IQRA IAS
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POLITY & GOVERNANCE

Simultaneous Elections: One Nation, One Election (ONOE)

Syllabus: Polity

Context

The Union Cabinet's approval for "One Nation, One Election" (ONOE) has reignited debates on its implications for **federalism, democracy, and electoral logistics**.

What Is One Nation One Election (ONOE)?

1. **Definition**: ONOE involves **synchronizing elections** for the Lok Sabha, state assemblies, and local bodies to streamline governance and reduce costs.
2. **Historical Practice**: India held simultaneous elections from **1951 to 1967**, which ended with the premature dissolution of state assemblies and the Lok Sabha.
3. **Scope**:
    - ONOE covers elections for **Lok Sabha and state assemblies**.
    - Municipal and panchayat elections are to be synchronized within **100 days** of the main elections.

Constitutional Articles Involved

1. **Article 83 & 172**: Duration of the Lok Sabha and state assemblies; amendments required to synchronize terms.
2. **Proposed Article 324A**: Establishes logistical mechanisms for simultaneous elections.
3. **Article 368**: Requires **state ratification** for amendments affecting local bodies.

Need for ONOE

1. **Reduced Costs**: ONOE minimizes **frequent election expenses**, which include campaign costs and government spending.
2. **Governance Efficiency**: Avoids disruptions caused by the **Model Code of Conduct (MCC)** during repeated elections.
3. **Resource Optimization**: Frees up **security forces and personnel** for essential duties.
4. **Voter Fatigue**: Prevents **declining turnout** due to frequent elections.
5. **Development Continuity**: Reduces **policy paralysis**, ensuring uninterrupted governance.

Ramnath Kovind Committee Recommendations

1. **Two-Phase Elections**:
    - Phase 1: Elections for the **Lok Sabha and state assemblies**.
    - Phase 2: Synchronize **local body elections** within 100 days.
2. **Proposed Article 82A**:
    - Outlines synchronization mechanisms for elections.
3. **Midterm Polls**:
    - Assemblies or Lok Sabha dissolved midterm will have elections aligned with the **national cycle**.
4. **Single Electoral Roll**:
    - Unified roll for all elections to streamline processes.
5. **Logistical Planning**:
    - Advance procurement of **EVMs, VVPATs**, and training of personnel.

Challenges of ONOE

1. **Overshadowing Regional Issues**: National issues may dominate, sidelining **local priorities** and concerns.
2. **Impact on Regional Parties**: Smaller parties risk losing political relevance, reducing **political diversity**.
3. **Federalism Concerns**: Centralized decision-making could undermine **state autonomy**.
4. **Logistical Hurdles**: Scaling up **electoral infrastructure**, resources, and trained personnel.
5. **Midterm Dissolutions**: Aligning dissolved assemblies with the **national electoral cycle** is complex.

Way Ahead

1. **Legislative Deliberation**:
   - Engage **stakeholders** through detailed parliamentary discussions.
2. **Consensus Building**:
   - Include **states and regional parties** to address federal concerns.
3. **Pilot Projects**:
   - Implement ONOE in **phases** to test feasibility and address challenges.
4. **Resource Investment**:
   - Strengthen **electoral infrastructure**, including personnel and logistics.
5. **Public Awareness**:
   - Educate citizens on the benefits and changes under ONOE.

Supreme Court Guidelines on Processing Mercy Petitions

Syllabus: Polity and Governance
Source: Supreme Court Judgment in *State of Maharashtra vs. Pradeep Yashwant Kokade*

Context:

The **Supreme Court of India** has issued detailed **guidelines to streamline the processing of mercy petitions** and execution of death penalties, aiming to avoid undue delays and uphold convicts' legal rights.

Major Guidelines Issued by the Supreme Court:

1. Dedicated Cells for Mercy Petitions:

- **States and Union Territories (UTs):** Must establish dedicated cells to handle mercy petitions promptly.
- **Timeframe:** Must ensure petitions are processed within prescribed time limits.

2. Attachment of Judicial Officer: A judicial officer from the **Law and Judiciary Department** will be attached to the dedicated cell for oversight and legal support.

3. Information Sharing and Documentation:

- **Prison Authorities:** Responsible for forwarding mercy petitions to the dedicated cell.
- **Coordination:** Gather case details from police stations and investigating agencies for submission.

4. Coordination with Governor and President's Secretariats: Mercy Petitions: Forwarded to the **Governor** and **President** for further action, ensuring smooth communication.

5. Electronic Communication: All communications to be conducted via **email** to enhance efficiency, except for confidential cases.

6. Guidelines and Reporting by States/UTs:

- **Executive Orders:** States must issue orders detailing the process of handling mercy petitions.
- **Compliance Reports:** States/UTs are required to submit compliance reports to the **Supreme Court** within three months.

7. Guidelines to Sessions Courts:

- Maintain records of pending mercy petitions.
- Issue notices to **public prosecutors** or **investigative agencies** to ensure no delays in pending appeals.

8. Execution Warrants: State Governments: To issue execution warrants promptly once the death penalty becomes enforceable.

About Mercy Petition:

1. Constitutional Framework:

- **Article 72:** Grants the **President** the power to:
  - Pardon,
  - Reprieve,
  - Respite, or
  - Commute sentences, including death penalties.
- **Article 161:** Similar powers for the **Governor** within the state jurisdiction.

2. Legal Framework: Governed by **Section 472(1)** of the **Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023.**

3. Key Precedents:

- **Maru Ram vs. Union of India (1981):**
  The President/Governor must act on the **aid and advice of the Council of Ministers** while deciding mercy petitions.

Significance of Guidelines:

1. **Efficient Process:** Avoids unnecessary delays in handling mercy petitions and execution.
2. **Transparency:** Ensures clear procedures and accountability across the judicial, administrative, and executive domains.
3. **Safeguards Legal Rights:** Protects convicts' constitutional and human rights during the final stages of the judicial process.
4. **Coordination:** Streamlines communication between authorities, reducing procedural lapses.

Union Cabinet Approves Bills on Simultaneous Polls

Syllabus: Polity – Election Reforms
Source: Recent Union Cabinet Decision

Context:

The Union Cabinet approved two Bills aimed at implementing **simultaneous elections** to the **Lok Sabha**, **State Assemblies**, and **local bodies**. These reforms are based on recommendations of a **high-level committee** chaired by former President **Ram Nath Kovind**.

About Simultaneous Elections:

Definition: Holding elections for the **Lok Sabha**, all **State Legislative Assemblies**, and **local bodies** (Municipalities and Panchayats) simultaneously.

Historical Context: Simultaneous elections were held in India until **1967**, after which they diverged due to early dissolutions of State Assemblies and the Lok Sabha.

Need for Simultaneous Elections:

1. **Governance Efficiency:**
   - Reduces disruptions caused by the frequent imposition of the **Model Code of Conduct (MCC)**, allowing uninterrupted implementation of policies and development programs.
2. **Economic Benefits:**
   - Substantial savings in election-related expenses for **separate elections**, which involve high costs for security, logistics, and administrative arrangements.
3. **Human Resource Optimization:**
   - Minimizes the diversion of **security forces** and other officials like teachers from their primary duties.
4. **Higher Voter Participation:**
   - Simultaneous elections reduce voter fatigue and improve turnout due to simplified voting schedules.
5. **Judicial Burden:**
   - Reduces election-related litigations by consolidating electoral processes.

Concerns Associated with Simultaneous Elections:

1. **Impact on Regional Parties:**
   - Could dilute the visibility of **regional parties**, as simultaneous elections tend to focus on national issues.
2. **Reduced Political Accountability:**
   - Public scrutiny of governments would happen only once every five years, reducing **mid-term corrective mechanisms**.
3. **Logistical Challenges:**
   - Requires a **large number of Electronic Voting Machines (EVMs)** and Voter Verifiable Paper Audit Trail (VVPAT) machines.

4. **Constitutional Challenges:**
    - May require amendments to key Articles of the Constitution (e.g., **Articles 83, 85, 172, 174**) to align the terms of various legislative bodies.
5. **Practical Issues:**
    - Difficulty in managing unforeseen circumstances like **hung legislatures** or **premature dissolutions** of Assemblies.

High-Level Committee Recommendations (Ram Nath Kovind Committee):

1. **Constitutional Amendments:**
    - Amend three Articles and insert 12 sub-clauses into the existing Articles to enable simultaneous elections.
    - Modify laws related to Union Territories with Legislative Assemblies.
2. **Single Electoral Roll:**
    - A **uniform electoral roll** to be prepared by the Election Commission of India (ECI) in consultation with State Election Commissions, requiring an amendment to **Article 325**.
3. **Local Body Elections:**
    - Conduct elections for **municipalities** and **panchayats** within **100 days** of parliamentary and Assembly elections.
4. **Appointed Date for Synchronization:**
    - The President to notify the date for the first sitting of the Lok Sabha and State Assemblies to ensure synchronization.
5. **Fresh Elections:**
    - For situations like **hung Houses** or **no-confidence motions**, fresh elections to be conducted only for the remaining term of the dissolved legislature.

Way Ahead:

1. **Consensus Building:** Ensure **political and regional consensus** for constitutional amendments and procedural changes.
2. **Infrastructure Development:** Scale up the capacity for **EVM production** and storage facilities.
3. **Awareness Campaigns:** Inform citizens about the benefits and logistics of simultaneous elections to foster public acceptance.
4. **Pilot Implementation:** Conduct **pilot simultaneous elections** in select states to test feasibility and address operational challenges.

Impeachment of a High Court Judge

Syllabus: Polity

Context

A motion to impeach a **High Court judge** of the Allahabad High Court has been introduced in **Rajya Sabha**, raising discussions on the accountability and integrity of the judiciary. This marks another attempt in India's judicial history, where none of the **six impeachment motions** have succeeded.

Constitutional Provisions for Impeachment

1. **Articles Governing Impeachment**:
    - **Article 124(4)**: Provides for the impeachment of Supreme Court judges.
    - **Article 218**: Extends the same provisions to High Court judges.
2. **Grounds for Impeachment**:
    - **Proven Misbehavior**: Includes corruption, partiality, or actions undermining judicial independence.
    - **Incapacity**: Includes physical or mental inability to perform judicial duties.
    - *Note*: These terms are not explicitly defined in the Constitution.
3. **Judges Inquiry Act, 1968**:
    - Regulates the impeachment process, detailing the investigative and procedural aspects.

Steps in the Impeachment Process

1. **Initiation**:
    - Requires **50 signatures** from **Rajya Sabha members** or **100 signatures** from **Lok Sabha members**.
    - Motion is submitted to the **Presiding Officer** (Speaker or Chairman).
2. **Investigation**:
    - The motion is referred to a **three-member committee** comprising:
        - **Chief Justice of India (CJI)** or a Supreme Court judge.
        - **Chief Justice of a High Court**.
        - A **distinguished jurist**.
    - Committee investigates the charges and submits a **report**.
3. **Report Submission**:
    - Report is placed before the House for deliberation.
    - If the committee finds the judge **guilty**, the House debates the motion.

4. **Parliamentary Approval**:
    - Requires a **special majority**:
        - **Two-thirds majority** of members present and voting.
        - **Majority of the total membership** of the House.
    - Must pass in both **Lok Sabha** and **Rajya Sabha**.
5. **Presidential Action**:
    - If passed by both Houses, the motion is sent to the **President**.
    - The President issues an **order for removal** of the judge.

Significance of Impeachment Process

1. **Judicial Accountability**: Ensures judges uphold the **independence, impartiality**, and **integrity** expected of their office.
2. **Safeguard Mechanism**: Protects against arbitrary or politically motivated actions.
3. **Preserves Public Confidence**: Maintains trust in the judiciary as a pillar of democracy.

Challenges in Impeachment

1. **Cumbersome Process**:
    - The process is long, complex, and requires an overwhelming **political consensus**.
2. **Ambiguity in Grounds**:
    - Lack of clear definitions for "misbehavior" and "incapacity" can lead to subjective interpretations.
3. **Failure to Pass**:
    - None of the six impeachment motions since independence have been successful, reflecting the **high thresholds** required.
4. **Judicial Independence**:
    - Excessive scrutiny risks undermining the judiciary's independence.

Previous Impeachment Attempts

1. **Justice V. Ramaswami (1993)**: Accused of financial irregularities but failed to garner the required majority in Lok Sabha.
2. **Justice Soumitra Sen (2011)**: Accused of misappropriation of funds; motion passed in Rajya Sabha but lapsed in Lok Sabha due to resignation.
3. **Justice C.S. Karnan (2017)**: Accused of contempt of court; no impeachment motion was initiated.

Way Forward

1. **Clearer Guidelines**: Define "misbehavior" and "incapacity" for consistency and objectivity.
2. **Strengthen Accountability Mechanisms**: Institutionalize processes like **Judicial Standards and Accountability Bill**, pending since 2012.
3. **Judicial Reforms**: Introduce a more efficient complaint redressal mechanism to address grievances against judges.
4. **Promote Judicial Transparency**: Enhance transparency through annual disclosures of assets and conduct reviews.

No-Trust Motion

Syllabus: Governance – Parliament and State Legislatures; Functions and Powers

Context: The Opposition is preparing to move a no-trust motion against **Rajya Sabha Chairperson Jagdeep Dhankhar**during the Winter Session, highlighting the **accountability of presiding officers**.

What is a No-Trust Motion?

A **procedural mechanism** to express **lack of confidence** in a **presiding officer** of a parliamentary house, ensuring **checks and balances** in governance.

Constitutional Basis

1. **Article 67(b)**: Governs the **removal of the Vice-President**, who serves as the Chairperson of the Rajya Sabha.
2. **Article 90**: Pertains to the **removal of the Deputy Chairperson** of the Rajya Sabha.

Rules and Procedure for a No-Trust Motion

1. **Initiation**: Requires a **14-day notice** to the Secretary-General of the Rajya Sabha.
2. **Majority Vote**: Requires a **simple majority** of the members present and voting in the Rajya Sabha.
3. **Concurrence of Lok Sabha**: For the **removal of the Vice-President**, the motion must be passed in both Houses of Parliament.

Grounds for Moving a No-Trust Motion

- **Violation of Parliamentary Norms**: Alleged failure to uphold the dignity of the House.
- **Bias or Unfair Practices**: Concerns over impartiality in conducting proceedings.
- **Constitutional Breach**: Non-adherence to the fundamental principles of governance.

Historical Context

- **Rajya Sabha**:
  - No no-confidence motion against a **Chairperson** has succeeded in the history of Parliament.
  - **2020**: Motion submitted against Deputy Chairperson **Harivansh** over farm Bills.
- **Lok Sabha**:
  - Precedents of motions against **Speakers** include:
    - **G.V. Mavalankar** (1951).
    - **Sardar Hukam Singh** (1966).
    - **Balram Jakhar** (1987).

Significance of No-Trust Motions

1. **Accountability**: Ensures **parliamentary transparency** by scrutinizing presiding officers.
2. **Democratic Functioning**: Strengthens checks on the conduct of **parliamentary leadership**.
3. **Political Consensus**: Promotes debate on **issues of procedural fairness** and constitutional adherence.

Challenges in Passing a Motion

1. **Majority Support**: Requires strong political alignment, often difficult in **coalition settings**.
2. **Justification**: Needs concrete reasons to gain consensus among members.
3. **Historical Rarity**: Success in such motions has been historically **low or unprecedented**.

French Government Collapses in No-confidence Vote

The recent collapse of the French government after the Prime Minister was ousted highlights the differences in political systems between **India** and **France**.

Contrasting Features of Indian and French Polity

Feature	India	France
Federalism	Federal structure with **unitary features**.	**Unitary state** organized on a decentralized basis.
Form of Government	**Parliamentary System**: President is ceremonial head; Prime Minister is head of government.	**Semi-Presidential System**: President (directly elected) holds substantial power; Prime Minister manages daily affairs.
President	Elected **indirectly** for a five-year term; no limit on the number of terms.	Elected by **universal direct suffrage**; five-year term renewable only once.
Secularism	**Positive secularism**: Equal respect for all religions; allows **state intervention** in religious matters.	Strict **separation between church and state**; prohibits state involvement in religious matters.
Referendum	No explicit provision for referendums in the Constitution.	Constitution explicitly provides for **referendums**.

Similarities Between Indian and French Polities

1. **Written Constitution:** Both nations have codified constitutions that outline governance structures.
2. **Bicameral Parliament:**
   - India: Lok Sabha (Lower House) and Rajya Sabha (Upper House).
   - France: National Assembly (Lower House) and Senate (Upper House).
3. **Independent Judiciary:** Both ensure judicial independence to uphold constitutional values and the rule of law.

Places of Worship (Special Provisions) Act, 1991

Context

The **Supreme Court of India** has set up a **three-judge Special Bench** to hear petitions challenging the constitutional validity of the Places of Worship (Special Provisions) Act, 1991.

Overview of the Act

Objective

- **Freeze the Religious Status**: Maintains the religious character of **places of worship** as it existed on **August 15, 1947**.
- **Prevent Conversion**: Prohibits the conversion of places of worship to ensure religious harmony.

Major Provisions

1. Prohibition of Conversion (Section 3)

- **What It Prohibits**: No place of worship can be converted from one religious denomination or sect to another.

2. Maintenance of Religious Character (Section 4)

- **Preservation Mandate**: The Act mandates the preservation of the **original religious identity** of all places of worship as on **August 15, 1947**.

3. Abatement of Cases (Section 4(2))

- **Legal Cases Prohibited**:
  - Pending legal proceedings regarding the conversion of places of worship **prior to 1947** are terminated.
  - New legal proceedings related to such conversions are disallowed.

4. Exceptions (Section 5)

- **Ram Janmabhoomi-Babri Masjid Case**: Excluded from the Act's provisions.
- **Ancient Monuments**: Places governed by the **Ancient Monuments and Archaeological Sites and Remains Act, 1958** are exempted.
- **Mutual Agreements**: Disputes resolved before the Act through mutual understanding are not impacted.

5. Penalties (Section 6)

- **Punishment for Violation**:
  - **Imprisonment**: Up to **three years**.
  - **Fines**: Monetary penalties for offenders.

Significance of the Act

1. **Promotes Religious Harmony:** Prevents **communal tensions** by maintaining the status quo of religious places.
2. **Historical Reconciliation:** Encourages peaceful coexistence by discouraging **retroactive disputes** over places of worship.
3. **Legal Uniformity:** Provides a **consistent framework** to address claims regarding religious sites.

Criticism of the Act

1. **Constitutional Validity**

- Petitioners argue that the Act violates:
  - **Article 14**: Right to equality.
  - **Article 25**: Right to freedom of religion.

2. **Restriction of Legal Remedies: Section 4(2)** disallows even legitimate claims, hindering judicial redressal.
3. **Selective Exemption:** The exclusion of the **Ram Janmabhoomi-Babri Masjid dispute** is viewed as inconsistent and politically motivated.
4. **Historical Injustice:** Critics argue that the Act ignores **legitimate historical grievances** of communities regarding places of worship.

Judicial Challenges and Observations

- The Supreme Court has admitted petitions challenging the Act, focusing on whether it aligns with the **basic structure of the Constitution**.
- Critics suggest that the Act undermines **judicial independence** by preemptively terminating legal cases.

Way Ahead

1. **Comprehensive Review:** Reassess provisions to ensure they align with constitutional principles of **equality** and **freedom of religion**.
2. **Promote Mediation:** Encourage amicable settlements for disputes through **negotiation** rather than legal confrontation.
3. **Strengthen Legal Framework:** Address gaps in the Act to balance **historical justice** with the need for **religious harmony**.

