-highest accidents.
  - **Uttar Pradesh** → Most fatalities, followed by Tamil Nadu.
- **Highways**: Just **5% of road length** accounted for **>53% of accidents & 59% of fatalities**.
- **Road Users Affected**:
  - **Two-wheeler riders → 45% deaths**.
  - **Pedestrians** → Second-highest share.

Major Causes of Accidents

1. **Human Error (Primary Factor)**
   - Traffic rule violations
   - Driving without license
   - Non-use of helmets, seatbelts, airbags
2. **Road Environment**
   - Poor road design & features
   - Adverse weather conditions
   - Congested residential areas
3. **Vehicular Conditions**
   - Old vehicles, mechanical failures
   - Overloading of goods & passengers

Mitigation Measures (MoRTH)

1. Education

- **Road Safety Advocacy Scheme**
- **National Road Safety Month/Week**

2. Engineering

- **Road safety audits**
- **Identification of accident black spots** on National Highways
- **Vehicle engineering**: Mandatory airbags, child safety measures

3. Enforcement

- **Motor Vehicles (Amendment) Act, 2019** → strict penalties
- **Electronic monitoring** (speed cameras, challans)

4. Emergency Care

- **Good Samaritan protections**

- **Compensation for victims**
- **Ambulance & Trauma care provisions**

Challenges

- Rising **motorization vs weak enforcement**.
- **Poor compliance** with safety devices (helmet/seatbelt).
- **Inadequate trauma care system** in rural highways.
- **Coordination gaps** between Centre, states & local authorities.

Way Forward

- **Vision Zero approach** (Sweden model) → No fatalities acceptable.
- **Urban design reform** → Pedestrian & cycle-friendly infrastructure.
- **Mandatory driver training & periodic license renewal**.
- **AI & IoT in transport** → Smart traffic lights, vehicle tracking.
- **State Road Safety Authorities** to implement MoRTH's measures effectively.

Practice Questions

Prelims

Q. Which of the following measures is/are included under the Motor Vehicles (Amendment) Act, 2019?

1. Increased penalties for traffic violations
2. Protection of Good Samaritans
3. Mandatory airbags for all cars

(a) 1 only
(b) 1 and 2 only
(c) 2 and 3 only
(d) 1, 2 and 3

✅ **Answer: (b)**

Mains

Q. *"Road accidents in India are more a governance failure than an infrastructure problem." Discuss in light of the Road Accidents in India 2023 Report.*

GEOGRAPHY AND DISASTER

Kilauea Volcano Eruption – Hawaii

📌 **Syllabus Mapping:**
✅ **GS Paper I – Geography:** Physical geography, volcanoes, landforms
✅ **GS Paper III – Environment:** Natural hazards and disaster management
✅ **GS Paper II – Governance:** Disaster preparedness, role of international cooperation in natural disasters

Context

The **Kilauea volcano**, one of the most active in the world, has erupted again in **Hawaii**, a volcanic archipelago located in the central Pacific Ocean. The eruption, taking place in the **Halemaʻumaʻu Crater** inside the **Hawaiʻi Volcanoes National Park**, is marked by **episodic lava fountaining**—a phenomenon not observed since the **1983–86 eruptions**.

About Kilauea Volcano

- **Location:** Island of Hawaii (Big Island), USA.
- **Nature: Shield volcano**, with broad, gently sloping sides formed by fluid basaltic lava.
- **Activity:** Among the **most active volcanoes globally**, with frequent eruptions in modern history.
- **Current Eruption Features:**
  - Episodic lava fountains.

  - High release of volcanic gases—**H_2O (water vapor), CO_2 (carbon dioxide), SO_2 (sulphur dioxide)**.
- **Protected Site:** Part of the **Hawai'i Volcanoes National Park**, a UNESCO World Heritage Site.

Geographical & Environmental Significance

1. **Volcanic Activity in Hawaii:**
   - Hawaii is the **only US state composed entirely of islands**.
   - Formed by volcanic hotspots in the Pacific Plate.
2. **Hazards from Kilauea's Eruptions:**
   - **Lava flows** destroying settlements, roads, and forests.
   - **Volcanic gases** causing acid rain, air pollution (known as *vog*).
   - Risk to aviation from volcanic ash clouds.
3. **Ecological Impacts:**
   - Alters landscapes, creating new land.
   - Initially destructive but later enriches soil fertility with minerals.

Analysis

- **Global Context:**
  - Kilauea's eruptions are comparable to other active volcanoes like **Mount Etna (Italy)** and **Mount Nyiragongo (DR Congo)**.
  - Highlights the importance of **volcanic monitoring and early warning systems**.
- **Scientific Value:**
  - Provides insight into **plate tectonics and hotspot volcanism**.
  - Helps volcanologists study **episodic eruption patterns**.
- **Disaster Management Angle:**
  - Requires coordinated evacuation planning, health monitoring due to gases, and **satellite-based lava tracking**.

Way Forward

- **Enhanced Monitoring:** Use of **satellite imagery, drones, and real-time seismic sensors**.
- **Community Preparedness:** Public awareness and early evacuation drills.
- **International Cooperation:** Sharing of data on volcanic activity for aviation and disaster relief.
- **Sustainable Tourism:** Balancing tourist inflow at Hawai'i Volcanoes National Park with safety protocols.

Practice Questions

Prelims (Objective):

1. Which of the following statements about the **Kilauea volcano** is/are correct?
   1. It is a shield volcano located in Hawaii.
   2. The current eruption has been marked by episodic lava fountaining not seen since the 1980s.
   3. Major volcanic gases released include CO_2, SO_2, and methane.
   - (a) 1 and 2 only
   - (b) 1 and 3 only
   - (c) 2 and 3 only
   - (d) 1, 2, and 3

Mains (Analytical):

Q1. Discuss the geographical significance of the Hawaiian volcanic system. How does the Kilauea eruption highlight the link between natural hazards and disaster preparedness?

Q2. Volcanic activity can both destroy and rejuvenate ecosystems. Explain with reference to the Kilauea volcano and other global examples.

Tawi River Flood Alert & Indus Waters Treaty

📌 **Syllabus Mapping**
✅ **GS Paper II – International Relations:** India–Pakistan relations, Indus Waters Treaty (IWT)
✅ **GS Paper I – Geography:** Rivers and drainage system (Himalayan Rivers)
✅ **GS Paper III – Disaster Management:** Flood forecasting and early warning

Context

- India recently **warned Pakistan of potential flooding in the Tawi River**, describing it as a **"humanitarian gesture."**

- The warning was sent through **diplomatic channels** rather than under the **Indus Waters Treaty (IWT)**, which normally governs such communication.
- This comes at a time when **IWT mechanisms remain in abeyance** after the **Pahalgam attack**, raising questions about future cooperation on transboundary rivers.

About Tawi River

- **Origin: Kailash Kund Glacier (Kali Kund)** near Bhaderwah in **Doda district, J&K**.
- **Tributary:** Left bank tributary of **Chenab River**, which flows into Pakistan.
- **Importance:** Known as the **"Lifeline of Jammu city"**, vital for drinking water, irrigation, and cultural significance.

Indus Waters Treaty (1960)

- Brokered by the **World Bank**, it governs sharing of Indus basin waters between **India & Pakistan**.
- **Eastern Rivers (Ravi, Beas, Sutlej):** Exclusive use to India.
- **Western Rivers (Indus, Jhelum, Chenab):** Allocated to Pakistan, with limited rights for India (hydropower, irrigation under restrictions).
- Includes provisions for **flood data sharing and advance warnings** to prevent disasters.
- Current abeyance of **IWT communication mechanisms** highlights the **political strain in bilateral relations**.

Significance of India's Warning

- **Humanitarian Gesture:** Despite strained relations, India extended cooperation to save lives.
- **Diplomatic Messaging:** By bypassing the IWT mechanism, India reinforced its position that the treaty framework is not being fully functional.
- **Regional Security & Trust Deficit:** Such deviations reflect the **erosion of institutional trust** post-terror attacks.

Contemporary Relevance

- **Climate Change:** Increased **glacial melt** and erratic rainfall raise flood risks in Himalayan rivers.
- **Transboundary Water Politics:** Similar disputes exist in **China–India (Brahmaputra)** and **India–Nepal rivers**, showing the importance of flood data sharing.
- **Humanitarian Diplomacy:** Such gestures can create small windows for dialogue even amidst conflict.

Way Forward

- **Revival of IWT Institutions:** Restart **Indus Commissioners' meetings** for transparent data sharing.
- **Regional Flood Forecasting Systems:** Collaborate through **SAARC Disaster Management Centre**.
- **Depoliticize Humanitarian Data:** Flood warnings and hydrological data should be insulated from political disputes.
- **Strengthen Local Resilience:** Invest in **real-time flood forecasting** and **community preparedness** in border regions.

Practice Questions

Prelims

Q. The Tawi River, recently in news, is a tributary of:
(a) Jhelum
(b) Ravi
(c) Chenab
(d) Beas

✅ **Answer:** (c) Chenab

Mains

Q1. Discuss the significance of the Indus Waters Treaty in India–Pakistan relations. In the context of recent flood warnings, evaluate whether humanitarian concerns can serve as a bridge in strained bilateral relations.

Q2. How can transboundary river management in South Asia be strengthened to deal with challenges of **climate change-induced floods**?

3I/ATLAS – The Interstellar Comet

📌 **Syllabus Mapping**
✅ **GS Paper I – Geography (Solar System, Celestial Phenomena)**
✅ **GS Paper III – Science & Technology (Space, Emerging Discoveries)**

Context

- In **2025**, astronomers discovered **Comet 3I/ATLAS** using the **Asteroid Terrestrial-impact Last Alert System (ATLAS) survey telescope** in **Rio Hurtado, Chile**.
- It is the **third known interstellar object** detected entering our solar system.

About 3I/ATLAS

- **Nature**: A comet-like body entering from **outside our solar system**.
- **Category**: *Interstellar object* – because it does **not follow a closed orbit around the Sun**.
- **Orbital Path**: **Hyperbolic**, unlike planets/comets bound to elliptical orbits.
- **Naming**: "3I" denotes the **third interstellar object**.

Preceding Discoveries

1. **1I/'Oumuamua (2017)** – first interstellar object discovered; cigar-shaped, mysterious trajectory.
2. **2I/Borisov (2019)** – first confirmed interstellar comet with clear tail.
3. **3I/ATLAS (2025)** – newest addition, strengthening evidence of **extrasolar objects frequently passing through our solar system**.

Why Important?

- **Astronomy**: Provides insights into **material composition of other star systems**.
- **Cosmology**: Offers evidence of **planetary formation processes beyond our solar system**.
- **Astrobiology**: Raises questions about **organic compounds traveling interstellar distances**, supporting panspermia theory.
- **Space Observation Capability**: Demonstrates improved **early-warning telescopes like ATLAS**, crucial for planetary defense against asteroids.