Railways (Amendment) Bill, 2024

Context

The Union Minister of Railways introduced the Railways (Amendment) Bill, 2024, in the Lok Sabha. This Bill seeks to **repeal the Indian Railway Board Act, 1905**, integrate its provisions into the **Railways Act, 1989**, and modernize Indian Railways governance.

Key Provisions

1. **Constitution of Railway Board**:
    - Establishes a statutory Railway Board as the apex decision-making body for Indian Railways.
    - The **central government** will determine:
        - Number of members.
        - Qualifications, experience, and terms of service.
        - Appointment process for the **Chairman** and **members**.
2. **Greater Autonomy to Zones**:
    - Provides railway zones with **enhanced operational autonomy** to improve efficiency and decentralize decision-making.
3. **Independent Regulator**:
    - Establishes an **independent regulator** to oversee:
        - Tariff regulation.
        - Safety standards.
        - Private sector participation and related policies.
4. **Organizational Continuity**:
    - Retains the current organizational structure of Indian Railways while introducing modern governance mechanisms.

Potential Impacts

1. **Enhanced Functioning of Railway Board**:
    - Statutory recognition strengthens its authority and independence, ensuring more efficient management and policymaking.
2. **Faster Decision-Making**:
    - **Decentralization** empowers regional zones, reducing bureaucratic delays and fostering agility.
3. **Transparency and Accountability**:
    - An independent regulator ensures:
        - Transparent tariff policies.
        - Fair oversight of private sector participation.
        - Improved safety and service standards.
4. **Increased Private Sector Involvement**:
    - Enhanced private investment may:
        - Improve infrastructure and services.
        - Lead to **higher fares** and **reduced subsidies**, affecting affordability for low-income groups.
5. **Operational Efficiency**:
    - Greater autonomy to zones promotes innovative, region-specific solutions for improved railway operations.

Significance

- **Modernization**: Aligns Indian Railways with global best practices in governance and regulation.
- **Private Sector Integration**: Encourages investments, enhancing service quality and infrastructure development.
- **Decentralized Operations**: Strengthens regional capacity to address local challenges and boost operational efficiency.

Challenges

1. **Tariff Regulation Concerns**: Risk of higher fares due to increased private sector participation.
2. **Implementation Risks**: Ensuring uniform compliance across zones may pose challenges.
3. **Safety Oversight**: Ensuring safety standards amidst increased private involvement requires robust monitoring mechanisms.
4. **Balancing Autonomy and Coordination**: Decentralization might lead to coordination challenges between zones and the central board.

Way Forward

1. **Policy Alignment**: Clear guidelines for coordination between the Railway Board, zones, and the independent regulator.
2. **Consumer Protection**: Establish mechanisms to safeguard passengers against excessive fare hikes.
3. **Capacity Building**: Train regional and zone-level officials to leverage newly granted autonomy effectively.
4. **Public-Private Balance**: Ensure a balance between private sector efficiency and public service obligations.

House Disruptions in India

Syllabus: Polity
Source: *Indian Express*

Context:

India's parliamentary democracy, often regarded as a model globally, is increasingly undermined by repeated disruptions in legislative proceedings. This trend not only wastes valuable time and resources but also weakens public confidence in democratic institutions.

Current Data on Parliamentary Disruptions in 2024 *(Source: PRS Legislative Research)*:

1. **Winter Session Stalemate:**
   - **Time Lost:** Over **32%** of scheduled hours lost due to disruptions over contentious bills and governance concerns.
2. **Budget Session Deadlock:**
   - **Productivity:** Lok Sabha functioned for only **45%**, and Rajya Sabha for **31%** of scheduled time.
3. **Frequent Walkouts and Protests:**
   - Opposition staged **17 walkouts**, disrupting debates on issues like unemployment and inflation.
4. **Declining Productivity:**
   - Legislative productivity has fallen below **50%** for four consecutive sessions, marking the lowest in a decade.

Reasons Behind Repeated Disruptions:

1. **Lack of Consensus:** Increased polarization between ruling and opposition parties hinders constructive dialogue.
2. **Contentious Legislation:** Lack of **pre-legislative consultations** fuels resistance to proposed bills.
3. **Unaddressed Opposition Demands:** Government's inadequate response to opposition issues leads to escalations.
4. **Procedural Violations:** Use of unparliamentary practices, including **sloganeering** and rushing to the well of the House.

Laws Governing Parliamentary Decorum in India:

1. **Rules of Procedure and Conduct of Business:** Authorizes presiding officers to maintain decorum in both Houses.
2. **Article 105 (Privileges):** Protects MPs' **freedom of speech** in the House but does not permit unruly behavior.
3. **Code of Conduct for Members:** Advocates ethical and disciplined behavior among parliamentarians.
4. **Rule 374(A) of Lok Sabha:** Allows for **automatic suspension** of members engaging in misconduct.

Consequences of Parliamentary Disruptions:

1. **Erosion of Public Trust:** Reduces confidence in the ability of democratic institutions to function effectively.
2. **Wastage of Resources:** Millions of rupees are spent on unproductive parliamentary sessions.
3. **Missed Legislative Opportunities:** Key socio-economic legislation gets delayed or abandoned.
4. **International Reputation:** Weakens India's image as a stable and effective democracy.

Way Ahead:

1. **Consensus-Building:** Institutionalize dialogue between ruling and opposition parties to prevent stalemates.
2. **Strict Enforcement:** Presiding officers must enforce rules to suspend or penalize repeat offenders.
3. **Ethical Training:** Train youth in politics to uphold decorum and democratic accountability.
4. **Pre-Legislative Consultations:** Engage all stakeholders to address potential issues before introducing contentious bills.
5. **Public Awareness:** Educate citizens about the repercussions of parliamentary disruptions to increase pressure on MPs.

Lok Adalat

Syllabus: Polity and Governance
Source: *The Hindu*

Context:

The **Executive Chairman of NALSA** highlighted that over **7 crore 70 lakh cases** were resolved through **3 National Lok Adalats (NLA)** organized by NALSA in 2024.

What are National Lok Adalats (NLA)?

- NLAs are **Lok Adalats held on a single day** across the country at **regular intervals**.

- They operate at all judicial levels, including the **Supreme Court**, **High Courts**, **District Courts**, and **Taluk Levels**.

About Lok Adalat:

Definition:

- Lok Adalat is an **Alternative Dispute Redressal (ADR)** mechanism.
- It resolves **civil** and **criminal cases**, either pending in courts or at **pre-litigation** levels, through **amicable settlement**.

Key Features:

1. **Statutory Status:**
   - Established under the **Legal Services Authorities Act, 1987**.
   - Decisions made by Lok Adalats are **final** and **binding** with **no appeal** allowed.
2. **Powers:**
   - Same powers as a **civil court** under the **Civil Procedure Code, 1908**.
   - Can summon witnesses, examine evidence, and enforce settlements.
3. **Voluntary Participation:**
   - Both parties agree voluntarily to resolve disputes.
4. **Low Cost:** No court fees are involved, making it **accessible** to the public.
5. **Speedy Justice:** Resolves cases quickly, reducing the backlog in regular courts.

History: The first Lok Adalat was held in 1982, at Junagadh, Gujarat.

Significance of Lok Adalats:

1. **Efficient Justice Delivery:** Reduces the burden on traditional courts by resolving cases swiftly.
2. **Accessibility:** Makes justice available to people at **minimal or no cost**.
3. **Promotes Harmony:** Encourages **reconciliation** and **compromise**, fostering better relationships between parties.
4. **Addresses Backlog:** Helps in tackling the **pendency of cases** in India's judiciary.
5. **Inclusivity:** Covers a wide range of disputes, including **civil**, **family**, **land**, and **commercial matters**.

Limitations:

1. **Non-Binding for Serious Offenses:** Certain **serious criminal cases** or **constitutional issues** cannot be addressed.
2. **Voluntary Nature:** Depends on the **consent of both parties**, which may not always be feasible.
3. **Limited Appeal Mechanism:** Absence of appeal in higher courts can be contentious.

eCourts Mission Mode Project

Syllabus: Governance

Introduction

The eCourts Mission Mode Project, spearheaded by the Ministry of Law and Justice, seeks to modernize the Indian judiciary through Information and Communication Technology (ICT). This initiative is pivotal in ensuring accessibility, efficiency, and transparency in justice delivery.

About the eCourts Project

1. **Origin and Launch**
   - Conceptualized: 2005 by the **eCommittee, Supreme Court of India**.
   - Launched: 2007 under the **Department of Justice**.
2. **Aim**
   - **Digitize the Judiciary**: Enhance judicial productivity.
   - **Accessible Justice**: Provide cost-effective and reliable access.
   - **Transparency**: Automate processes for improved accountability.
3. **Implementing Agency**
   - High Courts of respective jurisdictions oversee implementation.

Phases of Implementation

1. **Phase I (2007–2015):**
   - Focus: Basic computerization of courts, installation of hardware, and internet connectivity.
   - Introduction: Case Information Systems.
2. **Phase II (2015–2023):**

- Focus: **ICT Enablement** across courts.
- Developments:
  - Video conferencing facilities.
  - Citizen-centric services like **e-payment gateways** and online access to certified documents.

3. **Phase III (2023–2027):**
   - Focus: **Paperless Courts** and digitization.
   - Developments:
     - **Digitization of Legacy Records**.
     - Expansion of video conferencing to **hospitals and jails**.
     - Adoption of **cloud computing architecture**.

Key Features

1. **Citizen-Centric Services:**
   - **e-Filing**: Allows electronic submission of cases.
   - **e-Payment Gateways**: Facilitate online payments for court services.
   - **Online Certified Copies**: Simplifies access to court orders and judgments.
2. **Infrastructure Development:**
   - Hardware installation, **Local Area Network (LAN)**, and video conferencing facilities in courts.
3. **National Judicial Data Grid (NJDG):**
   - Provides **real-time case statistics** to monitor case pendency and disposal.
4. **Capacity Building:**
   - Training programs for judicial officers and court staff to use ICT tools effectively.
5. **Process Re-engineering:**
   - Simplifies and improves court processes for enhanced efficiency.
6. **Cloud Computing Architecture:**
   - Ensures secure, scalable, and cost-effective data management.

Significance of the Project

1. **Accessibility:**
   - Brings justice closer to citizens through digital tools.
   - Reduces dependency on physical presence in courts.
2. **Efficiency:**
   - Speeds up case disposal by digitizing workflows.
   - Saves time through video conferencing for hearings.
3. **Transparency:**
   - Reduces corruption by digitizing processes and ensuring traceability.
4. **Cost-Effectiveness:**
   - Minimizes paperwork and reduces expenditure on physical infrastructure.
5. **Improved Case Management:**
   - NJDG aids in tracking case progress and pendency reduction.

Challenges

1. **Infrastructure Gaps:**
   - Rural courts lack adequate digital infrastructure.
   - Uneven internet penetration limits access to online services.
2. **Digital Literacy:**
   - Limited digital literacy among stakeholders, including court staff and litigants.
3. **Data Security:**
   - Concerns over the protection of sensitive judicial data.
4. **Resistance to Change:**
   - Traditional mindsets in judiciary hinder adoption of ICT tools.

Way Forward

1. **Strengthening Digital Infrastructure:** Focus on improving internet connectivity in rural and remote courts.
2. **Training Programs:** Expand training for all judicial stakeholders on ICT usage.
3. **Data Protection Framework:** Implement robust mechanisms to secure judicial data.
4. **Public Awareness Campaigns:** Educate citizens about e-Court services for wider adoption.
5. **Monitoring and Feedback:** Regularly assess implementation progress and address bottlenecks.

The Disaster Management (Amendment) Bill, 2024

Syllabus: Governance

Context

The **Disaster Management (Amendment) Bill, 2024** was passed by the Lok Sabha to enhance the disaster management framework in India by amending the **Disaster Management Act, 2005**. It aligns with the **15th Finance Commission's recommendations** to integrate disaster risk reduction into development planning.

Key Changes Proposed in the Bill

1. **Centralized Disaster Planning**:
   - Shifts disaster plan preparation from **executive committees** to the **National Disaster Management Authority (NDMA)** and **State Disaster Management Authorities (SDMA)**.
2. **Expanded Functions of NDMA and SDMA**:
   - **Risk Assessment**: Regular assessment of disaster risks.
   - **Technical Assistance**: Provide expertise to government agencies.
   - **Relief Guidelines**: Recommend standardized relief measures.
3. **State and National Disaster Database**:
   - Creation of a comprehensive database detailing:
     - Type and severity of disaster risks.
     - Allocation and utilization of disaster management funds.
4. **Urban Disaster Management Authorities**:
   - State governments are empowered to set up **Urban Disaster Management Authorities** for:
     - State capitals.
     - Cities with **municipal corporations** to manage urban-specific risks.
5. **Formation of State Disaster Response Force (SDRF)**:
   - Empowers states to constitute SDRFs for:
     - Emergency response and rescue operations.
     - Defining their roles, responsibilities, and service conditions.
6. **Statutory Status for NCMC and HLC**:
   - **National Crisis Management Committee (NCMC)**:
     - Becomes the **nodal body** for major disasters.
   - **High-Level Committee (HLC)**:
     - Ensures financial assistance to states during disasters.

Disaster Management Act, 2005 Overview

1. **Three-Tier Framework for Disaster Management**:
   - **NDMA**:
     - Chaired by the **Prime Minister**.
     - Formulates policies, plans, and national-level guidelines.
   - **SDMAs**:
     - Led by **Chief Ministers**.
     - Focuses on disaster management at the state level.
   - **DDMAs**:
     - Headed by **District Magistrates**.
     - Implements disaster management plans at the district level.

Significance of the Amendments

1. **Enhanced Preparedness**: Centralized planning and technical support strengthen disaster risk reduction strategies.
2. **Localized Response**: Formation of **Urban DM Authorities** addresses unique challenges of urban areas.
3. **Improved Relief Measures**: Standardized guidelines and databases ensure efficient fund allocation and targeted relief.
4. **Strengthened Federal Cooperation**: Statutory status to **NCMC and HLC** enhances coordination between the Centre and states.
5. **Institutional Support**: Empowering SDRFs improves operational efficiency during emergencies.

Forest Rights Under FRA, 2006 Approved for Tribals in Anamalai Tiger Reserve (ATR)

Syllabus: Governance, Social Justice, Environment and Ecology

About Forest Rights Act (FRA), 2006:

- **Full Name:** Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.
- **Objective:**
  - Address **historical injustices** faced by forest-dwelling communities.
  - Ensure **livelihood and food security** while promoting **forest conservation**.

Key Features:

- **Forest Rights Recognized:**
  - **Individual Rights:**
    - **Self-Cultivation**: Farming rights on forest land.
    - **Habitation**: Residing rights in forest areas.
    - **Rehabilitation**: In-situ rehabilitation for displaced persons.
  - **Community Rights:**
    - **Access**: Grazing, fishing, and water usage in forests.
    - **Traditional Practices**: Collection of minor forest produce and protection of traditional knowledge.
    - **Conservation**: Rights to manage and conserve forests.
- **Eligibility:**
  - Communities residing in forests for **three generations (75 years)** before December 13, 2005.
- **Critical Wildlife Habitats:**
  - Conservation of **critical wildlife habitats** in National Parks and Sanctuaries while ensuring alternative rights for affected communities.

Institutional Framework:

- **Gram Sabha:** Initiates and determines the **nature and extent** of forest rights.
- **Sub-Divisional Level Committee:** Scrutinizes **Gram Sabha resolutions** and forwards them.
- **District Level Committee:** Acts as the **final authority** for approving forest rights.

Challenges in Implementation (Xaxa Committee Observations):

- **Arbitrary Rejections:** Lack of transparency in claim decisions.
- **Absence of Timelines:** No deadlines for resolving claims.
- **Displacement Concerns:** Inadequate focus on development-related displacements.
- **Capacity Gaps:** Limited training for officials and lack of awareness among communities.

Significance of Forest Rights in ATR:

- **Livelihood Security:** Empowers tribal communities to sustain their **economic and cultural survival**.
- **Environmental Conservation:** Leverages traditional knowledge for **forest preservation**.
- **Justice for Tribals:** Addresses **historical marginalization** and recognizes tribal relationships with forests.

Way Forward:

- **Streamline Processes:** Establish clear **timelines** and guidelines for claim resolutions.
- **Capacity Building:** Train officials and raise awareness among communities on FRA provisions.
- **Conservation with Inclusion:** Balance **forest management** with sustainable development objectives.

INTERNATIONAL RELATIONS

Syria and Middle East Tension

Syllabus: International Relations
Source: *The Indian Express*

Context:

The fall of Bashar al-Assad's regime in Syria after an 11-day offensive by rebel groups has led to a geopolitical upheaval in the Middle East, exacerbating regional instability and prompting global attention.

Middle East Tensions and Syria's Recent Fall

Syria's Collapse:

1. **End of Assad's Rule:**
   - The authoritarian regime collapsed under sustained attacks from rebel groups led by **Abu Mohammed al-Jawlani**, a former al-Qaeda operative.
   - Key supporters like **Iran** and **Russia** reduced focus, contributing to the regime's downfall.
2. **Rise of Hayat Tahrir al-Sham (HTS):**
   - Turkey-backed HTS has emerged as the dominant force, raising concerns about a shift toward Islamist authoritarianism.
   - Governance questions loom large as rebel factions scramble for control.

Factors Behind Middle East Tensions

1. **Authoritarian Regimes:** Fragile governance structures are vulnerable to internal dissent and external interventions.
2. **Proxy Conflicts:** Rivalries between **global powers** (e.g., the U.S., Russia) and **regional players** (e.g., Iran, Turkey) fuel instability.
3. **Sectarian Divides: Sunni-Shia tensions** underlie many conflicts, deepening divides and enabling violence.
4. **Geopolitical Ambitions:** Nations like **Turkey**, **Iran**, and **Saudi Arabia** compete for influence, often prioritizing power over stability.

Impacts of Middle East Tensions

Regional Impacts:

1. **Power Vacuum:** Assad's fall may lead to **infighting** among rebel factions, destabilizing governance efforts.
2. **Extremism:** The rise of **extremist groups** threatens peace and security across the region.
3. **Economic Disruption:** Trade routes and economic recovery efforts face setbacks due to conflicts.
4. **Humanitarian Crisis:** Renewed displacement exacerbates the **refugee crisis** and strains resources.

Implications for India:

1. **Energy Security:** Instability threatens **oil imports**, affecting India's energy needs.
2. **Diaspora Risks:** Indian workers in Gulf nations face potential security threats.
3. **Geopolitical Balancing:** India must navigate relations with competing powers like **Iran**, **Saudi Arabia**, and **Turkey**.
4. **Strategic Interests:** Preserving influence in the region remains crucial for India's **West Asia policy**.

Global Impacts:

1. **Radical Movements:**
   - Potential spread of **extremism** beyond the region poses global security risks.
2. **Geopolitical Rivalries:**
   - Renewed tensions among powers like the **U.S., Russia,** and **China** could worsen global conflicts.
3. **Economic Volatility:**
   - Fluctuations in **oil markets** impact global economic stability.
4. **Humanitarian Challenges:**
   - International intervention is needed to address **displacement**, **hunger**, and healthcare crises.

Way Ahead

1. **Inclusive Governance:**
   - Rebel factions must create a pluralistic system ensuring representation of **minorities** and addressing regional grievances.