India's Relevance

- India's observatories (e.g., **Indian Astronomical Observatory, Ladakh**) collaborate in global sky surveys.
- Supports India's push in **deep space exploration** under **ISRO's upcoming interplanetary missions**.

Practice Questions

Prelims

Q. Consider the following statements about interstellar objects:

1. Their orbital path is hyperbolic.
2. They are gravitationally bound to the Sun.
3. 3I/ATLAS is the third interstellar object discovered after 'Oumuamua and Borisov.

Which of the above are correct?
(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

✅ **Answer:** (c) 1 and 3 only

Mains

Q. *Discuss the significance of interstellar objects like 'Oumuamua, Borisov, and ATLAS in advancing our understanding of planetary formation and cosmic evolution.*

Gangotri Glacier Retreat – Key Concerns

📌 **Syllabus Mapping**
✅ **GS Paper I – Geography: Physical Geography, Glaciers, Water Resources**
✅ **GS Paper III – Environment: Climate Change, Conservation, Disaster Management**

Context

- A recent study indicates that the **Gangotri Glacier** has lost nearly **10% of its snowmelt flow in four decades**.
- This has direct implications for **river water availability, agriculture, hydropower, and ecology** in the **Ganga basin**.

About Gangotri Glacier

- **Location**: Uttarkashi district, Uttarakhand.
- **Length**: ~30 km (one of the largest in the Himalayas).
- **River Source**: Feeds **Bhagirathi River** (primary headstream of the Ganga).
- **Confluence**: Bhagirathi merges with **Alaknanda at Devprayag**, forming the Ganga.
- **Protected Area**: Situated in **Gangotri National Park**.

Key Fauna

- **Snow Leopard**
- **Himalayan Blue Sheep (Bharal)**
- **Himalayan Monal** – State bird of Uttarakhand

Recent Findings

- **10% decline** in snowmelt flow (1980s–2020s).
- **Accelerated retreat** due to:
  - Global warming
  - Reduced snowfall & altered precipitation patterns
  - Black carbon & soot deposition (reducing albedo)
  - Human activity (tourism, pilgrimage pressure).

Significance of Gangotri Glacier

- **Water Security**: Major freshwater source for north India.
- **Religious Importance**: Sacred origin of the **Ganga**.
- **Agriculture & Livelihoods**: Supports ~40% of India's population in the Ganga basin.
- **Hydropower Projects**: Bhagirathi river dams depend on glacier-fed flow.

Concerns & Implications

- **River flow reduction** → Threat to **agriculture, drinking water, and power supply**.
- **Increased Glacial Lake Outburst Floods (GLOFs)** → Disaster risks in Himalayan states.
- **Biodiversity impact** → Habitat loss for high-altitude species.
- **Cultural & Religious concern** → Retreating glacier threatens the symbolic purity of Ganga.

Government Measures

- **National Mission on Sustaining Himalayan Ecosystem (NMSHE)** – part of NAPCC.
- **National Centre for Polar and Ocean Research (NCPOR)** – monitoring Himalayan glaciers.
- **National Adaptation Fund on Climate Change (NAFCC)** – funding resilience projects.
- **Eco-sensitive Zone** notifications around **Gangotri National Park**.

Practice Questions

Prelims

Q. Which of the following rivers originates from the Gangotri Glacier?
(a) Alaknanda
(b) Mandakini
(c) Bhagirathi
(d) Dhauliganga

✅ **Answer:** (c) Bhagirathi

Mains

Q. *The retreat of Himalayan glaciers poses a critical threat to India's river systems and livelihoods. Discuss with special reference to Gangotri Glacier.*

Extreme Monsoon Events & India's Climate Risks

📌 **Syllabus Mapping**
✅ **GS Paper I – Geography: Monsoon system, Climate change**
✅ **GS Paper II – Governance: Disaster Management, Institutional frameworks**
✅ **GS Paper III – Environment, Disaster Management, Agriculture**
✅ **Essay Paper – Climate change & Sustainable Development**

Context

- Recent **Punjab floods** and **landslides/flash floods** in Uttarakhand, Himachal Pradesh, and J&K highlight rising **frequency & intensity** of **monsoon-related disasters**.
- India's **monsoon dependency (40% agriculture output, 47% population livelihood)** makes it highly vulnerable to such changes.

Changing Nature of Monsoon

1. **Erratic Rainfall**
   - Weaker **monsoon winds** but higher **atmospheric moisture** → intense rainfall bursts + frequent dry spells.
2. **Changing El Niño–Monsoon Relationship**
   - Traditional correlation weakening due to shifts in **global atmospheric circulation**.
3. **Spatial Variability**
   - **Dry regions wetter**, **humid regions drier**.
   - Ex: Decline in **Ganga basin rainfall**, rise in **Gujarat–Rajasthan precipitation**.
4. **Climate Change Effect**
   - Rising **sea surface temperatures (SSTs)** & **cloud moisture capacity** → more intense rainfall events.

Impacts of Changing Monsoon Patterns

1. **Disasters & Infrastructure Loss**
   - Short-duration intense rains overwhelm **dams, urban drainage & transport networks**.
2. **Health Risks**
   - **Vector-borne diseases** (dengue, malaria), **heat stress**, water-borne diseases rising.
3. **Forecasting Challenges**
   - Monsoon variability + **climate change influences** reduce forecasting accuracy → weakens preparedness.
4. **Economic Impacts**
   - 51% **rain-fed agriculture** highly exposed.
   - Direct GDP hit via crop failures, insurance burdens, and rural distress.

Governmental & Institutional Response

- **NDMA Guidelines (2019)** on flood management.
- **National Monsoon Mission (NMM)** – better modelling & prediction.
- **IMD Forecast Modernization** – Doppler radars, AI-based rainfall alerts.
- **PMFBY (Crop Insurance)** & **Disaster Relief Funds** for risk reduction.
- **State Climate Action Plans** under **NAPCC**.

Way Forward

1. **Pre-Disaster Approach**
   - Focus on **resilient infrastructure**, flood-zoning, and **sponge cities**.
2. **Strengthen Forecasting**
   - Expand **IMD localised alerts + AI & satellite-based nowcasting**.
3. **Climate-Resilient Agriculture**
   - Promote **climate-smart crops, micro-irrigation, MSP diversification**.
4. **Community Preparedness**
   - Decentralised disaster management committees at **panchayat & ward levels**.
5. **Policy Shift**
   - Integration of **climate risk in urban planning** & insurance-linked resilience.

Conclusion

The shift in India's monsoon is not just a meteorological phenomenon but a **developmental and disaster challenge**. India must **move from post-disaster relief to proactive risk reduction**, through **climate-resilient infrastructure, agriculture adaptation, and advanced forecasting systems**.

Practice Questions

Prelims

Q. Which of the following best explains the recent changes in India's monsoon patterns?
(a) Strengthening of monsoon winds and uniform rainfall
(b) Weakening monsoon winds with intense bursts of rainfall
(c) Stronger El Niño influence causing widespread drought
(d) Rise in rainfall across all regions uniformly

✅ **Answer: (b)**

Mains

Q. *"India's changing monsoon patterns are amplifying climate and disaster vulnerabilities." Critically examine with examples. Suggest measures for disaster risk reduction.*

Bhagirathi ESZ Bypass Project – Development vs Ecology

📌 **Syllabus Mapping**
✅ **GS Paper I – Geography: Environmental geography, Fragile ecosystems**
✅ **GS Paper II – Governance: Policy, Judiciary, Environmental clearances**
✅ **GS Paper III – Environment & Ecology: Conservation, Sustainable Development, Disaster Management**
✅ **Essay Paper – Development vs Environment, Sustainable Growth**

Context

- **Uttarakhand Govt.** has given **in-principle approval** for the **Netala bypass project** in the fragile **Bhagirathi Eco-Sensitive Zone (ESZ)**.
- The project was earlier **rejected by the Supreme Court's High-Powered Committee (HPC)** due to **ecological fragility & social concerns**.
- Highlights growing **conflict between strategic infrastructure needs (national security)** and **ecological safeguards** in Himalayan states.

Concerns with the Project

- **Strategic Justification**: Classified as **strategically important** by Ministry of Defence.
- **Ecological Risks**:
  - Proposed alignment prone to **slope instability, landslides, and subsidence**.
  - Segment already **collapsed during Dharali flash floods** (recent event).
  - Threatens **local biodiversity and riverine ecosystem** of Bhagirathi.
- **Social Risks**: Risk to **communities dependent on fragile mountain ecosystems**.

The Development vs. Environment Debate

Arguments for Developmental Parity

- **Economic growth** essential for poverty alleviation and food security.
- Infrastructure (roads, bypasses) improves **connectivity, tourism, defence logistics**.
- Without fulfilling human needs, **environmental protection loses legitimacy**.

Arguments for Environmental Parity

- **Environment sustains life**; irreversible damage makes development meaningless.
- Himalayan ecosystem is **ecologically fragile** – even minor construction has **disproportionate impacts**.
- **Cumulative impacts** of multiple projects can worsen floods, landslides, and disasters.

Drivers of Environmental Degradation

- **Economic growth pressures** → industrialisation, urbanisation.
- **Large-scale projects**: highways, hydropower, mining.

- **Policy loopholes**: Dilution/bypassing of **Environmental Impact Assessments (EIA)**.
- **Special Economic Zones (SEZs)** and fast-tracked clearances.

Sustainable Development Approaches

1. **Ecological Approach (Biocentrism)**
   - Humans must live within **finite ecological limits**.
   - Focus: **qualitative growth** rather than quantitative expansion.
2. **Strong Sustainable Development**
   - Environmental protection is a **precondition for economic development**.
   - Regulation + community participation essential.
3. **Weak Sustainable Development**
   - Growth is the **primary goal**, with environment included via tools like **green taxes, carbon credits**.
4. **Treadmill Approach**
   - Development = **sustainable economic growth**, relying on **technology & human ingenuity** to fix ecological problems.

Conclusion

The Bhagirathi bypass approval reflects a **classic clash**:

- **Strategic security & development needs** vs. **ecological fragility & disaster vulnerability**.
- Sustainable path lies in **balancing ecological prudence with strategic necessity**:
  - **Comprehensive EIAs**,
  - **Disaster-resilient design**,
  - **Local community consultation**,
  - **Adoption of strong sustainability principles** in fragile Himalayan ESZs.