2. **International Mediation:**
    - **Global powers** should mediate to prevent further conflict and extremism.
3. **Regional Stability:**
    - Nations like **Turkey** and **Saudi Arabia** must prioritize peace and stability over influence.
4. **Humanitarian Support:**
    - International aid must focus on addressing the **refugee crisis**, hunger, and healthcare challenges.

India Chairs the 68th Session of the United Nations Commission on Narcotic Drugs (CND)

Syllabus: International Relations

About the UN Commission on Narcotic Drugs (CND):

- **Establishment:** Formed in **1946** by the **Economic and Social Council (ECOSOC)** to oversee international drug control treaties.
- **Mandate:**
    - Principal policy-making body of the UN on **drug-related matters**.
    - Responsible for monitoring **global drug trends** and supporting balanced drug control policies.
- **Functions:**
    - **Normative Role:**
        - Discharges treaty-based functions and decides on the **scheduling of substances** under international control.
    - **Operational Role:**
        - Governs the **United Nations Office on Drugs and Crime (UNODC)**, offering policy guidance and budget approval for the **UN International Drug Control Programme**.
- **Membership:**
    - Comprises **53 member states**, elected by **ECOSOC** for four-year terms with equitable geographical representation.

Significance of India's Chairmanship:

- **Global Leadership:**
    - Marks **India's first chairmanship** of the CND, showcasing its leadership in **international drug policy**.
- **Policy Influence:**
    - Opportunity to shape **global drug policies** and advocate for **developing countries' concerns**.
- **Regional Representation:**
    - Brings perspectives from the **Global South**, fostering **inclusive dialogue** on drug issues.

Most Favoured Nation (MFN)

Syllabus: International Relations

Context

Switzerland recently revoked India's **Most Favoured Nation (MFN)** status under the Double Taxation Avoidance Agreement (DTAA), following a **Supreme Court ruling** in a tax case involving Nestlé. This decision will result in Indian companies facing a **10% withholding tax** on income in Switzerland starting January 1, 2025.

What Is Most Favoured Nation (MFN)?

1. **Definition**: MFN is a **trade principle under the World Trade Organization (WTO)** requiring member countries to treat each other equally in terms of tariffs, quotas, and trade barriers.
2. **Purpose**: It aims to **promote fair trade** by ensuring that no WTO member is treated less favorably than another.

Key Features of MFN

1. **Equal Treatment**:
    - Countries are granted the **lowest tariffs, highest import quotas,** and minimal trade restrictions available to any trading partner.
2. **Non-Discrimination**:
    - Ensures **uniform access** to markets among all member nations.
3. **Global Trade Norms**:
    - Encourages equitable trade practices and market access.
4. **Automatic Status**:
    - WTO's **164 members automatically** receive MFN status.

Exceptions to MFN

1. **Regional and Bilateral Trade Agreements**:
    - Preferential treatment under **free trade agreements (FTAs)** like RCEP or NAFTA is exempted.
2. **Developing Nations**:
    - Special provisions for **developing and least-developed countries** allow for differential treatment.
3. **Non-WTO Members**:
    - Countries like **Iran or North Korea** are not bound by MFN rules.

MFN Origin and Evolution

1. **Established**: Post-World War II, MFN became a **cornerstone of the multilateral trading system** under the WTO.
2. **Historical Context**: It replaced discriminatory practices of **imperial preference systems**, fostering global trade cooperation.

Revocation of MFN

1. **No Formal WTO Procedure**: WTO does not mandate a specific procedure for **suspending MFN status**.
2. **Unilateral Action**: Members can withdraw MFN treatment without notifying the WTO.

Recent Development: India and Switzerland

1. **Switzerland's Action**:
    - Revoked India's MFN status under the DTAA due to a Supreme Court ruling.
2. **Impact on Indian Companies**:
    - Indian firms operating in Switzerland will face a **10% withholding tax** on income from January 2025.

Significance of MFN

1. **Promotes Global Trade**: Ensures **stability** and predictability in international markets.
2. **Encourages Economic Integration**: Reduces trade barriers, fostering **global economic interdependence**.
3. **Fair Competition**: Prevents discriminatory trade practices and ensures a **level playing field**.

ECONOMY

Oilfields (Regulation and Development) Amendment Bill, 2024

Syllabus: Economics

Source: Indian Express

Context

The **Oilfields (Regulation and Development) Amendment Bill, 2024** was passed in the Rajya Sabha. It aims to modernize the regulatory framework, encourage domestic production of petroleum and natural gas, and attract private sector investments.

Key Features of the Bill

1. Expanded Definition of Mineral Oils

- **Inclusions:** All hydrocarbons, such as **natural gas, crude oil, shale gas, and coal-bed methane**.
- **Exclusions:** Coal, lignite, and helium are excluded to avoid overlap with other mineral regulations.

2. Introduction of Petroleum Lease

- Replaces the term **"mining lease"** with **"petroleum lease"** to encompass exploration, production, and disposal of mineral oils.
- Existing leases under the previous regime remain valid.

3. Decriminalisation of Offences

- Replaces imprisonment with **monetary penalties:**
  - **₹25 lakh** for violations.
  - **₹10 lakh per day** for continued violations.

4. Rule-Making Powers for the Central Government

- The **Centre can regulate**:
  - Environmental obligations.
  - Emission reduction targets.
  - Dispute resolution mechanisms.

5. Adjudication Mechanism

- Penalties to be adjudicated by **Joint Secretary-level officers**.
- Appeals directed to the **Appellate Tribunal** under the **Petroleum and Natural Gas Board Act, 2006**.

Significance

1. **Boosts Domestic Production**

- Encourages exploration of hydrocarbons, including **shale gas** and **coal-bed methane**, to reduce **import dependency**.
- Contributes to **energy security** by increasing domestic output.

2. **Enhances Private Sector Participation :** Clear regulations and reduced penalties attract **private investments**, fostering innovation in extraction technologies.
3. **Environmental Responsibility:** Introduces **rules for emission reduction** and sustainable practices in petroleum operations.
4. **Regulatory Simplification:** Decriminalisation promotes **ease of doing business** by reducing litigation risks and simplifying compliance.
5. **Aligns with Global Trends:** Focuses on unconventional hydrocarbons, such as **shale gas**, aligning India's policies with global energy dynamics.

Challenges

1. **State Rights:** Potential disputes over **state taxation rights** due to changes in lease terminologies.
2. **Environmental Concerns:** Private sector participation may lead to **over-extraction** and **ecological degradation** if not regulated effectively.
3. **Implementation Issues:** Effective enforcement of **environmental norms** and emission standards remains a challenge.
4. **Regulatory Overlap:** Coordination between **state and central authorities** for royalty collection and lease approvals could create bottlenecks.

Way Forward

1. **Strengthen Environmental Safeguards:** Develop robust monitoring mechanisms to prevent over-extraction and ecological harm.
2. **State-Central Coordination:** Establish frameworks to harmonize state and central roles in revenue collection and lease regulation.
3. **Capacity Building:** Train officers for adjudication and enforcement of penalties under the new regulatory framework.
4. **Stakeholder Involvement:** Involve industry experts, environmental groups, and state governments in policy discussions.
5. **Promote Technological Innovation:** Encourage private players to adopt **clean technologies** for exploration and extraction.

India's Digital Infrastructure

Syllabus: Economics

Source: PIB

Context

India's digital infrastructure has undergone a remarkable transformation in recent years, driven by advancements in cloud computing, AI, and digital governance. Flagship platforms like **Aadhaar**, **UPI**, and **DigiLocker** have positioned India as a **global leader in digital adoption**.

Components of India's Digital Revolution

1. Identity and Payments Platforms

- **Aadhaar:**
  - **World's largest digital identity system** with **138.34 crore enrolments**.
  - Enables seamless e-KYC, subsidies, and service authentication.
- **UPI (Unified Payments Interface):**
  - Facilitates **24,100 crore transactions** as of June 2024.
  - Drives financial inclusion and digitization of payments.

2. Digital Service Platforms

- **DigiLocker:**
  - Cloud-based platform for storing and verifying documents.
  - **37 crore users** enable paperless service delivery.
- **DIKSHA:**
  - Digital learning platform with **556.37 crore learning sessions**.

3. Cloud and Governance Ecosystem

- **MeghRaj and NIC Cloud Services:** Strengthen e-governance with secure cloud-based solutions.
- **e-Office:** Promotes paperless governance and administrative efficiency.

4. Flagship Applications

- **UMANG:** Integrates **2,077 services** from **207 departments** for ease of access.
- **MeriPehchaan (Single Sign-On):** Enables **132 crore transactions** for seamless user experience.
- **API Setu:** Facilitates **data exchange** with over **6,000 APIs** and **312 crore transactions**.
- **e-Hastakshar:** Provides **81.97 crore digital signatures** for secure authentication.
- **e-Sanjeevani:** Telemedicine platform delivering **12.4 crore consultations**, improving healthcare access.

Significance of Digital Infrastructure

1. Empowering Citizens

- Ensures accessibility to government schemes, financial inclusion, and healthcare.
- Promotes inclusivity through platforms like **UPI** and **DigiLocker**.

2. Economic Growth

- Boosts start-ups, e-commerce, and innovation ecosystems.
- Drives investments in emerging technologies like AI and blockchain.

3. Governance Efficiency

- Reduces red tape through paperless systems like **e-Office**.
- Strengthens policy implementation with real-time data insights.

4. Global Leadership

- Positions India as a model for the **Global South** in digital innovation.

5. Environmental Benefits

- Reduces carbon footprint with paperless solutions and energy-efficient technologies.

Challenges Facing India's Digital Revolution

1. **Digital Divide:** Unequal access to digital resources in rural and marginalized communities.
2. **Cybersecurity Risks:** Rising threats of cyberattacks and **data privacy violations**.
3. **Infrastructure Gaps:** Inadequate broadband access in remote and underserved areas.
4. **Skill Deficit:** Limited digital literacy hinders effective use of platforms like **UMANG**.
5. **Interoperability Issues:** Challenges in integrating state and departmental systems.

Limitations of Current Infrastructure

- **Connectivity Gaps:** Limited broadband penetration in rural India.
- **Over-Reliance on Technology:** Excludes non-tech-savvy citizens.
- **Data Privacy Concerns:** Lack of public awareness about risks of digital footprints.
- **Slow Implementation:** Bureaucratic delays in adopting digital tools.
- **Dependence on Imports:** Heavy reliance on imported digital hardware and software.

Way Ahead

1. **Expanding Connectivity:** Strengthen **BharatNet** to connect rural and underserved regions.
2. **Strengthening Cybersecurity:** Enforce robust data protection laws like the **Digital Personal Data Protection Act, 2023**.
3. **Promoting Digital Literacy:** Scale up campaigns like **PMGDISHA** to educate citizens on using digital tools.

4. **Encouraging Domestic Innovation:** Incentivize **domestic manufacturing** of digital hardware through **PLI schemes**.
5. **Bridging the Digital Divide:** Develop affordable digital solutions tailored for rural populations.

India Crosses $1 Trillion FDI Inflows Milestone (2000-2024)

Key Highlights

- **Cumulative Inflows (2000-2024)**: $1 trillion, with $667 billion attracted since 2014 (119% growth over 2004-2014).
- **Major Source Countries**:
  - **Mauritius**: 25% of total inflows.
  - **Singapore**: 24%.
  - **USA**: 10%.
  - Others: Netherlands, Japan, UK, UAE, Germany, Cyprus, Cayman Islands.
- **Key Sectors**:
  - **Services**: 16% of total inflows.
  - **Computer Software & Hardware**: 15%.
  - **Trading**: 7%.
  - **Telecommunications**: 6%.

About FDI

- **Definition**: Investment by a person resident outside India in:
  - **Unlisted Indian companies**.
  - 10% or more of **equity capital** in listed companies (fully diluted basis).
- **Nature**: Non-debt creating capital flow.

Significance of FDI

1. **Technology Transfer**:
   - Enables advanced technologies and capital inputs that cannot be achieved through trade alone.
   - Promotes innovation and enhances production capabilities.
2. **Human Capital Development**:
   - Employees receive specialized training, contributing to skill enhancement in the workforce.
3. **Tax Revenues**:
   - Profits generated by FDI contribute to **corporate tax revenues**, boosting government income.
4. **Balance of Payments (BoP)**:
   - Helps maintain stability in BoP by supporting foreign reserves and the rupee value.
5. **Economic Growth**:
   - FDI catalyzes sectoral growth, particularly in **services**, **IT**, and **manufacturing**.

Government Policies Boosting FDI

1. **Ease of FDI Approvals**:
   - **100% FDI under automatic route** for most sectors, barring strategic ones.
   - 90% of inflows received via the automatic route.
2. **Simplification of Regulations**:
   - Reduction of **42,000 compliances**.
   - Decriminalization of **3,800 provisions** (e.g., **Jan Vishwas (Amendment of Provisions) Act, 2023**).
3. **National Single Window System (NSWS)**:
   - One-stop portal for regulatory approvals and services developed by **DPIIT**.
4. **PLI Schemes**:
   - Incentives for sectors like **electronics**, **pharma**, and **automobiles**, attracting foreign investments.
5. **Infrastructure Modernization**:
   - Initiatives like **PM Gati Shakti Master Plan** streamline logistics and enhance connectivity, boosting investor confidence.

India Skills Report 2025

Syllabus: Economy, Human Resources Development

Context:

The **India Skills Report 2025** emphasizes the country's potential to address global workforce needs, aligning with the theme, **"Global Skills Mobility - India's Decade."**

Key Findings:

1. **Improved Employability:**
   - Over **50% of Indian graduates** are now employable, up from **33% a decade ago**.
2. **Top States in Employability:**
   - **Maharashtra**, followed by **Delhi**, **Karnataka**, and **Andhra Pradesh**.
3. **Cross-Border Mobility Potential:**
   - **USD 500 billion** could be added to the global economy by 2030 through talent mobility, with India as a central player.
4. **Changing Nature of Jobs:**
   - **25% of jobs** will undergo significant changes within the next five years, requiring **future-ready skills**.

Global Talent Ecosystem: Emerging Opportunities

1. **Europe:** Aging population and skill shortages in critical sectors drive demand for international talent.
2. **Gulf Cooperation Council (GCC):** Rising demand in **construction**, **healthcare**, and **IT** sectors.
3. **Workforce Transformation:** Hybrid work models and digital nomadism are reshaping global employment dynamics.

India's Potential in Bridging the Global Demand:

1. **Demographic Advantage:**
   - **65% of India's population** is under 35 years old, contributing **10-12 million entrants annually** to the job market.
2. **IT Industry:**
   - Valued at **USD 245 billion in 2023**, India's IT sector leads in digital transformation talent.
3. **Hybrid Work Models:**
   - Growing adoption allows Indian talent to **contribute globally without geographical constraints**.

Way Forward:

1. **Skill Development:** Expand initiatives like **Skill India** and align training with emerging global demands.
2. **Educational Reforms:** Focus on industry-relevant and **future-ready skills**.
3. **Global Partnerships:** Collaborate with countries facing workforce shortages to facilitate talent mobility.
4. **Promote Digital Nomadism:** Strengthen policies for remote work to maximize India's participation in the global talent pool.

RBI vs Centre: Autonomy and Coordination

Syllabus: Economy
Source: IE

Context:

The Reserve Bank of India (RBI) and the Central Government have often been at odds over policy matters, reflecting broader challenges in balancing monetary autonomy with fiscal accountability. As RBI Governor Shaktikanta Das' term concludes, these tensions remain relevant.

Laws Governing RBI-Centre Relations:

1. **RBI Act, 1934:**
   - **Role:** Defines RBI's responsibilities, including monetary stability and economic development.
   - **Section 7:** Grants the government authority to issue directives to RBI in public interest, a rarely invoked clause that highlights potential friction.
2. **Banking Regulation Act, 1949:**
   - Governs banking operations and empowers RBI to oversee the banking sector.
3. **Public Debt Act, 1944:**
   - Empowers the RBI to manage public debt on behalf of the government.
4. **Monetary Policy Framework Agreement (2016):**
   - Introduced inflation targeting with a 4% ± 2% band.
   - Mandates coordinated efforts between the RBI and government for monetary policy execution.

History of Tensions Between RBI and Centre:

1. **Y.V. Reddy (2003-2008):**
   - Clashed over **forex reserves usage** and loan waiver policies.
   - Disagreed on implementing Tobin tax (tax on foreign currency transactions).
2. **D. Subbarao (2008-2013):**
   - Resisted government's push for **interest rate cuts** during the financial crisis.

- Opposed the creation of Financial Stability and Development Council, arguing it undermined RBI's role.

3. **Raghuram Rajan (2013-2016):**
   - Advocated for RBI independence.
   - Resisted transferring regulatory authority to SEBI and raised concerns over **demonetisation preparation**.
4. **Urjit Patel (2016-2018):**
   - Resigned due to disputes over **surplus reserve transfer** and perceived interference under **Section 7**.

Factors Leading to Tensions:

1. **Monetary Policy Autonomy:**
   - RBI prioritizes inflation control and economic stability, while governments focus on growth and populist measures.
2. **Surplus Reserve Transfers:**
   - Governments demand RBI's reserves to meet fiscal deficits, causing friction over fiscal independence.
3. **Interest Rate Policy:**
   - Government pressures for rate cuts often conflict with RBI's inflation-targeting goals.
4. **Regulatory Disputes:**
   - Tensions over the RBI's control of financial institutions versus government's aspirations to intervene.
5. **Political Divergences:**
   - Short-term political goals often clash with RBI's long-term stability objectives.

Consequences of RBI-Centre Conflicts:

1. **Erosion of Trust:**
   - Weakens public and investor confidence in the RBI's autonomy.
2. **Policy Uncertainty:**
   - Conflicts create ambiguity in economic policymaking.
3. **Economic Instability:**
   - Misalignment of fiscal and monetary policies risks financial imbalances.
4. **Leadership Disruptions:**
   - High-profile resignations, like Urjit Patel's, reflect institutional discord.

Way Ahead to Resolve Issues:

1. **Enhance Dialogue:**
   - Regular consultations to harmonize fiscal and monetary policy goals.
2. **Strengthen Frameworks:**
   - Reinforce the **Monetary Policy Framework Agreement** for clearer role demarcation.
3. **Limit Political Interference:**
   - Avoid invoking Section 7 unless absolutely necessary.
4. **Transparent Decision-Making:**
   - Prioritize data-driven policies and open communication with stakeholders.
5. **Institutional Reforms:**
   - Create a formal dispute resolution mechanism to address conflicts between the RBI and Centre.

Cess and Surcharge

Syllabus: Indian Economy – Fiscal Policy
Source: Recent Discussion in the 16th Finance Commission

Context:

The **Chairman of the 16th Finance Commission** raised concerns regarding the increasing reliance on **cess** and **surcharge** and their implications on federal fiscal relations.

Articles 270 and 271 (Constitution of India):

1. **Article 270:**
   - Provides for the distribution of taxes between the **Union** and **States**.
   - **Cess and surcharge** are **excluded from the divisible pool**, meaning they are **not shared** with states.
2. **Article 271:**
   - Allows Parliament to impose a **surcharge** on central taxes for the Union's exclusive use.

About Cess and Surcharge:

Cess:

1. **Definition:**
   - A **tax earmarked for a specific purpose** but without a direct benefit to the payer.
2. **Examples:**
   - **Health and Education Cess**
   - **Krishi Kalyan Cess**
   - **Clean Environment Cess**
3. **Key Features:**
   - **Purpose-specific:** Collected for targeted welfare projects (e.g., education, health).
   - **Fund Allocation:** Credited to the **Consolidated Fund of India (CFI)** and used only after parliamentary approval.
   - **Duration:** Typically levied until the specific purpose is fulfilled.