Practice Questions

Prelims

Q. Which of the following statements is correct regarding **Eco-Sensitive Zones (ESZs)?**
(a) ESZs are legally binding under the Forest Rights Act, 2006.
(b) ESZs act as transition zones around Protected Areas to minimise ecological damage.
(c) ESZs are declared only by the State Governments.
(d) ESZs allow unrestricted industrial activities for economic development.

✅ **Answer: (b)**

Mains

Q. *Discuss the challenges of balancing strategic infrastructure development and ecological protection in the Himalayan Eco-Sensitive Zones. Suggest a way forward for sustainable development in fragile ecosystems.*

Cotton in India – "White Gold"

📌 **Syllabus Mapping**
✅ **GS Paper I – Indian Geography: Crops, Soil & Climate**
✅ **GS Paper III – Economy: Agriculture, Trade, Government Policies**

Recent Update (2025)

- **Government has extended the import duty exemption on cotton till 31st December 2025**.
- Aim: To bridge the **persistent demand–supply gap** in domestic cotton production and consumption.

About Cotton

- Known as: **"White-Gold"**.
- Nature: **Natural fibre crop**, semi-xerophyte.
- Season: **Kharif crop**, grown in **semi-arid regions**.

Climatic & Soil Conditions

- **Temperature**: Requires **high temperature**, ~210 frost-free days.

- **Rainfall**: Light to moderate rainfall (60–100 cm).
- **Sunlight**: Bright sunshine essential for growth.
- **Soil Types**:
  - **North India**: Deep alluvial soils.
  - **Central India**: Black clayey (Regur) soils.
  - **South India**: Red and black soils.
- Tolerance: **Semi-tolerant to salinity**, **sensitive to water logging**.

Production in India

- India: **2nd largest producer** (after China).
- Unique: Only country producing **all 4 cultivated cotton species** (*Gossypium arboreum, G. herbaceum, G. hirsutum, G. barbadense*).
- **Major Producing States**: Gujarat, Maharashtra, Telangana, Rajasthan, Madhya Pradesh.

Significance

- **Economic**: Major raw material for **textile & apparel industry**, critical for exports.
- **Employment**: Supports **~6 million farmers** and millions in allied industries.
- **Strategic**: Reduces dependency on imported fibres, ensuring textile sector competitiveness.

Policy Implications of Import Duty Exemption

- **Positive**:
  - Reduces input cost for textile industry.
  - Eases inflation in cotton-based products.
  - Helps bridge demand–supply mismatch.
- **Concerns**:
  - May **discourage domestic farmers** if imports depress market prices.
  - Long-term dependency on imports risks **self-sufficiency** in cotton.

Way Forward

- **Strengthen Cotton Productivity**: Promote **BT cotton**, drip irrigation, precision farming.
- **Research & Development**: Develop **climate-resilient, pest-resistant varieties**.
- **Value Chain Integration**: Focus on **cotton-to-textile clusters** for export competitiveness.
- **Sustainability**: Promote **Better Cotton Initiative (BCI)** and organic cotton.

Practice Questions

Prelims

Q. Which of the following crops is grown in black soils, requires high temperature, and is sensitive to waterlogging?
(a) Jute
(b) Cotton
(c) Wheat
(d) Sugarcane

✅ **Answer: (b) Cotton**

Mains

Q. *Discuss the importance of cotton in India's economy. In light of the government's recent import duty exemption till 2025, critically analyze the challenges and opportunities for India's cotton sector.*

Ranjit Sagar Dam (Thein Dam) – Flood Evacuation Operation

📌 **Syllabus Mapping**
✅ **GS Paper I – Geography**: Rivers & dams in India
✅ **GS Paper II – Governance**: Disaster management & evacuation
✅ **GS Paper III – Disaster & Security**: Role of armed forces in disaster relief

Context

- The **Indian Army** evacuated **CRPF personnel and civilians** stranded at **Madhopur Headworks** after heavy discharge from the **Ranjit Sagar Dam**.
- Highlights the **disaster management role of armed forces** during flood emergencies.

About Ranjit Sagar Dam (Thein Dam)

- **Location**: Near **Pathankot**, on **Punjab–Jammu & Kashmir border**.
- **River**: Built on **River Ravi** (one of the Indus system rivers under **Indus Waters Treaty, 1960**).
- **Type**: Multipurpose **hydroelectric cum irrigation project**.
- **Commissioned**: 2001.
- **Purpose**:
  - Irrigation for Punjab, J&K, and parts of Rajasthan.
  - Hydroelectric power generation.
  - Flood control and water storage.
- **Installed Capacity**: ~600 MW hydropower project.

Significance

- **Agriculture**: Provides water to canal systems in Punjab & Rajasthan → strengthens food security.
- **Energy**: Major renewable source of hydroelectric power in northern India.
- **Strategic Location**: On the Punjab–J&K border, important for regional water security.
- **Flood Control**: Prevents excess flooding of Ravi but sudden heavy discharges can endanger downstream settlements.

Current Relevance

- The recent **flood evacuation** shows the **dual role of dams**:
  - Source of development (irrigation, power).
  - Source of risk (flash floods due to heavy discharge).
- Underlines need for:
  - **Early warning systems**.
  - **Community preparedness**.
  - **Army-NDRF coordination** in flood relief.

Practice Questions

Prelims

Q. Ranjit Sagar Dam, sometimes seen in news, is built on which river?
(a) Beas
(b) Ravi
(c) Chenab
(d) Sutlej

✅ **Answer**: (b) Ravi

Mains

Q. *Discuss the significance of multipurpose river valley projects like Ranjit Sagar Dam in India. How do they balance the goals of development and disaster management?*

National Disaster Management Authority (NDMA)

📌 **Context**

- The **Prime Minister nominated two new members** and **renominated three existing members** to NDMA for three years.

About NDMA

- **Head**: Chaired by the **Prime Minister of India**.
- **Apex Body**: For **Disaster Management** in India.
- **Statutory Basis**: Mandated under the **Disaster Management Act, 2005**.
- **Mandate**: To **lay down policies, plans, and guidelines** for effective Disaster Management.
- **Vision**: *To build a safer and disaster-resilient India by a holistic, proactive, technology-driven, and sustainable development strategy.*

Functions

- Formulating **national disaster management policies & plans**.
- Coordinating with **State Disaster Management Authorities (SDMAs)**.
- Supervising **National Disaster Response Force (NDRF)**.
- Driving **capacity building & awareness programs**.
- Promoting **technology use** (GIS mapping, early warning systems).

ENVIRONMENT & ECOLOGY

Invasive Plants – Most Economically Damaging Globally

📌 **Syllabus Mapping:**
✅ **GS Paper III – Environment & Ecology:** Invasive species, biodiversity conservation, ecosystem restoration
✅ **GS Paper III – Economy:** Economic costs of ecological degradation
✅ **GS Paper II – Governance:** Environmental regulation, policy measures (trade, quarantine, biosecurity)

Context

A recent global study revealed that **invasive species** have cost societies more than **$2.2 trillion worldwide** due to environmental, agricultural, and economic damages. Interestingly, **plants emerged as the most economically damaging invasive species**, surpassing arthropods and mammals.

For India, where **Lantana camara, Parthenium hysterophorus, and Eichhornia crassipes** (water hyacinth) dominate ecosystems, the findings highlight the urgency of stronger **invasive species management**.

Understanding Invasive Species

- **Definition:** Non-native plants, animals, or microorganisms that spread rapidly when introduced into new ecosystems, disrupting **ecological balance**.
- **Examples in India:**
  - **Lantana camara** – clogs forests, reducing grazing potential.
  - **Parthenium hysterophorus (Congress grass)** – spreads on farmland, reduces crop yield.
  - **Eichhornia crassipes (Water hyacinth)** – chokes water bodies, depletes oxygen.
  - **African catfish** – threatens native freshwater fish diversity.

Impacts of Invasive Species

1. **Ecological Impacts:**
   - Outcompete native species for **nutrients, space, and sunlight**.
   - Disrupt **food chains and habitats**.
   - Reduce **biodiversity** and threaten endangered species.
2. **Economic Impacts:**
   - **Agricultural losses** due to crop competition.
   - Increased **fisheries management and irrigation costs**.
   - Costs of **chemical/mechanical eradication**.
3. **Public Health Risks:**
   - Some species (e.g., Parthenium) cause **allergies and respiratory problems**.
   - Can serve as **vectors for diseases**.
4. **Rare Positive Contributions:**
   - Non-native honeybees serve as **pollinators** in some ecosystems.
   - Some invasive trees provide **fuelwood** in degraded landscapes.

Control and Management Measures

1. **Prevention:**
   - Stringent checks on **international trade, shipping, and travel**.
   - **Ballast water management** to prevent marine invasions.
2. **Control Methods:**
   - **Biological control:** Use of natural enemies (parasitoids, pathogens, insects).
   - **Mechanical control:** Physical removal, clearing.
   - **Chemical control:** Herbicides, pesticides, fungicides (with caution to avoid secondary damage).

3. **Eradication and Restoration:**
    - Remove invasive species at **early stages**.
    - Restore ecosystems through **reintroduction of native species and habitat improvement**.

Analysis & Relevance to India

- **High Risk Regions:** The **Himalayan ecosystem, wetlands, and forests** are most vulnerable.
- **Biodiversity Hotspot Threat:** Western Ghats and North-East face severe invasion by **Lantana, Mikania, and Parthenium**.
- **Economic Link:** India spends large sums on **manual removal and herbicides**, but eradication remains incomplete.
- **Global Parallels:**
    - **Kudzu vine (USA)** – overruns farmland.
    - **Cane toad (Australia)** – threatens native amphibians.

Way Forward

- Strengthen **biosecurity laws and quarantine checks**.
- Enhance **community participation** in removal and monitoring.
- Integrate **remote sensing, drones, and AI** for large-scale mapping of invasive spread.
- Increase **research funding** for biological control methods.
- Mainstream **ecosystem restoration** into national missions like **National Biodiversity Mission**.

Practice Questions

Prelims (Objective):

1. Which of the following invasive species are commonly found in India?
    1. Lantana camara
    2. Parthenium hysterophorus
    3. Eichhornia crassipes
    4. African catfish

    Select the correct answer using the code below:

    - (a) 1 and 2 only
    - (b) 2 and 3 only
    - (c) 1, 2, 3, and 4
    - (d) 1 and 4 only

Mains (Analytical):

Q1. Invasive alien species pose both ecological and economic threats to India. Discuss with examples and suggest measures for sustainable management.

Q2. "Invasive species are a silent biodiversity crisis." Critically examine the statement with reference to India's forest and aquatic ecosystems.

Global Study on Invasive Plants & Economic Damage

📌 **Syllabus Mapping:**
✅ **GS Paper III – Environment & Ecology:** Biodiversity, invasive alien species, ecosystem restoration
✅ **GS Paper III – Economy:** Cost of ecological degradation, agriculture productivity
✅ **GS Paper II – Governance:** Policy and international cooperation on invasive species

Context

A global study revealed that invasive plants and animals expanding into new ecosystems have caused **over $2.2 trillion in damages worldwide**. Among all categories, **invasive plants have emerged as the most economically impactful species**, followed by **arthropods and mammals**.

This has major implications for countries like **India**, where ecosystems and agriculture are severely threatened by invasives such as **Lantana camara, Parthenium hysterophorus, and water hyacinth**.

Understanding Invasive Species

- **Definition:** Organisms (plants, animals, or microorganisms) that do not naturally occur in a given ecosystem but, once introduced, spread aggressively and disturb the ecological balance.
- **Examples in India:**

- **Lantana camara** – invades forests, reduces grazing capacity.
- **Parthenium hysterophorus (Congress grass)** – lowers farmland productivity, causes allergies.
- **Eichhornia crassipes (Water hyacinth)** – clogs rivers and lakes, reduces dissolved oxygen.
- **African catfish** – outcompetes native fish, threatens aquatic biodiversity.

Implications of Invasive Species

1. **Ecological Disruptions:**
   - Compete with native species for resources.
   - Reduce **biodiversity** by pushing out local flora and fauna.
2. **Economic Costs:**
   - Loss of agricultural yields and fisheries.
   - Increased expenditure on **eradication and management**.
3. **Food Web & Health Impacts:**
   - Disturb predator-prey balance.
   - Spread plant and animal diseases.
   - Some cause **human health issues** (e.g., Parthenium-induced respiratory allergies).
4. **Rare Benefits:**
   - Non-native honeybees serve as **pollinators** in ecosystems where native pollinators decline.
   - Some invasive plants provide fuelwood or fodder in degraded areas.

Control & Management Strategies

1. **Prevention:**
   - Strict checks on **trade, shipping, and air travel**.
   - **Ballast water management** to prevent marine invasions.
2. **Control Measures:**
   - **Biological control:** Use of predators, pathogens, or parasitoids.
   - **Mechanical control:** Manual removal, cutting, dredging.
   - **Chemical control:** Use of herbicides, pesticides, fungicides (with caution).
3. **Eradication and Restoration:**
   - **Early detection** and complete eradication before spread.
   - **Restoration programmes** – reintroduce native species, strengthen natural habitats.

Analysis & Relevance for India

- **High Vulnerability:** India's **biodiversity hotspots** (Western Ghats, Himalayas, North-East) face major threats from invasive plants.
- **Agriculture Link:** Farmers lose significant crop yield due to invasive weeds (Parthenium costs millions annually).
- **Climate Change Factor:** Changing rainfall and temperature regimes **accelerate spread** of invasives.
- **Policy Gaps:** Limited coordination across ministries, absence of a **dedicated national invasive species management authority**.
- **Global Lessons:**
  - Australia spends heavily on biological control of invasive cane toads.
  - USA combats kudzu vine invasions with strict monitoring.

Way Forward

- Establish a **National Invasive Species Management Authority** for coordinated action.
- Enhance **public participation** in removal campaigns.
- Use **remote sensing and AI** for real-time mapping and spread prediction.
- Promote **biological and eco-friendly controls** instead of chemical-heavy approaches.
- Strengthen global cooperation under **Convention on Biological Diversity (CBD)**.

Practice Questions

Prelims (Objective):

1. Which of the following invasive species are commonly found in India?
   1. Lantana camara
   2. Parthenium hysterophorus
   3. Eichhornia crassipes
   4. African catfish

   Select the correct answer using the code below:

   - (a) 1 and 2 only
   - (b) 2 and 3 only

- (c) 1, 2, 3, and 4
- (d) 1 and 4 only

Mains (Analytical):

Q1. "Invasive alien species are a silent biodiversity crisis." Discuss the ecological and economic consequences of invasive plants in India, citing examples.

Q2. Evaluate India's policy framework for managing invasive species. Suggest measures for prevention, control, and ecosystem restoration.

Crop Residue & Agroecological Biodiversity

📌 **Syllabus Mapping:**
✅ **GS Paper III – Environment:** Conservation, agroecological biodiversity, pollution impacts
✅ **GS Paper III – Economy (Agriculture):** Cropping patterns, sustainable practices, food security
✅ **GS Paper II – Governance:** Policies for air pollution and crop residue management

Context

A new study highlights that **crop residue management practices—especially burning—have severe consequences on agroecological biodiversity**. Beyond the well-known link with **air pollution in North India**, the findings reveal deeper disruptions in soil ecology, natural predator populations, and the agricultural food web.

What is Crop Residue?

- Crop residues are **plant materials left behind on fields after harvesting**, such as stalks, straw, and husks.
- Common in **paddy-wheat systems** of Punjab, Haryana, and Uttar Pradesh.

Key Findings of the Study

1. **Soil Degradation:**
   - Burning residues depletes **essential soil nutrients** like nitrogen and phosphorus.
   - Weakens long-term **soil fertility and crop productivity**.
2. **Air Pollution Effects:**
   - Residue burning releases **PM2.5, carbon monoxide, and greenhouse gases**.
   - Alters habitats for **arthropods and birds**, disrupting pollination and pest control.
3. **Decline of Natural Predators:**
   - Populations of **spiders, ladybirds, frogs, and earthworms** decline.
   - This reduces **biological pest control** capacity in fields.
4. **Trophic Cascade Effects:**
   - With predator decline, **pest outbreaks increase**, damaging crops.
   - Disruption of insects → affects birds, amphibians, and soil health → weakens **entire agro-food web**.

Implications

- **Agroecological Balance:** Natural pest regulation weakens, requiring **higher pesticide use**, which further damages biodiversity.
- **Economic Losses:** Farmers face **increased costs of inputs** (fertilisers and pesticides) and reduced productivity.
- **Public Health:** Air pollution from residue burning worsens **respiratory illnesses** (Delhi smog episodes).
- **Climate Impact:** Contributes to **greenhouse gas emissions** and global warming.

Policy & Legal Framework in India

- **National Green Tribunal (NGT):** Declared crop residue burning illegal in 2015.
- **National Policy for Management of Crop Residues (NPMCR), 2014:** Encourages in-situ management.
- **Schemes:**
  - **Central Sector Scheme on Crop Residue Management (2018):** Subsidy for machines like Happy Seeder, Super Straw Management System.
  - **National Clean Air Programme (NCAP):** Targets air pollution reduction.
- **Supreme Court Interventions:** Directed states to control stubble burning, especially in Punjab-Haryana region.

Sustainable Alternatives

1. **In-situ Management:** Use of **Happy Seeder** and **mulching machines** to recycle residues back into the soil.
2. **Ex-situ Utilisation:** Residues as **biofuel, biogas, compost, biochar, or paper industry raw material**.

3. **Agroecological Practices:** Crop rotation, intercropping, and organic farming to reduce pest pressure.
4. **Community-Based Solutions:** Custom hiring centres for farm machinery; linking farmers to **biomass power plants**.
5. **Incentives:** Financial support for farmers adopting **eco-friendly residue management practices**.

Analysis & Contemporary Relevance

- **Ecological Dimension:** Crop residue burning undermines **ecosystem services** like pollination and pest control.
- **Socio-Economic Dimension:** The practice continues due to **cost and labour constraints**, despite subsidies.
- **Technology Angle:** Need for innovations like **bio-decomposers (e.g., Pusa Decomposer)** for large-scale adoption.
- **Global Lessons:** Countries like **China and the US** promote **bioenergy from crop waste**, reducing both emissions and farmer costs.

Practice Questions

Prelims (Objective):

1. Consider the following impacts of crop residue burning:
   1. Decline in natural predators like frogs and earthworms
   2. Increase in soil nitrogen and phosphorus content
   3. Contribution to greenhouse gas emissions
   4. Pest outbreaks due to food web disruptions

   Which of the above are correct?

   - (a) 1, 2, and 3 only
   - (b) 1, 3, and 4 only
   - (c) 2 and 4 only
   - (d) 1, 2, 3, and 4

Mains (Analytical):

Q1. Crop residue burning is often discussed in the context of air pollution. Discuss its broader ecological and economic implications on agroecological biodiversity. Suggest sustainable alternatives.

Q2. Critically evaluate the effectiveness of India's policies on crop residue management. How can technology and community participation help mitigate this issue?

Nepal Joins International Big Cat Alliance (IBCA)

📌 **Syllabus Mapping:**
✅ **GS Paper III – Environment:** Biodiversity conservation, international environmental agreements
✅ **GS Paper II – International Relations:** Multilateral environmental cooperation, India's leadership role
✅ **Essay Paper:** Environment and sustainable development, India's soft power

Context

Nepal has officially joined the **International Big Cat Alliance (IBCA)**, an **India-led initiative** to strengthen the global framework for the conservation of big cats. Launched in **April 2023**, coinciding with the **50th anniversary of Project Tiger**, IBCA underscores India's leadership in wildlife protection and biodiversity diplomacy.

About the International Big Cat Alliance (IBCA)

- **Genesis:** Launched in April 2023 by India.
- **Aim:** Global conservation of **seven big cats**:
  - Tiger 🐅
  - Lion 🦁
  - Leopard 🐆
  - Snow Leopard ❄️🐆
  - Cheetah 🐆
  - Jaguar 🐆
  - Puma 🐈‍⬛
- **Headquarters:** Secretariat in **India**.
- **Structure:**
  - Multi-country, multi-agency coalition.
  - Open to **95 range countries** and **non-range countries** interested in conservation.

- **Current Membership:** 13 countries (including India & Nepal).

Significance of IBCA

1. **Environmental Dimension:**
   - Big cats are **apex predators** critical for maintaining ecological balance.
   - Conservation efforts ensure protection of **entire ecosystems**.
2. **India's Leadership:**
   - Builds on India's **success in tiger conservation** (from 9 tiger reserves in 1973 to 54 today).
   - Positions India as a **global voice in biodiversity governance**.
3. **International Cooperation:**
   - Platform for knowledge-sharing, joint research, capacity-building.
   - Strengthens **South-South environmental partnerships** (India-Nepal, India-Africa cooperation).
4. **Socio-Economic Angle:**
   - Big cat landscapes support **eco-tourism**, generating rural employment.
   - Enhances **community-based conservation models**.

Analysis

- **Ecological Importance:** Big cats regulate prey populations and prevent overgrazing, ensuring ecosystem stability.
- **Threats Faced:**
  - Habitat loss, poaching, human-wildlife conflict, illegal wildlife trade.
  - Climate change threatening snow leopard and cheetah habitats.
- **India's Role as Soft Power:**
  - Wildlife diplomacy adds to India's **environmental leadership credentials** (like International Solar Alliance & Coalition for Disaster Resilient Infrastructure).
- **Challenges Ahead:**
  - Ensuring adequate funding and coordination among member states.
  - Reconciling **conservation goals with developmental pressures**.