Surcharge:

1. **Definition:**
   - An **additional tax on an existing tax**, often levied on higher income slabs or special categories.
2. **Examples:**
   - **Surcharge on Income Tax** for individuals with income exceeding ₹50 lakh.
   - **Corporate Tax Surcharge.**
3. **Key Features:**
   - **No Purpose-Specific Use:** Unlike cess, surcharge revenue can be used for **general purposes**.
   - **Fund Allocation:** Credited to the **Consolidated Fund of India** without any specific earmarking.

Distinction Between Cess and Surcharge:

Aspect	Cess	Surcharge
Purpose	Levied for specific purposes (e.g., education, health).	No specific purpose; general revenue.
Sharing with States	Excluded from divisible pool.	Excluded from divisible pool.
Duration	Temporary (linked to specific goals).	Can be long-term without a fixed timeline.
Levy Authority	Imposed as an additional tax.	Imposed on an existing tax (tax on tax).

Concerns Raised by the Finance Commission:

1. **Exclusion from Divisible Pool:**
   - States lose a significant share of revenue since cess and surcharge are not part of the divisible pool.
2. **Reduced Fiscal Autonomy of States:**
   - Increasing reliance on cess and surcharge reduces states' financial flexibility.
3. **Lack of Transparency:**
   - **Cess funds:** Often remain unutilized or diverted for purposes other than originally intended.
4. **Disproportionate Burden on Taxpayers:**
   - Increases the overall tax burden on individuals and businesses without directly benefitting them.

Way Forward:

1. **Transparency in Usage:**
   - Publish detailed reports on cess and surcharge utilization.
2. **Review by the Finance Commission:**
   - Include cess and surcharge proceeds in the **divisible pool** or compensate states through other fiscal transfers.
3. **Purpose-Limited Levies:**
   - Restrict the use of cess to its original purpose and discontinue when the goal is met.
4. **Strengthen Fiscal Federalism:**
   - Ensure a **balanced allocation of resources** between the Union and the States for effective governance.

Parliamentary Committee Report on MGNREGS

Syllabus: Welfare Schemes

Context

The Parliamentary Standing Committee on Rural Development and Panchayati Raj highlighted key challenges and reforms for the **Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS)** to address issues like **low wages**, **regional wage disparities**, and **payment delays**.

Key Issues Highlighted

1. **Wage-Related Issues:**
   - **Low Wages**: Current wage rates are below minimum wages in most states.
   - **Disparity in Wages**: Significant differences in MGNREGA wages across states and UTs.
2. **Payment-Related Issues:**
   - **Delayed Payments**: Lack of timely fund disbursal affects workers' livelihood.
   - **Unpaid Allowances**: States often fail to provide unemployment allowances and delay compensation.
3. **Technological Barriers:**
   - **Internet and Smartphone Dependency**: Leads to the exclusion of workers, especially in remote areas.
   - **Poor Connectivity**: Delays in real-time monitoring and wage payments.
4. **Social Audit Irregularities:**
   - **Underutilization**: Only 14% of planned Gram Panchayats conducted social audits in 2020-21.
   - **Lack of Accountability**: Weak enforcement of audit recommendations.

Key Recommendations of the Committee

1. **Revision of Wage Rates:**
   - **Inflation-Linked Wages**: Link wages to an appropriate index to reflect inflationary trends.
   - **Parity in Wages Across States**: Article 39(d) should be adhered to ensure equal pay for equal work across all regions.
2. **Increase in Guaranteed Workdays:**
   - **From 100 to 150 Days**: To meet the increasing demand for work and create durable assets in rural areas.
3. **Timely Payments:**
   - **Financial Management**: Streamline wage disbursal processes to ensure timely payments.
   - **Fund Allocation**: Address fund shortages for material and wage components.
4. **Social Audit Strengthening:**
   - **Regular Audits**: Ensure compliance with the Social Audit Guidelines by Gram Panchayats.
   - **Capacity Building**: Train local bodies to conduct effective audits.
5. **Inclusion of Technology:**
   - **Connectivity Infrastructure**: Improve internet facilities in rural areas.
   - **Beneficiary Access**: Simplify the use of digital tools for marginalized workers.

About MGNREGS

1. **Launch Year:** 2005
2. **Ministry:** Ministry of Rural Development
3. **Type:** Centrally Sponsored Scheme
4. **Objective:**
   - Provide **100 days of wage employment** annually to adult rural members willing to undertake unskilled manual work.
   - Focus on **livelihood security** and **durable asset creation** in rural areas.
5. **Coverage:** Entire country except districts with 100% urban population.

Significance of MGNREGS

1. **Employment Generation:** Supports rural households, reducing distress migration.
2. **Women Empowerment:** Approximately 50% of beneficiaries are women.
3. **Social Security:** Acts as a safety net for marginalized communities during economic crises.
4. **Asset Creation:** Enhances rural infrastructure, including water conservation and road connectivity.

Challenges with MGNREGS

1. **Resource Allocation:**
   - Inadequate budgetary support affects smooth implementation.
2. **Corruption and Leakages:**
   - Ghost beneficiaries and mismanagement of funds.
3. **Monitoring Deficiency:**
   - Weak tracking of outcomes and fund utilization.
4. **Exclusion Errors:**
   - Vulnerable households often excluded due to poor awareness or procedural barriers.

Way Forward

1. **Enhance Budgetary Allocation:**
   - Increase funding to address wage revisions and material shortages.
2. **Focus on Regional Parity:**
   - Implement uniform wage structures across states to reduce disparities.

3. **Leverage Technology:**
    - Integrate **real-time monitoring systems** for fund tracking and process transparency.
4. **Strengthen Social Audits:**
    - Institutionalize community participation and enforce compliance with audit findings.
5. **Policy Adjustments:**
    - Increase guaranteed workdays to align with rising rural employment demand.

Report on Insolvency and Bankruptcy Code (IBC)

Syllabus: Economy - Financial Reforms and Regulation

Context

The Standing Committee on Finance highlighted the progress of the **Insolvency and Bankruptcy Code (IBC), 2016** in resolving distressed corporate assets and improving credit discipline but noted persistent challenges. The report suggests critical reforms to strengthen IBC's efficiency and effectiveness.

Key Issues Highlighted by the Committee

1. **Resolution Professionals (RPs)**:
    - Concerns over competence, conduct, and accountability.
2. **Government Claims**:
    - Ambiguity in the treatment of claims from government creditors like taxes and penalties.
3. **Delays in Adjudication**:
    - Long waiting periods at the National Company Law Tribunal (NCLT).
    - About 64% of Corporate Insolvency Resolution Processes (CIRPs) exceeded the **statutory 330-day limit**.
4. **Stakeholder Representation**:
    - Lack of clarity in stakeholder engagement during resolution processes.

Recommendations of the Committee

1. **Fast-Track Tribunals**:
    - Establish specialized tribunals with strict timelines for high-priority cases.
    - Adopt **urgent list systems** for time-sensitive matters.
2. **Timelines for Applications**:
    - Introduce provisions akin to **Article 226(3)** of the Constitution, mandating the processing of applications within **14 days**.
3. **Public-Private Partnerships (PPP)**:
    - Improve efficiency of judicial processes through models inspired by **Seva Kendras**.
4. **Specialized Expertise for NCLT Members**:
    - Ensure members have specialized knowledge, as recommended by the Supreme Court in the **Finolex Industries case**.
5. **Government Dues**:
    - Formulate clear guidelines on how to address government claims such as taxes and penalties.

About the Insolvency and Bankruptcy Code (IBC), 2016

Purpose

- Facilitates the time-bound resolution of distressed corporate assets.
- Balances interests of all stakeholders while promoting entrepreneurship and availability of credit.

Four Pillars of IBC

1. **Insolvency Professionals (IPs)**:
    - Manage the insolvency and liquidation process.
2. **Information Utilities (IUs)**:
    - Maintain data on lenders, debt, and terms of credit.
3. **Adjudicating Authorities (AAs)**:
    - **NCLT**: Handles corporate insolvency.
    - **Debt Recovery Tribunal (DRT)**: Handles individual insolvency.
4. **Insolvency and Bankruptcy Board of India (IBBI)**:
    - Regulates professionals and processes under the IBC.

Bima Sakhi Yojana: Empowering Women through Financial Inclusion

Syllabus: Governance, Social Justice, Economic Development

About Bima Sakhi Yojana

- **Initiative by:** Life Insurance Corporation of India (LIC).
- **Objective:**
  - **Empower women economically** by training them as LIC agents.
  - Promote **financial literacy and insurance awareness**.
- **Eligibility Criteria:**
  - **Age:** 18–70 years.
  - **Education:** Minimum Class X pass.
- **Key Features:**
  - **Training and Stipend:** Specialized training for women with a **stipend for three years**.
  - **Employment Opportunities:** Women can serve as **LIC agents** with potential growth to Development Officers.
  - **Insurance Access:** Expands awareness of **affordable insurance products**.
  - **Economic Independence:** Provides **sustainable livelihoods** with additional income.

Significance of the Scheme

- **Financial Inclusion:**
  - Extends **insurance and banking services** to rural and underserved areas.
- **Economic Empowerment:**
  - Enables women to earn approximately ₹1.75 lakh annually.
  - Fosters **economic self-reliance** for women.
- **Social Transformation:**
  - Reduces **gender disparity** in financial decision-making.
  - Strengthens the role of women in **economic ecosystems**.
- **National Vision Alignment:**
  - Supports **India's vision of becoming a developed nation** by 2047.
  - Leverages **women's participation** in economic growth.

Potential Impact

- **On Women:**
  - Enhances **financial literacy** and self-employment opportunities.
  - Improves access to **insurance and credit facilities**.
- **On Communities:**
  - Facilitates **insurance outreach** in underserved areas.
  - Promotes **community-driven financial ecosystems**.
- **On Economy:**
  - Boosts **insurance penetration**, contributing to financial sector growth.
  - Enhances **human capital development** by involving women in economic activities.

AGRICULTURE

India Expands the World's Largest Grain Storage Plan in the Cooperative Sector

Syllabus: Agriculture, Infrastructure, and Food Security

Context

The Indian government has expanded its **World's Largest Grain Storage Plan in the Cooperative Sector**, following the successful pilot phase where **storage units with a capacity of 9,750 metric tonnes** were constructed in **Primary Agricultural Credit Societies (PACS)** across 11 states. Over **500 additional PACS** have been identified for further infrastructure enhancement.

About the Grain Storage Plan

Ministry: Ministry of Cooperation

Purpose:

- Establish **decentralized storage facilities** at PACS level.
- Integrate **other agricultural infrastructure** like warehouses, processing units, and cold storage.

Implementation:

- Convergence of existing schemes like:
  - **Agriculture Infrastructure Fund**.
  - **Agricultural Marketing Infrastructure Scheme**.
- Implementing Agencies:
  - **National Cooperative Development Corporation (NCDC)**.
  - **NABARD**.
  - **Food Corporation of India (FCI)**.
  - **Central Warehousing Corporation (CWC)**.

Benefits to PACS:

- Avail **subsidies and interest subvention** for building agri-infrastructure.
- Empower grassroots-level cooperatives to manage food security.

Significance of the Initiative

1. Food Security:

- Reduces **food grain wastage** by addressing storage capacity gaps.
- Example: In **2021**, India produced **311 million metric tonnes (MMT)** of food grains, but storage capacity was **145 MMT**, leaving a **47% shortfall**.

2. Access to Credit: Farmers can store produce at PACS-level godowns and avail **bridge financing** for the next crop cycle.

3. Income Security:

- Enables farmers to:
  - Store grains and sell when **market prices improve**.
  - Sell to PACS at **Minimum Support Price (MSP)** for guaranteed returns.

4. Decentralized Infrastructure: Decentralized storage reduces the **burden on central warehouses** and improves accessibility for remote farming communities.

5. Rural Employment: Promotes rural job creation through infrastructure development.

Other Initiatives for Strengthening Storage Capacity

1. **National Cold Chain Development Scheme (NCCD):** Focuses on **cold storage infrastructure** for perishable commodities.

2. **Grameen Bhandaran Yojana:** Provides **subsidies for rural godown construction**, addressing village-level storage needs.
3. **Private Entrepreneur Guarantee (PEG) Scheme:** Incentivizes private sector participation in building warehouses.
4. **PM Kisan Sampada Yojana:** Supports **food processing and agri-logistics**, reducing post-harvest losses.

Challenges in Storage Infrastructure

- **Storage Gap**: India's storage capacity has not kept pace with rising agricultural output.
- **Inefficient Utilization**: Limited adoption of advanced storage technologies.
- **Post-Harvest Losses**: Significant losses due to inadequate storage, particularly for perishables.

Way Forward

1. **Expand Decentralized Infrastructure:** Scale PACS-level storage facilities to **all states and Union Territories**.
2. **Modernize Storage Facilities:** Introduce **smart warehousing technologies**, such as temperature and humidity controls.
3. **Enhance Farmer Awareness:** Educate farmers about **benefits of storage and credit access**.
4. **Public-Private Partnerships:** Involve private entities to bridge infrastructure and operational gaps.
5. **Monitor and Evaluate:** Establish a **real-time monitoring system** to ensure transparency and efficiency.

India Achieves Landmark Milestone in Advancing Digital Public Infrastructure (DPI) under the Digital Agriculture Mission

Key Developments

- **Gujarat**: First state to generate **Farmer IDs** for 25% of targeted farmers.
- Other states like **Madhya Pradesh (9%)**, **Maharashtra (2%)**, and **Uttar Pradesh**, **Assam**, **Chhattisgarh**, **Odisha**, and **Rajasthan** have initiated the process.

About the Farmer ID

- **Definition**: A **unique digital identity** for farmers, based on **Aadhaar**, dynamically linked to the State's land records system.
- **Automatic Updates**: Farmer ID updates automatically with changes in an individual's land record details.

Benefits of Farmer ID:

1. **Simplified Scheme Access**: Seamless entry into government schemes.
2. **Streamlined Credit**: Contactless crop loans processed within an hour.
3. **Personalised Services**: Tailored agricultural extension services.
4. **Transparent Transfers**: Ensures direct and efficient benefit transfers.
5. **Market Connectivity**: Enhances access to markets and financial inclusion.

This initiative is a significant component of the **'Agri Stack initiative,'** enabling a **standards-driven digital agriculture ecosystem.**

About Digital Agriculture Mission (DAM)

Objective: Umbrella scheme to support **digital agriculture initiatives** across states.

Key Components:

1. **Digital Public Infrastructure (DPI)**:
   - Establishes foundational systems like **Farmers' Registry** and **Crop Sown Registry**.
   - Implements **Digital General Crop Estimation Survey (DGCES)** to standardize data collection.
2. **Agri Stack**:
   - Comprises:
     - **Farmers' Registry**: Centralized database for unique Farmer IDs.
     - **Geo-referenced village maps**.
     - **Crop Sown Registry**: Real-time crop information.
3. **Krishi Decision Support System (Krishi-DSS)**:
   - Integrates **remote sensing data** with geospatial tools.
   - Provides **real-time information** to assist decision-making in agriculture.

Significance of Farmer ID and Digital Agriculture Mission

- **Enhanced Efficiency**: Reduces time, paperwork, and inefficiencies in service delivery.
- **Financial Inclusion**: Provides tailored credit and insurance products.
- **Data-Driven Agriculture**: Enables precise decision-making with real-time crop data.

- **Economic Growth**: Supports a sustainable and inclusive agricultural economy.

Soil: A Pillar of Agriculture

Context

The **10th World Soil Day**, themed *"Caring for Soils – Measure, Monitor, and Manage,"* highlighted the critical role of soil health in food production and sustainable agriculture. However, the current status of India's soil underscores challenges in maintaining fertility and ensuring agricultural productivity.

Present Status of Soil in India

Aspect	Details
Topsoil Importance	95% of food production depends on topsoil, which takes 1,000 years to regenerate.
Nitrogen Deficiency	Less than 5% of Indian soils are high in nitrogen.
Phosphate Sufficiency	Only 40% of Indian soils have adequate phosphate.
Potash Sufficiency	Only 32% of Indian soils have sufficient potash.
Organic Carbon	Only 20% of Indian soils are sufficient in organic carbon.
Fertilizer Subsidy	Urea accounts for two-thirds of the ₹1.88 lakh crore subsidy; globally cheapest at ~$70/tonne.
Imbalanced Fertilizer Use	Punjab uses 61% more nitrogen and 89% less potash than recommended.

Factors Impacting Soil Health

1. **Erosion**:
   - **Water Erosion**: Affects over **94 million hectares** due to heavy rainfall and poor land management.
   - **Wind Erosion**: Impacts **9 million hectares** in arid zones like Rajasthan and Gujarat.
2. **Salinity**:
   - Caused by improper irrigation practices, affecting coastal and irrigated areas.
3. **Chemical Overuse**:
   - Excessive use of urea causes nutrient imbalance and soil acidification.
4. **Deforestation**:
   - Removal of vegetation increases susceptibility to erosion.

Regional Variations in Soil Degradation

Region	Major Issues
Arid Regions	Severe wind erosion and desertification (e.g., Rajasthan).
Flood-Prone Areas	Erosion due to recurrent floods (e.g., Bihar, Assam).
Coastal Zones	Salinity ingress affects fertility (e.g., Odisha, Tamil Nadu).
Hilly Areas	Landslides and erosion caused by deforestation (e.g., Uttarakhand).
Semi-Arid Zones	Overgrazing and drought-induced degradation (e.g., Telangana, Maharashtra).

Effects of Soil Degradation

1. **Land Degradation**: Reduces agricultural productivity.
2. **Desertification**: Accelerates drought and biodiversity loss.
3. **Loss of Arable Land**: 40% of agricultural land globally is unproductive.
4. **Increased Flooding**: Reduced soil absorption increases runoff.
5. **Waterway Pollution**: Fertilizer runoff harms aquatic ecosystems.

Challenges in the Fertilizer Sector

1. **Imbalanced Use**: Overuse of nitrogen and underuse of phosphate and potash.
2. **Low Nutrient Use Efficiency**: Only 35–40% of applied fertilizers benefit crops.
3. **Subsidy Dependence**: Hampers innovation and efficiency.
4. **Leakage and Misuse**: Urea is diverted for non-agricultural uses.
5. **Environmental Impact**: Excess nitrogen emissions worsen global warming.

Government Initiatives to Address Soil Degradation

1. **Soil Health Card Scheme**: Provides farmers with soil nutrient profiles for balanced fertilizer use.
2. **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)**: Promotes efficient irrigation to reduce erosion.
3. **National Mission for Sustainable Agriculture (NMSA)**: Encourages organic farming and conservation.
4. **Watershed Management Programs**: Restores degraded lands.
5. **Afforestation Drives**: Restores soil cover to prevent erosion.

Reforms Needed

1. **Subsidy Deregulation**: Replace price controls with **direct income transfers** via digital coupons.
2. **Balanced Fertilizer Use**: Promote education and incentives for appropriate use of **N, P, and K** fertilizers.
3. **Focus on Micronutrients**: Emphasize micronutrient availability to improve productivity.
4. **Triangulated Data Use**: Integrate **soil health cards, fertilizer sales**, and farmer data for targeted interventions.
5. **Encourage Innovation**: Deregulate the fertilizer industry to attract private investments.

GI Tag Products

Syllabus: Indian Economy - Agriculture, Trade, and Cultural Heritage

Context: Ashtalakshmi 2024 showcased the North East region's **GI-tagged products**, reflecting its **unique cultural and agricultural traditions**.

Key Products in News:

Product	State	Speciality
Adi Kekir Ginger	Arunachal Pradesh	Medicinal ginger from Dibang Valley; aids digestion and menstrual pain relief.
Wakro Orange	Arunachal Pradesh	High nutritional value; grown traditionally.
Monpa Maize	Arunachal Pradesh	Nutrient-rich, showcasing Monpa tribe's agricultural practices.
Dalle Khursani	Sikkim	Fiery chili used in pickles; valued for pungency and medicinal benefits.
Naga King Chili	Nagaland	Among the hottest chilies worldwide; integral to **Naga cuisine**.
Chak Hao Rice	Nagaland	Aromatic black rice; rich in nutrients and agricultural diversity.
Kaji Nimu	Assam	Large, tangy lemon variety with a unique aroma.
Joha Rice	Assam	Aromatic rice reflecting Assamese agricultural traditions.

Significance of GI-Tagged Products:

1. **Cultural Heritage Preservation**: Protects the **identity of traditional products** and promotes cultural pride.
2. **Economic Boost**: Enhances market value and supports **local communities' livelihoods**.
3. **Global Visibility**: Promotes India's **diverse heritage** in global markets.
4. **Sustainability**: Encourages **eco-friendly and traditional practices**.
5. **Tourism Growth**: Fosters interest in **regional and cultural tourism**.

Global Status of Salt-Affected Soils Report

Syllabus: Environment and Agriculture

Context

The **FAO's Global Status of Salt-Affected Soils** report highlights the increasing threat of salinization and sodification, which reduce soil fertility and impact agricultural productivity globally.

About Salt-Affected Soils

- **Saline Soils**: Contain excessive soluble salts, leading to high **electrical conductivity (EC)**, which hinders plant growth.
- **Sodic Soils**: Contain high **exchangeable sodium ions**, affecting soil structure and permeability.

Factors Contributing to Soil Salinization and Sodification

Anthropogenic Factors

1. **Agricultural Mismanagement**:
   - Overuse of fertilizers.
   - Use of saline groundwater for irrigation.
   - Inadequate drainage systems.
2. **Deforestation**:
   - Loss of deep-rooted vegetation leads to **dryland salinization**.
3. **Excessive Water Extraction**:
   - Overpumping in coastal areas results in seawater intrusion.
4. **Mining Activities**:
   - Soil exposure to salts through excavation processes.

Natural Factors

1. **Climate Crisis**:
   - Increasing aridity and desertification.
2. **Permafrost Thawing**:
   - Releases salts trapped in frozen soils.

Key Findings of the Report

Global

1. **Land Coverage**:
   - Salt-affected soils span ~10% of global land (~1.4 billion ha).
   - Estimated increase to 24-32% due to human activities and climate change.
2. **Most Affected Countries**:
   - **Australia**: Largest area affected.
   - **Oman**: Highest percentage of salt-affected land.

India Specific

1. **Extent of Salt-Affected Soils**:
   - ~6.72 million ha (~2.1% of total geographic area).
   - ~17% of irrigated agricultural land impacted due to brackish water usage.
2. **State-Wise Impact**:
   - **Gujarat**: Most affected state (area-wise).
   - Followed by **Uttar Pradesh, Maharashtra, West Bengal, and Rajasthan**.

Sustainable Management Practices

1. **Mitigation Efforts**:
   - **Mulching**: Reduces evaporation and salt accumulation.
   - **Drainage Improvements**: Removes excess salts from the soil profile.
2. **Adaptation Strategies**:
   - **Breeding Salt-Tolerant Crops**: Enhances agricultural resilience.
   - **Water Management**: Efficient irrigation techniques like **drip irrigation**.
3. **Bioremediation**:
   - Use of salt-tolerant microorganisms to reduce soil salinity.
4. **Afforestation**:
   - Planting salt-tolerant trees to stabilize soils and improve fertility.

ETHICS, SOCIETY & SOCIAL ISSUES

Cyber Slavery

Syllabus: Internal Security and Ethical Issues

Context

The Tamil Nadu Crime Branch CID and Protector of Emigrants (POE), Chennai, recently thwarted an attempt to traffic three youths to Cambodia for **cyber slavery**, exposing a modern form of human exploitation tied to **online fraud networks**.

What is Cyber Slavery?

1. **Definition**:
   - Cyber slavery involves the **trafficking** and coercion of individuals into participating in **online scams**, fraudulent schemes, or cybercrimes under the control of **organized criminal syndicates**.
2. **Characteristics**:
   - **False Job Promises**: Victims are deceived with high-paying job offers, often in foreign countries.
   - **Cross-Border Trafficking**: Victims are illegally transported to countries with weak oversight or where criminal syndicates operate.
   - **Duress**: Victims face threats, violence, or restrictions on movement, forcing them to carry out cybercrimes.
   - **Vulnerable Targets**: Youth, low-income individuals, and those seeking overseas jobs are most susceptible.

Emerging Threat

1. **Global Expansion**:
   - The growth of digital platforms and **global connectivity** has allowed criminal networks to exploit cyberspace for **human trafficking**.
2. **Role of Criminal Syndicates**:
   - These syndicates operate out of **cyber hubs** in countries like **Cambodia, Myanmar, and Laos**, leveraging weak regulatory systems.
3. **Types of Exploitation**:
   - **Phishing Scams**: Tricking people into revealing sensitive information.
   - **Online Romance Fraud**: Extracting money under false pretenses.
   - **Investment Frauds**: Duping victims into fake schemes or crypto investments.

Impact of Cyber Slavery

1. **Victims**:
   - **Physical and Psychological Trauma**: Many victims face abuse and isolation.
   - **Legal Repercussions**: Victims may be criminalized in foreign countries for participating in illegal activities.
2. **Society**:
   - **Trust Erosion**: Cyber scams diminish public trust in online systems.
   - **Economic Loss**: Fraudulent activities drain resources and hurt financial ecosystems.
3. **Global Security**:
   - Strengthens **transnational crime networks**, undermining international law enforcement efforts.

Measures to Combat Cyber Slavery

1. **Legal and Policy Frameworks**:
   - **National Efforts**: Stricter checks on overseas recruitment agencies.
   - **Global Collaboration**: Partnerships between countries to tackle cyber trafficking.
2. **Technological Surveillance**:
   - Monitor online job portals and **flag suspicious recruitment patterns**.
3. **Awareness Campaigns**:
   - Educate the public, especially youth, on the risks of **overseas job frauds**.
4. **Victim Rehabilitation**:
   - Provide legal, psychological, and financial support to rescued victims.

Case Study: Tamil Nadu Rescue

The **Tamil Nadu Crime Branch CID** thwarted a trafficking attempt, showcasing the importance of vigilance in monitoring international job placements and **swift coordination** between **law enforcement and emigrant protection agencies**.

Way Forward

1. **Stronger Enforcement**:
   - Strengthen **anti-trafficking laws** and ensure strict penalties for cyber slavery networks.
2. **International Cooperation**:
   - Collaborate with **Interpol** and **cybercrime task forces** for intelligence sharing.
3. **Digital Literacy**:
   - Promote awareness of online job scams and **safe practices** for seeking overseas employment.
4. **Victim-Centric Policies**:
   - Shift focus to **rescue, rehabilitation, and reintegration** of victims into society.

Non-Implementation of Manual Scavenging Judgment

Syllabus: Social Justice – Vulnerable Sections, Judiciary and Government Policies
Source: Supreme Court Judgement

Context:

The Supreme Court (SC) expressed concerns over the Union and States' failure to implement its October 2023 judgment in the **Dr. Balram Singh v. Union of India** case, which mandated the eradication of manual scavenging and hazardous cleaning practices across the country. Despite schemes like **NAMASTE**, the ground reality remains unchanged.

About Manual Scavenging:

1. **Definition:**
   - Manual scavenging refers to the **cleaning, handling, or carrying of human excreta** from insanitary latrines, open drains, pits, or railway tracks.
2. **Current Status:**
   - As of 2021: **58,098 manual scavengers**, with **75% being women**.
   - **Fatalities:** Between 2018-2022, **339 deaths** occurred during sewer and septic tank cleaning.
3. **Constitutional Violation:**
   - **Article 17:** Abolition of untouchability.
   - **Article 21:** Right to life with dignity.

Key SC Directions in Dr. Balram Singh v. Union of India:

1. **Increased Compensation for Sewer Deaths:**
   - From ₹10 lakh to **₹30 lakh** for fatalities.
2. **Compensation for Disabilities:**
   - **₹20 lakh** for permanent disablement.
   - **₹10 lakh** for other disablements.
3. **Rehabilitation of Victims:**
   - **Scholarships** and **skill development programs** for affected individuals and families.
4. **Eradication Measures:**
   - Mechanized cleaning to eliminate manual scavenging.
   - Strict compliance with laws prohibiting hazardous cleaning.

Legal Framework:

1. **Prohibition of Employment as Manual Scavengers and Their Rehabilitation Act, 2013:**
   - **Prohibits:** Manual scavenging practices.
   - **Exceptions:** Cleaning excreta with **protective gear** is not considered manual scavenging.
   - **Penalty:** Up to **2 years imprisonment** or a fine of ₹1 lakh, or both.
2. **NAMASTE Scheme (2022-2026):**
   - **Nodal Ministries:**
     - Ministry of Social Justice and Empowerment (MoSJE).
     - Ministry of Housing and Urban Affairs (MoHUA).
   - **Purpose:**
     - Eradicate hazardous cleaning practices.
     - Ensure safety and dignity of sewer and septic tank workers.

- **Implementing Agency:**
  - National Safai Karamchari Financial Development Corporation (NSKFDC).

Challenges in Eradication:

1. **Implementation Deficit:**
   - Lack of **mechanization** in cleaning systems.
   - Poor **execution of NAMASTE Scheme**.
2. **Inadequate Compensation:**
   - Delay or denial of mandated compensation to victims' families.
3. **Social Stigma:**
   - Deep-rooted caste-based discrimination perpetuates manual scavenging.
4. **Lack of Rehabilitation:**
   - Limited access to **alternate livelihood opportunities** for affected individuals.

Way Forward:

1. **Strict Implementation of SC Directives:**
   - Ensure **time-bound disbursement** of compensation and rehabilitation measures.
2. **Mechanization of Cleaning Systems:**
   - Scale up the use of **technology and mechanized tools** to eliminate manual cleaning.
3. **Awareness and Advocacy:**
   - Conduct campaigns to end the **stigma** and promote **inclusivity**.
4. **Strengthening NAMASTE:**
   - Expand the scheme's reach and allocate **adequate resources** for effective implementation.
5. **Enhanced Monitoring:**
   - Establish dedicated cells to **monitor compliance** and ensure accountability.

Conclusion:

The persistence of manual scavenging highlights systemic gaps in policy implementation and social attitudes. Strict adherence to SC guidelines and robust government action are essential to **eradicate manual scavenging** and uphold the dignity of vulnerable communities.

Permanent Commission to a Woman Army Officer

Syllabus: Governance and Social Justice
Source: Indian Judiciary

Context:

The **Supreme Court (SC)**, under **Article 142** of the Constitution, has granted a **permanent commission** to a woman Army officer, Lt. Col. Suprita Chandel, in the case **Lt. Col. Suprita Chandel vs. Union of India & Ors.**

Background of the Case:

1. **Policy Amendment (2013):**
   - The Army amended its policy to allow permanent commissions to eligible officers.
   - Relief was granted to some officers by the Armed Forces Tribunal through age relaxation.
2. **Denial of Benefit:**
   - The appellant was denied similar relief as she was not a party in the original case.
3. **SC's Rationale:**
   - Reliefs granted to similarly situated individuals must be **automatically extended** to those who did not litigate but share the same conditions.
   - The Court cited **Amrit Lal Berry (1975)** and **K.I. Shephard (1987)** cases to reinforce this principle.

Supreme Court Verdict (2024):

1. **Equal Treatment:** SC held that denying permanent commission solely on procedural grounds was unjust.
2. **Directive:** Ordered the Army to grant permanent commission to the appellant under **Article 142** of the Constitution.

Permanent Commission to Women in the Army:

1. **Entry of Women (1992):**
   - Women were allowed to join certain cadres like the **Short Service Commission (SSC)** in non-combat roles.

2. **Prior Restrictions:**
    - Women served under **SSC** for 10+4 years and were excluded from command positions and permanent commissions.
3. **Landmark SC Judgment (2020):**
    - In the **Babita Puniya & Ors. vs. Union of India** case, the SC mandated granting **permanent commissions** and access to **command roles** for women in the Army.
    - Held denial of permanent commissions as a violation of **Article 14 (Right to Equality)**.

About Article 142 of the Constitution:

1. **Complete Justice Provision:** Grants SC the power to pass decrees or orders necessary to do **complete justice** in any case pending before it.
2. **Enforceability:** These orders are enforceable across India unless overridden by a Parliamentary law or a Presidential order.

Significance of the Verdict:

1. **Gender Equality:**
    - Strengthens **women's rights** in the armed forces, ensuring parity with male counterparts.
2. **Judicial Activism:**
    - Demonstrates the SC's role in upholding constitutional values like **equality and justice.**
3. **Institutional Change:**
    - Encourages gender inclusivity in hierarchical and traditionally male-dominated institutions like the Army.

Growing Calls for 'Right to Disconnect' in India

Syllabus: Governance and Social Justice – Labour Welfare

Context:

The death of a young employee due to work stress has reignited debates around the need for a **'Right to Disconnect' law in India**, aiming to ensure work-life balance and safeguard mental and physical health.

What is 'Right to Disconnect'?

- Refers to an employee's **right to ignore work-related communications (calls, emails, etc.) outside official work hours** without fear of disciplinary action.
- Focuses on maintaining a **boundary between professional and personal life.**

Need for 'Right to Disconnect' in India:

1. **Psychological and Social Impacts:**
    - **Mental health risks:** Prolonged work hours contribute to **stress, anxiety, and burnout.**
    - **Weakened social bonds:** Constant connectivity reduces time spent with family and friends, leading to **isolation.**
2. **Impact on Women:**
    - A recent report shows **Indian women** in professions like auditing, IT, and media work over **55 hours per week,** worsening work-life imbalance.
3. **Health Concerns:**
    - **Sleep disruptions:** Continuous screen time and after-hours communication contribute to **insomnia** and disturbed circadian rhythms.
    - **Cardiovascular diseases:** Increased stress levels elevate risks of **hypertension and heart-related issues.**
4. **Economic and Productivity Loss:**
    - **Decreased productivity:** Overworking reduces efficiency and creativity in the long run.

Current Status of the 'Right to Disconnect' in India:

1. **Absence of Legislation:**
    - No specific law recognizing the right to disconnect exists in India.
2. **Constitutional Provisions:**
    - **Article 38:** Directs the State to secure **social welfare** for the well-being of people.
    - **Article 39(e):** Safeguards **health and strength of workers.**
3. **Judicial Precedents:**
    - **Vishakha v. State of Rajasthan (1997):** Advocated for a **safe working environment** for women.
    - **Ravindra Kumar Dhariwal v. UoI (2021):** Stressed accommodating persons with **disabilities** for equitable workplace participation.
4. **Legislative Initiatives:**
    - A **Private Member's Bill (2018)** was introduced in the Lok Sabha to formalize the right to disconnect but hasn't progressed.

Global Practices on 'Right to Disconnect':

1. **France:** In 2001, the **Labour Chamber of the French Supreme Court** ruled that employees are **not obligated to work from home** or respond to communications post working hours.
2. **Portugal:** Passed a law making it **illegal for employers to contact employees** outside working hours, except during emergencies.
3. **Spain:** Recognized the right for **public workers and employees** to disconnect from work devices after hours.
4. **Australia:** Employees have a **statutory right** to disconnect from work outside official hours.

Way Forward for India:

1. **Legislative Framework:**
   - Introduce a **national-level law** recognizing the right to disconnect, addressing **private and public sectors.**
2. **Workplace Guidelines:**
   - Enforce **work hour limits** and **no-contact periods** as part of employment contracts.
3. **Technology Solutions:**
   - Implement **auto-reply features** for work emails and messaging services after work hours.
4. **Awareness Campaigns:**
   - Promote the **importance of work-life balance** among employers and employees.
5. **Role of Employers:**
   - Create **employee-friendly policies** prioritizing mental health and personal time.

GEOGRAPHY AND DISASTER MANAGEMENT

La Niña

Syllabus: Geography (Climatology)
Source: Recent WMO Observations

Context:

The **World Meteorological Organization (WMO)** reported that weak and short-lived **La Niña conditions** might develop during the **December-to-February** period.

About La Niña:

1. **Definition:**
   - **La Niña** is a climatic phenomenon associated with the **cooling** of sea surface temperatures in the **central and east-central equatorial Pacific Ocean**.
2. **Phase of ENSO:**
   - It is one of the three phases of the **El Niño Southern Oscillation (ENSO)** cycle:
     - **El Niño:** Warmer ocean temperatures.
     - **La Niña:** Cooler ocean temperatures.
     - **Neutral:** Neither significant warming nor cooling.
3. **Frequency:**
   - Occurs every **3 to 5 years**, though intervals can vary.
4. **Key Mechanism During La Niña:**
   - **Trade Winds:** Strengthen, pushing warm water westward toward **Asia**.
   - **Upwelling:** Increased upwelling off the **west coast of the Americas**, bringing **cold, nutrient-rich water** to the surface.

Impact of La Niña:

Global Impacts:

1. **Weather Patterns:**
   - **Asia:** Enhanced rainfall in **India**, **Indonesia**, and **Australia**.
   - **Americas:** Drier conditions in **southern U.S.** and **South America**.
   - **Africa:** Can result in wetter conditions in some parts of East Africa.
2. **Natural Disasters:**
   - Increased risk of **floods** and **cyclones** in certain regions (e.g., **India, Southeast Asia**).

    - Droughts in areas like **South America** and **southern U.S.**
3. **Ecosystems:**
    - Changes in **marine ecosystems** due to nutrient-rich waters from upwelling.
    - Potential stress on terrestrial ecosystems due to weather extremes.
4. **Economic Impact:**
    - Affects **agriculture** due to variability in rainfall.
    - Impacts **energy demand**, particularly for heating or cooling, depending on the region.

Impact on India:

1. **Monsoon:** Typically strengthens the **Indian monsoon**, leading to **above-normal rainfall**.
2. **Agriculture:** Favors crop yields dependent on robust monsoons (e.g., **rice**, **sugarcane**, **cotton**).
3. **Disaster Risk:** Increases risk of **flooding** and **waterlogging**, especially in areas with poor drainage.

Significance of Monitoring La Niña:

1. **Weather Predictions:** Helps governments and farmers plan for **floods**, **droughts**, and **agricultural output**.
2. **Disaster Preparedness:** Supports disaster mitigation efforts.
3. **Global Climate Understanding:** Contributes to long-term climate research and adaptation strategies.

Salar de Uyuni: The World's Largest Salt Flat and its Significance

Syllabus: Geography – Resources and their Distribution

Introduction

Salar de Uyuni in Bolivia, the world’s largest salt flat, is a geological marvel and a crucial resource in the global energy transition due to its vast lithium reserves. Located in the 'lithium triangle' of South America, this unique landscape has both ecological and economic significance.

What is Salar de Uyuni?