Way Forward

- **Strengthen Regional Cooperation:** Especially among South Asian tiger-range countries (India, Nepal, Bhutan, Bangladesh).
- **Community Involvement:** Incentivise locals as stakeholders in conservation.
- **Technology Use:** Camera traps, satellite tracking, AI-based monitoring of poaching and habitats.
- **Global Partnerships:** Expand membership to more **Latin American and African countries** for jaguar and lion protection.

Practice Questions

Prelims (Objective):

1. Which of the following are part of the **seven big cats** under the International Big Cat Alliance (IBCA)?
   1. Cheetah
   2. Puma
   3. Lynx
   4. Jaguar

   Select the correct code:

   - (a) 1, 2, and 3 only
   - (b) 1, 2, and 4 only
   - (c) 2 and 3 only
   - (d) 1, 3, and 4 only

Mains (Analytical):

Q1. Discuss the significance of the International Big Cat Alliance (IBCA) in strengthening biodiversity conservation and India's global leadership in environmental diplomacy.

Q2. "Conservation of big cats ensures the survival of entire ecosystems." Explain the ecological and socio-economic rationale behind this statement.

Paris Agreement – Article 9.1 Explained

📌 **Syllabus Mapping**
✅ **GS Paper II – International Relations**: Multilateral agreements, Climate change negotiations
✅ **GS Paper III – Environment**: Climate finance, Sustainable development, UNFCCC

Context

- At **COP30 (Belém, Brazil, 2025)**, India and other **developing countries** are demanding that **Article 9.1** be placed at the center of negotiations.
- The focus is on **climate finance obligations** of developed nations.

Article 9.1 – Core Principle

- Developed countries **"shall provide financial resources"** to assist developing countries with:
  - **Mitigation** (reducing emissions).
  - **Adaptation** (coping with climate impacts).
- This is in **continuation of obligations** under the **UNFCCC (1992)**.

Basis

- Anchored in **Common but Differentiated Responsibilities (CBDR-RC)**.
- Recognizes **historical responsibility** of developed nations in contributing to climate change.

Significance for Developing Countries

- **Financial Resources** are critical to meet climate targets.
- Without predictable, adequate, and concessional finance, **NDCs (Nationally Determined Contributions)** cannot be fully implemented.
- Helps vulnerable countries build **resilience** against climate disasters.

Current Issues

- Developed countries **fall short** of the promised **$100 billion annually** (agreed in 2009, extended till 2025).
- Lack of **clear roadmap** for scaling up finance post-2025.
- **Loans vs Grants** debate – most finance is in loans, increasing debt burden.
- Transparency gaps in **tracking actual climate finance flows**.

India's Stand

- Calls for:
  - **Equity and climate justice** in finance distribution.
  - **New Collective Quantified Goal (NCQG)** beyond $100 billion, aligned with **Article 9.1**.
  - Stronger role for **public finance** (not just private investments).
- India pushes developed nations to **fulfil historical commitments** rather than shifting responsibility to emerging economies.

Way Forward

- Clear **finance architecture** post-2025.
- Enhance role of **Multilateral Development Banks (MDBs)** and concessional finance.
- Establish robust **monitoring and reporting mechanisms**.
- Strengthen **South-South cooperation** alongside traditional North-South flows.

Practice Questions

Prelims

Q. *Article 9.1 of the Paris Agreement deals with:*
(a) Technology transfer for developing countries
(b) Carbon market mechanisms
(c) Climate finance obligations of developed countries
(d) Global stocktake of emissions

✅ **Answer:** (c)

Mains

Q. *"Climate finance remains the most contentious issue in global climate negotiations. Examine the significance of Article 9.1 of the Paris Agreement in ensuring equity and justice for developing nations."*

Air Quality Life Index (AQLI) – 2025 Annual Update

📌 **Syllabus Mapping**
✅ **GS Paper III – Environment: Pollution, Environmental Conservation**
✅ **GS Paper II – Governance: Health & Policy Interventions**
✅ **Essay – Environmental Degradation and Public Health**

About AQLI

- **Definition**: A pollution index that quantifies the impact of **particulate air pollution (PM2.5)** on **life expectancy**.
- **Developer**: Created by **Michael Greenstone**, Professor at the **Energy Policy Institute at the University of Chicago (EPIC)**.
- **Methodology**: Translates particulate matter concentrations into their effect on average life expectancy, making the health costs of air pollution more tangible.

Key Findings – 2025 Update

Global

- **South Asia** remains the **most polluted region** globally.
- Air pollution is the **greatest external risk to human health**, surpassing smoking or unsafe water.

India

- If **WHO air quality guidelines** (PM2.5 ≤ 5 μg/m^3) were met:
  - Average life expectancy in India would **increase by 3.5 years**.
  - **Delhi** would see the highest gain of **8.2 years**.
- Other states with high gains: Uttar Pradesh, Bihar, and Haryana.

Implications for India

1. **Health Costs**
   - Increased risk of cardiovascular, respiratory, and developmental diseases.
   - Air pollution is a **leading contributor to DALYs (Disability Adjusted Life Years)** lost in India.
2. **Economic Costs**
   - Productivity loss due to health issues.
   - Rising healthcare expenditure burdening both households and government.
3. **Environmental & Social Dimensions**
   - Pollution aggravates **urban-rural disparities**.
   - Women and children disproportionately affected.

Government Measures in India

- **National Clean Air Programme (NCAP)**: Target of 40% reduction in PM2.5 levels in 131 cities by 2026.
- **Graded Response Action Plan (GRAP)** in NCR region.
- **Promotion of Electric Vehicles (FAME II)** and biofuels to reduce vehicular emissions.
- **Ujjwala Yojana** to curb household air pollution.
- **Renewable Energy push** for cleaner power generation.

Way Forward

- **Strengthen NCAP** with legal backing and city-level accountability.
- **Promote clean energy transitions**: EV adoption, solar rooftops, green hydrogen.
- **Improve monitoring infrastructure** for real-time air quality data.
- **Regional cooperation** across states for tackling transboundary air pollution.
- **Public awareness and behavioural changes** to reduce household and vehicular emissions.

Practice Questions

Prelims

Q. The **Air Quality Life Index (AQLI)** is released by:
(a) World Health Organization (WHO)
(b) Energy Policy Institute at the University of Chicago (EPIC)
(c) UN Environment Programme (UNEP)
(d) Intergovernmental Panel on Climate Change (IPCC)

✅ **Answer: (b)**

Mains

Q. *Air pollution is not only an environmental issue but also a public health emergency in India. Discuss with reference to the findings of the Air Quality Life Index (AQLI) 2025.*

UNDP Report: "Securing Rights, Enabling Futures" (2025)

📌 **Syllabus Mapping**
✅ **GS Paper II – Governance: Welfare schemes, Rights Issues, Role of NGOs & SHGs**
✅ **GS Paper III – Environment: Conservation, Forest Rights, Tribal issues**
✅ **GS Paper I – Society: Vulnerable sections, Tribal communities**

Context

- **UNDP (2025)** released a report assessing **20 years of the Forest Rights Act (FRA), 2006** in **Chhattisgarh, Maharashtra, and Odisha**.
- The report highlights **innovations, challenges, persistent gaps**, and provides **recommendations for strengthening FRA implementation**.

About Forest Rights Act (FRA), 2006

- Full name: **Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006**.
- Objective:
  - Undo **historical injustices** to forest-dwelling communities.
  - Ensure **livelihood, food security, and tenure security**.
  - Strengthen **forest conservation through community participation**.
- Rights under FRA:
  - **Individual Forest Rights (IFRs)** – for cultivation and habitation.
  - **Community Forest Rights (CFRs)** – for minor forest produce, grazing, fishing.
  - **Community Forest Resource (CFR) Rights** – management and governance of forests.

Challenges in FRA Implementation

1. **High Rejection Rates**
   - Caused by **procedural errors, lack of documentation, misinterpretation** of FRA provisions.
2. **Recording of Rights**
   - Poor quality of land records.
   - Incomplete recognition and mapping of rights.
3. **Post-Recognition Issues**
   - Difficulty in delineating **Community Forest Resources (CFRs)**.
   - Weak functioning of **Community Forest Resource Management Committees (CFRMCs)**.
4. **Institutional Gaps**
   - Weak capacity at **state & central levels**.
   - Poor **inter-departmental coordination**.
5. **Other Concerns**
   - Social and knowledge barriers among tribal communities.
   - **Uneven state-level implementation**.
   - Limited involvement of **Gram Sabha** despite being the core authority under FRA.

Key Recommendations from UNDP Report (2025)

- **Recognition in Social Protection**: FRA right holders to be treated as a category in all **livelihood & welfare schemes**.
- **Dedicated Funds**: Special funds under **state & central schemes** for FRA beneficiaries.
- **Livelihood Linkages**: Integrate FRA with **National Rural Livelihood Mission (NRLM)**; promote **gender-sensitive opportunities**.

- **Sunset Clause**: Introduce an **end date** for recognition/vesting of rights → ensure faster completion.
- **Post-Rights Support**: Move beyond **welfare approach** → enable **community empowerment**.
- **Integration with PESA Act, 1996**: Harmonize FRA with **tribal self-governance mechanisms** for holistic forest governance.

Significance of the Report

- Reaffirms FRA as a **pillar of inclusive growth and environmental governance**.
- Links **tribal empowerment** with **SDGs (poverty reduction, gender equality, climate action)**.
- Bridges gap between **legal recognition** and **actual realization** of rights.

Way Forward

- Capacity building of **Gram Sabhas** and **forest committees**.
- Digital mapping of **forest rights and resources**.
- Ensure **convergence with MGNREGA, NRLM, CAMPA funds** for livelihood & ecological restoration.
- Strengthen **tribal women's role** in CFR governance.

Practice Questions

Prelims

Q. Which of the following rights are recognized under the Forest Rights Act, 2006?

1. Individual rights for habitation and cultivation
2. Community rights over minor forest produce
3. Rights to manage and conserve community forest resources

Options:
(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

✅ **Answer: (d)**

Mains

Q. *"The Forest Rights Act, 2006 is both a tool of social justice and ecological conservation, yet its implementation remains uneven." Critically analyze in light of the UNDP's 2025 report.*

Conocarpus Trees – Ban Recommendation by SC Panel

📌 **Syllabus Mapping**
✅ **GS Paper II – Governance**: Environmental policies, Supreme Court interventions
✅ **GS Paper III – Environment**: Invasive species, biodiversity conservation

Context

- A **Supreme Court–appointed panel** has recommended banning the exotic tree **Conocarpus** in India.
- The tree has already been banned in **Gujarat and Tamil Nadu** due to ecological and health concerns.