- **Area:** Spanning 10,582 square kilometers, it is the largest salt flat on Earth.
- **Elevation:** Situated at an altitude of 3,656 meters above sea level in the Andes Mountains.
- **Location:** Found in the Daniel Campos Province of Potosí, southwest Bolivia.

Formation of Salt Flats

- Formed from prehistoric lakes like **Lake Minchin**, which existed around **40,000 years ago** but gradually evaporated.
- As water disappeared, minerals like **salt** were deposited over time.
- The **flat and smooth surface** is due to the deposition of mineral salts in uniform layers.

Special Features of Salar de Uyuni

- **Flatness:** It is one of the flattest surfaces on Earth, with elevation variations of less than one meter.
- **Mirror Effect:** During the rainy season, the thin layer of water on the surface creates a **giant mirror**, reflecting the sky.
- **Scientific Importance:** The flat surface is used to **calibrate satellite altimeters** for Earth observation missions.
- **Tourism Hub:** Known for its surreal beauty, it attracts tourists from around the world.

Global Importance

Lithium Reserves

- **Lithium Triangle:** Salar de Uyuni, along with **Salar de Atacama (Chile)** and **Salinas Grandes (Argentina)**, forms the world's largest lithium reserve region.
- **Energy Transition:** Lithium, critical for manufacturing batteries in **electric vehicles (EVs)** and renewable energy storage systems, makes this region a cornerstone of the global energy transition.

Economic Potential

- **Bolivia’s Strategic Role:** With over **21 million metric tons of lithium**, Salar de Uyuni gives Bolivia immense economic leverage in the global market.
- **Challenges:** Political instability, lack of advanced technology, and environmental concerns limit the full-scale extraction of resources.

Other Major Salt Flats

1. **Chile:** Salar de Atacama – Known for its rich lithium and potassium deposits.
2. **Argentina:** Salinas Grandes – A smaller yet significant lithium source.
3. **USA:** Bonneville Salt Flats, Utah – Famous for land speed records and tourism.

Ecological and Cultural Significance

- **Ecology:**
  - Home to unique wildlife, including **flamingos** during the breeding season.
  - Sensitive ecosystem at risk due to unregulated mining and tourism.
- **Cultural Value:**
  - Integral to **local indigenous communities**, who rely on traditional salt mining for their livelihood.

HISTORY, ART & CULTURE

India Maritime Heritage Conclave (IMHC), 2024

Syllabus: Culture and History

Context

The **1st India Maritime Heritage Conclave (IMHC)** was organized by the Ministry of Ports, Shipping, and Waterways, with the theme **"Towards Understanding India's Position in Global Maritime History"**. It emphasized India's rich maritime history and its aspirations as a maritime powerhouse.

Key Highlights of the Conclave

1. **Theme**:
   Focused on exploring India's maritime contributions and positioning in global maritime history.
2. **National Maritime Heritage Complex (NMHC)**:
   - Being developed in **Lothal, Gujarat**, under the **Sagarmala Programme**.
   - Aims to be the **world's largest maritime heritage complex**, showcasing India's maritime legacy.
3. **Objectives**:
   - Promote awareness of India's maritime achievements.
   - Highlight historical trade linkages and naval power.
   - Strengthen India's identity as a **global maritime leader**.

India's Maritime Heritage Timeline

1. **Early Days (3000–2000 BC)**:
   - **Indus Valley Civilization (IVC)**:
     - Maritime trade links with Mesopotamia through ports like Lothal.
2. **Vedic Age (2000–500 BC)**:
   - **Rig Veda**: Earliest reference to maritime activities.
   - Mention of shipbuilding and navigation.
3. **Nandas and Mauryas (500–200 BC)**:
   - **Magadh Navy**: World's first recorded naval force.
   - **Arthashastra**: Mentions the **Department of Waterways** under Mauryan administration.
4. **Satavahana Dynasty (200 BC–220 AD)**:
   - Issued coins depicting **ships**, symbolizing maritime trade.
5. **Gupta Dynasty (320–500 AD)**:
   - Flourished in **ocean navigation** and **trade**.
   - Documented by travelers **Fa-Hein** and **Huen Tsang**.
6. **Southern Dynasties**:
   - **Chera Dynasty**: Ports like **Tyndis** and **Muziris** were significant trade centers.
7. **Marathas**:
   - **Shivaji's Navy**: Had over **500 ships**, symbolizing naval dominance.

ENVIRONMENT & ECOLOGY

Role of Indigenous Communities in Combating Desertification

Syllabus: Environment

Source: UNCCD COP16

Context:

The **first-ever Indigenous Peoples Forum** at COP16 of the United Nations Convention to Combat Desertification (UNCCD) emphasized the vital role of **indigenous communities** in combating desertification, protecting green areas, and fostering sustainable resource management.

Who are Indigenous Peoples?

- **Definition:** Tribal communities practicing distinct traditions, social, cultural, economic, and political systems, differing from dominant societies.
- **Examples:**
  - **Global:** Aborigines (Australia), Maori (New Zealand).
  - **India:** Santhals, Khasi, Garo tribes.
- **Global Presence:** Represent **5% of the world's population** and act as **custodians of 22% of Earth's green areas.**

Role of Indigenous Communities:

1. **Regenerative Agriculture & Agroforestry:**
   - **Example:** Mayan people's **Milpa technique** (polyculture-based agriculture) enhances soil fertility and biodiversity.
2. **Protected Area Management:**
   - **Example:** Soligas Tribe's active management of the **Biligiri Rangaswamy Temple Wildlife Sanctuary (BRTWS)** in India ensures biodiversity conservation.
3. **Forest Restoration:**
   - **Example:** Khasi and Garo tribes' **Sacred Groves** in Meghalaya prevent deforestation and preserve native flora.
4. **Water Management:**
   - **Example:** Traditional **karez** or **surang bavi** systems in Bidar (India) are efficient methods of rainwater harvesting.

Challenges Faced by Indigenous Communities:

1. **Extreme Poverty:** Limited access to economic opportunities.
2. **Forced Displacement:** Threatens their land and cultural heritage.
3. **Gender Discrimination:** Indigenous women face marginalization.
4. **Lack of Political Representation:** Minimal voice in policy-making.
5. **Access to Services:** Inadequate healthcare, education, and financial services.
6. **Climate Change:** Intensifies resource scarcity, affecting their survival and practices.

Recommendations:

1. **Inclusion in Decision-Making:**
   Indigenous peoples must be included in **global policy frameworks** for environmental conservation.
2. **Land Rights and Financing:**
   Recognize and protect their land rights with **direct financial access** to enhance conservation efforts.
3. **Integrate Traditional Knowledge:**
   Policies should incorporate **indigenous practices** for sustainable resource management.

Steps Taken in India for Green Area Protection Using Indigenous Knowledge:

1. **Joint Forest Management (JFM):**
   Engages local communities in managing degraded forest lands under government control.
2. **Green India Mission (GIM):**
   Focuses on protecting, restoring, and enhancing forest cover.
3. **Traditional Knowledge Digital Library (TKDL):**
   A digital repository to prevent **biopiracy** and protect indigenous knowledge.
4. **Forest Rights Act (FRA) 2006:**
   Empowers tribal communities by granting **community rights** over forest resources and practices.

UNEP Champion of the Earth 2024

Syllabus: Environment and Ecology
Source: *The Times of India*

Context:

Indian ecologist **Madhav Gadgil**, celebrated for his pioneering work on the **Western Ghats**, has been honored as a **UNEP Champion of the Earth 2024** in the **Lifetime Achievement** category.

About UNEP Champions of the Earth Awards:

Origin:

- **Established in:** 2005
- **Awarded by:** United Nations Environment Programme (UNEP)
- **Aim:** To recognize individuals, groups, and organizations for their transformative contributions to the **environment**.

Award Categories:

1. **Lifetime Achievement:** Recognizing a lifetime of environmental advocacy and action.
2. **Policy Leadership:** For those shaping policies to drive environmental progress.
3. **Inspiration and Action:** Honoring exceptional grassroots initiatives and advocacy.
4. **Science and Innovation:** Highlighting advancements in science and technology to address environmental challenges.
5. **Entrepreneurial Vision:** For business models promoting sustainability.

UNEP Champions of the Earth 2024 Winners:

Winner	Country/Organization	Category	Contribution
Madhav Gadgil	India	Lifetime Achievement	Advocacy for **ecosystem conservation**, particularly in the **Western Ghats**.
Sonia Guajajara	Brazil	Policy Leadership	Championing **Indigenous rights** and combating deforestation in the **Amazon Rainforest**.
Amy Bowers Cordalis	USA	Inspiration and Action	Efforts in **restoring the Klamath River ecosystem** and protecting Indigenous rights.
Gabriel Paun	Romania	Inspiration and Action	Protecting **Europe's last old-growth forests** in the Carpathian Mountains.
Lu Qi	China	Science and Innovation	Leading initiatives to reverse **desertification** and promote large-scale **afforestation** projects.
SEKEM	Egypt	Entrepreneurial Vision	Pioneering **sustainable agriculture** and transforming **deserts into arable lands**.

About Madhav Gadgil:

- **Contribution:** Known for developing the **Gadgil Report**, a framework for sustainable development and conservation in the **Western Ghats**.
- **Legacy:** Advocates for **inclusive environmental governance** by involving local communities in conservation efforts.
- **Recognition:** Acknowledged for integrating **science and indigenous knowledge** in ecosystem preservation.

Significance of the Awards:

1. **Inspiration:** Highlights innovative environmental solutions across diverse fields.
2. **Global Impact:** Recognizes efforts addressing global environmental challenges like **deforestation**, **desertification**, and **biodiversity loss**.
3. **Policy Influence:** Promotes replication of successful models in **sustainability** and **climate action**.

India Launched the World's First Green Steel Taxonomy

Syllabus: Environment and Climate Change – Energy and Industry
Source: Ministry of Steel

Context:

India has launched the world's first **Green Steel Taxonomy**, setting benchmarks for sustainable steel production to promote decarbonization in the steel industry. This taxonomy introduces classification systems and star ratings based on emission intensity.

Key Features of Green Steel Taxonomy:

1. **Definition of Green Steel:**
   - **Green Steel:** Steel with **CO2 equivalent (CO2e) emission intensity** of less than **2.2 tonnes** of CO2e per tonne of finished steel.
2. **Star Rating System:**
   - **Five-Star Rated Steel:** Emission intensity below **1.6 tonnes**.
   - **Four-Star Rated Steel:** Emission intensity between **1.6 and 2.0 tonnes**.
   - **Three-Star Rated Steel:** Emission intensity between **2.0 and 2.2 tonnes**.
   - **Review Period:** Thresholds for ratings will be revised every **three years**.
3. **Nodal Agency:**
   - The **National Institute of Secondary Steel Technology (NISST)** will oversee:
     - **Measurement, Reporting, and Verification (MRV)** of emission intensity.
     - Issuance of **greenness certificates** and **star ratings** annually.

Importance of the Green Steel Taxonomy:

1. **Advancing Decarbonization in the Steel Industry:**
   - Supports the upcoming **₹15,000 crore Green Steel Policy**, fostering low-carbon manufacturing.
2. **Global Competitiveness:**
   - Ensures Indian steel remains competitive under global mechanisms like the **EU's Carbon Border Adjustment Mechanism (CBAM)**.
   - Positions India as a leader in green steel innovation.
3. **Innovation and Market Growth:**
   - Encourages **technological advancements** in steel production.
   - Creates a market for **low-carbon products**, aligning with global environmental goals.

Key Initiatives to Decarbonize the Steel Sector in India:

1. **National Mission for Enhanced Energy Efficiency (NMEEE):**
   - Part of the **National Action Plan for Climate Change (NAPCC)** to promote energy efficiency.
2. **Perform, Achieve, and Trade (PAT) Scheme:**
   - A **market-based mechanism** to improve energy efficiency and trade **Energy Saving Certificates (ESCerts)**.
3. **Green Hydrogen Energy Mission:**
   - Promotes green hydrogen as a clean energy alternative for industries, including steel production.
4. **National Solar Mission:**
   - Supports the use of renewable energy in steel manufacturing processes.
5. **Steel Scrap Recycling Policy (2019):**
   - Aims to enhance steel recycling, reducing energy consumption and emissions.

Manganese Contamination: A Growing Health Concern

Source: Down to Earth (DTE)

Context: A recent study by the Mahavir Cancer Sansthan in Patna highlights significant manganese (Mn) contamination in water as a major contributor to the rising cancer cases in Bihar's Gangetic region.

What is Manganese?

- **Definition:**
  Manganese is a **naturally occurring metal** present in oxides, carbonates, and silicates.
- **Essential Role:**
  While necessary in **trace amounts** for human health, it becomes **toxic** in higher concentrations.

WHO Limits for Manganese in Water

- **Permissible Limit:**
  100 µg/L as per World Health Organization (WHO) recommendations.

Reasons for Manganese Contamination in Water

1. **Geogenic Sources:** Naturally occurring **manganese deposits** in sedimentary and igneous rocks leach into groundwater.
2. **Industrial Pollution:** Effluents from **mining, steel production, and battery industries** contaminate nearby water sources.
3. **Agricultural Runoff:** Excessive use of **fertilizers and pesticides** introduces manganese into the water table.
4. **Erosion and Sedimentation: Soil erosion** and sedimentation from natural processes elevate manganese levels in water.

Health Impacts of Excess Manganese in Water

1. **Neurological Disorders:** Prolonged exposure leads to **weakness, clumsiness, emotional instability**, and difficulty in movement.
2. **Carcinogenesis (Cancer Development):** Chronic exposure is linked to **cancer**, with higher contamination levels noted in advanced cancer cases in Bihar's Gangetic plains.

Regions Affected by Manganese Contamination

India:

- **Bihar's Gangetic Plains:** High levels linked to rising cancer rates.
- **West Bengal:** Murshidabad and 24 Parganas districts.
- **Karnataka:** Tumkur region.

Global Hotspots: Nigeria, Bangladesh, China, Japan, Greece.

Key Takeaways:

- **Manganese in water** poses serious health risks, particularly in regions with naturally occurring deposits or industrial activities.
- The study underscores the **urgent need for monitoring and mitigation** to protect public health, especially in vulnerable regions like Bihar.

Actionable Measures:

1. **Monitoring Systems:** Establish robust **groundwater quality monitoring** frameworks.
2. **Regulatory Compliance:** Enforce **strict industrial discharge norms** and regulate agricultural runoff.
3. **Community Awareness:** Conduct awareness campaigns about **health impacts** and promote the use of **water filters**.
4. **Remediation Technologies:** Invest in technologies for **manganese removal**, such as oxidation and adsorption techniques.

By addressing these factors, the health and environmental risks associated with manganese contamination can be effectively mitigated.

Decent Work in Nature-Based Solutions (NbS) Report Released

Syllabus: Environment, Employment, Sustainable Development

Key Findings of the Report

- **Employment:**
  - **60.5–63 million people** (1.8% of global employment) work in NbS globally.
  - **Asia-Pacific Region:** 95% of this employment is concentrated here, driven primarily by programs like **MGNREGS**.
- **Youth Employment:**
  - Approximately **14% of NbS workers** are youth aged **15–29**.
- **Women Employment:**
  - Women constitute **1/3rd of the global NbS workforce**.
- **Contribution to GDP:**
  - NbS contributes only **0.3% to the global GDP**.
- **Future Opportunities:**
  - **Green-grey infrastructure** can create **20–32 million new jobs by 2030**.

Key Recommendations for Propelling NbS Adoption

1. **Strengthen National NbS Policy Frameworks:** Integrate NbS into **infrastructure**, **agriculture**, and other development sectors.
2. **Training Programs for Skills Development:** Incorporate NbS into **education and training curricula** in rural and urban areas.
3. **Promote Workforce Inclusivity:** Ensure **fair wages**, **safe working conditions**, **social dialogue**, and **protection for marginalized communities**.
4. **Enhance Research and Data Collection:** Improve **data on NbS employment**, **skills**, and project outcomes for informed decision-making.

About Nature-Based Solutions (NbS)

- **Definition:**
  - Actions addressing societal challenges through the **protection**, **sustainable management**, and **restoration** of ecosystems.
  - They benefit both **biodiversity** and **human well-being**.
- **Examples:**
  - **Protecting coral reefs**, **building greener cities**, afforestation, and watershed management.

Significance of the Report

- **Socio-Economic Benefits:**
  - Enhances employment in climate-resilient sectors.
  - Provides opportunities for **youth** and **women**, driving inclusive growth.
- **Environmental Impact:**
  - Strengthens global efforts for **biodiversity conservation** and combating climate change.
- **Alignment with SDGs:**
  - Supports multiple **Sustainable Development Goals**, including **Goal 8 (Decent Work)**, **Goal 13 (Climate Action)**, and **Goal 15 (Life on Land)**.

BIOTECHNOLOGY & HEALTH

Nafithromycin: India's First Indigenous Macrolide Antibiotic

Context

India has achieved a landmark in addressing **Antimicrobial Resistance (AMR)** with the development of **Nafithromycin**, a breakthrough indigenous antibiotic.

About Nafithromycin

Developed By: Wockhardt Ltd., in collaboration with the **Biotechnology Industry Research Assistance Council (BIRAC)**under the **Biotech Industry Program**.

Key Objectives

1. **Combat AMR**: Address infections caused by drug-resistant bacteria.
2. **Treat Community-Acquired Bacterial Pneumonia (CABP)**: A major cause of morbidity and mortality.

Effectiveness

- **Enhanced Potency**:
  - **10 times more effective** than existing macrolides like azithromycin.
  - Effective against **typical** and **atypical drug-resistant bacteria**.
- **Shorter Treatment Regimen**:
  - A **three-day course** compared to longer regimens for other antibiotics.
- **Safety Profile**:
  - Superior safety, minimal side effects, and enhanced patient compliance.

Significance

1. First in Its Class: Marks the **global introduction** of a new **macrolide antibiotic** after over **three decades**.

2. AMR Crisis Management

- **WHO estimates** that by 2050, AMR could cause **10 million deaths annually**.
- Nafithromycin provides a critical solution to curb the rising burden of **AMR infections**.

3. Targeted Treatment

- Especially effective for **vulnerable groups**, including:
  - Children
  - Elderly populations

4. Reducing Healthcare Costs: Faster recovery reduces **hospital stays** and **treatment costs**.

Antimicrobial Resistance (AMR) and Nafithromycin's Role

What is AMR?

- The resistance of microorganisms (bacteria, fungi, viruses) to **antimicrobial treatments** like antibiotics, rendering standard medications ineffective.

AMR in India

- India is among the countries with the **highest AMR burden** due to overuse of antibiotics, poor sanitation, and unregulated sales.

Nafithromycin's Contribution

- Reduces dependency on older antibiotics.
- A critical **step forward** in India's **National Action Plan on AMR**.

Way Ahead

1. **Strengthen R&D for New Antibiotics:** Enhance funding and collaboration in **antibiotic innovation**.
2. **Promote Responsible Use:** Raise awareness about **rational antibiotic use** to limit resistance.
3. **Scale-Up Production:** Expand manufacturing for **domestic and global markets**.
4. **Global Leadership in AMR Solutions:** Position Nafithromycin as a model for India's **biotechnology leadership** in addressing **global health challenges**.