About Conocarpus

- **Common Names**: Buttonwood, Damas.
- **Origin**:
  - One species → Coastal areas of **Tropical America & West Africa**.
  - Another species → Arid coastal zones of **Somalia, Yemen, East & North Africa, Arabian Peninsula**.
- **Why Introduced in India**:
  - Ornamental tree, urban greening purposes.
  - Provides quick canopy, tolerates **heat, salinity, air & dust pollution**.
  - Requires **minimal maintenance**.

Concerns with Conocarpus

1. **Threat to Biodiversity**
   - Provides no sustenance for **native insects, birds, or mammals**.
   - Known as a **"green desert"** due to poor ecological value.
   - Exhibits invasive tendencies.
2. **Threat to Ecosystem**
   - **Excessive groundwater consumption**, unsustainable in arid zones.
3. **Public Health Risks**
   - Produces **allergenic pollen**, aggravating respiratory illnesses (e.g., asthma).

Policy Perspective

- Earlier **state-level bans** → Gujarat & Tamil Nadu.
- Present move → National-level restriction under **Supreme Court observation**.
- Reflects **precautionary principle** in environmental law (*Vellore Citizens' Welfare Forum vs. Union of India*, 1996).

Broader Issues of Invasive Species in India

- **Other invasive plants**: Lantana camara, Prosopis juliflora, Parthenium hysterophorus.
- Impacts → Biodiversity loss, soil degradation, altered hydrology, and human health hazards.
- India's **National Biodiversity Action Plan** & **Biological Diversity Act, 2002** aim to address these risks.

Practice Questions

Prelims

Q. Conocarpus, recently seen in the news, is:
(a) An indigenous medicinal plant in India
(b) An exotic tree recommended for ban due to biodiversity concerns
(c) A mangrove species native to Sundarbans
(d) A staple crop in semi-arid regions

✅ **Answer**: (b)

Mains

Q. *Invasive alien species pose serious ecological and health threats in India. Discuss with examples, highlighting recent concerns over Conocarpus trees.*

BIOTECHNOLOGY & HEALTH

Immunoglobulin M (IgM) Antibody

📌 **Syllabus Mapping**
✅ **GS Paper II – Governance & Social Justice:** Health, Immunity, Disease control
✅ **GS Paper III – Science & Tech:** Biotechnology, Applications in healthcare

Context

- A **new study** shows that **IgM antibodies** can not only neutralize pathogens but also act as **mechanical stabilisers of harmful proteins**, giving them an added protective role in the immune system.

About Immunoglobulin M (IgM) Antibody

- **Definition:** Largest antibody and the **first antibody produced** by the immune system when exposed to viruses, bacteria, parasites, or harmful invaders.
- **Formation in Fetus:** The **earliest antibody** to develop during fetal life.
- **Location:** Found in **blood plasma and lymphatic fluid**.
- **Structure:** Pentameric (five antibody units linked), making it efficient at **binding antigens**.

Functions

1. **First Line of Defence:** Immediate immune response before other antibodies (IgG, IgA, etc.) are produced.

2. **Agglutination & Neutralization:** Clumps pathogens together for easier destruction.
3. **Complement Activation:** Triggers the complement system to kill pathogens.
4. **Mechanical Stabilisation (New finding):** Can stabilize harmful proteins and prevent them from misfolding or aggregating, which could otherwise cause diseases.

Medical Significance

- **Diagnostic Role:** High IgM levels indicate **recent infection** (e.g., COVID-19 serology tests initially detected IgM, followed by IgG).
- **Autoimmune & Protein Misfolding Diseases:** Potential application in conditions like **Alzheimer's, Parkinson's**where misfolded proteins cause harm.
- **Vaccine Response:** IgM is often the first antibody type generated after vaccination.

Comparison with Other Antibodies

Antibody Type	Key Role	Location	Unique Feature
IgM	First responder, complement activation, new protein stabilisation role	Blood, lymph	Largest antibody, pentameric
IgG	Long-term immunity	Blood, extracellular fluid	Crosses placenta (maternal immunity)
IgA	Mucosal immunity	Tears, saliva, mucosal lining	First defence at entry points
IgE	Allergic reactions, parasite defence	Skin, lungs, mucosa	Triggers histamine release
IgD	B-cell activation	B-cell surface	Least understood, low concentration

Contemporary Relevance

- **COVID-19 diagnostics:** Differentiating IgM vs IgG helped track early vs late infection stages.
- **Neurodegenerative Diseases:** New role of IgM in **protein stabilisation** could inspire therapeutic interventions.
- **One Health & Immunology Research:** Advances in antibody research can improve **vaccines, zoonotic disease management, and precision medicine**.

Practice Questions

Prelims

Q. Consider the following antibodies:

1. IgM
2. IgG
3. IgA
4. IgE

Which of the above is the **first antibody** produced during an infection?
(a) 1 only
(b) 2 only
(c) 3 only
(d) 4 only

✅ **Answer:** (a) 1 only

Mains

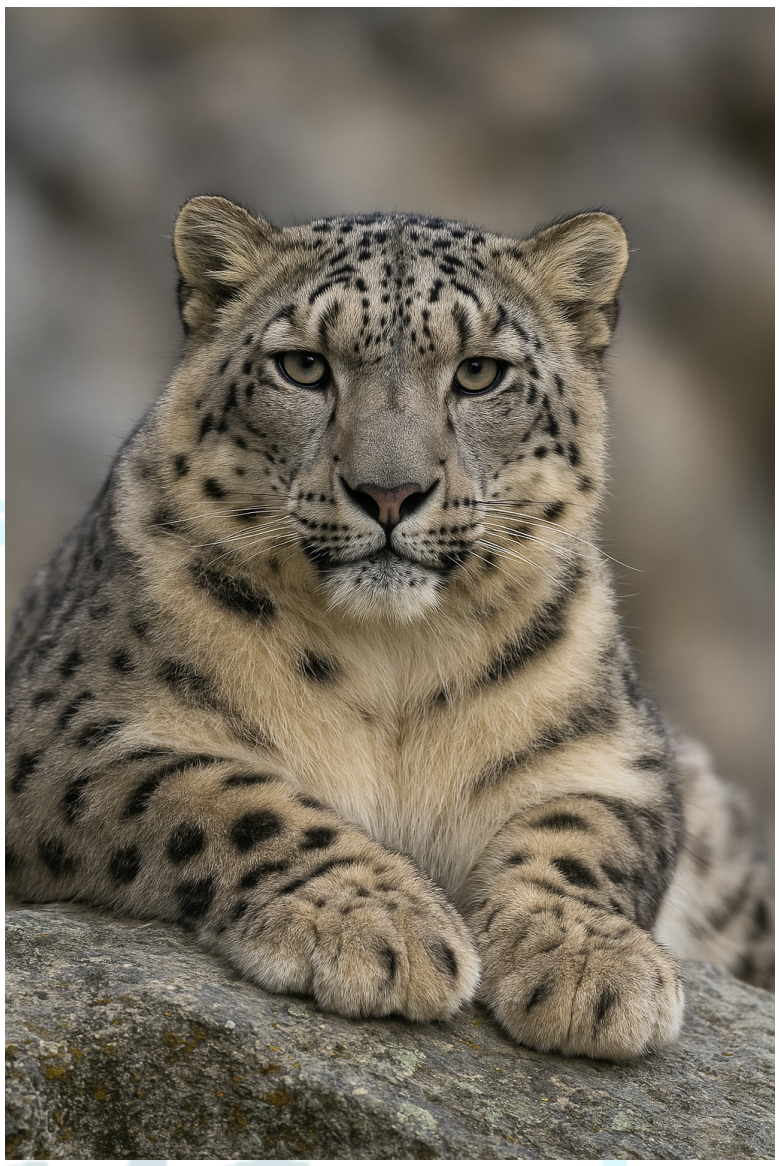
Q. "Recent research on Immunoglobulin M (IgM) reveals its dual role as both a pathogen fighter and a protein stabiliser." Examine its significance in disease prevention and modern healthcare applications.

Snow Leopard

📌 **Syllabus Mapping**
✅ **GS Paper III – Environment & Ecology:** Conservation, Biodiversity, Climate Change
✅ **GS Paper I – Geography:** Flora, Fauna, and Ecosystem Distribution

Context

- A recent **study in Jammu & Kashmir** shows that **common leopards are encroaching into snow leopard habitats**, likely due to **climate change and habitat shifts**.



About Snow Leopard

- **Habitat in India:** Found in **Jammu & Kashmir, Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh**.
- **Physical Features:**
  - Smokey-grey fur with dark rosettes.
  - Solitary, crepuscular (active at **dawn & dusk**).
  - Cannot roar (unlike tigers or lions).
- **Cultural Significance:** State animal of **Himachal Pradesh & Ladakh**.

Conservation Status

- **IUCN Red List:** *Vulnerable*
- **CITES:** Appendix I (highest protection)
- **India:** Schedule I & IV, Wildlife (Protection) Act, 1972

Threats

- **Habitat Encroachment:** Competition with **common leopards** due to rising temperatures.
- **Poaching:** For fur and bones.
- **Retaliatory Killings:** Due to livestock depredation.
- **Shrinking Prey Base:** Decline in wild ungulates.

Conservation Efforts in India

- **Project Snow Leopard (2009):** Community-based conservation in 5 Himalayan states.
- **SECURE Himalaya (UNDP–GEF, 2017):** Sustainable management of snow leopard habitats.
- **IBCA (2023):** International Big Cat Alliance for global conservation.
- **Camera Trapping & Citizen Science:** Used in Ladakh & Himachal for monitoring populations.

Practice Questions

Prelims

Q. Consider the following statements about Snow Leopards:

1. They are capable of roaring like lions and tigers.
2. They are listed as Vulnerable in the IUCN Red List.
3. They are found only in Ladakh in India.

Which of the statements given above is/are correct?
(a) 1 and 3 only
(b) 2 only
(c) 2 and 3 only
(d) 1, 2 and 3

✅ **Answer:** (b) 2 only

Mains

Q. Discuss the challenges in conserving high-altitude species like the **Snow Leopard** in the context of climate change and human-wildlife conflict.

Programmed Cell Revival (PCR) – A Breakthrough in Cell Biology

📌 **Syllabus Mapping**
✅ **GS Paper III – Science & Technology**: Biotechnology, Health Research, Advances in Medicine
✅ **GS Paper II – Governance**: Health Policy, Research Institutions
✅ **GS Paper IV – Ethics**: Bioethics, Human Values in Science

Context

- The **Centre for Cellular and Molecular Biology (CCMB)** has made a **seminal discovery** in cell biology by identifying a **"revival code"** that allows cells to **recover from near-death states**.
- This process, termed **Programmed Cell Revival (PCR)**, may transform fields such as **regenerative medicine, cancer therapy, and stem cell biology**.

Programmed Cell Death (PCD) – The Usual Path

- **Definition:** A genetically regulated process where cells **self-destruct** for organismal benefit.
- **Functions:** Removes damaged, infected, or unnecessary cells.
- **Types:**
  - **Apoptosis** – natural cell death without inflammation.
  - **Autophagy** – "self-eating" mechanism under stress.
  - **Necroptosis** – programmed necrosis with immune signaling.
- **Nature:** Traditionally considered **irreversible**.

Programmed Cell Revival (PCR) – The Discovery

- **Definition:** A novel mechanism by which cells in near-death states can **reverse the death process**.
- **Key Finding:** CCMB identified a **genetically encoded revival code** enabling this reversal.
- **Analogy:** Like rebooting a "dying" computer before it shuts down completely.

Potential Significance

1. Regenerative Medicine

- **Neurodegeneration:** May help injured neurons survive post-stroke/trauma.
- **Cardiac Health:** Can stimulate survival of heart cells after heart attack.
- **Organ Transplants:** Better preservation and revival of donor organs.

2. Cancer Research

- **Challenge:** Tumor cells may exploit PCR to resist chemotherapy/radiation.
- **Implication:** New therapies must balance between **revival of healthy cells** vs **inhibition in cancer cells**.

3. Stem Cell Biology

- Enhances understanding of how **cell fate decisions** are regulated.
- May improve techniques for **cell-based therapies and tissue engineering**.

4. Ethical & Policy Dimensions

- Raises bioethical concerns about **"playing with cell death"**.
- Need for **strict regulations** to prevent misuse (e.g., reviving malignant cells).

Global Perspective

- Comparable research is ongoing in **Harvard, MIT, and Japan's RIKEN Institute**, focusing on **cell rejuvenation and anti-aging biology**.
- India's discovery puts it in the **frontline of global biotech innovation**.

Way Forward

- **Research:** Expanding lab studies into pre-clinical models.
- **Policy:** Ethical guidelines under **ICMR** & **DBT**.
- **Collaboration:** International partnerships for regenerative trials.
- **Funding:** Strengthening schemes like **National Biopharma Mission** for translational research.

Practice Questions

Prelims

Q. With reference to **Programmed Cell Revival (PCR)**, consider the following statements:

1. It is the process by which dead cells are artificially revived using stem cells.
2. It is a reversal of programmed cell death (PCD) enabled by a genetically encoded code.
3. It may have potential applications in regenerative medicine and cancer research.

Which of the above is/are correct?
(a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 2 only

✅ **Answer:** (b) 2 and 3 only

Mains

Q. *Discuss the significance of the discovery of Programmed Cell Revival (PCR) by Indian scientists. How can it impact regenerative medicine and cancer therapy? Highlight the ethical challenges associated with such research.*

Arogyapacha – Indigenous Medicinal Plant of Western Ghats

📌 **Syllabus Mapping**
✅ **GS Paper III – Science & Technology**: Traditional Medicine, Biotechnology
✅ **GS Paper I – Indian Society & Culture**: Tribes & Ethnobotany
✅ **GS Paper II – Governance**: Benefit-sharing, IPR, Biodiversity Act

Context

- **Kuttimathan Kani**, a **forest elder from the Kani tribe**, who first revealed the knowledge of **Arogyapacha** to scientists, recently passed away in Kerala.
- His contribution paved the way for **India's first benefit-sharing model** under the Convention on Biological Diversity (CBD).

About Arogyapacha

- **Meaning:** "The green that gives strength."
- **Scientific name:** *Trichopus zeylanicus travancoricus*
- **Habitat:** Endemic to the **Agasthyamalai hills, Western Ghats** (Kerala).
- **Traditional use:** Used by the **Kani tribes** as an **instant energy stimulant**, **anti-fatigue herb**, and for healing multiple ailments.

Medicinal Properties

- **Antioxidant & Anti-stress**
- **Anti-microbial & Anti-inflammatory**
- **Anti-tumor & Anti-ulcer**
- **Anti-diabetic**
- Improves stamina and immunity.

Jeevani – From Traditional Knowledge to Commercial Drug

- Developed by **Tropical Botanic Garden & Research Institute (TBGRI), Thiruvananthapuram**.
- **Composition:** Arogyapacha + 3 other herbs.
- **Uses:** Herbal drug for **immunity boosting, stress relief, anti-fatigue**.
- **Unique Model:** Kani tribe received **50% royalty** from commercialization → *first-of-its-kind benefit-sharing under CBD*.

Significance

1. For Science & Health

- Opens avenues in **Ayurveda + Modern drug discovery**.
- Supports **nutraceutical & herbal drug industry**.

2. For Indigenous Rights

- Landmark case of **community intellectual property rights (IPR)**.
- Helped evolve frameworks like the **Biodiversity Act, 2002** in India.

3. For Conservation

- Promotes **sustainable use of Western Ghats biodiversity**.
- Prevents **biopiracy** by ensuring tribal knowledge is recognized.

Issues & Challenges

- **Overharvesting risk** → endangerment of species.
- **Implementation gaps** in benefit-sharing (royalties often delayed/contested).
- **Biopiracy threat** → need for stronger IPR protection of indigenous knowledge.

Way Forward

- Strengthen **People's Biodiversity Registers (PBRs)**.
- Promote **ethnobotanical research** with tribal partnerships.
- Ensure **timely royalty distribution** under benefit-sharing agreements.
- Integrate Arogyapacha into **AYUSH & wellness markets** with sustainability checks.

Practice Questions

Prelims

Q. A plant known as *Arogyapacha*, often used by the Kani tribes, is associated with:
(a) Energy stimulant and traditional medicine
(b) Sacred rituals in Nagaland
(c) Biofuel production in Assam
(d) Spice cultivation in Kerala

✅ **Answer:** (a) Energy stimulant and traditional medicine

Mains

Q. *Arogyapacha and the development of "Jeevani" mark a milestone in linking traditional knowledge with modern drug development. Discuss its significance for biodiversity conservation and benefit-sharing with tribal communities.*

Glanders

📌 **Syllabus Mapping**
✅ **GS Paper II – Governance**: Health, Government policies and interventions
✅ **GS Paper III – Science & Technology**: Biotechnology, Disease control, Zoonotic diseases

Context

- The **Department of Animal Husbandry & Dairying (DAHD)** has issued the **Revised National Action Plan on Glanders** to strengthen surveillance, prevention, and control of this zoonotic disease in India.

About Glanders

- **Nature of disease**: Highly infectious disease mainly affecting **horses, donkeys, and mules**.
- **Causative agent**: *Burkholderia mallei* (bacterium).
- **Zoonotic**: Can be transmitted to humans (life-threatening zoonosis).
- **Legal status**: Notifiable disease under the **Prevention and Control of Infectious and Contagious Diseases in Animals (PCICDA) Act, 2009**.
- **Treatment**: Difficult, no effective **vaccine** exists.

Transmission

- **Animal-to-animal**: Through contaminated feed, water, direct contact with nasal discharge.
- **Animal-to-human**: Occupational exposure (farmers, veterinarians, lab workers).

Symptoms

- **In animals**:
  - Nasal discharge, ulcers, enlarged lymph nodes
  - Pneumonia-like symptoms
  - Chronic skin lesions ("farcy buds")
- **In humans**:
  - High fever, chest pain, pneumonia, septicemia → can be fatal.

Significance

- **Public Health**: Classified as a **potential bioterrorism agent** due to severity and lack of vaccine.
- **Economic**: Threatens livelihood of equine-dependent communities (transport, rural economy).
- **Veterinary**: Equids (horses, donkeys, mules) play crucial roles in rural logistics, defense, and tourism.

India's Measures

- **Revised National Action Plan**: Surveillance, mandatory reporting, and biosecurity guidelines.
- **Equine Health Certification**: Testing before animal movement across states.
- **Collaboration**: DAHD with State Animal Husbandry departments and research institutes (e.g., IVRI).
- **International cooperation**: Reporting to OIE (World Organisation for Animal Health).

Practice Questions

Prelims

Q. *Glanders, recently seen in news, is caused by:*
(a) Virus
(b) Bacterium
(c) Fungus
(d) Protozoa

✅ **Answer:** (b) Bacterium (*Burkholderia mallei*)

Mains

Q. *Glanders is a neglected zoonotic disease with high fatality rates and significant economic implications. Discuss the challenges in its containment and the role of the National Action Plan in addressing them.*

SCIENCE & TECHNOLOGY

JWST Discovers 29th Moon of Uranus

📌 **Syllabus Mapping:**
✅ **GS Paper III – Science & Tech:** Space technology, achievements of scientists, telescopes and observatories
✅ **GS Paper I – Geography:** Solar system, planets and moons
✅ **Essay Paper:** Scientific discoveries and human quest for knowledge

Context

The **James Webb Space Telescope (JWST)** has discovered the **29th moon of Uranus**, temporarily named **S/2025 U1**, as its official name awaits approval by the **International Astronomical Union (IAU)**. This discovery further enhances our understanding of the **ice giant Uranus** and its complex system of rings and satellites.

About James Webb Space Telescope (JWST)

- **Launch:** December 2021, jointly by **NASA (USA), ESA (Europe), and CSA (Canada)**.
- **Mission Duration:** 5–10 years (extendable based on fuel reserves and performance).
- **Type:** Orbiting **infrared observatory**—far more powerful than Hubble.
- **Orbit:**

  - Unlike Hubble, which orbits Earth, JWST orbits the **Sun**.
  - Positioned at **second Lagrange point (L2)**, ~1.5 million km away from Earth.
- **Scientific Purpose:**
  - Study the **early universe** (light from first galaxies after the Big Bang).
  - Understand **formation of stars and solar systems**.
  - Detect **exoplanets** and analyse their atmospheres for habitability.

Significance of the Discovery

1. **Expanding Uranian System:**
   - Uranus was known to have 27 moons; discovery of **S/2025 U1** brings the count to 29.
   - Highlights JWST's capability in spotting faint, distant celestial objects.
2. **Understanding Ice Giants:**
   - Uranus and Neptune are under-explored compared to Jupiter and Saturn.
   - Discoveries could provide insights into **planetary system evolution**.
3. **International Scientific Collaboration:**
   - JWST is a **multinational project**, demonstrating how global cooperation advances space science.