World Malaria Report 2024

Syllabus: Health and International Organizations
Source: WHO

Key Findings

1. **Global Trends:**
   - **Malaria Cases:** Increased to **263 million in 2023**, up from 58.6 per 1,000 population at risk in 2022 to **60.4 per 1,000 population**.
   - **WHO African Region:** Accounts for **94% of global malaria cases**.
2. **India-Specific Findings:**
   - **Decline in Cases:** Cases reduced by **69%**, from **6.4 million (2017)** to **2 million (2023)**.
   - **Decline in Deaths:** Deaths declined by **68%**, from **11,100 (2017)** to **3,500 (2023)**.
   - **HBHI Group Exit:** In **2024**, India exited the **High Burden to High Impact (HBHI)** group.

About Malaria

1. **Cause:**
   - Caused by **Plasmodium parasites**, transmitted through infected **female Anopheles mosquitoes**.
2. **Geographical Prevalence:**
   - Predominantly affects **tropical regions**.
3. **Symptoms:**
   - Fever, chills, headache, fatigue, nausea, and vomiting.
4. **Plasmodium Species:**
   - **Major Threats:** *P. falciparum* and *P. vivax*.
   - Other species include *P. malariae*, *P. ovale*, and *P. knowlesi*.
5. **Malaria Vaccines:**
   - **RTS,S/AS01 Vaccine:** First WHO-approved vaccine (2021).
   - **R21/Matrix-M Vaccine:** Second WHO-approved vaccine (2023).

Initiatives to Combat Malaria

1. **WHO Initiatives:**
   - **Global Technical Strategy for Malaria (2016–2030):** Updated in 2021 to provide a comprehensive framework for malaria-endemic countries.
2. **India's Efforts:**
   - **National Strategic Plan: Malaria Elimination 2023–2027** to achieve malaria-free status.

Factors Increasing Malaria Vulnerability

1. **Biological Factors:**
   - **Age, sex, and immune response:** Children and pregnant women are particularly vulnerable.
   - Genetic factors such as **sickle cell traits**.
2. **Environmental Factors:**
   - **Climate variability:** Warmer temperatures and increased rainfall boost mosquito breeding.
   - **Land-use changes:** Deforestation and urbanization expose more populations to mosquito habitats.
3. **Social and Economic Factors:**
   - **Low socioeconomic status:** Limited access to preventive measures and healthcare.
   - **Migrant populations:** Lack of healthcare infrastructure for transient groups.
4. **Structural Challenges:**
   - Conflicts and migration disrupt healthcare systems.
   - Limited healthcare accessibility in remote areas increases vulnerability.

Way Forward

1. **Scaling Vaccination Campaigns:**
   - Expand access to **RTS,S/AS01** and **R21/Matrix-M** vaccines.
2. **Strengthen Surveillance:**
   - Use **digital tools** for real-time monitoring of malaria outbreaks.
3. **Environmental Management:**
   - Encourage **vector control measures** like indoor residual spraying and use of insecticide-treated bed nets.
4. **Community Engagement:**
   - Increase **awareness** through grassroots campaigns.
5. **Focus on Innovation:**
   - Research in **genetic mosquito control** and innovative therapies.

Department of Biotechnology Develops India's First Gene Therapy for Haemophilia A

Syllabus: Science and Technology
Source: DBT

About the Gene Therapy for Haemophilia A:

- **Developed by:** Department of Biotechnology (DBT) and Centre for Stem Cell Research (CSCR).
- **Mechanism:**
  - Uses **lentiviral vectors** to introduce a **normal copy of the Factor VIII gene** into **autologous hematopoietic stem cells (HSCs)**.
  - **HSCs:** Multipotent cells that can develop into various types of blood cells.
  - **Lentiviral Vectors:** A type of viral vector used to deliver genetic material to cells.

About Gene Therapy:

- **Definition:** A technique to treat, prevent, or cure diseases by manipulating genes.
- **How It Works:**
  - Replaces faulty genes.
  - Deactivates harmful genes.
  - Introduces new genes to improve health.
- **Methods Used:**
  - **Plasmid DNA:** Circular DNA molecules engineered for therapy.
  - **Human Gene Editing Technologies:** CRISPR-Cas9 and other advanced tools.
- **Types of Gene Therapy:**
  1. **Germline Gene Therapy:**
     - Modifies germline cells (egg or sperm).
     - Heritable changes that pass to offspring.
  2. **Somatic Cell Gene Therapy:**
     - Alters somatic cells (non-reproductive).
     - Changes affect only the treated individual.
- **Applications:**
  - **Inherited Genetic Disorders:** Sickle cell disease, cystic fibrosis.
  - **Acquired Disorders:** Cancer (leukemia), haemophilia.

About Haemophilia:

- **Definition:** A rare genetic condition where blood fails to clot due to deficiency in clotting factors.
- **Types:**
  - **Haemophilia A:** Caused by deficiency of Factor VIII.
  - **Haemophilia B:** Caused by deficiency of Factor IX.
- **Impact in India:**
  - India bears the **world's second-largest burden** of haemophilia.
  - Limited access to advanced treatments exacerbates the problem.

Significance of the Therapy:

1. **Medical Breakthrough:**
   - Offers a potential **cure** for Haemophilia A.
2. **Reduced Dependence on Factor VIII Injections:**
   - Enhances quality of life by eliminating regular clotting factor administration.
3. **Boost to Indigenous Healthcare R&D:**
   - Positions India as a leader in **advanced medical therapies**.
4. **Global Relevance:**
   - Scalable solution for haemophilia treatment worldwide.

Challenges in Gene Therapy Implementation:

1. **High Costs:**
   - Gene therapy remains expensive and inaccessible for many patients.
2. **Complex Technology:**
   - Requires highly specialized infrastructure and expertise.
3. **Regulatory Hurdles:**
   - Strict guidelines to ensure safety and efficacy.
4. **Potential Risks:**
   - Unintended genetic modifications or immune reactions.

Way Forward:

1. **Affordable Gene Therapy:** Government and private partnerships to make gene therapy accessible.
2. **Skill Development:** Train healthcare professionals in advanced genetic technologies.
3. **Regulatory Framework:** Develop robust and flexible guidelines to facilitate therapy deployment.
4. **Increased Awareness:** Promote public understanding of genetic diseases and therapies.

UNESCO Environmental DNA (eDNA) Expeditions Conducted in World Heritage Marine Sites (WHMS)

Syllabus: Environment and Ecology

About UNESCO's eDNA Expeditions

- **Objective:** A global **citizen science initiative** to measure **marine biodiversity** and assess the **impact of climate change**on species distribution.
- **Timeline:** eDNA sampling campaigns were conducted across **21 of 51 UNESCO WHMS** between **September 2022 and July 2023**.

About Environmental DNA (eDNA)

1. **Definition:**
   - **Genetic material** left by organisms in the environment, including DNA from cells, tissues, fluids, or excrement, collected from environmental samples like water or soil.
2. **Significance of eDNA:**
   - **Large-Scale Application:** Effective for **geographically distant** and **vast areas**.
   - **High Sensitivity:** Enables rapid detection of marine biodiversity with greater accuracy.
   - **Non-Invasive:** Sustainable and eco-friendly sampling.
   - **Cost-Effective:** Reduces the cost of traditional biological surveys.
   - **Rare Species Detection:** Identifies rare or **invasive species** (e.g., lionfish detection in Belize).
3. **Limitations of eDNA:**
   - **Limited Data:** Confirms presence but not **size, sex, or life stage** of organisms.
   - **Identification Challenges:** Incomplete DNA reference databases can hinder precise species identification.
   - **Prone to Contamination:** Requires stringent handling and analysis protocols.

- **High Laboratory Costs:** Sampling analysis involves advanced and expensive equipment.

UNESCO World Heritage Marine Sites (WHMS)

1. **Global Significance:**
   - Cover **over one-fifth** of the world's blue carbon ecosystems.
   - Store carbon assets equivalent to **10% of global greenhouse gas emissions**.
2. **Indian Context:**
   - **Sundarbans National Park** is the only Indian WHMS.
   - India hosts **26 MPAs (Marine Protected Areas)** in the Peninsular region and **106 MPAs** in its Islands.
3. **Threats to WHMS:**
   - **Climate Change:** Over **70% of WHMS** face risks from rising temperatures.
   - Host **35% of threatened marine species**, as per IUCN data.
4. **Role of WHMS:**
   - Act as **proxies** for a global network of over **18,000 MPAs**, showcasing best practices in marine conservation.

Disease X: A Global Health Threat

Syllabus: Health – Pandemic Preparedness
Source: The Hindu

Context:

A recent outbreak in the Democratic Republic of Congo, with over 400 fatalities, has reignited focus on **Disease X**, a hypothetical pathogen first highlighted by the **WHO in 2018** as a critical global health concern.

What is Disease X?

1. **Definition:** A placeholder term for an **unknown, highly infectious pathogen** capable of causing a global pandemic.
2. **Potential Causes:** Could originate from **viruses, bacteria, fungi, zoonotic sources**, or even bioterrorism.
3. **Historical Context:** Conceptualized after the **2014–2016 Ebola outbreak**, revealing gaps in **pandemic preparedness**.
4. **Severity:** Predicted to be **20 times more lethal than SARS-CoV-2.**

Key Features of Disease X:

1. **Novel Threat:** Represents pathogens with **no known medical countermeasures.**
2. **Zoonotic Potential:** Likely to emerge from **animal-human interactions**, especially in areas with poor surveillance.
3. **Environmental Links:** Driven by **deforestation, urbanization, and climate change.**
4. **Global Impact:** High mortality rates and the potential to **overwhelm healthcare systems.**

WHO Priority List of Pathogens:

1. **Purpose:** Guides global health research and preparedness for diseases with **high epidemic potential** but lacking vaccines or treatments.
2. **Pathogens Included: Ebola, Marburg, Lassa fever, Nipah, Rift Valley fever, Zika,** and **Disease X.**
3. **Criteria:** Rapid transmission, **high mortality**, and inadequate medical countermeasures.

Emerging Disease Patterns:

1. **Zoonotic Origins:**
   - Approximately **70% of emerging diseases** originate from animals.
2. **Environmental Factors:**
   - **Deforestation, urbanization,** and intensive agriculture amplify disease spillovers.
3. **Globalization:**
   - Interconnected **travel and trade** turn localized outbreaks into global pandemics.
4. **Undiscovered Pathogens:**
   - Over **1.7 million unknown viruses** in wildlife could infect humans.

Global Initiatives to Counter Disease X:

1. **WHO-Led Efforts:**
   - **Pandemic Treaty:** Promotes **global cooperation** for preparedness and equitable resource distribution.
   - **Pandemic Fund:** Strengthens health systems in **low-income nations.**
   - **mRNA Technology Hub:** Builds vaccine production capacity in developing countries.
   - **BioHub System:** Facilitates global sharing of pathogens.

2. **Indian Efforts:**
    - **Integrated Disease Surveillance Programme (IDSP):** Tracks outbreaks and monitors trends.
    - **National Institute of Virology:** Researches viral pathogens and zoonotic diseases.
    - **Emergency Response Fund:** Allocates resources for rapid pandemic responses.

Challenges in Predicting Disease X:

1. **Unpredictable Emergence:**
    - Complex interactions between **humans, animals, and the environment.**
2. **Vast Pathogen Pool:**
    - Only a fraction of human-infecting pathogens are identified.
3. **Climate Change:**
    - Expands the range of **vector-borne illnesses** and alters transmission dynamics.
4. **Resource Inequity:**
    - Disparities in **healthcare infrastructure** between nations hinder global preparedness.
5. **Technological Gaps:**
    - Limited genomic data and inadequate global **surveillance systems.**

Way Forward:

1. **Strengthen Surveillance:**
    - Expand **real-time genomic sequencing** and AI-driven outbreak prediction tools.
2. **Global Cooperation:**
    - Promote equitable sharing of **vaccines, diagnostics, and treatments.**
3. **Public Health Investment:**
    - Build robust healthcare infrastructure, particularly in **vulnerable regions.**
4. **Education and Awareness:**
    - Train healthcare workers and raise **community awareness** about emerging threats.
5. **Research and Development:**
    - Develop **universal vaccines** and prototype pathogen platforms.

African Swine Fever (ASF)

Syllabus: Health

Context

An outbreak of **African Swine Fever (ASF)** has been reported in **Kerala's Kottayam district**. Authorities have implemented containment measures such as **culling infected pigs** and declaring **infected zones** to prevent the disease's spread.

What Is African Swine Fever (ASF)?

1. **Definition**: ASF is a **highly contagious viral disease** affecting domestic and wild pigs, causing high mortality rates.
2. **Origin**: Endemic to **sub-Saharan Africa**, but has spread to **Asia, Europe**, and other regions.
3. **Affected Species**:
    - Exclusively affects **domestic pigs** and **wild boars**.
    - **Not zoonotic**: ASF poses no risk to human health.

How Does ASF Spread?

1. **Direct Transmission**:
    - **Contact with infected pigs** or their body fluids.
    - **Consumption of contaminated pork products.**
2. **Indirect Transmission**:
    - Contaminated surfaces, equipment, or feed.
    - **Soft ticks (Ornithodoros)** act as vectors.
3. **Human-Mediated Spread**:
    - Movement of infected pigs, pork products, and contaminated clothing or vehicles.

Symptoms of ASF in Pigs

1. **Physical Symptoms**:
    - **High fever**, loss of appetite, diarrhea, and vomiting.
    - **Inflamed eye membranes** and **red patches on the skin**.
2. **Behavioral Changes**:

   - Lethargy and difficulty moving.
3. **Mortality**:
   - High fatality rates, often causing death within 10 days of infection.

Prevention and Management of ASF

1. **No Vaccine or Cure**:
   - ASF has no effective **vaccine** or **treatment** currently available.
2. **Containment Measures**:
   - **Culling infected pigs** to stop disease spread.
   - Creating **buffer zones** around affected areas.
3. **Biosecurity Measures**:
   - Disinfecting equipment and transport vehicles.
   - Prohibiting the movement of pigs and pork products from affected areas.

Impact of ASF Outbreaks

1. **Economic Losses**: Significant losses for the **pork industry** due to mass culling.
2. **Supply Chain Disruptions**: Affects availability of pork products in local and global markets.
3. **Environmental Concerns**: Improper disposal of carcasses can lead to environmental contamination.

Way Forward

1. **Strengthening Surveillance**:
   - Regular monitoring and testing of pigs for early detection.
2. **International Cooperation**:
   - Sharing research and best practices globally to manage outbreaks.
3. **Developing a Vaccine**:
   - Accelerating global efforts in ASF vaccine development.
4. **Farmer Support**:
   - Providing compensation for culled pigs and supporting pig farmers in recovering losses.

Indian Star Tortoise

Scientific Name: *Geochelone elegans*
IUCN Status: Vulnerable (IUCN Red List)

Key Features:

- **Distinctive Shell:**
  - Obsidian black shell with striking sun-yellow star-like patterns.
  - Dome-shaped in the wild but often pyramid-shaped in captivity due to poor nutrition.
- **Size:** Small to medium-sized tortoises.
- **Diet:** Herbivorous, consuming grasses, leaves, flowers, and fruits.

Habitat:

- Found in **arid and semi-arid regions** of:
  - **Northwest India:** Bordering Pakistan.
  - **South India.**
  - **Sri Lanka.**
- Prefers scrublands, dry areas, and rocky habitats.

Genetic Diversity:

- **Two Genetic Groups:**
  - **Northwestern Group:** Less genetically diverse.
  - **Southern Group:** Highly diverse, indicating greater adaptation to local environmental conditions.

Conservation Status:

1. **Threats:**
   - **Illegal Wildlife Trade:** Often smuggled for exotic pet markets, particularly in Southeast Asia.
   - **Habitat Loss:** Urbanization and agricultural expansion lead to declining natural habitats.

- **Climate Change:** Alters their arid ecosystems.

2. **Legal Protection:**
   - Listed under **Schedule IV** of the **Wildlife Protection Act, 1972** in India, making trade illegal.
   - Included in **Appendix I of CITES,** restricting international trade.

Conservation Efforts:

- **Anti-Poaching Measures:** Strengthening enforcement against illegal trade.
- **Community Engagement:** Encouraging local communities to protect tortoise habitats.
- **Scientific Research:** Genetic diversity studies guide targeted conservation plans.
- **Rehabilitation Programs:** Rescuing and reintroducing trafficked tortoises into the wild.

Significance of Recent Research:

- **Genetic Insights:**
  - Understanding genetic variations helps identify priority areas for conservation.
  - Aids in breeding programs to maintain population diversity.
- **Ecosystem Role:**
  - The tortoise contributes to seed dispersal and maintaining ecological balance in its habitat.

SCIENCE & TECHNOLOGY

MuleHunter.AI: Revolutionizing Fraud Detection in Banking

Context

The Reserve Bank of India (RBI) has introduced **MuleHunter.AI**, a cutting-edge AI tool, to combat the rising menace of **mule bank accounts** that facilitate cybercrime and financial frauds.

About MuleHunter.AI

1. **What is MuleHunter.AI?**
   - An **AI-powered solution** to identify and curb mule accounts used in financial frauds.
   - Developed by the **Reserve Bank Innovation Hub (RBIH)** in Bengaluru.
2. **Objective**
   - To enhance the financial sector's ability to **detect and prevent frauds**.
   - Strengthen banking systems' capacity for **real-time monitoring**.
3. **Functions**
   - **Real-Time Identification**: Detects mule accounts promptly.
   - **Collaborative Framework**: Works in synergy with banks to improve fraud detection and mitigation.
   - **AI/ML Integration**: Employs **Artificial Intelligence** (AI) and **Machine Learning** (ML) for advanced fraud monitoring.

What are Mule Bank Accounts?

1. **Definition**
   - **Mule accounts** are banking accounts used by fraudsters to **launder illicit funds** or carry out illegal transactions.
2. **How They Operate**
   - Fraudsters recruit individuals, often with **limited financial literacy**, to provide their bank accounts for misuse.
   - These accounts are then used for **money laundering** or **phishing schemes**.
3. **Impact**
   - **Money Mules**: Innocent account holders are implicated in investigations, while actual criminals evade detection.
   - **Legal Consequences**: Account holders unknowingly aiding fraud may face **penalties and legal action**.

The Scale of the Problem

1. **Magnitude of Mule Accounts**
   - Over **4.5 lakh mule accounts** have been identified across India.
   - Cases span prominent banks like **SBI**, **PNB**, and **Canara Bank**.
2. **Rising Digital Fraud**
   - With India's rapid **digital banking adoption**, fraudulent activities have surged, necessitating robust fraud detection systems.

Significance of MuleHunter.AI

1. **Enhanced Fraud Detection**
   - Provides banks with a **centralized AI solution** to identify mule accounts efficiently.
2. **Real-Time Monitoring**
   - Reduces response time to suspicious activities, ensuring prompt actions.
3. **Protecting Innocent Account Holders**
   - Prevents misuse of accounts, safeguarding **trust in the banking system**.
4. **Boosting Financial Security**
   - Strengthens India's financial ecosystem against **digital fraud risks**.

Challenges in Tackling Mule Accounts

1. **Awareness Gap**
   - Many individuals are unaware that lending their accounts can lead to **serious legal implications**.
2. **Sophisticated Fraud Techniques**
   - Fraudsters constantly evolve techniques, challenging detection mechanisms.
3. **Inter-Bank Collaboration**
   - Effective fraud detection requires seamless coordination across multiple banks and institutions.

Way Forward

1. **Public Awareness Campaigns**
   - Educate citizens about the **risks of sharing banking information** and becoming money mules.
2. **Inter-Bank Cooperation**
   - Foster real-time data sharing among banks using platforms like MuleHunter.AI.
3. **Regulatory Enhancements**
   - Strengthen regulations to impose strict penalties on fraud facilitators and improve compliance.
4. **AI-Based Innovations**
   - Expand AI-driven solutions for broader applications in fraud detection and prevention.