Analysis

- **Scientific Impact:**
  - Strengthens our understanding of **planetary formation and migration** theories.
  - Contributes to comparative study between **giant planets' satellite systems**.
- **Technological Leap:**
  - JWST's **infrared sensors** can detect objects invisible to optical telescopes.
  - Critical for studying **dust-obscured regions** in space.
- **India's Relevance:**
  - India's **Astrosat** (launched 2015) focuses on multi-wavelength astronomy, though not as advanced as JWST.
  - Upcoming **XPoSat (2024)** shows India's growing presence in space astronomy.

Way Forward

- Continued **deep-space monitoring** of Uranus and Neptune.
- Collaborative missions between **ISRO and global space agencies** for outer planet studies.
- Public outreach to make space science **accessible and inspiring for youth**.

Practice Questions

Prelims (Objective):

1. Which of the following statements about the James Webb Space Telescope (JWST) are correct?
   1. It is placed at the second Lagrange point (L2), about 1.5 million km from Earth.
   2. It observes mainly in the **infrared spectrum**.
   3. It is jointly developed by NASA, ISRO, and ESA.
   4. Unlike Hubble, JWST orbits the Sun, not the Earth.

   Select the correct answer using the code below:

   - (a) 1, 2, and 4 only
   - (b) 1 and 3 only
   - (c) 2 and 4 only
   - (d) 1, 2, 3, and 4

Mains (Analytical):

Q1. Discuss the significance of the James Webb Space Telescope in advancing our understanding of the early universe and planetary systems. How does it differ from the Hubble Space Telescope?

Q2. "International cooperation is the backbone of modern space exploration." Examine this statement with reference to the James Webb Space Telescope.

Brown Dwarfs & Rare Quadruple Star System

📌 **Syllabus Mapping**
✅ **GS Paper III – Science & Technology**: Space technology, Astronomy discoveries
✅ **GS Paper I – Geography**: Universe, Solar system, Celestial phenomena
✅ **Essay/Interview**: Space exploration, India's role in astronomy

Context

- Astronomers discovered a **rare quadruple star system – UPM J1040−3551 AabBab** in the **Milky Way Galaxy**.
- It is unusual because it consists of:
  - **A pair of cold brown dwarfs** orbiting
  - **A pair of young red dwarf stars**.
- This discovery adds new insights into **stellar evolution** and the **formation of multiple star systems**.

About Brown Dwarfs

- **Definition:** Objects that **form like stars** (from collapsing gas and dust clouds) but **lack sufficient mass** to sustain long-term **hydrogen fusion** at their cores.
- **Nickname:** Often called *"failed stars"*.
- **Mass Range:** Between the heaviest gas giant planets and the lightest stars (~13 to 80 times Jupiter's mass).
- **Energy Source:** Can briefly fuse **deuterium (heavy hydrogen)**, unlike planets.
- **Atmosphere:** Similar to **gas giants (e.g., Jupiter, Saturn)** – contain methane, water vapour, and clouds.

Difference between Brown Dwarfs and Planets

Feature	Brown Dwarfs	Planets (like Jupiter)
Formation	Collapse of gas & dust (like stars)	Accretion in protoplanetary disk
Mass	13–80 Jupiter masses	<13 Jupiter masses
Fusion	Fuse **deuterium** (limited)	No fusion
Role in Astronomy	Bridge between planets & stars	Part of planetary systems

Significance of the Discovery

1. **Rare System:** Quadruple star systems are uncommon → provides data on **stellar clustering and orbital dynamics**.
2. **Stellar Evolution:** Helps understand the transition between **gas giants, brown dwarfs, and low-mass stars**.
3. **Astrobiology Implications:** Offers clues about planetary system formation around such unique star systems.
4. **Space Observations:** Future **James Webb Space Telescope (JWST)** studies could probe the atmosphere of these dwarfs for composition and temperature.

Way Forward

- More **sky surveys** using instruments like **Gaia, JWST, and upcoming Extremely Large Telescopes (ELTs)**.
- Study of brown dwarfs to improve **stellar classification** (OBAFGKM + L, T, Y classes).
- Integration with **India's space observatories** (e.g., Astrosat-2, proposed National Large Optical Telescope).

Practice Questions

Prelims

Q. Consider the following statements regarding **Brown Dwarfs**:

1. They form by collapse of gas and dust clouds like stars.
2. They sustain hydrogen fusion like main-sequence stars.
3. They are capable of limited deuterium fusion.
4. They have atmospheric compositions similar to gas giants.

Which of the above statements are correct?
(a) 1, 3 and 4 only
(b) 2 and 3 only
(c) 1 and 2 only
(d) 1, 2, 3 and 4

✅ **Answer:** (a) 1, 3 and 4 only

Mains

Q. *Discuss the significance of brown dwarfs in understanding stellar evolution. How does the discovery of the quadruple system UPM J1040−3551 AabBab contribute to our knowledge of multiple star systems in the Milky Way?*

BioE3 Policy – One Year Review

📌 **Syllabus Mapping**
✅ **GS Paper III – Science & Technology**: Biotechnology, R&D, Innovation, Applications
✅ **GS Paper III – Economy**: Employment, Industrial Growth, Sustainable Economy
✅ **GS Paper III – Environment**: Climate-resilient agriculture, Carbon capture, Bioeconomy

Context

- BioE3 Policy completed **one year (2024–25)**.
- Union Minister launched **India's first National Biofoundry Network** to strengthen indigenous **biomanufacturing & employment creation**.

About BioE3 Policy

- **Aim:** Accelerate **bio-based technologies & commercialization**.
- **Implementing Agency:** Department of Biotechnology (DBT), Ministry of Science & Technology.
- **Mechanism – BioEnablers:**
  - Bio-AI Hubs
  - Biofoundries
  - Biomanufacturing Hubs

Six Priority Sectors

1. **Bio-based chemicals & enzymes**
2. **Functional foods & smart proteins**
3. **Precision biotherapeutics**
4. **Climate-resilient agriculture**
5. **Carbon capture & utilization**
6. **Futuristic marine & space research**

Key Achievements in 1st Year

- Established **India's first Biomanufacturing Institute** (Mohali, Punjab).
- Launched **12+ joint research calls** – cell & gene therapy, climate-smart agriculture, carbon capture, functional foods.
- Initiated **Centre–State partnerships**: e.g., DBT–Assam MoU for BioE3 Cell.
- Set up **National Biofoundry Network** (6 institutions) to scale up proof-of-concept → commercialization.

What is Bioeconomy?

- **Definition:** Use of renewable biological resources to produce **food, energy, medicines & industrial goods** for **sustainability & growth**.
- **Sectors:** BioPharma & BioMedical, BioAgriculture, BioIndustrial, BioResearch.

India's Bioeconomy Status

- Grew from **$10 bn (2014) → $165.7 bn (2024)**.
- Target: **$300 bn by 2030**.
- Contribution: **4.25% to GDP** (India Bioeconomy Report 2025).

Significance

- **Economic:** New industries, jobs, rural livelihood opportunities.
- **Environmental:** Decarbonisation, circular economy, sustainable substitutes for petrochemicals.
- **Strategic:** Self-reliance in biomanufacturing, reduced import dependence.
- **Social:** Health (biotherapeutics), nutrition (smart proteins), food security.

Challenges

- High **R&D costs** & long commercialization timelines.
- Dependence on **rare bio-resources & technology imports**.

- **Regulatory & biosafety gaps** in emerging areas like gene therapy, synthetic biology.
- Need for **skilled workforce** in bio-manufacturing.

Way Forward

- Expand **National Biofoundry Network** to Tier-2/3 innovation hubs.
- Incentivize **bio-startups & MSMEs** through fiscal & policy support.
- Strengthen **biosafety, ethical, and regulatory frameworks**.
- Promote **international collaborations** (carbon capture, marine biotech, precision medicine).
- Focus on **Bioeconomy–Green Economy linkages** for SDG targets.

Practice Questions

Prelims

Q. Which of the following is/are covered under India's **BioE3 Policy**?

1. Climate-resilient agriculture
2. Space biotechnology research
3. Hydrogen fuel production

(a) 1 only
(b) 1 and 2 only
(c) 2 and 3 only
(d) 1, 2 and 3

✅ **Answer:** (b)

Mains

Q. *"India's BioE3 Policy seeks to position biotechnology as a key driver of the economy, environment, and employment. Critically examine its role in building India's bioeconomy."*

Hierarchical Reasoning Model (HRM): Brain-Inspired AI

📌 **Syllabus Mapping**
✅ **GS Paper III – Science & Technology: Artificial Intelligence, Emerging Technologies**
✅ **GS Paper II – Governance: Use of AI in Policy, Ethics in Technology**

Context

- Scientists at **Sapient** have introduced a new **Artificial Intelligence model – Hierarchical Reasoning Model (HRM)**.
- It is designed to **overcome limitations** of current **Large Language Models (LLMs)** like ChatGPT, which rely on **Chain-of-Thought (CoT)** reasoning.

What is HRM?

- **Inspired by the Human Brain**: Based on **hierarchical, multi-timescale processing**.
- **Integration of Information**: Mimics how different brain regions **synchronize short-term and long-term information**.
- **Objective**: Achieve **more natural, structured, and accurate reasoning** compared to linear CoT methods.

How HRM Works?

- **Single Forward Pass**: Executes reasoning tasks directly, without explicit supervision of intermediate steps.
- **Two Modules**:
  1. **High-Level Module** – *slow, abstract planning* (like prefrontal cortex functions).
  2. **Low-Level Module** – *fast, detailed computations* (like sensory-motor brain regions).

Why HRM Matters?

- **Limitations of CoT in LLMs**:
  - Often verbose and computationally heavy.
  - Errors in intermediate steps affect the final output.
- **HRM Advantages**:

- More efficient, less resource-intensive.
- Mimics **natural human-like problem-solving**.
- Potential for **real-time decision-making** in robotics, healthcare, defence, and governance.

Ethical & Governance Dimensions

- **Opportunities**: Faster AI for policymaking, disaster management, and space exploration.
- **Concerns**:
  - Transparency (black-box problem).
  - Risk of misuse in surveillance or warfare.
  - Regulatory gaps in AI standards (India's **Digital India Act** & global debates at **UNESCO AI ethics framework**).

Practice Questions

Prelims

Q. With reference to Hierarchical Reasoning Model (HRM), consider the following statements:

1. HRM is inspired by the brain's hierarchical, multi-time scale processing.
2. HRM relies on Chain-of-Thought (CoT) reasoning like current LLMs.
3. HRM uses two modules – a high-level planning module and a low-level computation module.

Which of the statements given above are correct?
(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

✅ **Answer:** (c) 1 and 3 only

Mains

Q. *Brain-inspired AI models like the Hierarchical Reasoning Model (HRM) are being hailed as the next step beyond Large Language Models. Critically examine their potential and challenges in governance, ethics, and technological innovation.*