Fermented Bamboo Shoot (Melye-Amiley)

Syllabus: Science and Technology – Health and Nutrition; North East India – Culture and Traditions

Context

A study by the **Institute of Advanced Study in Science and Technology (IASST)** has revealed that **Melye-Amiley**, a traditional fermented bamboo shoot from **Tripura**, exhibits **anti-obesity properties**. This finding highlights its role in enhancing **metabolic health** and **weight management**.

About Melye-Amiley

1. **Definition**:
   - A **traditional fermented bamboo shoot** product indigenous to Tripura.
   - Known for its **unique flavor** and **nutritional properties**.
2. **Region**: Originates from **Tripura**, a state in **North East India**.
3. **Source**: Derived from **bamboo shoots** through traditional fermentation methods practiced by local communities.

Significance of Melye-Amiley

1. Health Benefits

- **Anti-Obesity Properties**:
  - Reduces **lipid accumulation** in fat cells (adipocytes).
  - Enhances **fat browning regulator genes** and **thermogenic protein expression**, improving metabolic health.
- **Fatty Acid β-Oxidation**:
  - Promotes **mitochondrial biogenesis** and **energy expenditure** through **AMPK signalling pathways**.
- **Nutritional Content**:
  - Rich in **fiber**, **probiotics**, and essential micronutrients.

2. Cultural Importance

- Reflects **Tripura's culinary heritage** and **traditional knowledge**.
- A staple in **ethnic diets**, showcasing the integration of health and culture.

3. Scientific Relevance

- Offers potential as a **natural solution** for managing obesity and related metabolic disorders.
- Represents a step toward **functional foods** derived from indigenous ingredients.

Way Ahead

1. **Research and Development**: Further studies to explore its **long-term health impacts** and **commercial viability**.
2. **Policy Integration**: Promote as a **functional food** under health and nutrition programs like **POSHAN Abhiyaan**.
3. **Economic Opportunities**: Scale up production through **local cooperatives** and **startups**, fostering **livelihood opportunities** in Tripura.
4. **Awareness Campaigns**: Highlight its **health benefits** to boost acceptance among urban consumers.

Antimatter

Syllabus: Science and Technology – Quantum Mechanics and Fundamental Physics

Context

Recent research has advanced understanding of **antimatter**, offering potential explanations for the dominance of matter in the universe and shedding light on its scientific applications.

About Antimatter

What is Antimatter?

- **Definition**: Antimatter consists of **antiparticles**, which have the **same mass** but **opposite charge** as their matter counterparts.
  - Example: **Positron** (antielectron) is **positively charged**, unlike the **negatively charged electron**.
- **Discovery**:
  - **Theorized by**: Paul A.M. Dirac (1928).
  - **Observed by**: Carl Anderson in cosmic rays (1932).

Characteristics of Antimatter

- **Charge**: Opposite to corresponding matter particles.
- **Mass**: Identical to matter particles.
- **Behavior**: When antimatter comes into contact with matter, they annihilate each other, releasing **energy** in the process.
- **Existence**: Scarce in the observable universe due to annihilation during the **Big Bang**.

Origin of Antimatter

- **Big Bang Formation**:
  - Matter and antimatter were formed in nearly equal quantities.
  - A slight asymmetry in their populations led to **matter's dominance**, as most antimatter annihilated.

Matter vs. Antimatter

Aspect	Matter	Antimatter
Definition	Composed of particles like electrons and protons.	Composed of antiparticles with opposite charge.
Charge	Particles can be positive or negative (e.g., proton +).	Opposite charges (e.g., antiproton -).
Interaction	Interacts normally in the universe.	Annihilates matter, releasing energy.
Abundance	Predominates in the observable universe.	Rare; mostly annihilated post-Big Bang.
Examples	Electron (-), Proton (+), Neutron (0).	Positron (+), Antiproton (-), Antineutron (0).
Formation	Formed during and after the Big Bang.	Formed during the Big Bang; annihilated shortly after.

Significance of Antimatter

1. **Understanding Cosmic Origins**:
   - Provides insights into the **asymmetry** between matter and antimatter, addressing one of cosmology's biggest mysteries.
2. **Energy Source**:
   - Annihilation of matter and antimatter produces immense **energy**.
   - Potential for use in **space exploration** and advanced energy systems.
   - Example: 1 gram of antimatter could produce energy equivalent to **several kilotons of TNT**.
3. **Medical Applications**:
   - Used in **positron emission tomography (PET) scans**, enabling high-resolution imaging in **cancer diagnosis**.
4. **Testing Fundamental Physics**:
   - Antimatter aids in testing the **Standard Model of particle physics**.

- Helps probe **quantum mechanics** and **symmetries** in physical laws.

Challenges in Studying Antimatter

1. **Rarity**: Extremely scarce in nature, making it difficult to collect and study.
2. **Containment**: Requires advanced technology like **magnetic traps** to prevent annihilation on contact with matter.
3. **Cost**:
   - Production of antimatter in laboratories is **highly expensive**.
   - Example: Producing 1 milligram of antimatter could cost billions of dollars.

Willow: Google's Quantum Computing Chip

Syllabus: Science & Technology

About Willow Chip

1. **Technology:**
   - Operates using **superconducting transmon qubits**, which are tiny electrical circuits that exhibit quantum behavior at extremely low temperatures.
   - Designed to perform complex computations significantly faster than classical computers.
2. **Performance:**
   - Solves computations in under **5 minutes** that would take the **world's fastest supercomputers 10 septillion years (10^25)** to complete.

About Quantum Computing

1. **Definition:**
   - Utilizes the principles of **quantum mechanics** to solve complex problems more efficiently than traditional computers.
2. **Key Differences:**
   - **Traditional Computers:** Use bits (0 or 1).
   - **Quantum Computers:** Use **qubits**, which can represent both **0 and 1 simultaneously** due to superposition.
3. **Principles of Quantum Mechanics:**
   - **Superposition:** Enables qubits to exist in multiple states simultaneously, enhancing parallel processing.
   - **Entanglement:** Quantum particles interact such that the state of one directly influences another, no matter the distance.
   - **Decoherence:** The loss of quantum states due to environmental interactions.
   - **Interference:** Enhances the probability of correct solutions by amplifying favorable quantum states.

Applications of Quantum Computing

1. **Artificial Intelligence (AI) & Machine Learning (ML):** Faster model training and optimization.
2. **Cybersecurity:** Develops quantum-proof encryption and breaks traditional cryptographic systems.
3. **Financial Modeling:** Simulates market behavior and optimizes investment portfolios.
4. **Drug Development:** Analyzes molecular and protein interactions for faster pharmaceutical discoveries.
5. **Weather Forecasting:** Processes vast data sets for accurate predictions.
6. **Traffic Management:** Optimizes logistics and traffic systems.

Challenges of Quantum Computing

1. **Quantum Errors:** High sensitivity to noise and decoherence impacts accuracy.
2. **Scalability:** Specialized techniques and materials are required to build larger, reliable systems.
3. **Short Qubit Lifespan:** Qubits lose coherence rapidly, limiting computation time.
4. **Security Concerns:** Current quantum systems lack robust security protocols.
5. **Skilled Workforce Shortage:** Limited expertise in quantum technology and research.

India's Initiatives for Quantum Computing

1. **National Quantum Mission:**
   - Aims to **scale up scientific and industrial R&D** and create a thriving quantum technology ecosystem.
2. **Quantum Enabled Science & Technology (QuEST):**
   - Focuses on **research** to enhance national quantum capabilities.
3. **Quantum Frontier:**
   - Part of the **PM-STIAC mission**, supporting innovation in quantum science and technology.

James Webb Space Telescope Confirms Accelerated Expansion of the Universe

Syllabus: Science & Technology, Space Technology
Source: NASA

Key Findings from JWST:

- **Accelerated Expansion:** JWST data corroborates earlier Hubble Space Telescope findings that the universe is expanding **8% faster** than the predicted Hubble Constant.
- **Hubble Constant:** The theoretical rate of expansion is **67-68 km/s per megaparsec**, but telescope observations suggest a higher range of **70-76 km/s per megaparsec**.
- **Hubble Tension:** This discrepancy between predicted and observed expansion rates is termed the **Hubble Tension**.

Probable Causes of Expansion:

1. **Dark Matter (27% of the Universe):**
   - Hypothetical invisible matter inferred through its gravitational effects.
   - Stabilizes galaxies and contributes to cosmic structure formation.
2. **Ordinary Matter (5% of the Universe):**
   - Composed of stars, planets, moons, and other observable phenomena.
3. **Dark Energy (69% of the Universe):**
   - A proposed force responsible for the accelerated expansion of the universe.
   - Acts as an "anti-gravity" force, stretching the spacetime fabric.

Evidence Supporting Universal Expansion:

1. **Redshift of Galaxies:**
   - Light from distant galaxies shifts toward the red end of the spectrum, indicating they are moving away.
2. **Cosmic Microwave Background (CMB):**
   - Residual radiation from the Big Bang detected uniformly across the universe.
3. **Supernovae Observations:**
   - Distant supernovae appear dimmer than expected, suggesting an accelerating expansion.
4. **Gravitational Waves Observations:**
   - Provide insights into the dynamics of cosmic expansion.

Significance of Findings:

- **Cosmological Understanding:**
  - Challenges existing models of the universe and pushes the need for a revised cosmological framework.
- **Dark Energy and Matter Insights:**
  - Provides new avenues to understand these mysterious forces.
- **Technological Advancements:**
  - Demonstrates JWST's capability to refine our understanding of cosmic phenomena.

Way Ahead:

1. **Improved Measurements:**
   - Use advanced telescopes like JWST to refine the Hubble Constant.
2. **Collaborative Research:**
   - Integrate data from multiple observatories to resolve Hubble Tension.
3. **Theoretical Advances:**
   - Develop new models of physics that account for discrepancies in cosmic expansion.

ISRO Successfully Tests CE20 Cryogenic Engine

Syllabus: Science and Technology – Space Technology

Context:

The Indian Space Research Organisation (ISRO) successfully conducted the **sea-level hot test** of its **CE20 Cryogenic Engine** at the ISRO Propulsion Complex in **Mahendragiri, Tamil Nadu**. This marks another milestone in India's cryogenic technology advancements, crucial for ambitious space missions.

About Cryogenic Engine:

Definition:
Cryogenic engines use propellants in their liquid state at extremely low temperatures, combining **Liquid Oxygen (LOX)**as the oxidizer and **Liquid Hydrogen (LH2)** as the fuel.

Temperature Properties:

- **Liquid Oxygen (LOX):** Remains liquid below **-183°C**.
- **Liquid Hydrogen (LH2):** Remains liquid below **-253°C**.

Working Principle:

- **Cryogenic Pumps:** LH2 and LOX are pumped under high pressure into the combustion chamber.
- **Combustion:** The propellants are ignited in a controlled environment to produce thrust.
- **Nozzle:** High-pressure gases expand and exit through the nozzle to propel the rocket.

Features of CE20 Cryogenic Engine:

1. **Engine Restart Capability:**
   - Equipped with a **multi-element igniter** to facilitate restart during the mission.
   - Essential for **missions like Gaganyaan**, where multiple engine restarts are needed for precise orbital adjustments.
2. **Nozzle Protection System:**
   - Tested to prevent **flow separation** and **vibrations**, enhancing engine reliability.
   - Improves **performance** and ensures efficiency during extensive testing.
3. **Efficiency:**
   - Operates using a **staged combustion process**, maximizing thrust and specific impulse.

Significance of Cryogenic Engines for India's Space Program:

1. **Boost to Space Exploration:**
   - Enables **high-efficiency** launches for missions like **Gaganyaan**, **interplanetary exploration**, and **heavy satellite deployments**.
2. **Enhanced Payload Capacity:**
   - Provides a **higher specific impulse**, enabling rockets to carry **heavier payloads** into space.
3. **Self-Reliance and Technological Mastery:**
   - Mastery of cryogenic technology reduces **dependence on foreign expertise**.
   - Positions India among the **six nations** (USA, France, Russia, China, Japan, and India) with indigenous cryogenic engine technology.
4. **Economic Advantages:**
   - Increases **global competitiveness** in the space launch market by offering **low-cost, high-efficiency launch options**.
5. **Strategic Significance:**
   - Strengthens India's capacity for **defense-related satellite launches** and **space-based surveillance**.

Way Forward for India's Space Program:

1. **Future Missions:**
   - Integrating cryogenic engines in **Chandrayaan**, **Mangalyaan**, and future **human spaceflight missions**.
2. **Technological Upgradation:**
   - Develop next-generation cryogenic engines with **higher thrust** and **reusability**.
3. **Global Collaborations:**
   - Expand cooperation with international space agencies for joint ventures and technology sharing.

Space Pollution: Challenges and Solutions

Syllabus: Space and Technology
Source: The Hindu

Context:

The rapid expansion of space activities has led to significant environmental challenges, including emissions from rocket launches and the growing issue of **orbital debris.**

Present Space Pollution Data and Trends:

1. **Orbital Debris:**
   - Over **13,230 satellites** are in orbit, with **10,200 operational.**

   - Around **36,860 trackable objects** have been generated due to fragmentation events.
2. **Fragmentation Events:**
   - More than **650 collisions and break-ups** have occurred.
3. **Mass in Orbit:**
   - Total orbital mass exceeds **13,000 tonnes**, increasing collision risks.
4. **Growth Rate:**
   - Increasing launches by **private and public entities** overcrowd **Low Earth Orbit (LEO).**

Major Sources of Space Pollution:

1. **Defunct Satellites:**
   - Non-operational satellites that remain in orbit.
2. **Rocket Stages:**
   - Spent stages left in orbit post-launch.
3. **Fragmentation Debris:**
   - Pieces generated from **satellite collisions** and explosions.
4. **Satellite Burnup Ash:**
   - Metallic residues released during **atmospheric re-entry.**

Rocket Emission Impacts:

1. **Emission Composition:**
   - Releases **carbon dioxide, black carbon, and water vapor.**
2. **Black Carbon Effects:**
   - Absorbs sunlight **500 times** more efficiently than CO_2, intensifying warming.
3. **Ozone Depletion:**
   - Chlorine-based propellants damage the **ozone layer.**
4. **Energy Intensity:**
   - Rocket manufacturing consumes significant **energy and resources.**

Major Initiatives to Counter Space Debris:

1. **Kessler Syndrome Mitigation (NASA):**
   - Strategies to avoid cascading collisions in orbit.
2. **ESA's ClearSpace-1:**
   - Robotic mission to remove large debris by **2025.**
3. **Japan's ELSA-d Mission:**
   - Uses **magnetic capture** technology for de-orbiting defunct satellites.
4. **United Nations Guidelines:**
   - Recommends **safe satellite operations** and debris mitigation strategies.
5. **Active Debris Removal (ADR) Projects:**
   - Development of **nets, harpoons, and lasers** for debris capture (e.g., ESA and JAXA).

Dangers of Outer Space Pollution:

1. **Collision Risks:**
   - High-velocity debris can destroy operational satellites, disrupting **communication and navigation.**
2. **Climate Monitoring Disruption:**
   - Space junk hampers **weather prediction** and disaster management systems.
3. **Human Spaceflight Hazards:**
   - Threatens **International Space Station (ISS)** missions.
4. **Cost Escalation:**
   - Increased expenses due to debris **shielding** and orbital adjustments.

Barriers to Space Sustainability:

1. **Lack of Regulation:**
   - Absence of **binding international laws** for emissions and debris management.
2. **Commercial Resistance:**
   - Companies prioritize **cost-efficiency** over sustainability.
3. **Data Sharing Issues:**
   - Security concerns hinder a **unified debris tracking system.**
4. **Outer Space Treaty Gaps:**
   - No enforceable provisions for **environmental safeguards.**

Way Ahead:

1. **Regulatory Frameworks:**
   - Enforce global agreements through **COPUOS** for emissions and debris management.
2. **Green Technology Investment:**
   - Promote **reusable rockets, biodegradable satellites,** and cleaner fuels.
3. **Debris Management:**
   - Develop and deploy **Autonomous Debris Removal (ADR)** systems.
4. **Global Collaboration:**
   - Foster international partnerships for **equitable space access** and environmental protection.
5. **Sustainable Practices:**
   - Incentivize **eco-friendly practices** for private space actors.

Artificial Solar Eclipse

Syllabus: Science and Technology

Context

The European Space Agency (ESA) launched **Proba-3** from India, enabling the creation of **artificial solar eclipses**through **precise formation flying technology**. This innovation allows for extended studies of the **Sun's corona**, an essential component for understanding solar dynamics and space weather.

What is an Artificial Solar Eclipse?

1. **Definition**: An artificial solar eclipse replicates the **natural solar eclipse** by using satellites to block sunlight, enabling scientists to observe the **Sun's corona** under controlled conditions.
2. **Mechanism**: Created by **two satellites** aligned in space to simulate the **moon's role in blocking the Sun's light**, casting a shadow on one satellite.
3. **Purpose**: To facilitate **long-duration studies** of the Sun's corona, which is not possible during natural eclipses due to their short duration.

How It Works

1. **Satellite Pair**:
   - **Coronagraph Spacecraft (CSC)**: Observes the corona.
   - **Occulter (OSC)**: Blocks sunlight by positioning itself between the Sun and the CSC.
2. **Shadow Creation**:
   - The OSC blocks direct sunlight, creating an **artificial shadow** on the CSC, mimicking a solar eclipse.
3. **Precision**:
   - The satellites maintain **millimetre-level alignment** and stay **150 meters apart** using **Precise Formation Flying (PFF)** technology.

Significance of Artificial Solar Eclipse

1. **Extended Observation Periods**:
   - Unlike natural eclipses, which last a few minutes, artificial eclipses enable studies for **up to six hours per orbit**.
2. **Space Weather Predictions**:
   - Provides critical data to predict **geomagnetic storms** caused by solar activity, reducing risks to satellites, power grids, and communication systems.
3. **Scientific Exploration**:
   - **Unravels mysteries** of the Sun's corona, such as why its temperature (millions of degrees Celsius) far exceeds that of the Sun's surface (~5,500°C).
   - Improves understanding of **solar flares**, **coronal mass ejections (CMEs)**, and their impact on Earth.
4. **Technological Advancement**:
   - Demonstrates the potential of **precise satellite formation flying** for future space missions.

Precise Formation Flying (PFF) Technology

1. **Definition**: A technique that enables satellites to maintain **exact positions** relative to each other in orbit.
2. **Mechanism**: Relies on **GPS**, **inter-satellite radio links**, and **automated control systems** to achieve and sustain alignment.
3. **Proba-3 Implementation**: Two satellites remain **150 meters apart** with **millimetre-level precision** to simulate a solar eclipse.
4. **Applications Beyond Eclipses**: Enhances multi-satellite missions for **space telescopes**, **Earth observation**, and **gravitational wave detection**.

Benefits of Artificial Solar Eclipse and PFF Technology

1. **Improved Observations**:
   - Long-duration corona studies enhance understanding of the **Sun's magnetic field** and plasma dynamics.
2. **Space Mission Accuracy**:
   - PFF technology enables **highly accurate satellite configurations**, critical for future missions like **interferometers** and **exoplanet research**.
3. **Earth Impact Mitigation**:
   - Accurate predictions of space weather reduce **economic and technological risks**.
4. **Platform for Innovation**:
   - Demonstrates advanced engineering capabilities, fostering **scientific and commercial space ventures**.